

**OEU**

Observatory of the  
European University

# Methodological Guide

*Lugano, november 2006*



**Prime**

Network of Excellence funded by the European Commission

Strategic management of University research activities

PRIME stands for Policies for Research and Innovation in the Move towards the European Research Area. This Network of Excellence brings together over 200 researchers and 150 PhD students, from four main disciplines, over 40 institutions and 16 countries. The program of activities balances three research actions dedicated to producing world-class research and three structural actions aimed at achieving lasting effects in terms of structuring the field at the European level, those structural actions focusing on database and indicators issues, training, and interactions with the full range of stakeholders.

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PRIME - OEU GUIDE

## *Foreword*

The PRIME project of an «Observatory of the European University» (OEU) is set at the intersection of three movements.

- The growing interest for «macro» studies, allowing for large comparisons or providing general historical perspective;
- The development of focused studies on «excellence» in universities, based on scientometric benchmarking, patent analysis, and university-industry relations;
- The emerging questions on the governance of universities regarding the organisation of research activities, the strategies and related issues such as : laboratories and research centres versus teaching departments, interdisciplinary versus specialised disciplinary organisations, allocation and rewarding mechanisms, articulation between teaching and research positions, career paths in research...

The « Observatory of the European University » project has capitalised on these results and on existing knowledge to develop (with the participating universities):

- a common framework for the characterisation of research activities undertaken in universities; and
- an experiment in gathering data under different institutional conditions.

The overall aim for the creation and implementation of the «Observatory of the European University» was to provide universities with adequate tools for the governance of research activities. The final objective is to provide universities with a benchmark for comparisons with similar universities thanks to the development of a platform of quantitative data at the university-level across Europe.

### **PRIME Network of Excellence**

**<http://www.prime-noe.org/>**

Prime is a network of excellence to develop long-term research and shared infrastructures on policies for research and innovation in the move towards the European Research Area (ERA).

PRIME gathers 49 institutions, 230 researchers and 120 PhD students from 16 European countries.

Prime has developed a specific activity to follow the development of lasting cooperations and integration. It is managed by an independent group (Characterisation Group). Similarly, a specific activity has been developed to foster the participation of research group from New Member states.

Prime is managed by a 12 members executive Committee elected by the members governing board and supported by a 6 members scientific Committee

## PRIME – OEU GUIDE – FOREWORD

Two groups of participants have been interacting in the « Observatory of the European University »: the University Panel which was composed of representatives of (a number of) European universities (see list below) and the Research Team which is composed of all PRIME members.

### List of universities participating in the OEU University Panel and corresponding PRIME researchers

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## P R I M E – O E U G U I D E – F O R E W O R D

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<b>Universities</b>	<b>Country</b>	<b>We are grateful to</b>
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Dortmund Universität	Germany	Dr. Andreas Stich
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The PRIME-OEU Guide builds on the inputs of all people who participated in the project meetings:

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## I. OEU strategic Matrix

Antoine Schoen (IPTS), Jean Thèves (OST)

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Universities all over the world face a fast evolving landscape. Some of the changes which have the mightiest impacting on the EU University system<sup>1</sup> are largely exogenous:

- Universities evolve into an increasingly open context. Their educational function, as well as their research activity must link local responsibilities with open worldwide competition.
- Demographic changes – university is no more a growth industry. The need for adaptation should be analysed in the demographic context of a “greying” of European societies,
- A wide reform of the public sector: universities, like hospitals, need to cope with the rise of new public management; universities must justify themselves in front of an increasing number of public and private stakeholders
- Newly reformulated role of scientific and technological research for helping shape a knowledge society.

This first chapter will present the main current transformations of the EU University through the analysis of the driving trends which are shaping five complementary – and partially overlapping – folds of the University fabric:

- Funding patterns and costing structures
- Human resources
- Academic outcome
- Third mission
- Governance and strategy

The main driving trends shaping the EU University are rather well identified. They point, for instance, at: the increasing margins of autonomy granted to the institutions, the changes in the funding schemes of university research, needs to reach excellence for European research, the challenge of attracting the best and brightest scientists and students...

The five following sections will analyse the trends for each of the five thematic dimensions aforementioned<sup>2</sup>.

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<sup>1</sup> “University” is used here as a generic term which reflects the intrinsic diversity of institutions which are committed in higher education and in research. This diversity concerns the institutional settings (universities, colleges and other higher education institutions), the dimension, and the visibility of research activity conducted (research intensive or research active institutions).

<sup>2</sup> This section builds on the exchanges held with all the participants in the OEU project. It also uses the results of the workshop “*Future of the EU University*” organised by IPTS (European Commission - Directorate General Joint Research Centre) in Brussels on March 23<sup>rd</sup> and 24<sup>th</sup> 2006. Five key speakers have been invited to deliver presentations focused on the selected themes:

- Benedetto Lepori, University of Lugano
- Jürgen Enders, CHEPS, University of Twente

Some difficulties arise from the choice of these five thematic dimensions to describe the universities' operation. In a first place, this focus on research does not seem fit to properly cover the universities teaching mission. But actually, this issue of teaching can still be taken into consideration. For instance considering the funding, the levels of enrolment will be seen as a key element in the financial balance of institutions. Other example: universities' PhD production will be considered as part of the academic outcome. Similarly, with a human resources perspective, the work of university researchers will take into account the teaching work load and student/academy ratios.

A second major difficulty results from the interdependence of trends that can interplay. Some of them can even impact simultaneously on several dimensions of the universities' operation. And the resulting global effects remain partly unknown. For instance, in an ever more competitive environment, where strategic differentiation may be a clue for success, it is not clear what will happen to those institutions who will not adapt to the new constraints. Can bankruptcy be an option for a public university?

Despite these drawbacks, the OEU guide as a whole, like this first chapter, attempts to vertically analyse the universities' operation, along each of these five thematic dimensions.

In a second place this chapter discloses the OEU strategic matrix which presents, according to this thematic perspective a selection of management issues related to the universities' research activities.

The five next chapters, from 2 to 6, deal successively with the five aforementioned thematic dimensions. Each of these chapters provides methodological guidelines for the collection and compilation of data, respectively in the fields of: Funding; Human resources; Academic outcome; Third mission; Governance and strategy

The seventh chapter is an attempt to show how the data collected according with the methodologies presented in these five thematic chapters can be used by an institution for external communication within the scheme of Intellectual Capital Reporting.

The last chapter will propose a preliminary conclusion. It will draw some lessons related to the collection of data and the management of research and it will sketch some possible ways for developing one step further the development of a common framework for the sound characterization of university research.

## **1. Current transformations of the EU University**

### **1. a. Funding patterns and costing structures<sup>3</sup>**

EU University funding - which includes all the budget elements revenues and expenses - is characterised by new patterns: drop of block grants and line item budgets, rise of competitive funding and contract money...

- 
- Andrea Bonaccorsi, University of Pisa
  - Philippe Laredo, University of Manchester
  - Barbara Kehm, University of Kassel

<sup>3</sup> Based on Benedetto Lepori (2006), *Funding patterns and costing structures*, "Future of the EU University", IPTS meeting, March 2006

In the same time, various modalities of costing of research are being implemented throughout the EU universities: full economic costing of research, various levels of overhead ratios...

These transformations raise strategic issues for university management concerning the change of leverage which may weaken the power of universities' rectors, and the sustainability of recurring investments in the institution's infrastructure.

### Key driving trends

The 90's seem to have been a rather favourable period. Micro-scale information converges with OECD data to show a real increase in the total funds of all between 1995 and 2002 and a real increase of revenues per student.

The stabilisation of the number of students due to demographic changes and the flattening of the enrolment rate is a core factor: in the long term, universities will lose a key mechanism for their growth.

Regarding the composition of funding, it can be stated that funding structures are diverse (national, regional budget subsidies; EU, national, regional grants, fees) both across and within countries ("old" and "new" mechanisms co-exist). But the composition of funds did not dramatically change either in the last 10 years. Government allocation remains the dominant source of funds. Student fees have a limited role. Across countries we witness a very large variation in project related funds.

University funding encompasses largely uncharted territories. What are the patterns of the internal distribution of funds within one institution and how does this distribution process impact on the governance of the institutions? How will life-long learning and the enrolment of foreign students affect funding?

## 1. b. Human resources<sup>4</sup>

Universities' human resources include researchers, research staff and Doctorate students. Analysing a university's intellectual capital requires tackling the various issues related to embodied knowledge production (evolution of the number of graduates, specialisation, skills adequacy...) and exploring the factors affecting researchers' careers (mobility, attractiveness of scientific careers, markets for researchers in public and private research sectors...)

### Key driving trends:

The main driving force is the demographic feature, i.e. the declining number of students. European universities are facing two difficulties: they cannot attract foreign students and the current education profile they are not attractive enough for the life-long learning.

Universities are in a transition phase, moving from "interest organisation for academics" towards "producing organisation for clients". This change is characterised by trends of:

- "marketisation" : the competitive to access to scarce resources - researchers, funds and students – which has been afore addressed in the section dealing with the changes in the universities' funding patterns.

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<sup>4</sup> Based on: Jürgen Enders (2006), *Human resources*, "Future of the EU University", IPTS meeting, March 2006.

- **managerialisation** - academic work organisation is submitted to growing accountability requirements concerning the control of the university's main resources: academic work time used for teaching and research. In the past, division of labour prevailed mainly between universities. It was determined by institutional factors, e.g. an educational orientation vs. research universities. A growing division of labour occurs nowadays within the institutions. The professional specialisation is introduced to increase effectiveness and efficiency. This new management model doesn't contribute to make the academic workspace attractive.
- **flexibilisation** – career paths are getting more diversified. Recruitment criteria are no more exclusively limited to academic visibility. Teaching excellence and knowledge transfer experience are already explicitly proposed as alternative criteria to fill a position. Reputation remains a predominant asset. But it is more and more explicitly complemented by other factors: economic capital (ability to raise or compete for funds), social capital (integration in networks). Even senior researchers may be offered fixed term positions for professorship in European universities. This “flexibilisation” may conflict with university's objective to reinforce its academic staff's institutional allegiance towards the institution.
- **internationalisation** of higher education makes research more international as well. Attracting foreign students is crucial in order to make the academic labour market international. Mobility is therefore a very important issue. However there are to date in the EU University landscape only a few incentives for salary increases. The present career paths and wage allocation system can be assessed as not fully satisfactory: it is good for passive researchers and not good for the active ones. A drastic revision may be needed. But financial incentives have limits. Reputation races for star researchers are costly.

### 1. c. Academic outcome<sup>5</sup>

Universities' academic outcome includes various components: the production of codified (i.e. articles in refereed reviews) and embedded knowledge (PhD graduates).

#### Key driving trends:

Differentiation is one strategic option for European universities facing an increasingly competitive environment – an alternative option would be to develop homogenous curriculum and research portfolios all over European regions.

- Differentiation may be horizontal, alongside the vocational vs. academic dimension of the institutions' main mission.
- Differentiation may also be vertical, alongside a disciplinary specialisation vs. generalist orientation.

The need for a differentiated strategic positioning is considered more urgent. But the issues at stake are already tackled de facto by university managers - even if not explicitly as “strategic

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<sup>5</sup> Based on: Andrea Bonaccorsi (2006), *Academic outcome*, "Future of the EU University", IPTS meeting, March 2006.

dilemmas”. Academic production is a trade-off: between teaching and research, between public research and third mission, between undergraduate and postgraduate education...

According to an analysis based on recent data, a lack of horizontal and vertical differentiation prevails in the EU University.

Very few institutions have implemented a strategic choice between teaching and research. Two different institutional models have been identified. On the one hand, the UK and Switzerland have a higher average importance of doctoral students within university strategies and a much larger variability of the indicator of specialisation – i.e. intensity of PhD recipients out of the total student (undergraduate) population. On the other hand, Italy, Norway, Spain and Portugal have a much lower average value for this indicator and an extremely reduced variability. This feature reveals a lack of specialisation: doctoral students are scattered across universities with very different levels of research orientation

The extent of this lack of differentiation is confirmed when studying the individual scientific productivity of academic staff considered as an indicator of university specialisation in research vs. other activities (teaching, third mission). Two different institutional models have been identified. In “Latin” universities an extremely reduced variability prevails - lack of specialisation. Extremely productive scientists work alongside poorly productive ones, in the same institutional setting. This feature reveals a lack of governance mechanisms at the level of an individual university that is not able to select dynamically academic staff. Whereas Switzerland and Norway show a much larger variability of the same indicator across individual universities – a feature which reveals specialisation.

Moreover, the choices made by the EU University in terms of disciplinary specialisation seem to still pay a large tribute to the scientific tradition of the 20<sup>th</sup> century. European academic institutions are perfectly adapted to scientific fields characterized by:

- moderate rate of growth (controllability, limited cognitive distance between senior and junior scientists);
- proliferation pattern only if coupled with a low degree of complementarity and/or a moderate rate of growth;
- convergent pattern of search.

In other words, the European system has performed extremely well for most of the 20<sup>th</sup> century science, while it has had difficulties to adapt to late century new search regimes.

Underinvestment in PhD education and post-doc positions is also analysed as under optimal. Post-docs are a very efficient exploration machinery for public science. The USA takes advantage of the limited number of Post-doc positions in Europe. More than 50% of post-docs in the USA are covered by foreign PhD students, many of which are European (in many cases the best ones).

In the global competition for talents, the attractiveness of European universities is low, for both European and foreign junior people and it diminishes with the development of research career. It is still important at the undergraduate level, when the cost of migration is significant (but still not attractive if language advantages are not present). It diminishes significantly at the doctoral level. And it is at minimum at the post-doc level.

The texture of European universities place heavy constraints on the process of differentiation, particularly in research. This institutional inertia inhibits differentiation, producing highly inefficient outcomes. The main factors hampering the differentiation process pertains to:

- The university governance, i.e. a weak role of President and a tradition of shared governance (in the Academic Senate);
- The structure of university funding, i.e. a large share of government funding is distributed on a per capita/student basis;
- The absence of institutionalized mechanisms for comparison between universities limits the feasibility of vertical differentiation;
- Under empowered users and stakeholders are not in the position to exert sufficient pressure for change;
- Political factors, e.g. shared culture in favour of the principle “all universities are equal”; reluctance to increase student fees

#### 1. d. Third mission<sup>6</sup>

The University’s third mission encompasses the relations between a university and its non academic partners. It supersedes the sole transfer of knowledge towards economic actors (patents, licenses, spin-offs...). The complexity of this issue reflects the richness of the bounds linking the University to the society at large. Third mission should take into consideration

- The transfer of “competences trained through research” to industry;
- The ownership of knowledge (patents, copyright ...), the use of it (University’s spin-offs) and the contracts with industry and public bodies.
- The participation of academics in policy making, including advisory boards.

#### Key driving trends:

Universities have social and economic roles; they are economic and political forces. They are usually important employers in their region and are stakeholders for urban planning and public transport. Universities are also providers of services.

Teaching outcome – qualified brain workers – is the bulk of University’s third mission.

The University’s third mission is very dependent from the type of institution it refers to.

- For institutions providing basic professional higher education - e.g. for “professional bachelors” – the third mission aims mainly at shaping and proposing adequate curricula tailored to local employment needs.

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<sup>6</sup> Based on: Philippe Laredo (2006), *Third mission*, "Future of the EU University", IPTS meeting, March 2006.

- For the growing number of institutions providing specialised professional higher education - e.g. professional masters – the third mission aims mainly at developing an “industry relevant” research portfolio and masters which fit industry needs.
- For – the few - institutions providing academic training and education – i.e. where PhD is the central diploma – the third mission relates to the joint development of research activities with large firms, the strategic management of new intellectual property rights and of spin-off companies and the participation in public debates.

### 1. e. Governance and strategy<sup>7</sup>

Exposed to fiercer competition, universities need to develop consistent strategies in order to attract students, researchers and funds and to foster their scientific visibility. It remains unclear what will happen to those institutions and departments that are losing out in the game.

The reinforcement of the institutional autonomy which has been granted to the EU University has increased the latitude for the governing bodies of higher education institutions to foster their strategic capabilities. The ability of higher education institutions to steer or even influence the scientific orientations of their own research has been analysed as dependant on their internal distribution of powers.

#### Key driving trends:

The most common objective for redefining the relationship between governments and higher education institutions which can currently be identified across most European countries is the substitution of state bureaucracy by forms of multi-level governance. This not only includes more competitive and output-oriented modes of coordination between the state and the higher education institutions and among the higher education institutions themselves but also management-type mechanisms at the institutional level and a corresponding reorganisation of decision-making processes within the institutions. Key instruments in this context are, for example, the introduction of competitive mechanisms for the allocation of public funds, the conclusion of performance contracts between the government and higher education institutions, the introduction of regular evaluations of teaching and research, and the strengthening and “professionalisation” of management functions in the institutions.

Policy makers expect that the introduction of management structures and managerial forms of decision will make it possible to provide high quality education to more people and to have a more relevant research output at the same or even lower cost. However, decision-making structures within higher education institutions, the pace of reforms and priorities differ markedly across European countries.

Looking at those countries in which governance reforms are further advanced, notably the Netherlands, the UK and recently also Austria, the following trends can be observed:

- There is more monitoring of output and fulfilment of duties of academic staff. Apart from setting up incentive structures, performance based contracts with individual academic staff members and departments also lead to a higher amount of pressure with

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<sup>7</sup> Based on: Barbara Kehm (2006), *Governance and strategy*, "Future of the EU University", IPTS meeting, March 2006.

regard to achievements (e.g. output of doctorates and publications, attracting third party funding for research projects, monitoring presence at the working place and fulfilment of teaching duties, issues of intellectual property rights etc.).

- It is still regarded as difficult to intervene at the core of academic affairs and make them an object of management. Universities are expert organisations and depend on the expertise of their academic staff. This expertise needs a certain degree of freedom and autonomy. However, it has been observed that “poorer” departments, i.e. those which attract less external research funding, are more threatened by managerial intervention and more prone to lose legitimacy than “richer” departments which might become too independent (little fiefdoms). Results of a comparative study on the impacts of governance on research have certainly shown that research intensive departments (or groups) attracting considerable external funding become rather independent of managerial intervention.
- Competition within universities, in particular among departments, has increased. Mergers, closures, lower allocation of money or a reduction of research funds might be the consequences suffered if the performance is deemed insufficient.
- Traditional collegial governance is reduced in favour of a managerial one and thus a more hierarchical decision-making one that also includes an increasing number of external stakeholders (through boards). Decision-making powers of boards or university councils vary considerably (in some cases they have real decision-making powers, in others they can only make recommendations or provide advice). In principle, however, a mixture between forms of collegial governance and managerial governance is chosen in most cases.

Concerning the growing tension between teaching and research, the fact that academic reputation depends more than ever on research output (i.e. third party funding of projects and publications) must be emphasized.

Moreover, the link between teaching and research becomes weaker at the undergraduate level. Although incentives for good teaching and evaluation of teaching are widespread, the actual link between the two core functions is no longer emphasized as much as it used to be. This is different at the graduate/postgraduate level. There is increasing competition for the best talent and a continuous strong link between teaching and research.

This feature has led to new forms of differentiation within as well as between higher education institutions. At the undergraduate level there is an increasing number of teaching only positions whereas there is also an increasing number of research only positions. The same trend can be observed (at least in some countries) among departments: Research intensive departments and/or centres of excellence with a critical mass of doctoral students as well as teaching only departments. Whether that will eventually also apply at the institutional level is not clear as yet. There are some factors pointing in that direction while others contradict this type of differentiation.

## **2. The OEU strategic matrix**

The transformations at work in the EU University landscape, and most of all the ever stronger competition which puts this sector under strain, create the need for institutions to choose a sound strategic positioning. Such a positioning could for instance result, according to the

SWOT approach – a rather standard management recommendation -, from an analytical assessment of the institution's strengths and weakness and of the opportunities and threats of its environment.

In fact, very few European Higher Education institutions (HEI) are, to date, able to carry out even such a basic strategic positioning. This awkward situation stems from two difficulties. In the first place, the EU University landscape as described in the previous section is an environment whose future evolutions are very difficult to foresee. In times of such radical changes, great uncertainty prevails. And in the second place, HEI seem to face a similar internal gap of knowledge. Most of them are not able to properly characterize their research activities. Several research studies have shown that this situation results from the fact that the relevant data are no readily available at the local level. Some institutions may produce a lot of information, usually at an aggregated level, about their academic output or about their funding structure. But it has been clearly stated that not one has the whole set of data required to implement a strategic management of their research activities.

This lack of data has numerous negative implications. At the level of the institutions it means that whatever the degree of autonomy granted, the university governance is hampered by a “blind strategic steering”: not knowing exactly who they are, the institutions can’t properly select with whom they compete or should cooperate. The team of researchers involved in the OEU project has decided to contribute to filling in these twin knowledge gaps by developing a simplified scheme for strategic assessment of university research. This work has been carried out in close collaboration with the universities participating in the OEU project in order to insure that the result was not only intellectually consistent but also regarded as relevant by university managers.

The work, which has been actually largely heuristic, may nonetheless be described ex post as a two steps process.

The first task was to identify the main strategic issues which were deemed as critical for the management of university research.

Five main strategic issues have been singled out:

- The Autonomy, which can be defined as the university’s manoeuvrability, formally defined as the limits, exogenously established, to which a university must conform.
- The Strategic Capabilities, which is the real ability for a university to implement its strategic choices.
- The Attractiveness, which reflects the University capacity to attract resources (money, people, equipment, collaboration, etc.) within a context of scarcity.
- The Differentiation Profile, the main feature of a particular university that distinguishes this institution from other strategic actors, mainly universities but also other public research organizations.
- The Territorial Embedding which refers to the geographical distribution of university involvements, contacts, collaborations...

## PRIME – OEU GUIDE – STRATEGIC MATRIX

The second task was to study how these strategic issues could be translated along each of the five aforementioned thematic dimensions needed to analyse university's activity (funding, human resources...). This systematic work of translation can be presented as a 2 dimension matrix whose axes are the "strategic issues" (rows numbered from SI1 to SI5) and the "thematic dimensions" (columns numbered from TD1 to TD5). Each cell of this "OEU strategic Matrix" is filled with the thematic translation of one strategic issue. For instance, the strategic issue of "attractiveness" considered from the thematic point of view of "funding" has been translated as the ability for one university to collect competitive grant funding. The cells of the "OEU strategic matrix" are filled accordingly with selected Key Questions (KQ). The intersection of the SI  $i$  and TD  $j$  is labelled as the KQ  $i,j$ .

The Key Questions have been formulated so as to allow a quantitative characterisation of universities' research activity. For each of these Key Questions, indicators have been selected which can provide a basis for a quantitative answer. For instance, the indicator proposed for the afore presented Key Question of attractiveness towards funding compares the amount of competitive grants and funds collected by an institution to its total research budget. Second example: the Key Question that characterises an institution's academic differentiation (i.e. Strategic Issue of Differentiation applied to the Academic Outcome Thematic Dimension) aims at identifying the scientific fields in which an institution publishes the major part of its scientific articles. The indicators proposed for this characterisation encompasses: the share of publication in a discipline compared to the total publication of the university; the share of citation in a discipline. The whole list of indicators proposed for the Key Questions, presented in the OEU Strategic Matrix shown on next page, can be found in the following chapters.

OEU Strategic Matrix for the management of research activities

	FUNDING	HUMAN RESOURCES	ACADEMIC OUTCOME	« THIRD MISSION »	GOVERNANCE
AUTONOMY	<p>KQ1.1</p> <ul style="list-style-type: none"> <li>• What is the degree of freedom the government enjoys in the use of government funding?</li> <li>• How significant is the portion of non-governmental funding that goes to research?</li> </ul>	<p>KQ1.2</p> <p>What freedom is there to:</p> <ul style="list-style-type: none"> <li>• create new positions ?</li> <li>• recruit and allocate staff ?</li> <li>• specify staff duties ?</li> </ul>	<p>KQ1.3</p> <ul style="list-style-type: none"> <li>• Does the research portfolio reflect the university's strategic choices of scientific fields or does it result mainly from national or European Framework Programmes for RTD priorities?</li> <li>• What are the university degrees of freedom to evaluate the quality of Academic Outcomes?</li> </ul>	<p>KQ1.4</p> <ul style="list-style-type: none"> <li>• What are the university structures in charge of the management of relations with non academic partners (transfer office, etc.)?</li> <li>• What investments has the university realized in the process of its third mission (science parks, incubators, museums, etc.)?</li> </ul>	<p>KQ1.5</p> <ul style="list-style-type: none"> <li>• How much autonomy does the university have in elaborating its SRP?</li> <li>• What is the autonomy of the university in defining the content of the SRP, regarding external frameworks, procedures, priorities?</li> <li>• How much autonomy does each level have in the definition of a SRP?</li> </ul>
STRATEGIC CAPABILITIES	<p>KQ2.1</p> <ul style="list-style-type: none"> <li>• What is the amount of resources devoted to research activity?</li> <li>• How diverse is the funding basis for research?</li> </ul>	<p>KQ2.2</p> <ul style="list-style-type: none"> <li>• What is the actual use of incentives and performance-linked rewards (Salary, bonuses, promotion)?</li> <li>• What mechanism is available for steering research careers?</li> <li>• What are the mechanisms to enable junior researcher to develop their own projects</li> </ul>	<p>KQ2.3</p> <ul style="list-style-type: none"> <li>• What leverage does the university have to set scientific agendas in the various fields in which it is active?</li> </ul>	<p>KQ2.4</p> <ul style="list-style-type: none"> <li>• How is the third mission presented in the SRP?</li> <li>• What us does the research staff make of the transfer office?</li> </ul>	<p>KQ2.5</p> <ul style="list-style-type: none"> <li>• To what extent does the university have the ability to make strategic decisions and resource allocations according to the SRP, and to follow up and readjust?</li> <li>• To what extent does the university have to implement innovative research areas (seed money) according to the SRP?</li> <li>• To what extent can each level impact the SRP?</li> </ul>
ATTRACTIVENESS	<p>KQ3.1</p> <ul style="list-style-type: none"> <li>• What is the fund-raising capacity of the university?</li> <li>• Which kind of external sources does the university attract?</li> </ul>	<p>KQ3.2</p> <ul style="list-style-type: none"> <li>• How Attractive is the institution (unit) for future and for qualified researchers?</li> <li>• How much attractive is the university for research students at PhD level (does it make sense to raise the same question at the level of student enrolment)?</li> </ul>	<p>KQ3.3</p> <ul style="list-style-type: none"> <li>• What scientific partnerships appterns appear in the university's co-publications networks?</li> <li>• What are the university's scientific partnerships as characterized by visiting fellows, non-local PhD, or the academic events it organizes?</li> <li>• What scientific partnerships patterns appear in the university's portfolio of participation in and coordination of international research programs?</li> </ul>	<p>KQ3.4</p> <ul style="list-style-type: none"> <li>• What laboratories of non-academic actors are located on the university premises?</li> <li>• What are the research collaborations with firms and non-academic public bodies outside the university premises?</li> </ul>	<p>KQ3.5</p>
DIFFERENTIATION PROFILE	<p>KQ4.1</p> <ul style="list-style-type: none"> <li>• What is the structure of the budget by scientific fields (large disciplinary groups) and by type of research (basic, applied, R&amp;D)?</li> <li>• What is the structure of the university's own resources that are allocated to and derived from research by scientific fields (see above) and type of research (see above)?</li> </ul>	<p>KQ4.2</p> <ul style="list-style-type: none"> <li>• Is the institution clearly specialized in the training of PhDs?</li> <li>• What profile does the university choose for recruitment</li> </ul>	<p>KQ4.3</p> <ul style="list-style-type: none"> <li>• In which field does the university publish the major part of its scientific articles?</li> <li>• In which fields does the university publish the main parts of its "non articles" Academic Outcomes (books, chapters, e-journals)?</li> <li>• What are the main instances of academic recognition that have been awarded to university researchers?</li> </ul>	<p>KQ4.4</p> <ul style="list-style-type: none"> <li>• What are the main focal points of non academic collaboration for the university, in terms of industrial, cultural, and social relations?</li> <li>• What are the original/unique facilities and/or services located on the university premises and open to external actors?</li> </ul>	<p>KQ4.5</p> <ul style="list-style-type: none"> <li>• Does the content of its SRP distinguish the university from other institutions?</li> </ul>
TERRITORIAL EMBEDDING	<p>KQ5.1</p> <ul style="list-style-type: none"> <li>• What is the geographical origin of research funding?</li> <li>• What is the geographical origin of funding for young researchers?</li> </ul>	<p>KQ5.2</p> <ul style="list-style-type: none"> <li>• Are there mobility-enhancing activities?</li> <li>• Is there regional support for training researchers?</li> <li>• Is there regional support for recruiting qualified researchers?</li> </ul>	<p>KQ5.3</p> <ul style="list-style-type: none"> <li>• What are the main geographical levels of scientific cooperation for the university?</li> <li>• Where do the university's PhDs students come from and where do they go to after completion of their PhD?</li> </ul>	<p>KQ5.4</p> <ul style="list-style-type: none"> <li>• What are the main geographical levels of the university's industrial relation?</li> <li>• What are the main geographical levels of involvement in policy and public debate for the university for shaping / accompanying regional / national / international policies?</li> <li>• What specialised structures of the universities are open to the public (law shops (legal advice), museums, libraries, etc.)?</li> </ul>	<p>KQ5.5</p> <ul style="list-style-type: none"> <li>• What are the degrees of participation of the different actors at different territorial levels of negotiation and influence?</li> <li>• What are the needs to which (or objectives to which) the content is related to?</li> </ul>

This OEU Matrix should be considered as the result of a trade-off between two conflicting constraints. On the one hand, the sound steering of such complex institutions as universities, which are responsible for multiple missions, requires a lot of information. Therefore a tool designed for characterising these activities is necessarily multidimensional. But on the other hand practical considerations had to be taken into account in building this analytical framework and in selecting the proposed indicators. The assessment processes currently in use are already creating a huge workload for European universities. Therefore any new measurement system is hardly welcome. As such it should be stressed that the proposed matrix doesn't aim at building another evaluation exercise, a great effort having been made to limit the cost of data collection.

Despite this precaution, the interactions woven between the group of researchers and the universities participating in this project have clearly shown that no institution was able to produce the indicators required to fill-in such a table. This situation results mainly from two causes: first, the scarcity of data and information readily available and secondly, the lack of a methodological framework which could be used for producing potentially comparable information.

The five next chapters constitute an attempt to fill-in such a gap. Each of them will: first propose different ways for collecting data pertaining to the five thematic dimensions (i.e. funding, human resources, academic outcome, third mission, governance); secondly propose definitions for the categories to be measured (e.g. what is a researcher? what is project funding?) and thirdly propose illustrations - based on the example of the participating universities - of indicator compilations relevant for filling-in the OEU strategic matrix.

The processes of data collection presented in these thematic chapters enable – or constrain! – a university manager to gather much more information than strictly required for filling the OEU strategic matrix. But this synthetic strategic view can't actually be produced without an initial collection of data at a micro level. This in-depth characterisation of the various folds of the university fabric is therefore not unnecessary. This knowledge is in fact a prerequisite for steering a university, be it for human resources, financial matters, setting of scientific agendas...

In summary the process proposed in this document will guide university managers through the tedious task of collecting primary data at a much disaggregated level. It will then offer them a methodological framework for building a research activity profile for characterising the institution that they are in charge of. And subsequently, this information will make possible the choice of strategic options.

PRIME - OEU GUIDE

## I. Funding

Emanuela Reale and Bianca Poti (CERIS-CNR)  
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With the participation of University of Aveiro (Portugal) - AV, University of Bologna (Italy) - BO, University of Lausanne (Switzerland) - LA

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## 1. The participant Universities within the national University systems

The Universities acting as volunteer participants in the Funding Group are: University of Aveiro (Portugal), University of Bologna (Italy), University of Lausanne (Switzerland). Hereafter we provide a brief outline of these Universities as well as of the national University systems funding structure.

### 1. a. University of Aveiro (AV)

#### Main characteristics of the system

The Portuguese system of higher education is a diversified system, with private and public sub-sectors, and universities and polytechnics within each of those sub-systems. The oldest and largest institutions are the public universities, the younger the private HEIs (mostly dating from the late eighties). The Portuguese system diversified its structure in the seventies to non-university higher education and the emergence of a binary system, with the creation of the Polytechnics, envisaging the supply of more vocationally oriented programmes and less emphasis on research.

Currently, there are in Portugal 14 public universities (and one university college with a status similar to that of a university) and 8 private universities apart from a large number of private university colleges. Universities provide courses in practically all fields of study. Two public universities have integrated polytechnic schools. The public polytechnic network includes fifteen generalist institutions, three polytechnic health institutes, the ones integrated in the universities of Aveiro and the Algarve, as well as a handful of small institutions of nursing and military training. The network of private and co-operative polytechnic colleges includes ten schools of teacher training, nine nursing colleges, eight health colleges (two of which are integrated in universities and two in a polytechnic college) as well as quite a number of schools which provide courses in the Arts, Administration and Management and Technologies.

#### 1. HE Portugal - Growth of enrolments, total and by sub-sector

Year	1991		1996		2003	
	No.	%	No.	%	No.	%
Public university	103.999	55,7	147.340	44,1	171.014	43,6
Public polytechnic	31.351	16,8	65.377	19,6	109.624	27,9
Private	51.430	27,5	121.399	36,3	111.653	28,5
Total	186.780	100,0	334.868	100,0	392.291	100,0
Enrolment rate % (20-24 yrs)	24,4%		44,3%		49,6% (census 2001)	

Universities grant “Licenciatura” degrees (4-6 years, according to scientific fields), “Mestrados” (1-2 years) and Doctoral programmes. Most private universities can not award PhD degrees and only recently have been allowed to award master degrees. Polytechnic Institutions, public or private, traditionally awarded a first-cycle degree, “bacharelato”, with a three-year duration, which could be completed with an additional one or two years study program (with a diploma of specialised higher education studies) in order to become equivalent to a university “licenciatura” degree. Currently they are in a transition to award 4

or 5-year licenciatura degrees, similar to universities. They can not award master or PhD degrees, unless in co-operation with a university institution (national or foreign).

The recent developments in higher education policy had important consequences in the funding system (and mechanisms) used to allocate public funds to public HEI's. These policies tended to promote more autonomous and less dependent institutions, also in terms of funding. However, and in what concerns financial resources, Portuguese HEIs remained with a non-diversified funding basis (since most of their funding are provided by government's sources).

### **Funding System**

As far as the teaching function is concerned, since the early nineties, the Ministry of Education provides the funding according to a basic formula, whose establishment is related with growing institutional autonomy. The formula applies to the running costs of public institutions of higher education, and it is negotiated between the institutions and the Ministry of Education. The basic criteria used in the formula reflect a funding basis in a throughput perspective. Therefore, the main consideration is with the costs supported by the institutions of higher education, in their activity (namely in terms of the number of students enrolled). This formula uses students/ staff ratios, which vary according to the field of study, being smaller for degrees that request more practical or laboratory classes, e.g., medicine, sciences and engineering. The funding of each program takes into consideration the following aspects: number of registered students, the student/academic staff ratios, the student/non-academic staff ratios, the average cost of the teaching staff, the average cost of the non-teaching staff and the budgetary structure expressed in the percentage composition of personnel costs and other operational costs. These indicators are defined as reference values that should be attained through a gradual convergence process, though this process has in practice been somehow erratic.

In what concerns research activity, the funds were mostly provided by the science budget rather than the education one. Research activity has been mostly funded through three sources: research grants to support master and, mainly, doctoral and postdoctoral studies (at home and abroad), research grants to individual research projects, and multi-annual funding to recognised research centres. The first funding source is indirectly related with research output, since it mainly contributes to the medium and long-term research potential of the units. The second one is the most significant of the three in financial terms. The research projects are selected on a competitive basis, based on a panel of experts' recommendations. The third one, although not extremely financially significant, plays an important role by its stability. It aims to guarantee a minimum level of activity, covering the basic expenses of the research units. However, if the research unit attempts to achieve a high level of research activity it will have to compete for the funds provided by the second source. Other funding sources available to Portuguese universities include projects developed for public institutions (ministries, administration, etc), and private sources (such as consultancy activities). Nevertheless, the few data available indicate that these sources do not represent a significant amount of money, especially in what refers to private sources of funding.

Finally, and besides the sources provided by government, there is small amount of funding provided by student's fees. Until 1992 the level of tuition fees in public institutions remained very low (ca. € 6 per year), since its value was kept constant since its establishment in 1944. In 1992 a new tuition's framework was established, corresponding to the actualisation of the value of 1944 (ca. €300). This change led to resistance from the students, and significant political disturbance, with various ministers of education having to resign due to this controversy. In spite of this resistance, the changes were implemented. With the change of

government in late 1995, this discussion gained momentum again. The new government suspended the law of 1992, with the promise of preparing a new law on the funding of public higher education. However, by the mid-97, a new law was approved (Law 113/97), re-establishing the tuition fees at a level similar to that previous to the suspension of the law. The main difference was that the level of tuition, in the 1997 version, was equal for all students of public institutions and linked to the national monthly minimum wage (in the 1992 law the level of tuition fees was means-tested). In spite of some resistance of the students, the ministry managed to succeed in re-introducing the payment of fees. In the new funding law of August 2003 the annual level of tuition fees was significantly increased from its current €350 to a value to be determined by each public institution (between €450 and €850 for academic year 2003-4), though most institutions decided to charge the maximum value (or will soon do so).

The fees paid by the students are considered to be resources of the HEIs. Despite this increased participation of students and their families in the costs of higher education, their financial role in the funding of public institutions is small (representing currently less than 10% of the current budget allocated by government to public HEI's), and even after this recent increase will probably remain as a minor contribution to public HEIs budgets. This situation is very different from private institutions, which are basically supported by students' fees (at the moment between €2000-2500). This gap in terms of tuition fees adds to the perceived different quality to place public HEIs (notably universities) as the first priority of prospective students, minimising the competition threat posed by private institutions to most public institutions.

### **Availability and Limitations of Data**

Financial data concerning the Portuguese universities are collected through the Department of Fiscal Execution of the Portuguese Ministry of Education, which had the responsibility for higher education affairs until 2002. At the moment we have access to the global budgets of Portuguese universities from 1997 till 2001. In these budgets it is possible to collect data about:

universities revenues: student fees, government funding and EU funds. Data on income from assets is not relevant in the Portuguese case;

universities expenses: with staff (total expenses for academic and non-academic staff), other current expenses and capital expenses.

The available data is not disaggregated by school or by faculty for all universities, since not all these organic units have administrative and financial autonomy.

Financing data, both funds and expenses, refer to civil years (1997 till 2001). This time period is obviously different from academic years, that usually start at September and end in July.

Government funding refers to the funds given by the State to universities through the Ministry of Education until 2002, and henceforth by the Ministry for Science and Higher Education. This money is given as a lump sum, according to a formula that essentially takes into account the number of students enrolled in each university. It is up to the university to decide how to distribute internally the money; nevertheless the big share of the money goes to academic and non-academic staff salaries. Some institutions have replicated internally the criteria defined in the national formula, whereas others have made some adjustments. There are also some important differences internally in terms of the degree of financial autonomy enjoyed by schools/departments in each university.

The universities' global budgets also receive funds from the EU. These include funds that come through the IGFSS and the European Social Fund (Cohesion Funds) that have been

supporting training activities. Some of these funds have also been allocated, with a joint contribution of the Portuguese National Government and the EU, to infrastructural spending such as new buildings, equipment and labs. This has been particularly relevant in the late eighties and early nineties when the system underwent a significant process of expansion. However, and despite the stabilisation of enrolments, this has still been quite relevant for some institutions to renew their buildings and equipment.

Portuguese HEIs also receive student fees. The available data refers to the total amount students paid to each one of the universities considered in each one of the years under analysis. In Portugal, for the years under study, fees were equal for all universities and all degree programs, and all students had to pay them. So their total amount depends exclusively on the number of students enrolled in each particular university. The values for 1997 are very low, compared to other years, since at that time the law regulating students' fees had been suspended in late 1995 until the approval of a new law in 1997.

One section of the revenues is considered own or private resources. The values included in this heading refer to that income earned by the universities from various activities and that they can dispose according to their objectives with far more freedom than what it happens with governmental and EU funding. The main sources of private funds are the following ones: fees paid by students for various services; income generated through training (short-term courses), research activities and other services (overheads and others); net balances transferred from previous fiscal years.

In terms of expenses the main category is with academic and non-academic staff. It is only possible to collect data on the total staff expenses from the universities global budgets, since the data present both together. At the national level is not possible to discriminate these expenses by academic and non-academic staff since there are multiple categories and therefore any kind of imputation would be too crude. Other current expenses include all other expenses besides salaries and capital. Then there are Capital expenses. These include basically those expenditures on equipment, labs and others not included in the current budget due to their long or medium term nature.

The main problem regarding financial data is that it is very hard to get access to it. Financial data is not readily or easily available, since there is no systematic treatment and publication by the Ministry in charge of higher education and science matters. It is only possible to have access to data from public institutions, since private ones do not provide other data besides those publicized by national statistics on students' enrolments and graduate numbers. Another significant problem is not having data disaggregated by faculty or school. That makes impossible to know the amount of expenses by scientific area (human and social sciences, natural sciences, technical sciences and medicine), without recurring to problematic imputation.

### **University of Aveiro – general overview**

The university of Aveiro is a rather recent institution, which was established around 30 years ago. This university was created alongside several other public universities during the first significant expansion of the Portuguese HE system. The university of Aveiro is one of the few Portuguese institutions which features a purpose-built campus and that has helped the institution to keep a significant centralization compared with other Portuguese public universities. Thus, it is organized around departments, which are supposed to collaborate in

terms of teaching and research. This has become more complex due to the expansion of the institution, but it is still a significant feature of its organizational fabric.

## 2. University of Aveiro – general overview

Year of establishment	1973
Enrolled students (BA)	10.790
Enrolled students (PG)	1.623
Academic Staff	1.038
Departments	17
Schools	3
Research Units	17

The university has always had a strong focus on technological degrees and this is still reflected in the distribution of the number of enrolled students. However, the development of the university has led also to the creation of programmes in most scientific areas.

## 3. University of Aveiro's activities

	<i>Engineering</i>	<i>Teacher Training</i>	<i>Sciences</i>	<i>Business and Economics</i>	<i>Arts</i>	<i>Languages</i>
%	43.16	20.49	12.53	12.15	7.76	3.91

Source: UA

The university of Aveiro has a very good reputation within the national scientific system. It normally rates very well in terms of scientific publications and its capacity to engage with the local economic environment. To this situation have contributed various factors, such as the high qualification of its academic staff (it has one of the highest percentages in the country of academic staff with a PhD degree), and the fact of being located in a very strong economic region. This is reflected in the performance of its research centres, as assessed by the national science foundation.

## 4. Distribution of UA Research Units according to National Science Foundation Evaluation

	<i>Excellent</i>	<i>Very Good</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>
%	25.	50	19	6	0

Source: UA

**1. b. University of Bologna (BO)**

**General overview of the University system**

The dimension of the Italian University system in the academic year 2001-2002 is presented in the following prospect, which also gives the size of Bologna within the national system.

**5. University of Bologna – general overview**

	<i>Italy</i>	<i>Bologna</i>
Universities and Polytechnics	77*	
Faculties	515	22
Students (in total)	1.684.533	96.501
Graduates	167.082	10.785
Phd students	25.687	1.633
Professors and researchers	55.004	2.964
Technical and Administrative Staff	50.800	2.565
Total budget (2001, thousands Euros)**	8.747.072	484.927

\*Of which 12 are private universities. Source: Miur

\*\*Clearing transactions not included.

Some fundamental characteristics of the Italian Universities are:

Universities have been attributed full autonomy, so that they can issue their own charters and regulations and decide independently about their own budgets;

The fundamental public nature of the higher education system, exclusively based on the Universities, largely public, and mostly funded by the Government even when they are private institutions;

Strict connection existing, in principle, within the Universities, between teaching and research. For each activity, Universities are required to pursue an excellent performance and to act for gaining a leadership position at international level.

Other characteristics affecting the funding structure are:

the direct government contribution constitutes the major share of the funding (see next paragraph),

Government funds Universities by way of a lump sum, so they have large autonomy on how to spend the public funds. A serious constraint is the personnel cost (salaries), which freezes a large part of the university budget. Since the structure of the personnel is not simple to be changed, the Universities handle a limited amount of Government funds. Although the existing constraints, the Universities can modify the composition of the research personnel, and thus modify the allocation of resources,

the budget allocated to the Universities is determined yearly, even if a multi-annual plan exists. This implies that the total amount of available resources can be different from one year to another, and this fact could generate a financial uncertainty at institutional level,

the Government funding of Universities comprise an integrated allocation for both teaching and research, for they are considered as completely intertwined activities. A special competitive fund (PRIN) provides additional financial sources for University research,

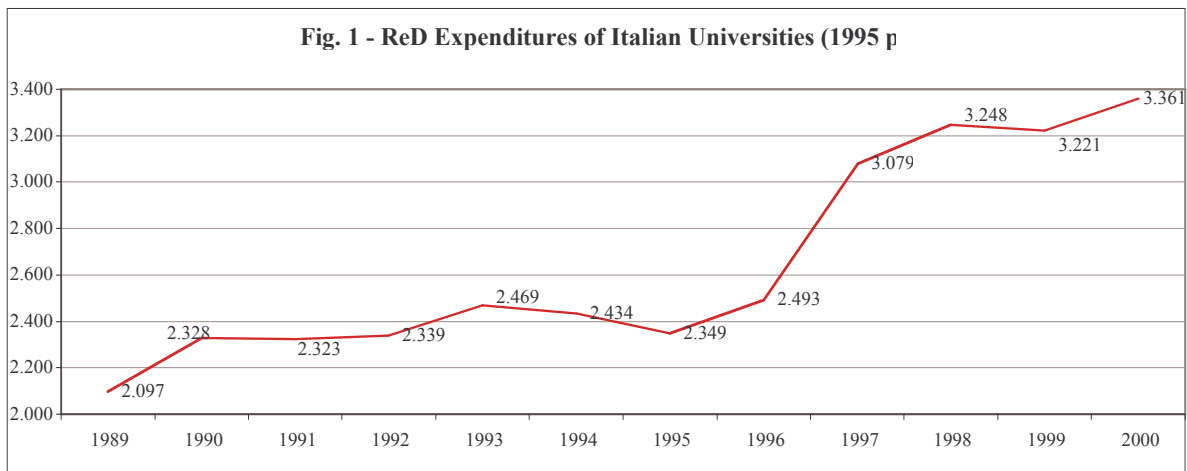
the Government funding model is shifting from an input based model to a performance-based funding (see next paragraph),

Universities have no legal constraints on fund raising from external sources. The only limit is imposed for the students' fees, which should not exceed a level determined by the Government.

### National Funding structure

According to ISTAT national statistics, universities' R&D resources, in the period 1989-2000, shifted from 2.097 million € to 3.361 million € (1995 constant prices). The expenditure growth rate from 1989 to 1996 has been equal to 18,9%, while from 1997 to 2000 it was equal to 9,2%, with an average annual growth of 3%.

### 6. R&D Expenditures of Italian Universities

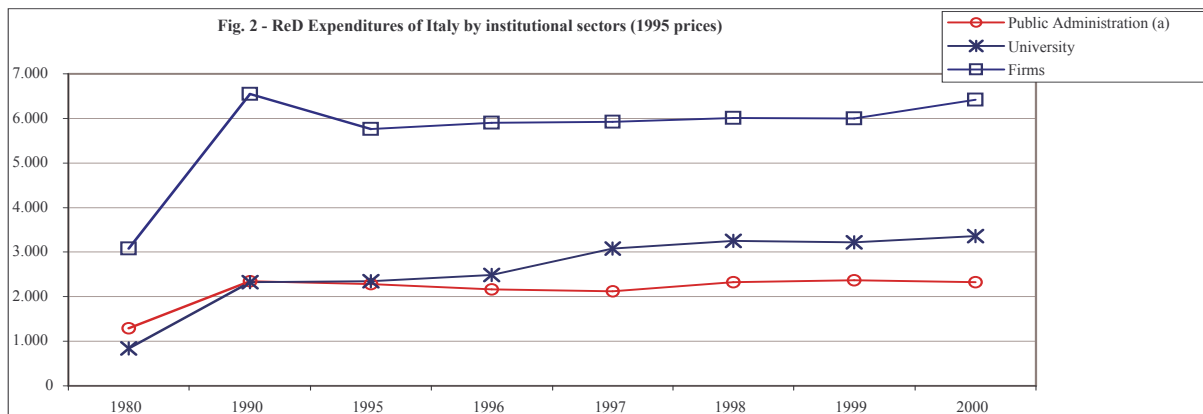


Source: Istat. Break in series from 1997

The comparison of the same ratios with those related to the Public Research Institutes (PROs) R&D expenditures, presents very different values: in the first period (from 1989 to 1996) the PROs expenditures decrement rate was equal to 5%, only partially regained in the forthcoming period (+8% from 1997 to 2000).

Therefore, figures show that in Italy, during the nineties, the cut off of the public resources devoted to R&D went with a process of progressive concentration of the R&D expenditures within the Universities.

### 7. R&D Expenditures of Italy institutional sectors



Source ISTAT. Break in series from 1997, (a) Government expenditures without University

The total Universities funding resources in 2001 amounted to 9.800 million €, and in 2002 10.500 million € (CNVSU data).

The University funding is composed by two kinds of sources:

resources transferred by the Public Administrations (included the Government general fund – FFO). These resources covered a ratio of 77% of the total funding in 2001, but their weight was reduced in 2002 (73%) due to the public budget constrains, and to the improvement of the universities capability to attract external funds;

resources autonomously acquired by the Universities. These resources covered a ratio of 21% in 2001, but are now growing up (23,5% in 2002).

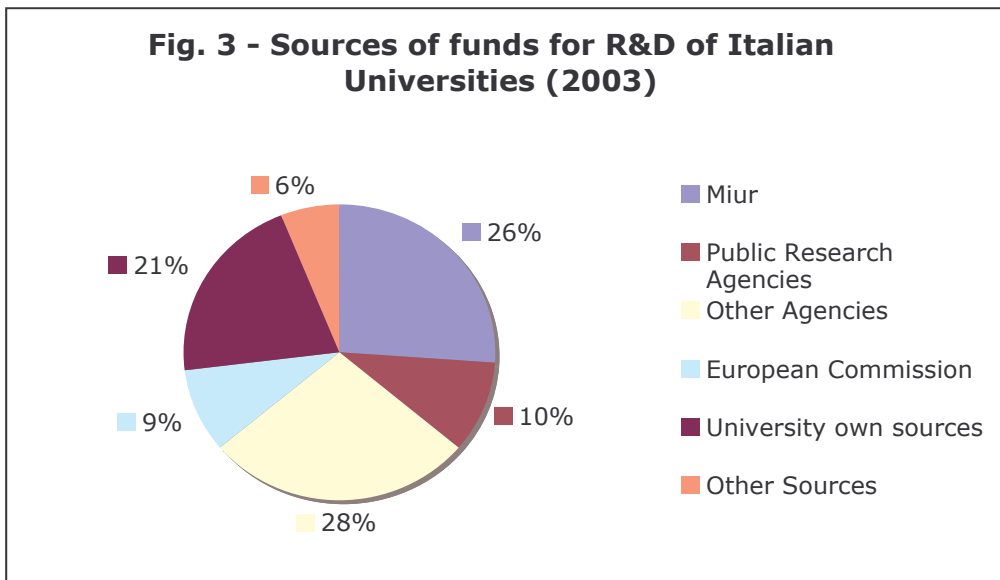
The resources transferred by the Public Administration to the Universities mainly come from the FFO (96%), which represented, in 2001, a ratio of 64,2% over the total budget of universities. The resources autonomously acquired mainly come from the students’ fees (decreasing from 50,8% in 2001 to 46,3% in 2002), from agreement with external funders (22%), and from contracts and grants (22%).

The personnel’s cost covered a ratio of 61% over Universities’ expenditure in 2002. 68% of this amount is devoted to personnel with a permanent position. Moreover, almost the total amount of the FFO is devoted to the payment of the personnel.

According to the CNVSU data, in 2003 the University funding for R&D was 946 million €, of which 21% come from the University itself, 36% come from other public sources (mainly Government through project funding) and 28% come from other agencies, which include private sources (associations, non-profit organisations, firms) and local authorities.

It is important to note that CNVSU data figure out large differences between the Italian Universities as to the structure of research funding, which are linked to the fields of sciences covered, the age of the University, the economic and local context, and the quality of the research output.

### 8. Sources of funds for R&D Italian Universities (2003)



Source: CNVSU, 2004. Other Agencies include private institutions.

From 2005, a new funding model is applied by the Government for the distribution of the FFO among the Universities. The aim is to use the financial mean for modifying the Universities behaviours toward a more accountable system of resource allocation, and to

maintain, at the same time, a reasonable level of resources for teaching and research activities. The proposed model is based on four types of parameters:

a share of 30% of funding should be linked to the external demand that the University must satisfy. The demand is measured on the basis of the enrolled students and their academic characteristics (input based funding);

a share of 30% should be allocated on the basis of the educational results, measured through the number of credits yearly acquired (output based funding);

a share of 30% should be allocated on the basis of the research outcome (output based funding);

a share of 10% should be linked to specific incentives.

The various shares of funding will be allocated by weighting the parameters calculated for each University on the overall University system. In this way, the system should allow to control, through a comparison of the parameters for a certain number of years, which kind of correctives have to be introduced for re-balancing all the system. The goal is to create a set of incentives for reducing the differences existing within the Italian Universities functioning.

As for the rules of management, the basic units for research within the Italian University are the Departments, to which the basic financial resources are transferred by the University central administration. Departments are autonomous in managing their own budget, including all the external source of funds for R&D.

### **The University of Bologna**

The University of Bologna is one of the biggest higher-education institutions in Italy. Its history as one of the leading academic institutions in sciences and humanities makes it a fundamental reference point within the scenario of European culture. Over the last few decades the launching of many exchange programmes has brought thousands of exchange students to Bologna, and they have enormously enriched the city's cultural and social status. The University of Bologna holds partnership agreements with over 500 foreign Universities, just taking into account the Socrates-Erasmus exchange programme. According to the information on the web site, the main structures of Bologna University are:

*Academic Structures* Faculties, Departments and Institutes constitute, as a whole, the cultural teaching and administrative axis of the University of Bologna.

*Advanced Schools* The Advanced Schools combine high-level scientific research with qualified and specialised teaching training.

*Collegio superiore* The Collegio Superiore is an institution of the University of Bologna created with the aim to select youths particularly motivated in their studies and to promote educational itineraries of an interdisciplinary nature.

*Service Structures* The University of Bologna places diverse service structures at the disposal of students, teaching personnel, and the general public.

*Buenos Aires Campus* The first campus located abroad

*University Residential Centre of Bertinoro* Founded in 1994 to host a number of summer courses, in the last few years it has become the residential centre of the University of Bologna, and each year welcomes more than 20,000 people.

*Residenza di Studi Superiori (University Residential Centre)* The Residenza di Studi Superiori gives hospitality to students and didactical activities of Collegio Superiore and to Senior and Research Fellows of Institute of Advanced Study.

**Language centres** The University of Bologna offers different ways to improve and develop your knowledge of foreign languages, which along with computer proficiency, is an adaptable skill that all students need to have regardless of their course of study. There are two language centres, one in Bologna (CILTA) which includes the ALTAIR special project and one in Romagna (CLIRO)

**CUSB - University Sport Centre** Browsing these pages students can find all the necessary information to carry out a sporting activity, competitive or amateur level, at the Alma Mater Studiorum.

From 1997 the University of Bologna set up the Osservatorio della Ricerca (**Research Observatory**) as collegial organism of all the scientific fields existing in the University, with the aim to identify criteria for the analysis and the evaluation of the research results, according to the most important experiences developed at national and international levels. The Research Observatory activities are devoted to better the quality of the University scientific outcome, and to supply information and knowledge to the NUV (University Unit of the Internal Evaluation), with which it operates in strict connection. (see also: [http://www.eng.unibo.it/PortaleEn/Research/Services+for+teachers+and+researchers/Research\\_assessment\\_.htm](http://www.eng.unibo.it/PortaleEn/Research/Services+for+teachers+and+researchers/Research_assessment_.htm))

The University web site ([www.eng.unibo.it](http://www.eng.unibo.it)), provides more information on structure, as well as on organisation, resources and activities of the University.

### Availability and limitations of data

Data have been collected at University level. Two main series of funding data were used: the University Final Budget, and data collected by the University Unit of the Internal Evaluation (NUV). NUV is in charge for supplying data and indicators on teaching and research activities (based on input and output data) to the national bodies in charge of evaluation (CNVSU and CIVR).

Furthermore, specific elaboration or estimations were developed for complying with the OEU agreed definitions. The main limitations of data are the way in which the research share of the personnel cost is calculated (because it does not take into account the differences between disciplines) and the lack of equipment costs.

## 1. c. University of Lausanne (LA)

### General Overview

Dating from the foundation of the Academy in 1537, the University of Lausanne forms a vast campus devoted to teaching and research.

The University of Lausanne is composed of 7 Faculties (theology and religious studies, law, arts, social and political science, economics and business administration, earth sciences and environment, and also biology and medicine) where approximately 10.000 students and 2.200 researchers work and study.<sup>1</sup>

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<sup>1</sup> Source: [http://www.unil.ch/central/page2228\\_en.html](http://www.unil.ch/central/page2228_en.html)

Comparing the number of students of the University of Lausanne with all other Swiss universities (except universities of applied sciences) shows that LA can be seen as a medium sized university.

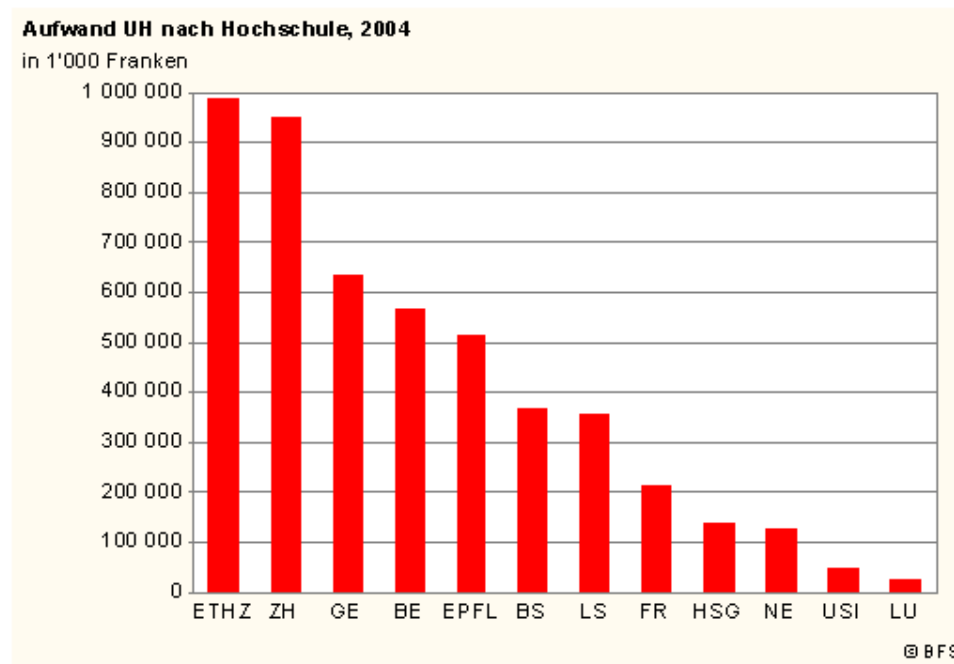
**9. Number of students of Swiss HEI**

Uni Basel	4552	5405	9957
Uni Bern	5964	6210	12174
Uni Freiburg	4312	5625	9937
Uni Genève	6001	8565	14566
Uni Lausanne	4681	5771	10452
Uni Luzern	790	981	1771
Uni Neuchâtel	1608	1987	3595
Uni St.Gallen	3361	1300	4661
Pädagogische Hochschule St.Gallen	149	233	382
Uni Zürich	10963	12869	23832
Uni Svizzera italiana	1044	979	2023
Ecole polytechnique fédérale de Lausanne	4883	1524	6407
Eidgenössische Technische Hochschule Zürich	8873	3679	12552
Total	57181	55128	112309

Source: Swiss Federal Statistical Office

A comparison of the expenditures in 2004 (in thousands of Swiss francs) of all Swiss HEI confirms the medium position of LA.

**10. Comparison of expenditures of Swiss HEI**



Source: Swiss Federal Statistical Office

The University of Lausanne enjoys a favourable location at the heart of the French-speaking region of Switzerland, and pursues an active policy of collaboration at various levels;

at local and state (cantonal) level where the university is associated with many well-known research institutes;

in the lemanic region, where the university is at present working on a project of development and cooperation with the University of Geneva and the Federal Polytechnic of Lausanne (this is in addition to existing and long-established examples of cooperation);

at regional and national level the University of Lausanne is in close collaboration with all the Swiss centres of higher education, and participates in many federal projects. With the Azur Triangle, the University of Lausanne also works in close collaboration with the University of Geneva and the University of Neuchâtel;

at a European and international level the University of Lausanne takes part in numerous academic programmes and networks, aimed at developing scientific collaboration beyond the frontiers of Switzerland.

### **The volume of Swiss HE funding**

The expenditure (in thousands) of Swiss universities<sup>2</sup>:

2003: 4'734'812 sfr or 3'054'774.2 euro.

The expenditure (in thousands) of Swiss universities of applied sciences<sup>3</sup>:

2003: 908'300 sfr or 586'000 euro.

Total expenditure (in thousands):

2003: 3'640'774.2 euro.

### **The sources of base and external funds**

Four types of actors provide the funding of Swiss higher education institutions:

Federal Government

Cantons owning a higher education institution

Other cantons

Thirds

The part of funding provided by these actors varies according to the different types of higher education institutions. In summary, one can say that the Federal Government almost exclusively finances the Federal Institutes of Technology (EPF). Cantonal universities and Universities of applied sciences (UAS) are financed by all for types of actors mentioned above.<sup>4</sup>

More in detail, the EPF receive a global budget from the Swiss Government.<sup>5</sup> The type “other sources” includes for example amounts allocated for research activities by the National Science Foundation (FNRS), incomes from services to thirds or research mandates for the private sector.

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<sup>2</sup> *Cantonal universities and Federal Institutes of Technology. Source: Swiss Federal Statistical Office. Conversions in euro made by the author.*

<sup>3</sup> *In French: Hautes écoles spécialisées.*

<sup>4</sup> *Source: Swiss Federal Statistical Office.*

<sup>5</sup> *The funding of the EPF is legally stated in the federal Law called Loi sur les Ecoles polytechniques fédérales.*

As mentioned, all four types of actors cited above finance the cantonal Universities. However, the importance of each financial source varies according to the different institutions. Most of the cantonal universities are very dependant on the cantonal and federal funding. The part of funding of all universities together made by cantons (including both types of cantonal funding, i.e. by the canton owning the higher education institution and the other cantons) is 55%. It varies from 31% (University of St.Gallen) to 69% (University of Lucerne). The part of the federal funding of all universities (including basic funding<sup>6</sup>) is 13%. It varies between 11% (University of Berne) and 23% (University of Fribourg).<sup>7</sup> The part of third means varies from 12% (University of Fribourg) to 48% (University of St.Gallen).<sup>8</sup>

Like the cantonal Universities, UAS are financed by the Federal Government, by the cantons and by thirds. The Federal Government has to finance a 1/3 of the investment and exploitation costs of the UAS.<sup>9</sup> The part financed by the cantons varies between 43% and 56%. Third means vary from 13% (Fachhochschule Ostschweiz) to 31% (Fachhochschule Zentralschweiz).<sup>10</sup>

### Typology of financial sources

The Swiss Federal Statistical Office indicates the following possible sources for Swiss universities<sup>11</sup> which are considered either as contribution to the bill or as third means.

#### The money allocated by the Federal Government.

Contribution to the bill:

- Global budgets for the EPF/Contributions resulting from the federal Act on financial assistance to universities (determined by the number of students) <sup>12</sup>.
- Contributions for investments
- Contributions related to projects
- Remaining federal contributions

Third means:

- Swiss National Science Foundation
- Commission for technology and innovation
- European Union research programs
- Other international research programs and institutions
- Research mandates from the federal Government

#### University cantons (cantons having a university)

Contribution to the bill:

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<sup>6</sup> Although the FNRS is essentially financed by the federal Government, it is considered as third mean because it's allocated in competitive manner.

<sup>7</sup> Source : OECD. *L'enseignement tertiaire en Suisse*. Paris : Organisation for Economic Cooperation and Development. 2003 : 103.

<sup>8</sup> Source : Swiss Federal Statistical Office.

<sup>9</sup> Source : Law of the UAS. In French : *La loi sur les Hautes écoles spécialisées*. Art. 19.

<sup>10</sup> Source : Swiss Federal Statistical Office.

<sup>11</sup> Cantonal universities and Federal Institutes of Technology. The universities of applied sciences are not considered.

<sup>12</sup> In French : *Loi sur l'aide aux universités (LAU)*.

- Global budget

**The other cantons contribute also to the funding of the universities.**

Contributions to the bill:

- Intercantonal agreement.<sup>13</sup> It regulates the contributions of the cantons whose inhabitants study in a university outside of the own canton. The contributions are also determined by the number of students and by the disciplines followed by these students.
- Other contributions

Third means:

- Other public research mandates.

### **Thirds**

Contributions to the bill:

- Student fees
- Other own means of the HEI
- Foundations

Third means:

- Research mandates from private sector
- Services
- Further training

### **Some rules of management**

Generally, the university cantons have changed considerably their laws in the 90'. One change consisted in the autonomy the different universities have received.<sup>14</sup> They operate with global budgets determined in contracts between them and the cantonal authorities. These contracts define the objectives to be achieved and the means allocated for that purpose. However, this managerial shift towards autonomy does not imply that higher education institutions are granted complete autonomy. "They are free to decide "how" to achieve the objectives stated in the contract with the political authorities, but not to determine the objectives."<sup>15</sup> Moreover, this common trend of autonomy is translated in different ways according to the university. Besides larger autonomy, a strengthening of the rectorates is a second feature. Traditionally based on a militia system, the rectorates became "professional" in order to have more time to promote profound reforms in their institutions. In parallel, new executive bodies have been set up. "To a large extent, these bodies are composed of actors coming from outside the university and are appointed directly by the political authorities of the canton."<sup>16</sup> Again, their effective room of manoeuvre may differ from one university to another. In financial matters, the cantons tend to maintain the control over the budget of their

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<sup>13</sup> *In French : Accord intercantonal universitaire (AIU).*

<sup>14</sup> *Source : Schenker-Wicki, Andrea. Finanzierungs- und Steuerungssysteme der universitären Hochschulen in der Schweiz. Beiträge zur Hochschulforschung. Heft 4. 2002.*

<sup>15</sup> *Source : Leresche, Jean-Philippe, Perellon, Juan-Francisco. Co-ordinating the Impossible ? Current Changes of Governance Patterns in Swiss University Policy. 1999 : 139. Jessica Kingsley Publishers. London and Philadelphia.*

<sup>16</sup> *Idem. P. 131.*

University, whereas the directors of the EPF are quite powerful in the management of their budget.<sup>17</sup> As we could already see in the previous paragraph, management responsibility at deeper level such as research institutes varies according to the university too. Evaluation can certainly be considered as an important instrument of management. All units (including research, teaching, services, direction, etc.) of the University of Zurich, for example, are regularly evaluated.<sup>18</sup>

### Availability and limitation of data

Data have been collected at the university level, both through the office of the statistics and the office of research. Limitations mainly concern equipment costs, which do not appear in the university budget and thus had to be deduce from the staff budget. Another limitation comes from the fact that university data do not distinguish between central and local sources of funding.

## 2. Methodological proposal for the characterization of university funding

The characterization of university funding for research activities is considered a main element in the assessment of an institution's performance. The availability of adequate funding resources, and the space of manoeuvre in using these resources are key instruments for academic institutions to address strategic objectives and pursuing the mission of performing research at the cutting edge.

The proposal, which is presented in this document, tries to tackle these issues. It aims at providing explicit and sound methodological procedures and guidance for the characterization of university research funding.

This will be done firstly, by addressing the identification of key issues and related indicators. Then, it will be proposed a simple and generic tool for mapping university research funding along the five identified dimensions: autonomy (Issue 1 and 2), strategic capabilities (Issues 3 and 4), attractiveness (Issues 5 and 6), differentiation profile (Issues 7 and 8), territorial embedding (Issue 9). Finally, this generic tool will be used for the characterization of funding resources in terms of autonomy.

The agreed approach for selecting the relevant indicator, through a bottom- up process, which involved the Universities, were:

to focus on a restrict number of indicators considered by the Universities as the most important for management and evaluation purposes,

to adopt a pragmatic view, for providing definitions which could work in different national contexts,

to use estimations, if possible, for dealing with lack of data availability,

to keep out the solution of a number of relevant problems (such as university boundaries, overheads calculation, university and hospitals), which go beyond the aim of this first experimental work.

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<sup>17</sup> Source : Lepori, Benedetto. *La Politique de la Recherche en Suisse. Institutions, acteurs et dynamique historique*. 2004.

<sup>18</sup> Source : Universität Zürich. *Das Evaluationsverfahren*. 2003.

## **2. a. Definitions**

Hereafter a set of definitions of the main categories of data used in this document is presented. The choice is derived from an agreement between the OEU universities acting as volunteer participants of the Funding Group, which takes into account both the usefulness of the definitions for the University management purposes and for comparison between countries, as well as their coherence with the data availability. Thus, the definitions provide a conceptual framework of the measures, which are able to characterise the University funding.

### **Research**

According to the OECD's Frascati Manual, research and experimental development "comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to device new applications". We must consider that experimental development is carried out rarely within University. Although it is not possible to distinguish between basic, applied and development, we can consider the latter type of research more an exception than a rule.

### **Research staff (or personnel)**

According to the OECD's Frascati Manual, research staff is defined as all persons employed directly on R&D, as well as those providing direct services such as R&D managers, administrators, and clerical staff.

### **Researchers**

According to the OECD's Frascati Manual, researchers are defined as professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also the management of the project concerned.

### **Core funding**

Core funding includes the general block grant coming from Government authorities (central and local) to support both teaching and research activities.

### **Non-core funding**

Non-core funding includes project funding, contract and grants for research activities coming from external sources and university own resources. It also includes research funds distributed through the research councils on competitive basis.

### **Lump sum**

Lump sum is the budget which is transferred from the Government (or from other external sources) without any specific constraints or destination (the budget which is at disposal of University).

### **University own resources (or revenues)**

Own resources include income from: Student fees, Donations, Sales of goods and services, Royalties

### **Fields of science**

Fields of science are individuated according to the OECD's Frascati Manual (six large disciplinary groups)

## Political level

Funding coming from international, national, local level of policy making

## Research budget

Research budget is composed by core funding for research, by non-core funding for research, and by personnel cost (only the share for research).

## Lab

We call “Lab” the meso-level for the administration of research funding, between the University level and the research groups. It could be disciplinary or interdisciplinary-oriented, it could have different denominations in the national University systems as well as different position and role within the University organization. We consider this level as the most relevant for University management and evaluation purposes. In the following tables some of the proposed indicators are disaggregated at the lab level. Tables present only a few labs as example, but data are available for all the labs existing in the Universities.

### 2. b. Currency and referring years

All data presented in the following paragraphs are expressed in thousand euros, current value. The years selected for the test are 2002 and 2003.

### 2. c. Data used by the Universities

AV: The data presented are based on the University’s final annual budget. Some calculations have been made in order to make the university available data compatible with the agreed definitions.

BO: Final Annual Budget of the University (Funding and Expenditures, cash data). Indicators on research budget come from University calculation on the Final Budget, for supplying data to the national organisms in charge of performance evaluation (CNVSU and CIVR). This choice would assure homogeneity between national statistics and data provided by the University at meso-level of dis-aggregation (Departments, Institutes, Centres). Some adjustments have been applied for fitting the existent data of the University of Bologna with the agreed definitions. Personnel cost is not always included in the proposed indicators. Notes on the different tables signal the specificities for each elaboration. Total budget do not include clearing transactions and building costs. Values are all in Thousands Euros.

LA: Final Annual Budget of the University (Income and Expenditures). Some calculations have been made for fitting the university available data with the agreed definition. Equipment cost are not given in the database. Thus, it had to be deduced from the staff budget. Values have been converted in Euros.

## 3. Key issues and related indicators

### 3. a. Issue 1. What is the degree of freedom the University enjoys in the use of government funding?

#### Rationale

University funding indicators are one important instrument to understand the ongoing University policy and the relationship between the use of the autonomy and the national priorities. Funding indicators are useful for:

- Assessing the University outcome in funding
- Benchmarking the University funding practices through common descriptors and indicators
- Monitoring the university capability of using its autonomy for steering the funding structure: coping with the reduction of core funding, enhancing the interaction with businesses enterprises, adopting more entrepreneurial behaviour, improving R&D capacity.

The structure of the budget could be represented as composed by two main parts:

- the resources transferred by the Government as basic funding (including resources transferred from regions and other public research institutes, excluding funding for building),
- the resources autonomously acquired by Universities, through student fees, research and service contracts from different sources, external agreements included the international sources (loans and returns from financial investments are excluded).

The Government funding model can be described through the Government criteria for allocation of basic funds. In this respect, the literature distinguishes between two main “philosophies” of funding allocations - input-oriented and output-oriented. In terms of research activities, the criteria used aim at assessing the actual availability of human resources and general equipment of a particular HE&R institution (input funding) and the extent to which these “inputs” are used in terms of research productivity, notably regarding the number of publications, completion of PhDs, etc.

A model for representing it could be to identify how much of the core fund comes from:

Input-oriented funding

demands to be satisfied by the universities (number of enrolled students) through number of academic staff, research staff, existing equipment

Output-oriented funding

outcomes of the educational activities (number of credits yearly acquired), evaluation of research activity (national process of evaluation), special incentives for education or research activity

We could also distinguish between the situations where the formula funding is available from those that is not. One dimension to be taken into account concerns the portion of the budget coming via the formula, compared to the part coming via other funding mechanisms.

The indicators try to provide a measurement of the University real autonomy, its degree of freedom in allocating the resources, taking into account the constraints of funds regularly devoted to sustain personnel costs and the maintenance of the equipment (both could be considered as a sort of pre-allocated funds). Furthermore they try to identify the relevant level of management of the research budget.

The degree of freedom identifies the actual legislative framework within which HE&R institutions operate. In fact, the notion of “institutional autonomy” takes many forms depending on the national context, in which it is being applied.

### **Indicator a.1.**

Amount of budget constraints (personnel cost-equipment costs)/ total budget

**11. University of Bologna**

	2002	2003
Personnel cost	233.552	244.715
Equipment cost	NA	NA
Total budget constraints	233.552	244.715
% on Total budget	38,8%	39,1%

**12. University of Lausanne**

	2002	2003
Personnel cost	133'051	139'642
Equipment cost	51'045	54'409
Total budget constraints	133'051	139'642
% on Total budget	31%	31%

**Comments:**

AV: Unfortunately, it was not possible to obtain the data only for personnel expenditures. However, our knowledge on the Portuguese system indicates that current expenditures are largely absorbed by personnel. The expenditures of the university of Aveiro seem to be strongly dominated by current expenditures, and thus by personnel. Moreover, since the staff of Portuguese public HEIs is considered as civil servants, this imposes significant rigidity in any HEI expenditure.

BO: Personnel expenditures derive from the University final budget. Equipment data not available. Clearing transaction costs and building costs are not included in the total budget.

LA: Total and personnel expenditures have been calculated exactly. Equipment costs have not been isolated separately but calculated as the difference between total and personnel costs. Therefore, the value for equipment expenditures is just approximate.

**Indicator a.2.**

Amount of research budget managed by the university at central level / total budget for research

**13. University of Lausanne, year 2003**

	LA
Research budget managed at central level	19.355
% on total research budget	23%

**Comments:**

The amount of research budget managed at central level is calculated by each University. In some cases estimations are needed (see also the issue n. 3).

AV: From the data provided by the university it was not possible to obtain the amount of the research budget managed at the central level. However, this is not expected to be very significant. On the one hand, because the funding of research privileges the direct funding to research units. On the other hand, even when the university receives research funds its influence is still largely indirect because it is then largely transferred to lower levels (departments and research units).

BO: Apart from the research staff cost, the large amount of resources devoted to research is managed by the Labs, which have their own research budget. They are in control of funding coming from external sources, as well as on the share of FFO transferred by the central level. The management is to some extent shared with the central level for funding coming from University own resources. Overheads on external contracts were not calculated.

LA: According to a responsible of the statistical service of the UNIL it is only possible to distinguish coarsely between resources managed at the central and at lower levels. He names one type of expenditure managed by the university at central level, i.e. the expenditure for the projects in the framework of “SVS (Sciences, Vie, Société)”. Therefore, these results should be considered and interpreted cautiously!

**3. b. Issue 2. How significant is the portion of non-governmental funding that goes to research?**

**Rationale**

The Government increasing concern for the growing up in the level of public funding pushed towards policies aimed to reduce the public support in favour of exploiting the University capability to attract external sources. Furthermore, the emergence of new paradigms for the steering of the Higher Education system, namely the NPM paradigm, and the introduction of the autonomy-accountability principles modified the Government funding model, favouring the shift from block grant funding toward project funding. Even the funding structure of the Universities is changing. The preference is for a lump sum budgeting transferred on a performance-based model, which is gradually replacing the input-based model in a large number of European countries.

The indicators focus on lump sum budgeting for research.

The weight of Government lump sum on total funding for research measures the autonomy of the University for addressing its own research objectives and priorities.

The thresholds imposed to fund-raising give another insight on the constraints and limits imposed to the University autonomy. Fund raising comprises the University effort for attracting both own resources, and research contracts and grants.

**Indicator a.3.**

Relative weight of Government lump sum for research as a share of total budget for research.

**14. University of Aveiro (Euro)**

	2002	2003
Government lump sum for research	400.394,00 €	384.631,00
% on total Government lump sum	0,9%	0,9%
% on total research budget	3,77%	4,53%

**15. University of Bologna (thousand Euro)**

	2002	2003
Government lump sum for research	49.526	47.490,5
% on total Government lump sum	14,9	14,0
% on total research budget	23,2	21,8

**16. University of Lausanne (thousand Euro)**

	2002	2003
Government lump sum for research	61.954 (also NSF and public mandates)	72.458
% on total Government lump sum	37,6% (also NSF and public mandates)	
% on total research budget	83,8%	

**Comments:**

The indicators focus on Government lump sum budgeting for research. The source is the Final budget of University. When University do not have a specific Government fund devoted to research (but funding for research and education activities are joint together) University should calculate, or estimate, the share devoted to research.

AV: What is counted here is a small part that comes through the higher education funding formula. The values obtained are very low for various reasons. On the one hand, most of the government funding goes straight to research units based on assessment and competitive funding. On the other hand, another large part of government funding comes via research contracts with the university and with research units.

BO: The Government lump sum for research is not in the final budget. It can be calculated only by estimating. The share of time dedicated to research by the personnel, on average between the different fields of science (0,5), was used as parameter for calculating the share of Government lump sum (FFO in Italy) devoted to research. The formula used was: (FFO-Personnel cost)/0,5. Thus, this estimation suffers of shortcomings deriving from the calculus of the research personnel cost (see indicator b.1)

LA: Although Government lump-sum includes, according to the definition, only “the budget transferred from the Government (or from other external sources) without any specific constraints or destination (the budget which is at disposal of University)”, we include additionally here also funding coming via the Swiss National Science Foundation (funded de facto by Confederation) and from other public entities. Otherwise, it this indicator would not answer to the question raised in the issue 2.

**Indicators a.4.**

Thresholds imposed to fund-raising (including weight of tuition fees on total budget and incentives given to private donors to support research activities).

**3. c. Issue 3: What is the amount of resources devoted to research activity?**

**Rationale**

The measurement of the research effort of the University is a central issue for understanding the weight of the research effort on the other University functions (mainly teaching activities). All the Universities are supposed to perform educational functions, while it is not the same for research functions. The monitoring of the variation over time of the research effort is essential for designing the strategic capabilities of the University and for implementing them, by assuming a more research-intensive profile.

The aim of the indicator is to get a more complete view of the resources available for research, including the two components (Government transfer and autonomously acquired contracts) and weighting them on the total University budget.

Moreover, the personnel cost is the main component of the University costs. The aim of the indicator is to estimate how much of this cost goes to research.

**Indicator b.1.**

Amount of resources devoted to research on the total budget

**17. University of Aveiro**

	2002	2003
Lab 1		
Lab 2		
Lab 3		
....		
Total budget for research	10.623.615 €	8.495.011 €
% resources devoted to research on the total budget	16,41%	13,16%

**18. University of Bologna**

	2002	2003
Lab 1	639	380
Lab 2	332	470
Lab 3	27	120
....		
Total budget for research	213.781	218.052
% resources devoted to research on the total budget	35,5	34,8

19. University of Lausanne

	2002	2003
Lab 1		
Lab 2		
Lab 3		
....		
Total budget for research	73'937	85.434
% resources devoted to research on the total budget	40%	44%

**Comments:**

The source is the Final budget of University. The amount of money that goes to research is composed by two components: R&D expenditures coming from the Government core funding; R&D expenditures coming from external source. The problem for the former is to identify how to calculate the share of core funding that goes to research, including the personnel cost. For overcoming it, a practical approach has been adopted. National data should be used, elaborated by the Universities themselves, for calculating the resources devoted to the research activities. Each University provide a methodological note on its own calculation for the personnel and the equipment share. The staff that is only involved in R&D is not taken into account, but the amount of time all the university staff declare spending working on R&D.

Other problems arise from the calculation of indirect funding. Indirect funding are monetary funding coming from external bodies, such as charities, non profit organisations or public research institutes, not included in the University budget. This is the case for post docs provided by charities or facilities provided by public institutions or hospitals. This case is very frequent in the biomedical research. It is the most problematic indicator: Universities in some cases have no control on this source of funding and the relevance of the indirect funding itself is not known. In this phase indirect funding was not included.

AV: The share of the research activities underestimates the effort of the institution in terms of resources allocated to research. It only includes the staff allocated on a full-time basis to research. However, this group represents a very small portion of research staff in the Portuguese scientific system. The greater part is made of the academic staff, which are supposed to allocate a significant portion of their time to research activities. However, for budgetary and administrative matters, these are considered as expenditures in teaching, which is the primary reason why these people were hired by the University.

BO: Figures of Labs do not include personnel cost. The share of research personnel cost is included only in the total budget for research. It was estimate on the basis of national parameters, that are values elaborated through a statistical survey devoted to measures the ratio of time devoted to research by the academic staff. For calculating the research personnel cost, we apply the share of time devoted to research by the academic staff on average. Nevertheless, the values are different between disciplines, so the average value we adopted in this first exercise should be considered as tentative. Current costs for research are included.

LA: The research staff cost (expenditures) has been calculated on the basis of the estimations of the personnel itself (time dedicated to research activities)

**Indicator b.2.**

Weight of research staff cost/personnel total cost

This is a very problematic indicator, which is very important for research. Problems arise mainly from:

- the possibility to distinguish the share of research cost in different research fields,
- the possibility to identify the costs of tenured, tenure-track and temporary positions within the research staff.

The Final budget of Universities does not provide this data as well as University internal statistics. Actually, the total research staff cost should be calculated (or estimated) by each university without distinguishing between stabilised and non-stabilised positions (see Indicator b.1.).

**3. d. Issue 4: How diverse is the funding basis for research?**

**Rationale**

The capability of the University to attract external resources is important for understanding the possibility to enlarge the funding basis for research in a context of growing reduction of core funding.

The focus of the indicators is on the non-core funding, its structure and its weight with respect to the other resources devoted to R&D and to the overall budget of the University. The aim is to measure the whole range of sources of funds and its diversification, the dependence of the University from some major sources, the relative importance of the core funding with respect to the research budget.

**Indicator b.3.**

Structure of non-core funding by source of funding

**20. University of Bologna - Year 2003**

	Lab 1	Lab 2	Lab 3	...	Total
Government project funding	107	46	83		12.873
Contracts and grants	112	158	-		18.075
Research Councils	NA	NA	-		NA
EU/International	-	-	-		4.020
Other (specify)	161	266	37		13.236

**Indicator b.4.**

Relative weight of non-core funding on the research budget

**21. Relative weight of non-core funding on the research budget - Year 2003**

	AV	BO	LA
Non-core funding	5.160.719€	48.204	35.229
Total budget for research	8.495.011 €	218.052	85.433
% non-core funding on the research budget	60,75%	22,1%	41,2%

**Comments:**

AV: The data suggest that a large part of the research funding comes from non-core sources.

BO: Non-core funding does not include the personnel cost. Data are those University supplied to the CNVSU.

LA: It is interesting to know that 73% of the non-core funding is used for research.

**3. e. Issue 5: What is the fund-raising capacity of the university?**

**Rationale**

The capability of the University to attract external funds deriving from different activities linked or non linked to research gives another useful insight on the space of manoeuvre that the institutions can create for getting additional resources.

This indicator provides a measure for understanding if own resources can be considered a strategic mean for reinforcing the University research base.

**Indicator c.1.**

Relative weight of own resources in the overall budget and in the research budget

**22. Relative weight of own resources in the overall budget and in the research budget**

	2002		2003	
	Overall budget	Research budget	Overall budget	Research budget
AV	18,78% (10,66%)	25,28%	15,60% (6,47%)	31,91%
LA	10%	14.6%	9.5%	14%

**Comments:**

AV: The value included in own resources is the result of adding what is received through contracts and services and what is received from Public Administrations (since the contracts

signed with public institutions often come through that and not as a private contract). The larger value also includes student fees, which are considered as own resources of the HEIs.

BO: For measuring the relative weight of own resources in the research budget we included only the part of own resources used for research the largest amount of which derived from student fees.

**3. f. Issue 6: Which kind of external sources does the university attract?**

**Rationale**

The basic idea is to supply data and indicators for going insight the capability of the universities to attract alternative or complementary funding, and the dependence of the institutions to one dominant type of funding.

The focus is on the so-called “market funds”, i.e. funds linked to an external research commitment of the University. The basic assumption is to go insight the sources of funding for understanding the University range of formal linkages, moreover the industrial support to the academic activities.

**Indicator c.2.**

Research contracts and grants by source of funding

**23. University of Aveiro**

Year 2003 (values in brackets represent the % of total number of contracts)

	Lab 1	Lab 2	Lab 3	....	Total
European/International					48 (13%)
Central Government					124 (39%)
Local authorities					NA
Firms and other private organisms					9 (3%)
UA and other Portuguese HEIs					94 (29%)
Agencies and other public institutions					38 (12%)

**24. University of Bologna – Year 2003**

	Lab 1	Lab 2	Lab 3	...	Total
European/International	-	-	-		4.020
Central Government	107	46	83		12.873
Local authorities	*	*	*		*
Firms and other private organisms	112	158	-		17.365
Agencies and other public institutions	-	-	-		710

\* included in agencies and other public institutions

**25. University of Lausanne Year 2003**

	Lab 1	Lab 2	Lab 3	...	Total
European/International					1.747 (7%)
Central Government					
Local authorities					
Firms and other private organisms					10.094 (40%)
Agencies and other public institutions					13.162 (53%)

**Comments:**

The source is the University Final budget. Contracts and grants can be articulated by source of funding (Central Government, local authorities, public agencies, European, International, firms, other private organisms) but it is not possible to distinguish between research and service contracts. Because it is not possible to distinguish between them, all the contracts and grants should be included, apart from the cases of contracts and grants specifically devoted to support educational activities.

This table does not reflect very well reality for LA because main funding agency of Switzerland, National Science Foundation, is legally independent but funded by the Confederation. Moreover, a part of “other public institutions” may also come from the central government.

**Indicator c.3.**

Weight of research contracts on the total budget for research

**26. Weight of research contracts on the total budget for research**

	2002	2003
AV	21,55%	23,96%
BO	15,1	16,0
LA	14%	13%

**3. g. Issue 7: What is the structure of the research budget by scientific fields (large disciplinary groups)?**

**Rationale**

The capability to concentrate resources on priority areas for funding is a very important aspect, which could help the structuring of specialised University profiles. At the same time, some concerns could emerge, as the growing amount of resources concentrated on the

scientific fields seen as the most important for the economic development could undermine other important fields, which are perceived as less “useful”. Realising a good balance between these different pushes is a challenge that affects the designing of the university mission and the scope of the academic freedom for research activities.

The indicator is aimed to understand what is the specific profile of the University and what are the features distinguishing the University from the other research institutions.

The assumption is that the scientific fields are good proxies of the differences of research activities at institutional level.

### **Indicator d.1.**

Structure of the research budget by scientific fields (large disciplinary groups, % values)

#### **27. Structure of the research budget by scientific fields**

(Only the year 2003)

	BO	LA
Natural Sciences	8,4	29
Engineering And Technology	0	0
Medical Sciences	78,9	36
Agricultural Sciences	0	0
Social Sciences	10	22
Humanities	2,7	13

#### **Comments:**

AV: The university could not provide data at this level of disaggregation

BO: Data are those provided by the University to the CIVR. Personnel cost not included, and government lump sum for research not included.

LA: The Frascati Manual classification does not take “forensic sciences into account”. As at the University of Lausanne it is part of the faculty of Law, we choose to integrate it to social sciences.

### **3. h. Issue 8: What is the structure of the university own resources that are allocated to research by scientific fields?**

### **Indicator d.2.**

Structure of own resources allocated to research, by scientific fields (large disciplinary groups, % values)

**28. Structure of own resources allocated to research, by scientific fields**

(Only the year 2003)

	BO	LA
Natural Sciences	29,1	12,5
Engineering And Technology	15,5	0
Medical Sciences	18,2	71,7
Agricultural Sciences	10,3	0
Social Sciences	10,4	12,5
Humanities	16,5	3,3

**Comments:**

AV: The university could not provide data at this level of disaggregation

BO: Data are those provided by the University to the CIVR.

LA: We remember that the research share is calculated on the basis of estimates of the personnel. As expenditures for research are especially high for medical instruments, etc., the share of research, as calculated here, may vary regarding the real allocations/expenditures for research.

**3. i. Issue 9: What is the political origin of research funding?**

**Rationale**

The territorial embedding of the University is a key factor for controlling its capability toward the codified and non-codified knowledge diffusion and the impact on the socio-economic environment

As to the funding indicators, the measurement of the political level that contributes to the University activities is aimed to understand how much the institution is linked to the local agents (research actors, local administrations, firms, others), or to the other political levels (national, international).

**Indicator e.1.**

Structure of research funding by political level

**29. Structure of research funding by political level**

(Only the year 2003)

	European and International	National/Federal	Local/Regional
AV	6,51%	93,49%	NA
BO	5,5	94,3	0,2
LA	2,3%	97.7% for national and local levels	

**Comments:**

The source is the Final budget of University. The structure of the University budget by political level is feasible for the overall budget, but it is not always possible to disaggregate the data by objectives (for instance by using the NABS classification).

AV: Portugal does not have a regional level of government and the local level (municipalities) only has a role regarding basic education. Thus, the public expenditure is overwhelmingly centrally administered.

LA: Data do not allow distinguishing between local and national research funding.

**4. Characterisation of University funding**

We now try to develop a scheme for characterising the University funding in terms of autonomy. Autonomy for the aim of this work has been defined as the space of manoeuvre of the University for pursuing its mission, for establishing strategies and for implementing actions.

Room of manoeuvre can be measured using indicators able to describe:

- the capability of University to get money from external sources, which will allow larges possibilities to make resource allocation in coherence with the established priorities,
- the significance of the Government lump funding devoted to research comparing with the overall budget devoted to research,
- the absence of budget constraints and the possibility to act freely for fund raising.

For the sake of comparability, definitions of categories of data could be considered as a good result for identifying the relevant dimension of University funding. Critical issues are:

- the possibility to calculate the research personnel cost, in different research fields, including also the costs of personnel in training or not tenured position, which in some cases are hidden,
- the availability of data on Government lump sum by labs and by scientific fields,
- the availability of the university Government funding by political objectives.

According with these premises, and taking into account the rationales for the different issues presented in this guide, as well as the rationales for each indicator selected<sup>19</sup>, we now propose a first tentative list of key dimensions able to characterise, in a comparative way, the autonomy that the University should manage:

1. Research capability on the overall budget (Indicator b.1)
2. Capability to reduce the existing budget constraints (Indicator a.1)
3. Relationship between core funding and non-core funding (Indicators a.3, b.4)
4. Relationship between Government and non-Government funding (Indicators a.3, b.3)
5. Relationship between contracts and grants and University own resources (Indicators c.1, c.3)

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<sup>19</sup> See note 1

6. Share of private contracts and grants on total contracts and grants (Indicator c.2)
7. Relationship between International, national and local source of funding (Indicator e.1)
8. Different structure of non-core funding by scientific fields (Indicators d.1, d.2)

Each of the identified dimensions allows the University to control, over the years, aspects such as the reinforcement or diminishing of its research capability, the dependence from block grant funding for research activity, and the capability to enlarge the amount of resources deriving from non-governmental sources, and even the possibility of achieving a higher level of International funding over time.

The capacity of each university to design a financial strategy is also placed in evidence by the analysis of aspects such as the volume of Contracts and grants, and their prominence vis-a-vis to Government's project funding, as well as by the University's financial involvement in financial terms with private organisms. Both indicators could give important evidences for designing University strategies. Furthermore the analysis of the relationship between contracts and grants and University's own resources offers insights on reciprocal influences between both aspects.

Last but not least, our work confirms the existence of large differences between research fields, moreover in terms of external sources of funding. Thus, a characterisation of University autonomy in different research fields is an essential issue for the analysis of Universities' capacity to diversify the strategies and management, as well as for evaluation purposes.

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### III. Human Resources

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## 1. Introduction

In the last two decades, in most of the developed world, universities have increased their share in research at the expense of other specialised public research organisations. On average, in the European Union, since the eighties, the weight of universities in the public sector research overall employment has risen from 55 to 66 %. This trend is observed both in countries where universities were traditionally in competition with strong public research agencies like France (with university research share jumping from 46 to 63%) and in countries where they were already dominant (for example, in Switzerland from 71 to 94%, or in Sweden from 83 to 88%)<sup>1</sup>.

A thorough knowledge of its human capital is essential to a university since it is the most important asset mobilized for fulfilling its two main missions, education and research. As in most industries, labour can be to some extent substituted by machines, but education and research are and will remain labour intensive activities, using the most qualified manpower.

We know very little of the “production function” of research, largely because of the difficulties faced in measuring output but also in identifying properly the various inputs that enter the process and finally in understanding the processes involved in the highly specific activity.

Devising appropriate classification is therefore of the utmost importance when attempting to monitor in some detail the efforts and results of people working in teams in the field of research, where actors complement each other in a largely unchartered ways.

Some of the issues facing research organisations and, more specifically universities, are largely related with trends they cannot control individually, like the growing competitive pressure or the diversification of funding. But there are lines of action they can take. Within the limits of their autonomy, they can attempt at improving their position by concentrating their efforts on their domains of excellence, by attracting the most qualified staff and by harnessing the existing human resource through appropriate incentives and efficient allocation of tasks.

Such lines of action are crucially dependent on the availability of relevant and reliable information that will allow each institution to compare itself with its partners or competitors and to identify the weaknesses to alleviate and the opportunities to seize in order to realize their strategic goals. They need a battery of unambiguous and adequate indicators.

This chapter attempts to

- establish a workable classification of the various components of this human resource that would fit to the different legal contexts and traditions that prevail across Europe.
- isolate the crucial issue that institutions face in relation with the human resource they devote to research.
- identify data, either readily available or to be constructed, and to propose and discuss indicators of human resource based on them that may be used in order to assess their action and better manage their operations.

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<sup>1</sup> OECD (2003) *Governance of public research: Towards better practices*, table 5.2

## 2. *Conceptual framework*

The first conceptual effort needed when addressing the human resource engaged in university research has to do with definition of what is meant by research personnel and what constitutes significant groups that can be distinguished among them.

### 2. a. **Definitions and classifications**

A traditional divide in analysis of production is that between those directly engaged in production (the operational core, in the Mintzberg terminology) and those who, although playing an essential role in supporting them, do not take part directly in the production.

It is highly debatable whether, in the production of new knowledge as well as in other sectors, such a distinction rests on a clear conception of the production process.

It is nevertheless usual and we shall explore its relevance.

#### 2.a.i **Research staff, research support staff**

Academic staff, also referred to as scientific personnel, is the part of personnel engaged in research and teaching having qualified as researchers. Titles and status differ from one country to another, the most usual titles being professor (assistant, associate or full professor) or lecturer (junior, senior, principal lecturer).

Research staff is a wider concept since it includes people doing only research and researchers in training.

Research staff is distinct from technical staff participating in research called research support staff. This category of staff is also distinct from clerical and administrative staff taking part in the administration of research.

#### **Relation to the standard classifications**

By using a combination of classifications for levels of education (ISCED) and levels of occupation (ISCO), the Canberra Manual of the OECD<sup>2</sup> distinguishes three groups of personnel in the field of research:

Two are specific to Research: the major groups "Professionals" and "Technicians and Associate Professionals".

The Professionals group is defined as follows: "This major group includes occupations whose main tasks require a high level of professional knowledge and experience in the fields of physical and life sciences, or social sciences and humanities. The main tasks consist of increasing the existing stock of knowledge, applying scientific and artistic concepts and theories to the solution of problems, and teaching about the foregoing in a systematic manner. Most occupations in this major group require skills at the ISCED categories 6 or 7." (Graduate or postgraduate degree).

The Technicians and Associate Professionals group is defined as follows: "This major group includes occupations whose main tasks require technical knowledge and experience in one or more fields of physical and life sciences, or social sciences and humanities. The main tasks consist of carrying out technical work connected with the application of concepts and operational methods in the above-mentioned fields, and in teaching at certain education

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<sup>2</sup> OECD (1995), Manual of the Measurement of Human Resources Devoted to S&T «Canberra Manual»

levels. Most occupations in this major group require skills at the ISCED category 5." (diploma or short university degree).

A third group is less specific in terms of level of education and level of occupation: "administrative staff" defined in the Frascati Manual as follows: "all persons providing direct services such as R&D managers, administrators and clerical staff." They are not part of scientific personnel but contribute to research.

### **Broad categories of staff employed in relation to research**

The suggested categories for staff will therefore be:

- Scientific personnel or research staff
- Research support staff
- Administrative support staff for research

These categories do not cover all personnel employed by universities and research institutions. Universities employ teaching-only personnel who will not be counted as scientific personnel. They also employ technical and administrative personnel engaged in activities not related to research.

It may sometimes be difficult to assign one person or a specific group of personnel to one of these broad categories.

In some countries, owing to different statutory frameworks, research support staff is clearly separated from research staff, whatever the level of education required. In the French CNRS, a person employed as a research engineer may have exactly the same academic qualification as a person employed as a researcher and nevertheless be assigned to the category of research support staff when the Canberra manual would clearly treat him/her as research personnel.

Research support staff may also, sometimes, in a laboratory, perform the same functions as administrative support staff. This situation may distort comparisons between laboratories or universities that resort to different types of contracts for performing similar tasks or that organize a different distribution of tasks.

#### **2.a.ii Permanent and temporary staff**

A second divide likely to impact on the scientific production relates to the status of people employed in the field of research.

##### **Permanent or stable staff**

A feature that used to be prominent in Academe is the Tenure, a specific kind of permanent contract supposed to provide a security of employment conducive to long term productivity.

Tenure or permanent contract:

Under the tenure system, after a probationary period, academic staff are granted by their employer a labour contract that provides for a protection against dismissal without a cause.

A permanent contract simply does not specify the period of employment. The termination of the contract is open to both parties under the general provisions of the labour relation legislation.

Tenure is sometimes associated with civil servant status: Civil servants or public agents are employed by the State without a contract under statutory rules. The statute ensures lifelong

employment and a career, in the sense of a foreseeable progress in compensation and responsibilities.

The concept of stable staff is less easy to define since stability may be assessed only: Temporary contracts are frequently renewed, resulting in stable employment without the type of guarantees conferred by tenure or permanent contract.

This is why the concept of stable employment, although used in the literature, will not be retained in the definition of human resource indicators.

### **Temporary staff**

The term temporary staff encompasses a wide range of situations: From *casual* employment where staff is hired for a specific task, possibly for a limited number of hours or days, to contracts signed for a specified period of time that may be quite long (up to six years).

One category of temporary staff is of particular interest for it constitutes a vital resource for departments and research laboratories, the post-doctoral “students”. Although they work under many different types of contracts, they constitute a category of itself. Although they may all work full time in the same laboratory, they may be employed by the university or by various external partners, which leads to risks of omission or underestimation. This was noted by the OEU working group on funding, when post docs are funded externally, *e g* by charities or firms, which is common in biomedical research. In this context, the inclusion of such researchers in the work force of the laboratory or the institution should not be dependent on the funding of their position but rather on the nature of their occupation.

They may work part time in which case they are to be distinguished from casual researchers who are hired for short term tasks.

#### **2.a.iii Full-time, part-time staff**

Increasingly, people are working part-time under many different patterns: They may hold several jobs or allocate their time among different activities. They may work in a permanent position but choose (or be imposed) a working year or a working week shorter than the legal or the usual worker. It is frequent for temporary staff to be offered nine or ten months renewable contracts synchronized with the time structure of the academic year. Post-doctoral positions are offered on a part-time basis, at least as far as pay is concerned.

### **Part time employment**

When doing headcounts, we must take into consideration the existence of part-time positions in labs and departments. Regular part-time employment is usually well documented in institutional statistics. Using the appropriate time quota, one should calculate full-time equivalent staff (FTE).

The matter is more difficult for dealing with casual employment. Number of staff working part-time on an irregular basis can be estimated from financial sources, when their compensation is recorded separately from that of regular employees.

### **Distribution of working time among different activities**

A much more frequent situation is that where staff (permanent or temporary, full-time or part-time) allocates their working time among activities that ought to be assessed and recorded separately. This is a common problem for cost accounting. In some industries, knowledge of such time distribution is vital and firms have developed sophisticated methods for recording time spent on various tasks. Such methods are not frequently used in the academic world and we may have to resort on less demanding (but less accurate) techniques for estimating such

distributions. It may be appropriate to distinguish academic staff from support staff in this respect.

### **Academic staff**

By definition, academic staff are likely to allocate their time among at least three broad activities: Teaching, research and administration. A third mission of universities can be isolated from the two other missions of research and education/training, but it is debatable whether this mission entails a different type of activity as far as staff is concerned. The part of their administrative tasks that can be related clearly to either teaching or research should be assigned to each of these activities. Time spent on the wider administration of their faculty or university should also in principle be allocated to the same activities according to allocation criteria, in the way used in accounting to allocate overhead costs to individual products or processes. Time spent for research is therefore the sum of time spent directly on researching, time spent on administration of research and time spent indirectly on administration related to research. It is rather unusual in universities to resort to techniques that are common in private organisation such as time sheets (often imposed on professional staff like that of consultants' firms). They are however getting more familiar to researchers since many externally funded projects require that such time sheets are submitted to the funding organisation.

Most often, such refined accounting techniques are not used to assess the research component of academic staff time. Several less sophisticated methods have been used for estimating time devoted to research activities: Estimates on the basis of self-declaration or some external judgement (dean, head of department, etc...), or uniform use of a standard ratio (as in France where it is commonly estimated, against all evidence, that academics spend half their time on research).

### **Support staff**

The same problem of allocation of working-time among distinct sets of tasks concerns support staff, but less frequently since administrative organisation is usually based on a clearer division of labour, except at the highest level of the administration of a faculty or university. Routine surveys may be conducted with members of staff or heads of administrative units to assess the resources devoted to activities, in relation with allocation of positions or budgets. In universities where a large share of the administrative and technical support staff performs tasks related to either research or teaching, such surveys ought to be conducted on a regular basis. This enables the institutions to assess precisely the number of full time equivalent personnel engaged in various research related activities at the laboratory level or at the level of the institution as a whole.

#### **2.a.iv Research students: Students or researchers?**

Although in many countries, access to doctoral programmes (or PhD programmes for short) formally requires only a first degree (Bachelor degree or the equivalent) universities increasingly offer post-graduate programmes preparing for doctoral studies. Such programmes like Research Master programmes, imply research in a department or in a laboratory. The status of students enrolled in such programmes is ambiguous: If they are taught and trained to become researchers, they cannot be considered as true researchers. Some institutions enrol students in PhD programmes and award them Master's degree "in passing". Some universities treat them as researchers, others do not. The grants received by master's students may be seen as a compensation for their participation in research or as a maintenance grant similar to that of undergraduate students.

In order to allow for international comparison, only doctoral students will be considered as research students. If institutions wish to include master's students in the figures, they must set them apart from doctoral students.

In some countries, PhD students are part of the university personnel on an employment contract. In others, only part of the research students have contracts that provide for a specified amount of work not directly related to their research such as undergraduate teaching. Those who benefit from a grant are not required to perform any task outside of their research. When there is a variety of schemes for funding doctoral studies, the situation of research students may differ widely from one field to the other or from a university to another.

Research students who hold a part-time job outside of their department or research laboratory in order to fund their studies should not be counted as full-time researchers.

## **2. b. The different contexts of work: organisational setting of research**

Although definition of research is widely agreed upon, its organisation differs substantially from country to country, from university to university in a country and, sometimes, in the same institution among different fields of research.

The significant units in which research is conducted and managed may be large or small, closely or loosely related to teaching. These different settings make it difficult to compare the resources used and the results achieved.

### **2.b.i Department, faculty, laboratory**

The traditional and most common organisation centres on departments, homogeneous group of scientists teaching in the same academic subject and researching in the same scientific field, more or less broadly defined. Departments of related fields are grouped together in a School or a Faculty that provides a common administration. From this perspective, a rapid survey of institutional structures in different countries as seen through their internet sites enables to depict a "typical university" that comprises from six to ten faculties, each counting from three to twelve departments. In most countries, the department was traditionally and still is the significant unit for research: People in the department know each other and share common goals in teaching and in research.

Over the last decades, however, the increasing separation of funding and evaluation of research and teaching has led to different structures where departments have become clearly distinct from laboratories or research centres. The search for a « critical mass » necessary for accessing new types of targeted funding has led to a concentration of research units in larger and larger laboratories dedicated to broader field or multidisciplinary research.

A different pattern has also emerged when a significant part of public research is conducted in specialized institutions outside of the universities. This is the case in France, and, to a less extent in Spain and in Germany, where several research agencies operate research units on

their own and sometimes in partnership with universities<sup>3</sup>. In France, most research centres are jointly operated by universities and national research agencies, each bringing in its own staff, equipment and finance.

### 1. Overall structure of various HEI

University	Number of faculties	Number of departments or research units	Number of joint units (in association with)
Maastricht	7	95 departments (48 in Medical school) 14 research institutes	13 associated institutes
Autonoma Madrid	8	62 departments 8 institutes	5 (CSIC)
Bourgogne	11	49 research units	27 (CNRS, INRA, INSERM)

Such a trend of increasing differentiation of research structures further complicates the building of a common framework for observation and comparison between institutions and between countries.

#### 2.b.ii Organisation of support to research

The organisation of support for research, the operation of equipment and facilities is also likely to differ from institution to institution. Some universities provide support to researchers through central services when others leave it to departments and faculties to decide on the most adequate organisation.

This choice has strong implications on the ability of the institution to manage its human resource and to assess both cost and performance of its services. In universities where support services to research are concentrated, the measurement of resources used by each department or research project may prove more problematic.

#### 2. c. “Perimeter” of institutions

When attempting to identify the human resources allocated to research in an institution, one cannot avoid to consider the question of the boundaries of the institutions. Although most scientific personnel and research support staff are easily identified as employees of the university, some participants in the research effort are in a different position.

Research is often a co-operative activity of networks and partnerships. Research projects developed in networks often imply common work by researcher belonging to different institutions. This may be reflected in indicators measuring the extent of such scientific co-operation but this growing practice, obvious when one looks at individual research projects, distorts the picture when looking at institutional units as stable groups of researchers.

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<sup>3</sup> The best known of such agencies are CNRS in France, CSIC in Spain and the Max Planck Gesellschaft in Germany.

From that point of view it is equally important to record “imported” and “exported” staff: Researchers who are on the payrolls of an institution but are seconded for a substantial period of times should not be counted in their institution of origin in the same way as they should appear in the headcounts of the receiving university or laboratory. When payrolls are the only source of information on staff, such a distinction is likely to be overseen.

A special reference should be made to medical research where a major share of research takes place in hospitals which are not infrequently quite distinct from universities. Although university hospitals are quite common, in several countries, hospitals are separate institutions, linked to universities by contract or less formally.

The overlapping of activities related to research, teaching and health care has a strong impact on the allocation of the working time of the personnel of these institutions.

### 2.c.i Foundations, charities

A situation that needs special attention is secondment of researchers employed by one organisation to another one. This case is quite frequent for temporary research staff like post-docs and “casual researchers” who are funded by external sources like foundations and charities. In some instances, foundations are in fact a parallel organisation created and operated to circumvent rule and regulations of the universities or of their partners. It is not uncommon that a successful department or laboratory relies on staff formally employed by many employers with different rights and duties.

### 2.c.ii Joint ventures

Another situation likely to make more complicated collection and comparison of data and indicators is the case of joint ventures. In jointly owned and operated laboratories, staff may have several employers and different types of contracts for the same type of position.

## 2. d. Appropriate level of observation

In most fields, owing to the collective nature of research, individuals are more and more rarely the appropriate level at which production can be observed and analysed. But research projects are usually conducted at a level lower than the department or the laboratory. Some universities identify sub-units or research groups that are fairly stable and very homogeneous in terms of research subjects. These become more visible in very large labs or in case of amalgamation of existing research unit or departments where the various component retain part of their identity and some degree of autonomy.

Department, laboratories or more generally “units” are usually a level at which resources are managed, finance, equipment, staff. Depending on the management structure of the university, the autonomy of such units may be large or narrow. The sub-unit level is very rarely a level of management. As a consequence, although it would often be the most appropriate level for observing research activity, little statistics and administrative data on human resource are collected and available at this level.

## 2. e. Scientific fields

### 2.e.i Different affiliations for scientific personnel

Researchers are connected in various ways to the different fields of science: They may be identified by the subject in which they took their PhD, by the department and faculty to which they belong or by the field in which their publications are classified. These various affiliations do not necessarily coincide.

First, researchers may slide or jump from one field to another during their career.

The teaching needs of a university or a faculty may induce recruitment of academic staff in a subject where there is no active research unit locally.

Faculties are also sometimes pluri-disciplinary and may operate departments where people from several research specialties work together. In some instances, it has been considered a valuable asset for an institution to own such structures enabling them to push research to new frontiers of science.

When scientific personnel working together in a lab have different contracts or are employed by different employers, these may use different classifications. In research units jointly operated by universities and national research agencies, in France, research staff employed by different institutions working on the same project may be classified in different fields.

All these discrepancies create problems when identifying staff numbers for various fields of science and make comparisons difficult or misleading.

### 2.e.ii Classifications of research sectors in a university

Universities organize freely their schools or faculties, department or research laboratories. In relation with their history, their size and their scope, they choose to operate a smaller or larger number of such internal units. Restructuring takes place from time to time, for management purposes or in order to take account of long-term evolutions such as the creation of new domains for teaching and research or the merger of existing institutions.

The organisational structure of research is therefore very diverse. It may even happen that two institutions have no field of research in common, which makes it impossible to compare them. Not all universities are fully comprehensive and in some countries there are numerous institutions specializing in one or two fields of research. In France, when it was decided to split the larger institutions into several smaller universities, the choice was often made to create a university from one single faculty, like in Paris. Comparisons are therefore limited to an homogeneous subset of institutions.

As many statistics needed for the construction of indicators are collected at the level of such units, it is likely that local classifications will not be in accordance with any type of standard classification. The smaller the number of classes, the easier the comparison will be. But, at the same time, too small a number of fields will hide important specificities.

The Frascati manual<sup>4</sup> provides a classification in six fields

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<sup>4</sup> Proposed Standard Practice for Surveys on Research and Experimental Development «Frascati Manual» OECD Paris 2002

- 1 Natural sciences.
- 2 Engineering and technology.
- 3 Medical sciences.
- 4 Agricultural sciences.
- 5 Social sciences.
- 6 Humanities.

The main shortcoming of this classification is the inclusion of the broad field of Biology in the Natural Sciences. The observation of university structures shows that Biology is less and less associated with Physics or Chemistry and increasingly often coupled with Medical or Health sciences. Agricultural sciences are also increasingly associated with Biology under the heading of Life Sciences.

This suggests the following adaptation of the Frascati classification:

- 1 Natural sciences (Frascati 1 less Biology 1.5)
- 2 Engineering and technology.
- 3 Health sciences.
- 4 Life sciences (Frascati 4 plus Biology 1.5).
- 5 Social sciences.
- 6 Humanities.

If this level of aggregation still reveals too fine, a classification in three broader fields may be advocated:

- 1 Science and technology (Frascati 1+2-1.5)
- 2 Life and Health sciences (Frascati 1.5+3+4)
- 3 Social sciences and humanities (Frascati 5+6)

Very often, data gathering is constrained by existing national or even “local” classifications that are historically determined or stem from a specific policy. Adapting the available data to standard classifications implies much effort and sometimes, for lack of relevant information, the use of estimates or rules of thumb that is likely to distort the real picture of research.

Comparing several institutions either implies to resort to the lowest common denominator of the research fields or to limit the comparison to common specific fields.

## **2. Comparison of three institutions**

	<b>Maastricht</b>	<b>Autonoma Madrid</b>	<b>Bourgogne</b>
<i>Frascati 6 fields</i>	<i>Faculties</i>	<i>Faculties</i>	<i>Research sectors</i>
1 Natural sciences	-General sciences	-Sciences	-Science and technology
Of which Biology			-Life sciences
2 Engineering and technology	-General sciences	-Sciences	-Science and technology
3 Medical sciences	-Medicine -Health sciences	-Medicine	-Health & Life sciences
4 Agricultural sciences			
5 Social sciences	-Law -Business and economics	-Political science -Economics -Education	-Social and human sciences
Of which Psychology	-Psychology	-Psychology	
6 Humanities	-Arts and culture	-Philosophy	-Social and human sciences

### **3. Other methodological issues**

#### **3. a. Statics versus dynamics**

Attempting to characterize the human resources devoted to research in a university requires considering both a situation and an evolution. The situation at a given date gives an indication of the strength and structure of the resource at the institutional level and at the level of the most appropriate unit

The research structure of a university can be described at some point in time by describing the composition of the human resource and its distribution among the various functions and operational units of research. This structure may be compared with some reference in order to detect singularities or imbalances.

Such structures do not help much managers who want to take action if they are not complemented by dynamic observations.

The dynamics of the human resource may be revealed by data or indicators that express evolution over a given span in time. They show what transformation is actually taking place. For example, if an aged population of researchers constitutes a problem for a university, it is important to look at the renewal of this population and at the age of the newcomers.

When data are systematically collected on a regular periodic base, building dynamic data is quite trivial. But when data collection is irregular or when various data are gathered with different periodicity, it may reveal hazardous to construct satisfactory information on the dynamics of the human resource.

#### **3. b. Transversal nature of human resource**

Data on human resource are needed in most dimensions of the OEU matrix. When organising collection of data on human resource, this should be kept in mind

### 3.b.i Human resource and funding

One of the main sources for data on human resources is accounting and financial records. The payrolls provide accurate information on numbers and types of employees.

When universities have developed extended cost accounting practices, most of the data needed for the construction of human resource indicators are readily available. It does not mean however that such data give a complete and reliable picture of the research activity: Some of the personnel actually taking part in research may be seconded by an organisation distinct from the university or paid by a third party. This may also be the case when research programmes are jointly operated and separately funded by several research institutions.

### 3.b.ii Human resource and scientific production

It is obvious that the identification of research staff and its precise location is a precondition for measuring scientific output in a meaningful way.

In order to interpret the structure and evolution of scientific output, the latter has to be related to wider information on the distribution and characteristics of the human resource involved. For this reason, the classifications used ought to be consistent which often leads to more aggregate measurements and therefore to a loss of information.

### 3.b.iii Human resource and academic outcome

With the publication of international league tables on research excellence, it has recently become obvious that the measurement of research outcomes at the departmental or institutional level depends crucially on a proper identification of the organisation in which outcomes are produced or, rather, to which outcomes will be assigned. In a competitive world in which such rankings matter a lot since they are used as a base for resource allocation decisions, the production of knowledge that relies heavily on team work, cooperation and networks, inevitably creates tensions and lead to power struggles.

### 3.b.iv Human resource and third mission

It is in the domain of the relations of universities with industry and with their social environment that the identification of human resources devoted to research and development raises most problems. A number of potential indicators that have been listed by the OEU working group on third mission should be included in data collection and identification.

This is the case for involvement of firm members in supervision of PhD theses, PhD students supported by industry, PhD students under contract with industry, number of permanent staff in transfer offices, number of staff having moved from university to new firms, number of PhDs and Post Docs involved in new firms.

### 3.b.v Human resource and governance

In monitoring institutional governance, the distribution and characteristics of staff involved in research and development provide useful information on the internal structure of the university. Among other indicators the OEU working group on governance has mentioned: Number of academics/researchers by broad disciplines or by faculty, by fields of research, by projects; Number and size of labs and departments, Number of teams sub-units within each; *At the rectorate level (central administration)*, staff in charge of the research policy or working in a Transfer office, specified in numbers as well as by level of qualification.

## 4. The indicators

The OEU Project's purpose is to provide institutions with tools to assist them in the management of their research activity. Four overarching issues have been identified as crucial for universities in five dimensions of their research policy. Each of these issues can be approached through a set of indicators designed to provide relevant information in a synthetic way. Each indicator is based on specific data defined without ambiguity as much as possible.

The presenting of these indicators will clearly state their rationale, i.e. how each of them relates to the issue and how it should be understood. The problems likely to arise from the collection and the treatment of data will be briefly mentioned.

### 4. a. Characterisation of the institution (7 indicators)

Among the various indicators designed to characterize an individual university, a number relate directly to the dimension of human resource.

#### 4.a.i Indicator of Specialisation

##### *Rationale*

As institutions do not cover all fields of research, this indicator provides an important information on comparability of institutions.

##### *Data*

#### 3. Number of fields of research in which the institution operates research units (out of 6 fields)

	UMLV Marne	UNIL Lausanne	UAM Madrid	U Aveiro	U Paris-Sud	U Maastricht	U Bourgogne	EPFL Lausanne	U Ca' Foscari Venice
Number of research fields (out of 6)	3	4	5	5	3	4	6	2	3

Source chapter ICU, Paloma Sanchez, UAM, Using Frascati's 6 fields

##### *Comments*

The indicator is dependent on the definition of the fields of research and related to the research structure of the institution: A larger number of units is likely to increase the presence of the institution in several fields.

#### 4.a.ii Indicators of research structure

A set of indicators designed to inform on the size and the distribution of human resource taking part in research, e.g. the number of significant research units

**4. Number of significant research units**

University	Number of faculties	Number of departments or research units	Number of joint units ( <i>in association with</i> )
U Maastricht	7	95 departments (48 in Medical school) 14 research institutes	13 associated institutes
U Autonoma Madrid	8	62 departments 8 institutes	5 (CSIC)
U Bourgogne	11	49 research units	27 (CNRS, INRA, INSERM)

This indicator has to be calculated at the level of the institution and by scientific fields. For the meaning of “significant research unit”, see the section on definitions. The concept of laboratory, familiar to the natural scientists does not fit with other fields and is often not relevant to the management of research personnel.

## Distribution of research staff

**Rationale**

Indicators of distribution are to be calculated both at the institution level and at the research unit level, or, at least at the level of the fields of research.

They provide information on the actual production process and the differences in practices between fields or research and sometimes research units.

- **Share of permanent researchers**

*Number of permanent researchers / total number of researchers*

- **Share of temporary researchers**

*Temporary researchers (excluding PhD students) / Total number of researchers*

- **Share of research students**

*Number of research students (PHD students) / Total number of researchers*

- **Ratio of support staff to research staff**

*Number of research support staff per researcher*

*Number of technical research support staff per researcher: When feasible, it is useful to draw a distinction between staff participating in research and staff taking part in the administration of research.*

- **Ratio of technical support staff to research staff**

- Ratio of administrative support staff to research staff

*Data*

**5. U Bourgogne - Distribution of research personnel (Full time equivalent 2003-2005)**

Institution Field/Faculty	Permanent researchers(1))	Temporary researchers (2)	Research students	Technical support staff	Administrative support staff	Total research staff
Humanities	54	3	110	0,4	3,4	170,8
Social Sciences	99	11	474	19,1	9,1	612,2
Health sciences	119	3		24,1	3,5	149,6
Life sciences	61	1	209	30,6	4,8	306,4
Natural sciences	93	1	204	24,1	9,8	331,9
Technology	75	4		6,7	0,5	86,2
Whole university	501	23	997	105	33,5	1659,5

*Source: Tableau de bord IATOSS 2003, PhD survey 2004, Staff survey 2004*

*(1) Only university academic staff (titulaires de statut enseignement supérieur)*

*(2) Only ATER on short term contracts for teaching and research*

The method for calculating full time equivalent staff applied to Permanent researchers is different from that of support staff: Support staff working time is allocated between research and teaching on the basis of a periodical survey for which the personnel are asked to allocate their time among three functions, in a list of 19. For permanent research staff, it is considered that half their working time is allocated to research, in accordance with the statutory definition of their duties. It should be stressed that such a method is highly unsatisfactory, especially since it does not take into account their participation in the administration of research.

**6. Indicators of Distribution of research staff**

U Bourgogne Field/Faculty	PR/R I1.2.2.1	Temp/R I1.2.2.2	Stu/R I1.2.2.3	Sup/R I1.2.2.4	Tec/R I1.2.2.5	Adm/R I1.2.2.6
Humanities	32,3%	1,8%	65,9%	2,3%	0,2%	2,0%
Social Sciences	17,0%	1,9%	81,2%	4,8%	3,3%	1,6%
Health sciences	97,5%	2,5%	0,0%	22,6%	19,8%	2,9%
Life sciences	22,5%	0,4%	77,1%	13,1%	11,3%	1,8%
Natural sciences	31,2%	0,3%	68,5%	11,4%	8,1%	3,3%
Technology	94,9%	5,1%	0,0%	9,1%	8,5%	0,6%
<b>Whole university</b>	<b>32,9%</b>	<b>1,5%</b>	<b>65,5%</b>	<b>9,1%</b>	<b>6,9%</b>	<b>2,2%</b>

*Comments:*

The above indicators highlight some of the problems mentioned earlier:

-The excessive weight of Student-Researchers compared to other researcher stems from the underestimation of Temporary researchers.

-The assignment of research students to the 6 fields of research is obviously skewed. -The large number of research students in the social sciences compared with the small ratio of support staff underlines large differences in the conditions in which PhD are prepared in France according to the field of research.

#### **4. b. Indicators of Autonomy (4 indicators)**

Autonomy of institutions to manage their research staff and organise their work according to the needs perceived locally, nationally and internationally is essential for implementing a research policy and reacting to changes in environment. This autonomy is never complete since universities have to comply with general labour relations legislation and with conditions imposed upon them by their various sponsors and funders. This constraining circumstances are likely to vary very much from one country to the other but also from one institution to the other in the same country and from one field of research to the other even in the same institution. A factor of local variation is the way institutions or research units seize opportunities when they exist.

##### **4.b.i Degree of autonomy in creating permanent positions**

###### ***Rationale:***

By permanent position is meant either tenure or permanent contract. It is usual that the decision to create such a position in the public sector is subjected to formal procedures at the level of the state. When universities are allowed to create new professorship, their freedom is sometimes restricted by a fixed ceiling on the number of such positions. The indicator relates to financial responsibility of the institution.

###### ***Data***

This indicator cannot usually be estimated otherwise than by comparison with some reference in the past, abroad or in another setting. A likert scale could nevertheless be attempted with the following values: None, little, fair, large, complete

###### ***Comments***

Although absolute values have little meaning for such an indicator, it is useful in assessing the dynamics of autonomy.

##### **4.b.ii Share of staff appointed without approval of an external authority**

Rationale : This indicator differs from the previous one in that it measures the degree of autonomy in recruiting staff on already existing positions. The constraints imposed on creation of permanent positions are justified by the desire of the funding authority not to be carried away but this does not imply a further control. When such a control exists on actual recruitment of new staff, it is based on a different motive, usually ensuring that certain criteria of qualification are met by the candidate. It relate to the freedom of the institution to define its recruitment criteria

###### ***Data***

The indicator relates the number of recruitments made without any external approval to the total number of recruitment, over a three or four year period, in order to avoid erratic variations.

**Comments**

In large institutions, it would be interesting to estimate the indicator at the level of the research units or at least of the field of research.

**4.b.iii Rate of reallocation of staff (between fields or faculties):**

**Rationale:**

This indicator measures the actual use of autonomy in allocating staff by an institution.

**Data**

Number of permanent research positions transferred from one field of research to another or from a faculty or a field of research to another over a period of three years in relation with the total number of positions.

**7. Reallocation of positions among fields (permanent academic staff)**

U Bourgogne (2004-2006)	Positions lost	Positions gained	Total number of positions	Rate of reallocation %
<b>Fields of research</b>				
Social sciences		4	203	+1,97
Humanities			108	0
Life + earth sciences	1		121	-0,8
Medical sciences +sport		5	243	+2,05
Natural Sciences	16		170	-9,41
Engineering & technology		8	158	+5,06
UB	17	17	1003	1,69

*UB Bilan du contrat 2003-2006*

**Comments**

The rate in itself is rather ambiguous without the knowledge of the institutional environment. It indicates a definite policy of the institution only to the extent that reallocation is possible and necessary: According to the initial portfolio of the institution in given fields of science and research specialties, the need to restructure may be stronger or weaker. An old institution well positioned in emerging disciplines might find more pressure for reallocation than a younger specializing in more stable fields.

Another ambiguity, is illustrated by the above table, stems from the fact that needs for academic positions are not only linked with research developments but also with changes in teaching. In a country like France where teaching in higher education is, to a large extent, demand-driven, the teaching needs are likely to undergo dramatic changes. If it is possible to even out limited fluctuations by resorting to temporary staff and overtime, large drifts in enrolments put a strong pressure on universities to depart from a recruitment policy exclusively geared to research.

4.b.iv Distribution of teaching time (by fields or faculties)

***Rationale***

The distribution of teaching time of academic staff is both a measure of the degree of autonomy of the university in specifying staff duties. A dispersion in the size of the teaching load indicates conversely that the university recognize different degrees of involvement in research. It is essential to measure the actual amount of time spent on teaching as the knowledge of statutory rules does not provide any useful information.

***Data***

The indicator would be the average teaching time for the institution and by department or field of science, together with its standard deviation in order to identify dispersion.

***Comments***

Variation of the distribution of teaching time among fields of research may reflect properly differences in attitude towards research but it may also reflect the sheer pressure of teaching in temporarily understaffed departments. Similarly, the involvement of staff in administration might distort the picture of the faculty involvement in research.

**4. c. Indicators of strategic capabilities (3 indicators)**

4.c.i Performance-related bonuses

***Rationale***

The actual use of incentives and performance-linked rewards by the institution is indicative of the policy of the institution. To make sense, it has to be related with indicators of outcomes.

***Data***

For researchers and research support staff, by field of research, department or faculty: share of researchers receiving supplementary salary or bonuses for their participation in research activity (under whatever scheme, local, regional or national).

***Comments:***

A large share in a research unit or in an institution may be interpreted as a sign of collective excellence or as the result of a non-discriminating policy, depending on the size of the bonuses: Institutions may decide to distribute evenly a small amount of incentive money, with little or no effect. They may also, through the sheer quality of their research, secure additional funds to distribute to reward excellence.

4.c.ii Support to young researchers

***Rationale***

Universities may set aside funds to encourage young researchers to start projects on their own and acquire their scientific autonomy.

They may help and support their researchers to apply for similar funds at the regional or the national level.

*Data***8. Number of projects funded or financial support granted to researcher under 40, under schemes specifically designed to promote the scientific autonomy of young researchers**

In Spain, there are four mechanisms for steering research careers. They come from different financial sources: internal, national and regional level. In UAM

<b>Contracts</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
Ramon y Cajal (1)	24	33	58	19
Juan de la Cierva (2)				14
CAM (3)			10	8
UAM (4)			6	8

(1) Only young researchers (< 10 years after PhD)

(2) Only young researchers (< 3 years after PhD)

(3) Autonomous Community of Madrid.

(4) Autonomous University of Madrid.

*Comments*

The use of this indicator is limited to one country because of the specificity of such schemes and also because of the difficulty to distinguish on merit funding under such schemes and ordinary funding of research projects. The only criterion of the age of the head of project could convey similar information.

**4.c.iii** Distribution of income from Intellectual property*Rationale*

Income from patent licensing and copyright accruing to the institution may be shared with the researchers or the research units at the origin of the related intellectual production. This constitutes an incentive for researchers to enter the burdensome patenting process that is likely to bring in new resources for funding research in the institution.

*Data*

Share of income from patents and copyright allocated to researchers and research units by fields of research, faculty or department.

**4. d. Indicators of attractiveness (7 indicators)**

There are different reasons for universities to prove attractive or to increase their attractiveness. One is visibility: Attracting numerous students or qualified researchers is the proof that the quality of the institution is recognised, nationally and internationally.

Another reason is the need for renewal of research staff: The quality of recruitment depends on attractiveness.

For research students, the importance of the peer effect on the training of researchers is a very powerful motive for attracting bright students.

Issue : renewal, specialisation

#### 4.d.i How attractive is the university for research students at PhD level?

Share of national research students enrolment, by field of research

Share of the foreign research students

##### *Rationale*

The indicator when computed by field of research or by faculty, provides the institution with a clear view of whether they attract more students in some fields of study than in others.

##### *Data*

#### 9. UB PhD enrolments

U Bourgogne	PhD enrolments	National share of enrolments	Foreign students
Fields			
Humanities except history	110	1,1%	34,4%
Social sciences + history	474	1,6%	29,5%
Life + earth sciences	209	2,1%	45,0%
Health sciences +sport	82	3,3%	10,7%
Sciences & technology	204	1,2%	35,0%
<b>Total UB</b>	<b>1079</b>	<b>1,6%</b>	<b>28,3%</b>

Year 2004-2005

##### *Comments*

The figures indicate that this university is more attractive in health sciences and in life sciences. If on average it attracts 1,6% of the students enrolled in French universities, the figure is almost double for health sciences and sport. This may not indicate a strong attraction but rather the fact that not all universities offer PhD programmes in this field.

Although the definition of research students has been limited to PhD students, the figures for enrolment at the PhD level do not give a complete picture of the actual attraction of a university in a field of research since student often find it safer to select the institution they wish to join at the master level. In many universities, the master programmes are seen as the best preparation for the PhD programmes they offer.

Share of research students having graduated at master's level from another university, by field of research.

##### *Rationale and comments*

This is a better indication of the actual capacity to attract students and easier to measure since it does not depend on the availability of national enrolment figures that are often known with a delay.

#### 4.d.ii How Attractive is the university for qualified researchers?

Average number of candidates per position open (by field, compared to national average)

##### *Rationale*

The number of applicants to a position is a good measure of attractiveness of a department or a university in a given research field. It should however be related to some information on the number of potential applicants. This is dependant on the actual recruitment process operated in the country and in the field. Some positions are open on conditions that limit severely the number of applicants.

**Data**

Number of applications for positions open in a field of research during the last three years related to the number of applicants to all positions open in the same field at the national level.

**Comments**

The contextual information needed to devise this indicator may not be available when institutions have no obligation to publish the number of applicants. In some countries where all applications are processed at the national or at the regional level, such information is usually available.

Share of outsiders in academic staff recruitment (applicants, selected)

**Rationale**

This indicator reflects both the policy of the institution or its departments and its standing or prestige among the scientific community. When combined with the previous indicators, it allows to separate policy from attraction.

**Data**

**10. Origin of newly appointed permanent staff (year 2004)**

%	Same university	Other French university	A foreign university
Lecturers			
U Bourgogne	37,5	59,4	3
All French universities	30,4	65,8	3,8
Professors			
U Bourgogne	66	33	0
All French universities	59,3	31	9,6

Source : Ministry of Education, directorate for academic personnel

**Comments**

The indicator is dependent on the actual selection process which may be quite different among different fields.

Visiting researchers (number, origin), by field of research

**Rationale**

The number of visiting researchers is both the indication of the policy of the institution and its attractiveness. It is linked with the amount of resources set aside for this purpose. It may also bring new resources when visiting researchers are funded from outside, through regional, national or international sources.

**Data**

Number of visiting researchers staying more than 3 months over a period of three years in research units by field of research or faculty

**Comments**

The definition of the minimum duration of the visiting period is designed to separate participation in research from meetings in relation with current research projects developed in networks or partnerships. The three months period need not be consecutive.

Post-doctoral Fellowships, by field of research

**Rationale**

The possibility to attract qualified researcher at the beginning of their career benefits universities in several ways:

- It enable the circulation of recent methods and techniques.
- It provides institution with a highly qualified research manpower.
- It allows them to test their adequacy with the specific needs of the institution and eases the recruitment process for permanent staff.

**Data**

This indicator can be broken down into three to accommodate the various funding sources (See definitions)

- Number of post doctoral positions allocated to the institution by field of research
- Number of post doctoral positions linked with competitive research project (local, national, and EU), by field of research
- Industrial Fellowships (see Third mission)

**11. UAM fellowships distribution**

U Autonoma Madrid	2000	2001	2002	2003	2004
Fellowships linked with research contracts	42	51	47	58	42
Fellowships allocated to UAM					
- CAM Autonomous community of Madrid (1)	36	20	20	10	6
- EU mobility grants for foreign researchers	21	11	10	12	10
Industrial fellowships (2)					

1 CAM programme is being phased ou

2 Information not collected

**Comments**

Owing to the multiple funding sources the identification of the number and the location of the post doctoral fellows is delicate.

#### 4. e. Indicators of differentiation profile (5 indicators)

The aim of a university to differentiate itself from its competitors is mostly reflected, in the domain of human resources, by its dedication to producing trained researchers, at the master level, at the doctorate level or, further, through post doctoral positions and contracts.

When a university intends to specialize in the training of doctoral students, it should look at the conditions in which such training is organised (especially its capacity to supervise doctoral theses), at its attractiveness and at its efficiency in producing qualified researchers who will find a position in relation with their level of qualification.

##### 4.e.i Number of PhDs per researcher by field, discipline or faculty

###### *Rationale*

The average number of PhD students per researcher qualified to supervise doctoral work is an indication of the intensity of doctoral training in the various fields of research of the institution.

###### *Data*

See table below

###### *Comments*

This indicator should be calculated over a period of three years to even out fluctuations that are common at this level of education.

When possible, this ratio should be accompanied by the distribution of doctoral supervision duties among research staff at the faculty or department level. It is not un frequent that a small number of researchers supervise a large number of doctoral students. Both too small and too large a number of students supervised are worrying since they may indicate an under-utilisation of precious resources or improper training conditions for the students.

The comparison between the two universities shows a difference for medical students. In France, the Doctorate in Medicine is considered not as a research qualification but as a professional qualification (“*Doctorat d’exercice*”).

##### 4.e.ii Number of PhD awarded relative to the number of research students enrolled.

###### *Rationale*

This is an indicator of productivity. If measured over a period of time, it reflects the degree of non-completion of doctoral programmes, and more specifically in some fields of research, of the PhD thesis.

**Data**

See table below

**Comments**

This indicator should be calculated over a period of three years to even out fluctuations that are common at this level of education.

The dispersion of values among the different fields of research should be considered in relation with the training conditions of PhD students, like the share of students with a financial support, the student/supervisor ratio and so on.

**12. UB research staff vs PhD enrolments**

<b>U Bourgogne</b>	<b>Research staff*</b>	<b>PhD enrolments</b>	<b>Ratio student / staff</b>	<b>Completed PhD</b>	<b>Ratio PhD completed / staff</b>
<b>Fields</b>					
Humanities	125	110	0,9	7	0,06
Social sciences + history	137	474	3,5	41	0,3
Life + earth sciences	192	209	1,1	21	0,11
Medical sciences +sport	50	82	1,6	19	0,38
Sciences & technology	291	204	0,7	43	0,15
<b>UB</b>	<b>795</b>	<b>1079</b>	<b>1,4</b>	<b>131</b>	<b>0,16</b>

Year 2004-2005 – Research staff = permanent staff qualified to supervise research students (HDR)

**13. UAM research staff vs PhD enrolments**

<b>Autonoma Madrid</b>	<b>Permanent staff*</b>	<b>Enrolled PhD students*</b>	<b>Student / staff ratio</b>	<b>Completed PhD*</b>	<b>PhD degree/staff</b>
<b>Faculty</b>					
Sciences	400	706	1,8	304	0,8
Economics	125	395	3,2	67	0,5
Law	128	239	1,9	38	0,3
Computing engineering	27	68	2,5	15	0,6
Philosophy	253	728	2,9	162	0,6
Medicine	148	1053	7,1	292	2
Psychology	82	321	3,9	77	0,9
Education	95	38	0,4	6	0,1
<b>Total UAM</b>	<b>1258</b>	<b>3548</b>	<b>2,8</b>	<b>961</b>	<b>0,8</b>

\*Three year average 2001-2004

## 4.e.iii Average time to graduate by faculty or field of research

**Rationale**

Although related to the completion rate, this indicator answers a different question: How long does it take to complete a PhD. Time to graduate varies among disciplines as can be observed on national data. What is most interesting to institutions is to know if they do better or worse and to relate their performance to other information on the way they organise their doctoral programmes.

**Data****14. Average time to graduate by faculty or field of research**

U Bourgogne	Average time to graduate (2005) (Years)
<b>Fields</b>	
Humanities	5,6
Social sciences + history	5,9
Life + earth sciences	4,2
Medical sciences +sport	4,3
Sciences & technology	4,3
<b>UB average</b>	<b>4,8</b>

**Comments**

The social sciences and humanities stand out as the fields where PhD completion process is the longest. In order to identify whether this is the result of poor supervision practices or more difficult conditions for students, there should be available information on PhD student financial support

## 4.e.iv Share of funded PhD students

**Rationale**

The share of funded PhD students is an indicator of both the priority given to training of researchers by the institution and its capacity to attract external funding for that purpose.

**Data:**

Number of PhD students getting some specific funding (Salaries, grants) from institutions, public agencies or private organisations, by field of research or faculty. Total number of PhD students enrolled by field of research or faculty.

**Comments:**

As all students have to live while working for their PhD, they all get some kind of funding, whether through paid occupation outside of the university or through familial support. The

difficulty in this matter is to isolate “proper” funding that will allow students to concentrate on their studies.

**4.e.v** Share of PhD graduates employed in research three years after graduation

**Rationale**

The best measurement of the adequacy of training is provided by the labour market for researchers. How rapidly do graduates find a job related with their training and their qualification? The situation of the graduates on the labour market is likely to be influenced by the overall economic situation of a country or a sector. The performance of institutions in training researchers who fulfil the needs of the sectors various sectors should not be assessed too early after graduation since the transition to stable employment is a complex process.

**Data**

A national survey on a sample of PhD graduates has been conducted in France and from 2007 on, Universities have to provide similar data. The data used in the national survey are not representative for each institution.

**15. Share of PhD graduates employed in research 3 years after graduation**

French Universities % Field of research	Public sector : university and research agencies	Private sector	Total employed in research
Physics, Math	44	21	65
Engineering	43	27	70
Chemistry	38	23	61
Life and earth sciences	51	11	62
Social sciences	31	6	37
Arts and humanities	44	2	46

IREDU 2006

**Comments**

The indicator shows that in some fields of research, most PhD graduates do not find employment in research occupations strictly defined.

**4. f. Territorial embedding (5 indicators)**

This dimension relates to the way in which universities are connected with their economic and social environment. The stable links they have been able to create at the local and regional level with industry, government and other social actors might be a source of support in many aspects of their policy. As far as the human resources is concerned, it is obviously in the

interest of local government and local business that a university attracts prestigious and highly qualified workers and that it provides, through training of researchers and the creation of high technology firms.

Even when universities do not limit their reach to their direct environment, all such social and economic benefits accruing to the region justify local and regional governments in developing policies that support them in the management of their human resources. Such policies can be observed in relation of the issues of attractiveness and mobility. The indicators that are necessary to monitor and compare this regional support are a sub-set of indicators that were presented when dealing with attractiveness in the human resource dimension or in other dimensions like funding. It could be appropriate to present them separately in order to emphasize the embedding of the institutions.

#### 4.f.i Mobility-enhancing activities funded at the local level

Resources devoted to (inward and outward) mobility

##### *Rationale*

Mobility, as distinct from recruitment, implies temporary participation of researchers from one institution in the research activity of another one. Inward mobility may enhance the capability of the receiving university by bringing in new ideas, new methods and new techniques. Outward mobility may complement the continuing training of its researchers. Both can help setting up new networks of co-opération.

##### *Data*

Funds allocated to the university by local government and industry to support inward and outward mobility of research staff.

Number of mobility grants awarded by field of research

##### *Rationale*

This is a subset of the previous indicator. It relates to one specific type of support that is the allocation of fixed grants in order to cover the costs of travelling and/or staying in another institution, usually in a foreign country.

##### *Data*

Type and number of inward and outward mobility grants awarded by local and regional administrations or industries to researchers seconded from another institution or to another institution.

##### *Comments*

The notion of grant does not easily apply to support from industry.

#### 4.f.ii Local or regional financial support for training researchers

Funding of PhD fellowships by local or regional bodies, by field of research

##### *Rationale*

In order to attract to the region highly qualified manpower likely to enable the creation or the development of new activities in advanced technology, regional and local government may

join with local industry to fund grants for PhD students in specific sectors or fields of research.

**Data**

Number of grants to PhD students on schemes originating from local and regional government or industries.

**Comments**

The term “grant” may correspond to various forms of financial support (fellowships, salaries, paid leave for training ...) provided it does not imply full time work for the student concerned.

Locally or regionally funded post-doc fellowships, by field of research

**Rationale**

This indicator is similar to the previous one but for schemes concerning PhD graduates at the early stage of their career (less than 10 years after graduation).

When such funding implies the payment of salaries, the work implied must be under the control of a university research unit.

**Data**

Number of research staff working in research units of the university and funded directly or indirectly by local and regional government or industry.

**Comments**

The complexity of the legal, statutory and financial situation of post doctoral employment has been dealt with in several parts of the present publication.

**4.f.iii** Local or regional financial support for recruiting qualified researchers.

Regional initiatives for supporting recruitment of researchers

**Rationale**

Contrary to mobility supporting schemes, such initiatives tend to promote permanent settling of the researchers. They include financial support for moving, finding accommodation or helping spouse and family to follow the researcher.

**Data**

The indicator can only consist in a brief description of such initiatives. When feasible, it could be expressed in financial term

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## IV. Academic Outcome

Antoine Schoen (IPTS), Jean Thèves (OST)  
with Pauline Mattsson and Gaston Heimeriks (IPTS)

With the participation of the University of Granada (Spain)

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## 1. Introduction

Teaching, Research, and Public Service are widely seen as traditional University's missions. Therefore the characterization of academic outcome resulting from research activities is considered a main element in assessment of an institution's performance. Universities' academic outcome encompasses the researchers trained in the university and the publications produced by the university's researchers – i.e. explicit and embodied knowledge. This chapter will focus on the latter – the other stream of universities' academic outcome - PhD production - being treated in the previous chapter.

This chapter will mainly rely on scientometrics resources. Scientometrics is based on the enumeration and statistical analysis of scientific output in the form of articles, publications, citations, and other, more complex indicators. It is an important tool in evaluating research activities, laboratories, research institutions as well as scientists, or scientific specialisations and performance of countries.

Existing literature in scientometrics and indicators provides a considerable foundation of expertise. Bibliometric indicators are to be calculated on the basis of different types of documents (herein called « articles ») which have been published in scientific journals by laboratories of the university under study.<sup>1</sup> The principal database available for these calculations is the *Science Citation Index* (SCI), the standard tool in bibliometrics for the exact sciences. It is a very selective database, fairly oriented toward good quality academic scientific activity for well-internationalised fundamental disciplines. Its representativity is less good in applied fields, or field research, or fields where research has a national tradition, and also in disciplines where information passes by other channels, most notably computer science.

The limitations of scientometrics are also well known. It is important to keep in mind the well-known difficulty that evaluation of published research faces in the social sciences. The documentary databases established under the ISI (namely the SSCI or Social Science Citation Index et le AHCI or Arts & Humanities Citation Index), as well as the CCS&BS (Current Contents Social & Behavioral Sciences), are generally considered to be inappropriate for characterising the production of non-Anglophone researchers in the sense that a number of the journals which are considered important scientific references by non-Anglophones are not included in these databases. The bibliometric evaluation of work published in these disciplines necessitates the construction of a list of journals considered as scientific by the community of researchers concerned, a list from which then can be calculated conventional bibliometric indicators.

The use of data about scientific publications for the analysis of the production of higher education institutions is a tool commonly used by institutions, policy-makers, stakeholders. Bibliometrics data are, for instance, frequently used to construct rankings or to compare institutions, research entities or individuals. These data are also largely used to determine the level of funding granted to HEI according to

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<sup>1</sup> Bibliometric analyses are sensitive to the choice made among various methodological options: perimeter of the database, type of counting, type of document counted, etc.

various formulas which take into account the publication outcome of the entity under scrutiny. But in fact, the institutions themselves don't use often these data to manage strategically their research activities.

This under-use of bibliometrics data stems out of various reasons among which three will be highlighted here. Firstly, universities usually don't have readily at their disposal the complete and consistent set of data required for an informed steering of their research activities. Secondly, bibliometrics don't benefit from any reference methodological framework which could guide the collection, treatment and analysis of data – a situation which hinders the development of this field beyond the community of scientometrics experts. The third barrier to the use of publication data, which is linked with the previous one, results from the “network effect”. As very few institutions have developed a consistent characterization of their research activities, one university which would invest resources in such an exercise won't be able to compare its profile with others actors' profiles and has therefore only a weak incentive to be a first mover.

This chapter aims at providing explicit and sound methodological procedures and guidance for the characterization of university research activities.

It will first address the issues related to the identification and location of university scientific outcome. It will then propose a simple and generic tool (SIMRA) for mapping university research activities. And it will finally use this generic tool for the characterization of academic production in terms of production, collaboration and visibility.

## **2. Location of university scientific outcome**

University academic outcome is manifold. It covers: the production of codified knowledge (i.e. : articles in refereed reviews); the production of embodied knowledge (i.e. : PhD), and other types of academic production (i.e. : conferences, books, CDs, temporary or permanent exhibitions, etc....) as well as internet visibility (i.e. : electronic working papers...).

The ultimate goal for the OEU project will be to assess all these various aspects of university academic outcome. But as a first step the work has been focused on the characterization of codified knowledge as afore defined.

This initial focus is bound to generate a restrictive - first – picture of university research activity, more specifically as books, e-working papers form a significant (and growing for the latter) share of the whole output of a researcher. But the tools and data required for building a comprehensive characterization are missing for the time being. And their development is out of the reach of the OEU project. The risk to be assumed is then of course to produce “precisely wrong” profiles. And it is therefore of paramount importance to include later on in the perimeter of the assessment valuable bits of knowledge other than strictly peer-reviewed articles in order, finally, to produce more – even if roughly – right pictures of global university research outcomes.

Even with these strong limitations, a host of methodological difficulties remain to be solved before producing a robust university academic outcome. Two of them are

addressed here. Which articles can be included in one university list of scientific papers? How should the university boundaries be defined to include the proper set of publications?

## 2. a. Thomson Scientific's excellent but limited coverage

Bibliometrics studies are bound to the *de facto* monopoly established by Thomson Scientific - formerly known as the Institute for Scientific Information. This private company provides access to an information system which consists of five databases<sup>2</sup> that contain current and retrospective multidisciplinary information from approximately 8,700 of the most prestigious, high impact research journals in the world. Thomson Scientific database is therefore the standard tool in bibliometrics for the exact sciences. It is a very selective database, fairly oriented toward good quality academic scientific activity for well-internationalised fundamental disciplines. Its representativeness is less good in applied fields, or field research, or fields where research has a national tradition, and also in disciplines where information passes by other channels, most notably computer science.

This unique source tells only part of the story of academic production, due to delineation considerations, balance among disciplines, 'biases' of coverage including a strong positive bias for english-speaking researchers ... Studies have shown that corrections of coverage may change significantly performance indicators, sometimes in a even spectacular way. The adjustment of perimeter of journal inclusion within databases will determine variations in the classic bibliometric indicators used for comparison, such as world shares of publications or relative impacts. For instance, considering the case of the whole Russia, considered as one scientific actor, an adjustment in the perimeter of journal inclusion have modified the performance indicators by a factor 2<sup>3</sup> !

It is also important to keep in mind the well-known difficulty that evaluation of published research faces in the social sciences. The documentary databases established under the Thomson Scientific are generally considered to be inappropriate for characterising the production of non-Anglophone researchers in the sense that a number of the journals which are considered important scientific references by non-Anglophones are not included in these databases. The bibliometric evaluation of work published in these disciplines necessitates the construction of a list of journals considered as scientific by the community of researchers concerned, a list from which then can be calculated conventional bibliometric indicators. But this is out of the

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<sup>2</sup> Science Citation Index Expanded™, Social Sciences Citation Index®, Arts & Humanities Citation Index®, Index Chemicus®, Current Chemical Reactions®

<sup>3</sup> The presence in the perimeter of journal inclusion of a sub-population of nationally-oriented journals creates large irregularities. This can lead to an over-estimation of share and an under-estimation of the impact, for countries with national editorial tradition, while the impact of a few mainstream countries arguably benefits from the presence of this sub-population.

MICHEL ZITT, SUZY RAMANANA-RAHARY, ELISE BASSECOULARD, Correcting glasses help fair comparisons in international science landscape: country indicators as a function of ISI database delineation., *Scientometrics* 56, 2, 2003, 259-282

reach of the OEU project. And therefore, as the main stream of bibliometrics studies, the framework developed in this paper will use the Thomson scientific databases.

## 2. b. University Perimeter

What is the perimeter of an institution? This question, which may seem trivial doesn't refer to a theoretical post-Coasian, questioning similar to the one probing the "boundaries of the firm". It relates to very concrete problems.

The first issue, linked to data handling, may be summarized as follow : how to locate articles written by researchers belonging to an university in the Thomson Scientific databases ? The well-known absence of 'unification' of names/addresses in databases makes the identification of players particularly arduous. One single institution may appear with various labelling in articles references. Publications written by researchers attached, for instance, to the French University of Paris XI may cite as contacts: University of Paris XI as it is called administratively; University of Paris Sud (another name for the same institution); University of Paris Sud 11 (what appears on the website), UPS (one of the possible acronym); Science Faculty of Orsay (one of the nine faculties composing the whole university), or one name of the 60 laboratories which composed the latter... This diversity of names illustrates how painstaking can be any process of automatic publication retrieval. And the authors' address(es) give(s) usually no evident additional clue.

The second issue relates to institutional (and controversial!) debates which concern mostly the hybrid forms of research entities, which are, for instance, dominant in France. Most of the universities' research is conducted in teams where scientists belonging to one (or several) university(ies) work and publish together with colleagues belonging to one (or several) public research organisation(s). How should the results of this collaborative work be accounted for? To exclude all papers published by these hybrid research entities would not make sense. And it will deprive the universities from most of their publications. To include all the publications produced by these hybrid units could also distort the research activity profile of one university. Because it may give credit to one university for papers which have been published by researchers who are not on the university payroll but whose wage is accounted for by another legal entity, e.g. a public research organisation.

Another example of difficulties in defining boundaries may be found in research groups in hospitals. They are linked to the University, directly if they are a university-hospital or, indirectly if they are universities associated with a hospital<sup>4</sup>

One fair way to resolve this dilemma is the following : to attribute to the university the only papers which, as authors, have at least one researcher on the payroll of the university.

This solution doesn't solve for sure all the subsequent difficulties, especially in a productivity perspective. In fact the university inputs used to produce a given set of articles may be largely underestimated. And as the perspective of the OEU project is

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<sup>4</sup> Hospitals with an agreement with the university. For example, their doctors provide teaching and supervising of student research

not to build a ranking or to produce an assessment which may serve as a basis for a funding scheme, there is no direct incentive for an institution to mishandle the data.

For those reasons and for the success of the process, it is up to the university's responsibility to identify the papers to be considered as produced by the university. The actor should conduct a self-identification of its academic outcome, using, when necessary, sound methodological advices. Experts can help to locate the institution's papers in Thomson scientific databases; they may provide guidance for the treatment of data and the production of the relevant indicators.

### **3. Mapping of university research activities**

The first task for a university which starts an exercise of characterization of its research activities is to locate the scientific fields where its researchers are involved in. The first section will present a simple tool – the SIMRA matrix – for this systematic survey. The second section will present various options which are at hand for the university managers to adapt this tool according to the level of desegregation they want to work at: the 171 Thomson Scientific specialities; 30 sub disciplines or the 8 disciplines.

#### **3. a. A generic tool : the SIMRA table**

The tool proposed for the location of a university scientific involvement is a table crossing scientific fields and university research entities. The latter could be laboratories, departments, research teams or even faculties: whatever “research entity” the institution is interested in assessing scientific activities.

We should here clearly distinguish between:

the level of analysis – i.e. what is the relevant focus for management purposes (faculties, research centers, research groups...). The characterisation of academic outcome can be performed at these various levels of disaggregation. Each of these levels may be relevant according to the purpose of the analysis. Do we intent to carry out a global assessment of the institution? Or is the focus on one or some of the university's activities?

the level of data collection – i.e. what is the university's sub-institution where information is the more convenient to be gathered. There is no “one best solution”. The level of data collection should be selected on a case by case basis, depending practically firstly from the structure of the information system through which bibliometrics information can be collected and secondly from administrative organisation prevailing within the university.

For instance, in the case of Granada University that is used as main illustration in this chapter<sup>5</sup>, the department has been considered as the more appropriate level for the primary data collection. The departments have a focused specialty (i.e. algebra) and provide thus a fine-grained picture of the university's activities, with more than hundred entities. Moreover, the administrative rule prevailing in this university sets that all university researchers belong to one only department. Therefore recognition of publications performed at the department level allows identifying all the university's

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<sup>5</sup> Figures presented in the tables of this chapter are based on Thomson Scientific data compiled by OST, except tables 4, 12, 13, 19, 23, 24, 26 based on Thomson Scientific data compiled by IPTS.

streams of research (i.e. publications) with clearly distinct labels. No information will be missed nor double counted.

That does not mean that the analysis has then to be developed at this very level of data collection – department for Granada. For this university we can, for instance, analyse jointly the 5 departments that are active in mathematical research. Or we can aggregate all the departments that belong to a faculty. Or we can also assess the whole university’s research in summing the research performed in all the departments.

In another example, Paris-Sud University, the laboratories are the most convenient level for collecting information about academic outcome – every four years all the university’s laboratories (about hundred of them) have to produce a report on past activities which includes a list of publications. These reports are therefore an interesting option for capturing all the university’s publications. And here again, data gathered at laboratories’ level might be jointly compiled to characterise the faculties’ or the whole university’s research activities.

The generic table presented below for the location of a university scientific involvement is a table called SIMRA: for scientific and institutional mapping of research activities.

**1. Generic SIMRA**

	Scientific Field 1		Scientific Field i		Scientific Field m	Total
Research Entity 1						
Research Entity j						
Research Entity n						
Total						

This table can be developed along the two axes according to the specific needs of a university. Either with a much aggregated view; combining for instance faculties and disciplines as shown in Table 2.

**2. Aggregated SIMRA**

	Discipline 1		Discipline i		Discipline m
Faculty 1					
Faculty j					
Faculty n					

Or with a very disaggregated perspective combining the complete list of laboratories with the most detailed list (170) of Thomson scientific specialities as shown in Table 3.

### 3. Disaggregated SIMRA

	Scientific Speciality 1		Scientific Speciality i		Scientific Speciality m	Total
Department 1						
Department j						
Department n						
Total						

All intermediary solutions may be chosen, with some scientific fields and research entities analysed at a close range, and others looked at with a more aggregated focus.

As a first example from Granada University, the table below presents, at an intermediary level, the spread of publications produced by the five departments which are active in mathematics.

### 4. Intermediary SIMRA for Granada University Mathematics Research Activities

Subfield	Mathematics	Civil engineering	Earth science	Electrical and electronics engineering	Information technology & communication systems	Medical research, & organs	Computer science & engineering	Neurology	Physics	Space science
Active	x		x	x		x		x	x	
Non-active		x			x		x			x

The criteria guiding the choice for the level of aggregation may be linked to:

The relevance of a detailed analysis. If an institution is not active in a scientific field, there is of course no need to develop the part of the table which covers all the specialities included in this very field. At the same time, for another scientific area in which the institution is very much involved, the table could be developed in depth, covering sub disciplines or even specialities.

The focus of the research management. The broadest characterization university research activities should cover all the entities which are active in any field of production of new knowledge. Apart from this ideal situation, university managers may choose to focus on some of the components of the whole institutions for their assessment exercise. In that

case, they may choose to fill the SIMRA table with the only corresponding research entities

The availability of data and the difficulty of data collection may partly dictate the choices of the « level of institutional detail » at which the analysis can be performed. It will often prove necessary to combine different levels of observation or to articulate the analysis by levels: departments, laboratories, research teams and even individuals who are institutionally linked with the university.

### 3. b. Various options to aggregate the research activities

The research activities have been classified according to three levels of desegregation. (Origine OST)

French OST has developed an aggregated level which encompasses 9 disciplines:

- applied biology - ecology
- fundamental biology
- chemistry
- multidisciplinary journals
- mathematics
- physics
- medical research
- earth and space sciences
- engineering

French OST has also developed a corresponding intermediate level detailed with 32 sub disciplines

- astronomy/astrophysics
- Chem.B./ Cell.B./ MolB./MolGen1
- Biology – gener. – var.
- Vegetal Biology/agronomy
- Cancerology
- Chemistry
- Analytical chemistry
- Medical chemistry / pharmacy
- Ecology/environment
- animal path. / breeding / nutr.
- Endocrinology/reproduct
- Gastroe/cardiov/pneu/chir
- Gen2:genet-organ/evolut
- Chemic.Eng./polym/colloid
- Mec.Eng./fluides/energy
- Immunology
- Informatics/information
- Biomedical ingeneering

Materials/metal/cristallo  
Mathematics/statistics  
Medicine-gener-var.  
Micr/vir/mal-inf/bioproc  
Multidisciplinary  
Neurosciences/neuropathol  
Optics/photon/elec/signa  
Phys1:p-gen/p-nucl/p-math  
Phys2:phys/applied phys  
Physico-chimistry/spectrosc  
Public health/epid/gyne/tox  
Food Sc/nutrition  
Medical Specialities-other  
Earth-Ocean-Atmosphere

And the finest grained disaggregated level organizes science in 171 “Thomson Scientific” specialities. See below, as illustration, the correspondence between the discipline « Fundamental Biology » and the 24 scientific specialities of the SCI (see the whole list of specialities in annex);

Anatomy, morphology  
Biochemistry, molecular biology  
Bioengineering  
Cellular Biology, Histology  
Molecular and Cellular Biology  
Biomaterials  
Biomethods  
Biophysics  
Biotechnology and Applied Microbiology  
Embryology  
Genetics, Heredity  
Biomedical Engineering  
Neuro-Imaging  
Microbiology  
Microscopy  
Neurosciences  
Nutrition  
Parasitology  
Physiology  
Psychology  
Behavioral Sciences  
Reproductive Systems  
Laboratory Techniques  
Virology

Correspondences between these three systems of aggregation are currently not unambiguous. A project is being undertaken at OST to combine more easily analysis performed at the three levels afore presented. Ideally this development should produce a correspondence table with an organization which should look like the one below.

**5. Objective for the articulation of various aggregation levels of scientific fields**

Discipline 1				Discipline 2				...		
Sub disc 1		Sub disc 2		Sub disc 3		Sub disc 4		Sub disc 5		...
Sci	Sci	Sci	Sci	Sci	Sci	Sci	Sci	Sci	...	
Sp 1	Sp 2	Sp 3	Sp 4	Sp 5	Sp 6	Sp 7	Sp 8	Sp 9		

**4. Filling the SIMRA positioning tables**

The basic methodological tools presented afore can now be used for building a characterization profile of university research activities. This process requires filling successively the SIMRA tables with information, data and indicators related to the academic outcome of the institution under scrutiny.

The various types of bibliometrics indicators to be compiled will be presented in the three last sections of these parts: production indexes, collaboration indexes, and visibility Indexes. But as a first step we should address a need which is crucial for any bibliometrics analysis: the prerequisite of reference tables without which any interpretation is bound to be meaningless.

**4. a. Reference tables for intra-fields comparisons are a prerequisite for any bibliometrics interpretation**

Several factors plead for the use of reference tables for any bibliometrics analysis.

Firstly, as it is true for any indicator, the interpretation of one institution’s performance is very difficult when not put in the perspective of other actors’ results. One may comment evolution in values, welcoming for instance an increase in the number of publications. But more in depth interpretation will be impossible without having access to corresponding information about the average behaviour, be it at the national, European, or world level.

Another reason, more specific to the field of bibliometrics, makes this requirement even more acute. Bibliometrics characteristics differ radically among scientific disciplines : production of articles, patterns of citations... So even with a strictly intra-institutional perspective, it will not possible for a university to assess comparatively the activities of two of its faculties which are active in different fields like biology and mathematics without having access to the average performance recorded in these respective fields.

This methodological prerequisite raises a series of issues related to the availability of these data. Currently, this reference information should be compiled using the Thomson Scientific data and are therefore subject to the strict IPR enforced by this company. Putting these reference tables at the disposal of EU universities willing to characterize soundly their research activities will require a specific agreement with Thomson Scientific. The European Commission DG RTD led project Regional Key Figures aiming at establishing a data warehouse disaggregated at regional level and including scientometrics information may provide the proper institutional space to foster accessibility to reference bibliometrics information<sup>6</sup>.

The scope of scientometrics information required for building these reference tables can be easily described three principles:

Firstly, scientometrics information should be available at **three levels of scientific specialisation**, which are from the finest grained to the most aggregated levels:

- Scientific specialties level - from the Thomson Scientific Database - which encompasses 171 categories
- Sub-disciplines level, which encompasses 32 sub disciplines
- Disciplines level which encompasses 9 categories

Secondly, scientometrics information should be available at **four levels of geo-localisation**:

- regions (defined as NUTS 3) : +/- 200
- countries : 25
- EU 25
- world

Finally, scientometrics information available should relate to three aspects of scientific outcome:

- Production (number and « market share » of articles, specialisation of production)
- Collaboration (profile of authorship - single author and various geographical patterns of co-authoring – and specialisation of collaboration)
- Visibility (number and « market share » of citations, direct impact and relative impact normalised as ratio of relative citation, profile of activities by class of visibility)

The table below identifies the type of information which should compose a complete set of reference tables.

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<sup>6</sup> Two ways may be explored to put this “private knowledge” in the field of public goods.

Firstly, with a public policy approach, a deal could, for instance, be concluded between a EU-related consortium (DG RTD or EAC, ERAWATCH Network, OEU ...) and Thomson Scientific covering the co-production of these reference tables and allowing a shared and dual use of these information. According to this scheme, Thomson Scientific may provide this information as a private service to its individual customer. And EU universities which would sign an ad hoc subscription may gain access to this reference tables as a public service.

A second solution may be to have this service provided on case by case basis, eventually in the framework of an OEU related agreement; by an actor who is already a Thomson Scientific licensee. The fact that the universities who may get access to these reference tables are already - for most of them - Thomson Scientific subscribers – although for other specific services - should be taken into account when trying to strike a global deal.

6. Content of scientometrics reference tables for EU institutions

	Region	Country	EU 25	World
Production	<ul style="list-style-type: none"> <li>• Number of Region's publications (full counting)</li> <li>• Region's world market share of publication</li> <li>• Region's specialisation profile of production (% by disciplines)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of Country's publications (full counting)</li> <li>• Country's world market share of publication</li> <li>• Country's specialisation profile of production (% by disciplines)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of EU25's publications (full counting)</li> <li>• EU25's world market share of publication</li> <li>• EU25's specialisation profile of production (% by disciplines)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of World's publications (full counting)</li> <li>• World's specialisation profile of production (% by disciplines)</li> </ul>
Collaboration	<ul style="list-style-type: none"> <li>• Region's number of publications with single author</li> <li>• Region's number of co-publications with a co-author in the same region</li> <li>• Region's number of co-publications with a co-author from another region in the same country</li> <li>• Region's first 10 co-authoring regions - with a co-author from another region in the same country</li> <li>• Region's number of co-publications with a co-author from a region in another country within the EU 25</li> <li>• Region's first 10 co-authoring regions - with a co-author from a region in a another country inside the EU 25</li> <li>• Region's number of co-publications with a co-author from a region in another country outside the EU 25</li> <li>• Region's first 10 co-authoring regions - with a co-author from another country outside the EU 25</li> <li>• Region's specialisation profile of collaboration (% by co-authoring territorial entities)</li> </ul>	<ul style="list-style-type: none"> <li>• Country's number of publications with single author</li> <li>• Country's number of co-publications with a co-author in the same Country</li> <li>• Country's number of co-publications with a co-author from another country within the EU 25</li> <li>• Country's first 10 co-authoring Countries - with a co-author from another country inside the EU 25</li> <li>• Country's number of co-publications with a co-author from another country outside the EU 25</li> <li>• Country's first 10 co-authoring Countries - with a co-author from outside the EU 25</li> <li>• Country's specialisation profile of collaboration (% by co-authoring territorial entities)</li> </ul>	<ul style="list-style-type: none"> <li>• EU25's number of publications with single author</li> <li>• EU25's number of co-publications with a co-author from within EU25</li> <li>• EU25's number of co-publications with a co-author from outside the EU 25</li> <li>• EU25's first 10 co-authoring Countries - with a co-author from outside the EU 25</li> <li>• EU25's specialisation profile of collaboration (% by co-authoring territorial entities)</li> </ul>	<ul style="list-style-type: none"> <li>• World's number of publications with single author</li> </ul>
Visibility	<ul style="list-style-type: none"> <li>• Number of Region's Citations (counting)</li> <li>• Region's world market share of citations</li> <li>• Region's specialisation profile of citations (% by disciplines)</li> <li>• Region's Direct impact</li> <li>• Region's Relative impact</li> <li>• Region's Profile of activity by class of visibility (% of papers by classes of citations)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of Country's Citations (counting)</li> <li>• Country's world market share of citations</li> <li>• Country's specialisation profile of citations (% by disciplines)</li> <li>• Country's Direct impact</li> <li>• Country's Relative impact</li> <li>• Country's Profile of activity by class of visibility (% of papers by classes of citations)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of EU25's Citations (counting)</li> <li>• EU25's world market share of citations</li> <li>• EU25's specialisation profile of citations (% by disciplines)</li> <li>• EU25's Direct impact</li> <li>• EU25's Relative impact</li> <li>• EU25's Profile of activity by class of visibility (% of papers by classes of citations)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of World's Citations (counting)</li> </ul>

#### 4. b. Production and productivity indexes

The production of scientific articles can be measured in absolute terms (in number of publications) and in shares (of publications, of citations, etc.), the latter being calculated at various scales (e.g. geographic scale such as regional share, national share, continental, or world). Production can be cut up according to « disciplinary field » at the various levels of disaggregation which have been presented afore.

The first task is to locate university's articles. Two approaches are being explored within the OEU project for the identification and analysis of relevant publications.

The first approach is considering the university's laboratories addresses as a first element of information with which to extract a first rough list of corresponding publications from the Thomson Scientific databases. This initial rough list is then submitted to the university who has the responsibility to check these articles and select the relevant one among them in order to produce a "clean list" of the university publications – which will be called the "university publications"

The second approach is using, as a starting point, a declarative list of articles produced by the university, which encompasses all the articles that the institution's researchers have declared as their academic outcome. These declared publications should be filtered through a systematic check in the Thomson Scientific databases. The validated articles can then be associated with their respective "identification key" and are considered as the "clean list" of university publications - which will be called the "university publications".

The university publications can then be affected to the relevant scientific fields in order to fill the relevant cells of a "Production table" which should look like the illustration presented below.

The sub-institutional level where the publications are split is here for instance the university department level. And this basic information will be then treated at two more aggregated levels. Firstly at the most global level: the university. And secondly at an intermediate level corresponding to a scientific field which will be here, with the University of Granada case, the field of "mathematics" to which covers the activity of five departments of this university: Algebra; Applied Mathematics; Geometry and Topology; Mathematical analysis, Statistics and Operations Research.

One methodological clarification should be made here, concerning two possible ways (either fractional or full) for counting publications.

The scientific articles, often being co-signed by many authors and many institutions, several options of counting process can be chosen, in particular the fractional count and the integer count. In a logical process of contribution to world science, the authors' contributions to each article are fractioned in order to get a total of 100% on the whole group of authors. This principle is also applied to the possible repartition of a scientific journal in several specialities. This type of count, called "fractional", where each article has a unitary weight, is additional in every scale and well adapted to macro-analysis. Extended to the impacts, this type of count is preferable for international visibility comparison (see below).

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The other logical process to consider the “participation” in world science, relies on count of “distinct integer”: each actor is credited with a participatory unit as long as he is present in a publication, and this logical process is extended to disciplinary affiliations of the journals. The number of participation is superior to the contribution. For example, France can be present in 8% of the world publications but contributes to 5% when the fractional count is applied. Because of multiple counts, this kind of count produces sums of actors’ participations that are superior to 100% and the data vary with the scale changes. Despite this inconvenient, the “full counts” are well adapted to micro-analysis and is easier to comment for co-publications.

The first two tables presented below illustrate with the case of Granada University these two possible approaches of publications counts.

**7. Granada University Scientific Production –Number of articles (fractional count)**

institute	disciplines	2002	2003
Granada	Fundamental biology	78	81
	Medical research	58	67
	Applied biology - ecology	52	47
	Chemistry	55	66
	Physics	46	51
	Earth sciences	45	65
	Engineering	55	61
	Mathematics	54	66
	Multidisciplinary journals	2	1
	total	445	506

**8. Granada University Scientific Production –Number of articles (full count)**

institute	disciplines	2002	2003
Granada	Fundamental biology	135	155
	Medical research	103	122
	Applied biology - ecology	90	82
	Chemistry	109	123
	Physics	78	91
	Earth sciences	83	122
	Engineering	88	107
	Mathematics	87	100
	Multidisciplinary journals	4	2
	total	650	781

The three tables below illustrate various combinations of disaggregation. The first one provides a finer look on the publications scientific classification, distributing them according to scientific specialities. The second one is a close-up on the five mathematic departments considered as a sub-institution administrative unit. And the third table combines these two disaggregations with a distribution of the departments of mathematics' production according to the scientific specialities of these publications.

**9. Distribution of Granada University's Scientific Production according to disciplines (fractional counts)**

institute		2002	2003
Granada	mathematics	37	47
	artificial intelligence	23	22
	physical chemistry	16	19
	analytical chemistry	18	17
	botanics, vegetal biology	12	15
	geophysics, geochemistry - var.	8	14
	nutrition, dietitics	10	13
	biochemistry, molecular biology	12	13
	applied mathematics	13	12
	geosciences	9	10
	electrical and electronical engineering	5	10
	general pysics	13	10
	orgnical chemistry	7	10
	particle physics	3	9
	environmental sciences	10	8
	pharmacology, pharmacy	9	8
	chemical engineering	4	8
	nuclear and mineral chemistry	6	8
	microbiology	8	7
	mineralogy	5	7
statistics and probability	3	7	
information sciences	2	6	
odontology	5	6	
biomethods	5	6	
celullar and molecular biology	5	6	

**10. Scientific Production (fractional and full counts) of Granada University  
Departments of Mathematics**

Institute		2000	2001	2002	2003
Mathematics Research					
Activities	number of publication (fract.)	68	75	65	76
	number of publication (full)	91	99	89	112

**11. Distribution of Granada University Departments of Mathematics  
Scientific Production according to disciplines**

institute	specialities	2002	2003
Mathematics Research Activities	mathematics	53	68
	applied mathematics	21	24
	statistics and probability	7	12
	general pysics	4	5
	geosciences	1	4
	electrical and electronical engineering		3
	control 2		2
	geophysics, geochemistry - var.	2	2
	mathematics - other	1	2
	mathematical physics	6	2
	anesthesiology		1
	astronomy and astrophysics		1
	biocybernetics		1
	informatics - var.2		1
	information sciences		1
	informatics/theory and systems		1
	endocrinology	2	1
	public health	2	1
	operational research	1	1
mecanical engineering		1	

Scientific publications can be distributed according to disciplines or specialities using correspondence tables which cover all journals included in the Thomson Scientific databases The first table below illustrates the journals distribution according to

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disciplines. The second table illustrates the journals distribution according to scientific specialities

**12. Distribution of journals according to disciplines**

Journal Abbrev.	Journal full name	ISI Classification
A P J ALLER	ASIAN PACIFIC JOURNAL OF ALLERGY AND IMMUNOLOGY	CLINICAL IMMUNOLOGY & INFECTIOUS DISEASE (CM)
AAPG BULL	AAPG BULLETIN	EARTH SCIENCES (S)
ABDOM IMAG	ABDOMINAL IMAGING	RADIOLOGY, NUCLEAR MEDICINE & IMAGING (CM)
ACAD EM MED	ACADEMIC EMERGENCY MEDICINE	ANESTHESIA & INTENSIVE CARE (CM)
ACAD MED	ACADEMIC MEDICINE	GENERAL & INTERNAL MEDICINE (CM)  HEALTH CARE SCIENCES & SERVICES (CM)
ACAD RADIOL	ACADEMIC RADIOLOGY	RADIOLOGY, NUCLEAR MEDICINE & IMAGING (CM)
ACC CHEM RE	ACCOUNTS OF CHEMICAL RESEARCH	CHEMISTRY (S)  CHEMISTRY & ANALYSIS (LS)
ACCRED Q A	ACCREDITATION AND QUALITY ASSURANCE	SPECTROSCOPY/INSTRUMENTATION/ANALYTICAL SCIENCES (S)
ACI MATER J	ACI MATERIALS JOURNAL	MATERIALS SCIENCE & ENGINEERING (ECT)

**13. Distribution of journals according to specialities**

Journal Abbrev.	Journal full name	Subdiscipline
A U-ARCHIT URBAN	A + U- ARCHITECTURE AND URBANISM	ART & ARCHITECTURE
AAA-ARB ANGLIST AM	AAA-ARBEITEN AUS ANGLISTIK UND AMERIKANISTIK	LANGUAGE & LINGUISTICS
AAPG BULL	AAPG BULLETIN	EARTH SCIENCES
AATCC REV	AATCC REVIEW	MATERIALS SCIENCE & ENGINEERING
ABDOM IMAGING	ABDOMINAL IMAGING	RADIOLOGY, NUCLEAR MEDICINE & IMAGING

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ACAD EMERG MED	ACADEMIC EMERGENCY MEDICINE	ANESTHESIA & INTENSIVE CARE
ACAD MED	ACADEMIC MEDICINE	GENERAL & INTERNAL MEDICINE
ACAD MED	ACADEMIC MEDICINE	HEALTH CARE SCIENCES & SERVICES
ACAD PSYCHIATR	ACADEMIC PSYCHIATRY	PSYCHIATRY
ACAD RADIOL	ACADEMIC RADIOLOGY	RADIOLOGY, NUCLEAR MEDICINE & IMAGING
ACAD MANAGE EXEC	ACADEMY OF MANAGEMENT EXECUTIVE	MANAGEMENT
ACAD MANAGE J	ACADEMY OF MANAGEMENT JOURNAL	MANAGEMENT
ACAD MANAGE REV	ACADEMY OF MANAGEMENT REVIEW	MANAGEMENT
ACCIDENT ANAL PREV	ACCIDENT ANALYSIS AND PREVENTION	PUBLIC HEALTH & HEALTH CARE SCIENCE
ACCOUNT ORG SOC	ACCOUNTING ORGANIZATIONS AND SOCIETY	ECONOMICS
ACCOUNTS CHEM RES	ACCOUNTS OF CHEMICAL RESEARCH	CHEMISTRY
ACCOUNTS CHEM RES	ACCOUNTS OF CHEMICAL RESEARCH	CHEMISTRY & ANALYSIS
ACCREDIT QUAL ASSUR	ACCREDITATION AND QUALITY ASSURANCE	SPECTROSCOPY/INSTRUMENTATION/ANALYTICAL SCIENCES
ACI MATER J	ACI MATERIALS JOURNAL	MATERIALS SCIENCE & ENGINEERING

Interpreting the figure presented in the production table shows the need to access to reference data. What means a count of articles if it is not related to the total number of publications in this scientific field? This information is required to calculate “market shares” (calculated at the world or the EU level) which could be presented in appropriate tables.

The two tables provide illustrate this contextualisation, comparing respectively Granada University and Granada University Mathematics Departments’ productions to Spanish, EU 25 and World productions.

**14. Granada University’s market shares of scientific publications (full counts)**

institute	indicators	2002	2003
Granada	number of publications	650	781
	national share	2,6	3,0
	europaean share	0,21	0,25
	world share	0,08	0,10

**15. Granada University Mathematics Departments’ market shares of scientific publications (full counts)**

	indicators	2002	2003
Mathematics Research Activities	number of publications	89	112
	national share	0,35	0,43
	europaean share	0,03	0,04
	world share	0,01	0,01

The scientific production of a university is obviously linked to its size. Various methods have been tested for taking into account the size factor. The first approach is simply consisting in making a ratio between the output produced (e.g. articles published) and the total inputs marshalled for this production. Work by economists illustrates the variety of productivity ratios which can be envisioned depending on whether the denominator concerns staff size, budget, and so forth. Other approaches in terms of DEA (Data Envelope Analysis) represent more powerful methodological tools for measuring the efficiency of the process of transforming inputs into outputs. The publication impact analysis presented below offers another option for gauging the production of a university independent of its size.

**4. c. Collaboration indexes**

The analysis of co-publications can be carried out for different sorts of measurements: absolute flows, normalised flows, mutual affinities, etc. Scientific activity is by nature cooperative whether that being within a group or among groups. Bibliometric analyses are concerned mainly with institutional collaborations (thanks to the address data for the author) and very little concerned with collaboration among individuals. The term « co-publication » is used for publications arising from collaboration among different laboratories which results in an article published with several signatures. As an example, the co-presence of two or more universities on the same article but which are giving different addresses identifies a « co-publication » whereas the co-presence

of universities on the same article and giving the same address can be thought of as a collaboration by institutional arrangement (i.e. structural or affiliated co-presence) <sup>7</sup>.

Indexes of collaborations can fill various dedicated SIMRA tables designed to suit one university’s specific management needs and focuses. These tables may present, for instance, the percentage of co-authored papers, the percentage of internationally co-authored papers (see next table), co-authored papers written with researchers from a given country or from a given institution.

The two tables below distribute University’s publications according to patterns of co-authorship. The first one presents, at discipline level the patterns of co-authorship for Granada University according to disciplines. The second one presents a distribution of co-authorship patterns for the Granada University Mathematics Departments publications.

**16. Distribution of co-authorship patterns for the Granada University publications**

		single author	co- publication	co- publication Granada	national co- publication	international co- publication	europaean co- publications
institute		2002	2002	2002	2002	2002	2002
Granada	Fundamental biology	35%	65%	35%	19%	11%	4%
	Medical research	31%	69%	36%	22%	12%	5%
	Applied biology - ecology	61%	39%	10%	16%	14%	10%
	Chemistry	55%	45%	10%	20%	15%	8%
	Physics	49%	51%	17%	11%	22%	13%
	Earth sciences	42%	58%	20%	17%	21%	9%
	Engineering	65%	35%	8%	18%	9%	4%
	Mathematics	56%	44%	6%	15%	23%	16%
	Multidisciplinary journals	48%	52%	4%	28%	20%	0%

national co-publication (Granada excluded)

<sup>7</sup> This distinction has its limits; a single-author article must be considered as a co-publication when the author mentions several institutional affiliations.

**17. Distribution of co-authorship patterns for the Granada University Mathematics Departments publications**

		2002	2003
Mathematics Research Activities	single author	51%	53%
	co-publication	49%	47%
	co-publication Granada	18%	9%
	national co-publication	12%	14%
	international co-publication	18%	24%
	europaean co-publications	12%	16%
	total	65	76

national co-publication (Granada excluded)

Here again, a sound interpretation needs to be based on a comparative analysis of the corresponding reference data.

The next table presents a ranking of Granada University’s partner countries according to frequencies of co authorship.

**18. First international collaborations for Granada University**

International partnership of the institution

institute	partner countries	2002	2003	2002	2003
Granada	USA	43	61	17%	18%
	ITA	39	44	16%	13%
	FRA	26	26	10%	8%
	GBR	12	26	5%	8%
	DEU	12	20	5%	6%
	BEL	7	10		3%
	CEI	6	9		
	CHE	6	9		
	JPN	5	9		
	MEX	9	8		
	total ( international co-publications - full counts)	251	334		

**4. d. Visibility Indexes**

Scientific articles include a bibliography, the « cited articles ». The number of references made to an article (« citations received » by this article) is thus a measure of its visibility – or as is often said, its « impact ».

Citation analysis, which has been studied in a vast literature, measures the scientific utility, visibility, and international influence of a publication. It depends nevertheless on a number of factors such as the journal and the language of publication, the habits of citation in a certain discipline, the focus of the article (fundamental, applied, methodological, or other). The interpretation of citation data as a direct measure of quality is therefore incorrect (for example an article in English has at least five times more chance of being cited than the same article published in French). The social character of the citation reflex also cautions against simplistic interpretation (accommodating citations, etc.); citation effects are amplified, for example, in the case of the most visible articles.

The table below presents for instance the number of citations received by Granada University Mathematics Departments papers. These percentages of cited, non-cited, or highly cited articles should be interpreted at a disciplinary or speciality level, in comparison with the corresponding average performances.

**19. Number of citations received by Granada University Mathematics Departments papers**

Nr Cit	0	1	2	3	4	5	6	7	8	9	10
% of pub.	41,4%	19,8%	10,3%	5,2%	6,0%	3,4%	0,9%	1,7%	1,7%	5,2%	1,7%

The table below presents - according to disciplines - the shares of the Spanish markets of publication and citations for Granada University papers.

**20. Market shares of publications and of citations of Granada University papers**

institute	2003	Nat. share of publications	Nat. share of citations
Granada	fundamental biology	3,0	1,9
	medical research	1,6	0,9
	applied biology - ecology	2,8	2,3
	chemistry	2,3	2,1
	physics	2,6	2,5
	earth sciences	5,3	2,8
	engineering sciences	3,0	3,8
	mathematics	7,1	7,1
	multidisciplinary journals	1,2	0,7
	all disciplines	3,0	2,0

An important parameter is the variety of citation behaviour from discipline to discipline, resulting in the average number of citations per article varying widely between, for example, fundamental biology and mathematics<sup>8</sup>. Measurement is therefore sensitive to the categories chosen.

It is important to use indicators susceptible to comparison from one field to another, like relative impact. Nonetheless, a defined field at a given level (say, by discipline) incorporates a heterogeneous situation at lower levels (by specialty, or by journal, for example). Different levels chosen for analysis (normalisation by journal, speciality, academic discipline) lead to differing evaluations. This leads in practice to carrying out various normalisations to considering various indicators. The OST recently studied the problem of the stability of these indicators as a function of scale.

Relevant indicators may provide information about the overall visibility of a university and relative impact by discipline

In bibliometrics, it is essential to have at hand several measurements describing an institution's production so as to be able to grasp the many facets of research. In bibliometrics, « impact » describes the number of citations per article. Direct impact is the average number of citations per article for a given actor (e.g. a university), according to a certain counting method and across a defined period of time. Relative impact is a ratio of the absolute impact of the actor for a given field to an average reference impact for that field (for example the average impact for a country, for the world)<sup>9</sup>.

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<sup>8</sup> This can be attributed to differences in the practice of referencing, to phenomena linked to the dynamics of certain fields ("age" of citations and growth"), and to the position compared to other fields from which it can receive a flow of citations.

<sup>9</sup> It is also, for the actor, the ratio of its part of the citations market to its part of the publications market in this field.

$$\text{impact actor} = \text{cit}(\text{act}) / \text{pub}(\text{act})$$

$$\begin{aligned} \text{impact relatif actor} &= ( \text{cit}(\text{act}) / \text{pub}(\text{act}) ) / ( \text{cit}(\text{ref}) / \text{pub}(\text{ref}) ) \\ &= ( \text{cit}(\text{act}) / \text{cit}(\text{ref}) ) / ( \text{pub}(\text{act}) / \text{pub}(\text{ref}) ) \end{aligned}$$

For a particular actor who articles are not very visible, for reason of choice of journal or research theme, this system will have quite different consequences on "market share of citations" and " on the impact indicator. Adding an article of low visibility to a corpus of research articles published will have little effect on the "citations market share", but will tend to lower the indicator impact .

**21. Visibility – Granada University's relative impact, relative expected impact and RCR (2 years) 2002 - full counts**

		relative impact	relative expected impact	RCR
institute	disciplines	2002	2002	2002
Granada	fundamental biology	0,51	0,60	0,86
	medical research	0,90	0,87	1,04
	applied biology - ecology	0,45	0,98	0,46
	chemistry	1,19	1,10	1,08
	physics	1,71	1,31	1,31
	earth sciences	0,53	0,89	0,59
	engineering sciences	0,96	0,86	1,11
	mathematics	0,93	0,89	1,05
	multidisciplinary journals	0,31	1,37	0,23
	all disciplines	0,72	0,77	0,93

A relative impact above 1 indicates a greater visibility than the reference. This measurement is characteristic of a given level of observation and allows the comparison of one field with another at this level, for example among disciplines, without translating the heterogeneity of characteristics within the discipline.

In order to take account of the heterogeneity of citation behaviour, it is necessary to turn to normalised indicators for scientific fields, for example by discipline or by journal. One well known form of normalised indicator is the ratio of relative citation (RRC), which effects a normalisation at the level of the journal. In this approach, relative impact is considered as resulting from combining the hoped-for relative impact with the ratio of relative citation (RRC). The RRC translates a normalisation by scientific journal, which is assimilated to a particular specialty with its own bibliometric characteristics. From this viewpoint citations received by an author for an article are considered as resulting from two components: on one hand the expected level of citation (the average impact for articles in a given journal)<sup>10</sup>, and on the other hand the ratio between the citations actually received and the number expected. In this way it is possible to characterise the RRC for each university, which is by

<sup>10</sup> The impact of each journal here is calculated differently from the "impact factor" of the ISI-JCR (where the type of document is taken into account, the calculation for each article is done for "year of citation", time spans are accounted for, etc.) The "hoped-for" impact used here follows the same logic as the "impact factor" by actor. There are variant forms of RCR in use especially ones which include supplemental normalisations, and in particular by "type of document" (article, syntheses, letters, etc.) For the present study, it would seem advisable not to distinguish between these types and to keep the possible advantage of "syntheses", ordered by publishers and portraying a position of reference in a field (despite editorial bias) compared to normal articles.

construction the ratio of real impact to expected impact. The RRC therefore shows for each actor the over- or under-visibility of this actor considering the journals in which it publishes<sup>11</sup>.

The table below presents - according to disciplines - the various ratios of impacts shares of Granada University papers.

For further and complementary analysis of the activity of universities, institutions may use indicators based on an ordinal vision by classes of visibility

The distribution of citations, like most bibliometric distributions, is very asymmetrical; a large percentage of articles are little cited or not at all, while a few are heavily cited. Articles can be sorted by the following classes: the 5% most cited articles in the world; the next 5%; the next 10%; the next 20%; the next 20%; the next 40%.

For each institution it can be noted what percentage of its articles are included, for example, in the « most cited » class worldwide, in each discipline<sup>12</sup>. In practice the last (and sometimes next to last) class is non-cited articles which can be numerous depending on the length of the period over which citations are counted.

An « activity indicator » can be calculated for each class of visibility. This indicator is equal to the ratio of the percentage of its articles which the actor places in a certain class to the percentage of articles in this class worldwide. For example, for the « excellence » class of the 5% most cited, the latter percentage is by construction

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<sup>11</sup> For an actor (act) raw impact  $IB(act) = cit(act) / pub(act)$

hoped-for citations for an actor,  $CE(act) = \sum_{journal} [pub(act,journal) \times impact(journal)]$

hoped-for citations for a set of actors,  $CE(\sum act)$  is identical to  $cit(\sum act)$ .

Hoped-for impact of an actor,  $IBE = \sum_{journal} [pub(act,journal) \times impact(journal)] / pub(act)$

$RRC = IB / IBE = CE / cit(act)$

The RCR is calculated indifferently from raw impacts or relative impacts.

$RRC = IR / IRE$  The overall impact  $IR = IRE \times RRC$  thus portrays the combination of two forms of competition:

- the competition for access to high impact journals ("is an actor present in high-visibility journals?") – characterised by the "hoped-for" impact;

- the competition for visibility within each research micro-community that the author is addressing, with a micro-community supposedly defined by a journal ("is an actor rather visible or barely visible in the journals where the actor's publications appear?") -- characterised by the RCR.

The "publication strategy" consists notably of positioning oneself in respect to these two arenas of competition

<sup>12</sup> It may be desirable, for example, to record the activity indicator of an institution for articles of "high visibility", defined as those in the class of 35% most often cited. Supposing that the institution has placed 50% of the articles it signs or co-signs (presence count) in this set of 35% most often cited worldwide, then the proposed indicator is "the activity indicator" for articles of high visibility", in this case the ratio of 50:35 or 1.43.

close to 5%.<sup>13</sup> On the basis of a distribution of citation rates by class, the OST has developed a methodology making possible a profile of citations for each university<sup>14</sup>. The rank order of classes is plotted on the x-axis and the activity indicator on the y-axis. The profiles then can be characterised by their general tendencies, for example ascending or descending, and secondarily by their shape: regular, dome, trough, etc.

Descending profile: the actor is more present in classes of higher visibility. The performance is better as the slope gets steeper.

Flat profile: the actor is present in all fields, with an impact close to the world average.

Ascending profile: performance weakens as slope steepens. This suggests an impact inferior to world average impacts.

## 22. Example of the activity indicator (all disciplines combined) of an institution with a “descending profile”

---- Orange : indicator normalised by discipline ——— Vert : indicator normalised by ISI specialities



### 4. e. Interdisciplinarity Indexes

The aim of non-disciplinary research is to use elements from different established disciplines developing either similar or different solutions to problems. The elements can include exchange of ideas, theories, resources, equipments, data, personnel, and epistemological concepts. The degree of non-disciplinary research can be divided into four different categories:

Number of disciplines involved

<sup>13</sup> The real value may differ from the nominal value because of ex-aequo situations. The activity indicator, similarly, is the ratio of the institutional share in world articles in a class to institutional share in all articles worldwide.

<sup>14</sup> Michel Zitt (OST-Inra), Serge Bauin (UNIPS-CNRS), Ghislaine Filliatreau (OST), 2004, *Indicateurs Bibliométriques des Institutions Publiques de Recherche Françaises (2000 – hors sciences humaines et sociales)*, published as part of the the Cooperative Publication of Science Policy Indicators for French Research Institutions.

Degree of similarity between them

The novelty and creativity involved in the combination

Degree of integration

According to the degree of non-disciplinarity a number of various concepts have been developed to best describe the level of element exchange. These include multi-, inter-, and transdisciplinarity.

- Multidisciplinary research occurs, according to Weingart (1999), when researchers from separate disciplines work side by side trying to solve one single problem. Different theories from different disciplines are used and the findings can vary between disciplines.
- Interdisciplinary research, in contrast to multidisciplinary research, creates its own theories, concepts and methods and the results are more coherent and integrated.
- Transdisciplinary research has been defined as a meta-theoretical exchange between disciplines based on a common theoretical understanding.

In this methodological guide we will focus on interdisciplinary research which integrates knowledge from several disciplines solving common research questions. Many unsolved research questions are of interdisciplinary characters that have to be addressed with an integrated disciplinary knowledge. Also it is getting more obvious that similar underlying methodologies can be used across many disciplines.

Interdisciplinary collaborations can allow transfer of elements from one discipline to be exploited and integrated into other disciplines. Interdisciplinarity is a concept that is widely used in the priority areas for many European Universities.

Different indicators can be possibly used for identifying and measuring interdisciplinarity research using bibliometrics.

**Citations between different disciplines.** Articles can both be cited by sources from different disciplines and cite (refer to) sources outside their own discipline. Both information sources can be used as indicators of interdisciplinarity. The distribution of references to different disciplines of a given paper can be used to measure the level of interdisciplinarity, track the rate of knowledge transfer between disciplines, and calculate the number of disciplines involved<sup>15</sup>. Publication citations can be used as an indicator of communication between different disciplines. In a converging field both the stage of evolution and the positioning of a discipline can be measured. Several studies assume that journals belonging to the same discipline should have strong citation relationships while journals relationship belonging to different disciplines should be weaker<sup>16</sup>.

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<sup>15</sup> Glänzel 1999; Rinia 2002; Van Leeuwen and Tijssen 2000

<sup>16</sup> Doreian and Fararo 1985; Borgman and Rice 1992; Tijssen 1992; Leydesdorff and Cozzen 1993; Besselaar and Heimeriks and Besselaar 2005.

**Publications outside a centre’s or department’s main research area.** The percentage of articles published outside a centre’s or department’s main research area can be used as an indicator of interdisciplinarity.

**Co-authorship among authors from different academic background.** Publications involving authors from different disciplinary centres or departments can be an indicator of knowledge transfer between researchers from different academic backgrounds.

The two tables below pertain to the first type of interdisciplinarity assessed as a cross-border reference space. The first presents a distribution - according to disciplines - of citations received by Granada University Mathematics Departments publications. The second presents a distribution - according to disciplines - of references cited in the Granada University Mathematics Departments publications.

**23. Interdisciplinarity – Distribution according to disciplines of citations received by Granada University Mathematics Departments publications**

Subfield	% Ref
Mathematics	55,3%
Physics	7,4%
Earth Sciences	5,6%
Public Health & Health Care Science	4,6%
Medical Research, General Topics	2,9%
Multidisciplinary	2,6%
General & Internal Medicine	2,6%
AI, Robotics & Automatic Control	1,9%
Endocrinology, Nutrition & Metabolism	1,6%
Endocrinology, Metabolism & Nutrition	1,6%
Biology	1,5%
Anesthesia & Intensive Care	1,0%
Research/Laboratory Medicine & Medical Technology	1,0%

**24. Interdisciplinarity – Distribution according to disciplines of references cited in in Granada University Mathematics Departments publications**

Subfield	% Cit
Mathematics	41,2%
Earth Sciences	8,8%
Physics	8,8%
Electrical And Electronics Engineering	6,1%
Engineering Mathematics	6,1%
Endocrinology, Metabolism & Nutrition	3,1%
Environment/Ecology	3,1%
Environmental Engineering & Energy	2,2%
General & Internal Medicine	1,8%
Orthopedics, Rehabilitation & Sports Medicine	1,8%
AI, Robotics & Automatic Control	1,8%
Public Health & Health Care Science	1,8%
Computer Science & Engineering	1,8%
Medical Research, General Topics	1,8%
Environmental Medicine & Public Health	1,3%
Anesthesia & Intensive Care	1,3%
Endocrinology, Nutrition & Metabolism	1,3%

The table below pertains to the second type of interdisciplinarity assessed as a cross-border publication space. It presents the distribution according to disciplines of articles published by Granada University Mathematics Departments.

**25. Interdisciplinarity – Distribution according to disciplines of Granada University Mathematics Departments publications (full counts)**

disciplines	fundamental biology	medical research	chemistry	physics	earth sciences	engineering	mathematics	all disciplines
2002	1	8	1	9	4	6	69	89
2003	1	3		8	5	7	90	112

The two tables below pertains to the third type of interdisciplinarity assessed as a collaboration of authors from different academic background. The first presents a

distribution of collaborations between authors from different departments. The second presents a distribution of collaborations between authors from different faculties.

**26. Interdisciplinarity – Distribution of collaborations within Granada University between authors from different departments**

For 2003	Granada University co-authored publications	With authors from 2 departments	With authors from 3 departments	With authors from more than 3 departments
% of total Granada University publications	55,96 %	13,96 %	1,93 %	0 %

**4. f. Setting scientific agendas – what is at the university disposal**

For this specific issue, which deals with the power that the university is able to gather for conducting research within a coherent research strategy and policy, the focus is on the people (researchers and not research managers) that are responsible for the strategies.

As seen previously, one of the most important academic outcome, for both the researchers (in terms of career opportunities) and university (in terms of funding and international recognition) is the scientific publications. Nevertheless, a publication, as good as it can be, has to pass the gate of the journal publication process, and this process might be dependent on other factors than the only “quality” of the paper.

As stated by Braun (2004), the members of the editorial and advisory boards of scientific journals are rightly considered the gatekeepers of the science journals. It becomes then important for an institution to have some of its staff playing the role of gate-keeping in a peer-reviewed journal, and even is the “invisible college” might be a better tool than the visible one (as a proper institution) for career opportunities and reputation, it reveals the “potential” strategic capabilities of a university.

In this section, we try to develop two ways for tackling this issue of scientific gate-keeping:

- “classical” scientific gate-keeping
- “indirect” scientific gate-keeping

The “classical” gate-keeping deals with the people (researchers) involved in scientific and advisory boards. The editorial boards, with its thematic components and its discrepancy, from the editor-in-chief to the advisory board, are an element of description of both the involvement of people into the scientific networks and the “keeper” activity of those people. A University that has some of its staff into such a board might increase its “scientific” influence among others. As stated by Braun (2004): gate keeping indicators can be successfully used also for evaluations at institutional level.

The SIMRA for gate keeping is presented the same way and offer a transversal framework in order to analyse the correspondence of the profiles between scientific publications and scientific gate keeping activities. As for the former, the level of analysis is, as an objective, the institution. Nevertheless, the data gathering process might be at a lower level.

### 27. Scientific Gate keeping

	Scientific Speciality 1		Scientific Speciality i		Scientific Speciality m
Laboratory l	$N_{11}$				
Laboratory j			$N_{ij}$		
Laboratory n			$N_{in}$		$N_{mn}$

As afore shown, the specialities refer to journals, and the possibility to link the participation of a staff to an editorial board to a specific discipline is a value-added option for relating this information to the publication activity.

The “indirect” scientific gate-keeping issue deals with the review papers that are published in scientific journals.

Researchers are sometimes asked to write reviews that will then be published in the scientific journals. Those reviewers are brought by the editorial board because of the competences and knowledge on the issues dealt with in the specific journal. In the same way than the use of the ISI database for building scientific production indicators, the use of the database allow to see who the reviewers are, where do they appear and what institution are they coming from.

For an institution, the participation of its staff to those activities is reflecting firstly the excellence of the researcher (considered as such by peers), but also, some influence in the debate on the reviewer discipline through its review activity. We call this, “indirect” scientific gate-keeping since the review author is coming in a second step in the elaboration of the scientific knowledge through publication, after the editorial board choices have been made.

#### **Non-articles outcome: books, chapters, e-journals**

Written documents as a format for academic outcome.

The higher education institutions activities are similar from one another. They devote their time and resources to teach, do research, and bring some knowledge to the society. For this reason, they are now more and more running for “excellence”, living in a market-like environment, market for students as well as for external funds. At the same time, they all are very different when looking at their specific research activities: some are mainly into humanities while others are mostly engineering oriented, some are doing a lot of biotechnology while others are building new physics facilities to enhance their research capacity within this area.

Comparisons, rankings, studies on universities are done based on the paradigm that that all are similar and produce the same kind of products (students and publications), that is measurable through a few databases. The reality is very much different from that, and the actual academic output is very different from one university to another. It is the format of the academic product which is similar (i.e. a written document), not the format of the content (ISI-type article).

Books, but also non-ISI articles, and chapters, represent a simple output, a great number of written documents, all of them time consuming for the researcher and playing a specific role in the HEI overall activities.

As outputs, those have to be considered for understanding the higher education system. From three missions of HEI detailed above, one only is usually considered by policy-makers worth measuring for building a profile of the institution activities.

SSH as a secondary issue

As it is well known, the study of academic outcome through scientific publication is very biased and has strong limitations while using the ISI database (or any other ones).

As Hicks (2004) states it for social sciences, there are four types of literatures: journal articles, books, national literatures and non-scholarly literature, mainly produced through the HEI “third mission” activities. Databases usually gather the first type, and leave outside the three others.

A specific work undertaken among six groups of economics (Nederhof, Van Raan, 1993) shows that half of the publications are of “non-ISI” type. Still, even if the ISI articles are among the most cited, books citations are also very high. As such, SSH is also an issue that has to be dealt with if any complete picture of HEI academic outcome is to be drawn for building profiles or comparing research activities and knowledge production.

The SSH issue is not secondary for profiling activities, but it is secondary when it comes to measures and analysis because of the limits defined above.

Non-articles outcomes: the continuous limit of scientific production analysis

The OEU is willing to draw profiles, as real as possible, in order to give an overall picture of HEI activities within the European context and in order to provide research managers with tools to auto-analyse its trajectories and to build strategies. Nevertheless, there are some limitations in the exercise due to the new uses of indicators for strategic management of research in the HEI. When it comes to scientific production, the limitation is due to production that is not referred to as articles, but as discussed previously, these type of output is also to be taken into account for a complete profile

## **5. Feed-back on the strategic matrix**

This last section of the chapter will feed back on the strategic matrix presented chapter 2 with the indicators presented and developed in this chapter. In order to look through the “academic outcomes” thematic dimension, we need here to link each cell of the matrix (from KQ1.3 to KQ 5.3) with the relevant tables elaborated with our data and indicators.

**5. a. Transversal issue: autonomy**

Does the research portfolio reflect the university strategic choices of scientific fields or does it result mainly from national or European framework programmes for RDT policies?

What are the university degrees of freedom to evaluate the quality of academic outcomes?

The first aspect deals with the specialisation of the institution and its similarities with either the national or the European specialisations. Its degree of autonomy, regarding academic outcome, might be highlighted with the gap between the institution specialisation and the national/European features. Several degree of specialisation/autonomy might be relevant from the regional level to the European level.

The second aspect of the autonomy issue of academic outcome, which is related to the quality aspect of the outcome and the possibility for the institution to evaluate it, is linked with the impact indicators (or citation-based indicators). For these specific indicators, several citation-based indicators might be relevant such as citation market share, the relative impact or the RCR.

**5. b. Transversal issue: strategic capabilities**

What leverage is at university disposal to set scientific agendas in its various fields of activity?

The capacities for the university to have some kind of impact on setting scientific agendas is very much linked, partly, to the capacities of its researchers to be fully active within different networks, one of them being the edition network. What is called the indirect scientific gate-keeping is a proxy, based on the same database than the other tables, and which at least highlight who are the researchers whom work and overview on a subject is considered worth being published, and often, are invited to do so.

**5. c. Transversal issue: attractiveness**

What scientific partnerships do appear in the university networks of co-publications?

What are at the university's scientific partnerships characterized by its visiting fellows, the non-local PhD, the academic events it organizes?

What scientific partnerships do appear in the university portfolio of participation in and coordination of international research program?

In order to cross both the academic outcome dimension with the attractiveness of an institution, we have developed indicators that reflect mainly the networks of publication of the institution, by looking at the partnerships (national/international). This indicator, through time, is a good proxy for evaluating this issue. Still, we have to be careful for the result analysis since a very high degree of co-publication might either mean a strong attractiveness or a strong dependence on other institutions/researchers to have some outcomes.

**5. d. Transversal issue: differentiation profile**

In which domains does the university publish the main parts of its scientific articles?

In which domains does the university publish the main part of its “non articles” academic outcomes (books, chapters, e-journals)?

What are the main marks of academic recognition which have been awarded to university researchers?

This issue refers to the same indicators as the first KQ, with a difference on the analysis of the results (which have to be considered according to the complete matrix). Whereas the first KQ was looking at strategic choices, this issue refers to the present situation, whether it be the consequences of precedent choices or not.

The second part of this KQ is a subject that has not been only slightly discussed within this chapter for not forgetting this aspect when dealing with academic outcomes management.

The last part is strongly related to the human resources thematic dimension.

**5. e. Transversal issue: territorial embedding**

What are the main geographical levels of scientific cooperation for the university?

Where do the university PhDs students come from and where do they go after completion of the PhD?

This issue, strongly related to the “third mission” thematic dimension, is also tackled through indicators that are presented for the attractiveness issue. The PhD student aspects of territorial embedding are strongly linked with the human resources thematic dimension. For the geographical levels of scientific cooperation of an institution, indicators of co-publications might be useful.

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## V. Third Mission

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## 1. Introduction

European universities must build on their strengths as institutions as they strive towards modernisation and improving their competitiveness. The universities need modern governance and management<sup>1</sup>. One of the key challenges for university administrators is to identify the strengths and weaknesses of their activities. They need different kinds of information for strategy building. One of the key strategic issues for university management is the *third mission of universities*.<sup>2</sup> This means the university's relationship with the non-academic outside world: industry, public authorities and society. The 3rd mission includes several different activities such as the commercialization of academic knowledge through collaboration with industry, patenting / licensing, creation of spin-off companies, participation in policy-making, involvement in social and cultural life.

In the process of adapting to new challenges, the importance of the 3<sup>rd</sup> mission of universities is highlighted. However, many European universities still underestimate the potential benefits of sharing knowledge with economy and society. The lack of openness of universities to the business community may be seen either in the career choices of doctorate holders, or in the relatively low proportion of private sources of university funding. The universities, as the European Science and Research Commissioner Janez Potocnik emphasized “need to adapt to the demands of a global, knowledge-based economy, just as other sectors of society and economy have to adapt”. (Cordis Focus, June, 2006, p. 11.)

The relevant information can support the core actors of the European innovation system to respond to new challenges. The overall aim of the PRIME / OEU is to provide universities with tools for the management of their research and 3rd mission activities.<sup>3</sup> The ultimate goal of this chapter is to develop meaningful indicators for university administrators to measure and benchmark the 3<sup>rd</sup> mission of different European universities overall. The development of this strategy-making tool is a long-term process.

The diversity of European universities has a strong influence on the importance of one or another kind of 3rd mission. As European universities vary – general and specialized, hard science-oriented or business schools, large and small, offering only undergraduate degrees or all degrees including doctoral degrees, territorially embedded and not embedded – we need a critical mass of universities and their detailed information in formerly uncovered fields to provide standard definitions.

The ‘3<sup>rd</sup> mission’ is a field where positional indicators and individual strategic indicators are needed for university administrators and other decision-makers. The

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<sup>1</sup> The term *management* is expressing the changes in governing university. This paper uses “management” when it refers to a skill or action, but when it talks about a group of people in charge of university, the term *administration* is used. The administration of educational institutions needs more and more managerial skills.

<sup>2</sup> Gulbrandsen and Slipersaeter (2006) give a short overview how 3<sup>rd</sup> mission has emerged in the practice of universities and in the literature. Their overview, as the majority of the literature, focuses on the economic dimension of the 3<sup>rd</sup> mission.

<sup>3</sup> In this chapter, the term “universities” covers all institutions of higher education, irrespective of their name and status in the EU member states.

different activities of the 3rd mission may be measured with different kinds of indicators. This chapter will present the indicators by activities of the 3rd mission. Several activities or dimensions of the 3rd mission have a longer tradition and their measurement has been discussed in the literature (such as patents and collaboration with industry). Some other activities or dimensions (such as the societal dimension) got in the focus of university administrations only in recent years and there is no established practice for their measurement.

The section on the strategic matrix of the 3<sup>rd</sup> mission (shown in annex 1) identifies five broad transversal issues using 5 thematic dimensions: (1) Autonomy, (2) Strategic capabilities, (3) Attractiveness (4) Differentiation profile, and (5) Territorial embedding.

It takes a few years to fill the overall analytical framework and the OEU strategic matrix of 3<sup>rd</sup> mission with relevant data and indicators. Indicator development for the 3rd mission is in the blue-sky stage. The observation of 3rd mission is in a less matured stage than the 1st and 2<sup>nd</sup> missions of universities. The topic itself is less homogenous than topics relating to other transversal issues – funding, human resources, and academic outcome – which have been discussed in other chapters. On top of that, there is a much shorter tradition of studying the 3rd mission. For these reasons, the definitions of 3rd mission activities are less standardised, and there is a scarcity of accumulated data. If data and indicators are available on one or another dimension of the 3rd mission, most of them may be found in research papers but are rarely available from university archives.

This chapter takes into account both the economic and societal dimensions of the 3rd mission. For the economic dimension, it contains measurement in the experimental stage. For the societal dimension it does not go further than describing the focus of activities, several attempts of classification and highlighting borderlines. Other issues are pre-matured for the guidebook. This chapter is a ‘cook book’: none of the potential users have to employ all of the suggested indicators. Apart from the differences in the availability and reliability of data the application of indicators depend on the character of the university, and on which kind of strategy is important for university. The chapters contain indicators that various universities can employ if they are focusing on one or another dimension of the 3rd mission.

In the section regarding the economic dimension, the description of measures and designed indicators are followed by illustrations from various universities in several cases. The number of actors for illustration is limited because of three different reasons:

- (1) There are almost no data relating to several dimensions of the 3rd mission, or if data exists, they are not directly available;
- (2) In the universities which volunteered investigation, there are no activities in one or another field of the 3rd mission;
- (3) Data are not disclosed. Since the purpose of the guidebook is to develop a tool for university administrators and evaluators, data which are only available in researcher databanks and research papers are not employed here.

This chapter can provide very few real examples for indicators, because of a lack of available data, or lack of disclosure of information and because of the limited number of PRIME OEU researchers with participating universities working on this topic.

## **2. Conceptual framework and location of university 3<sup>rd</sup> mission**

The 3<sup>rd</sup> mission of universities means the relationship with the non-academic outside world: industry, public authorities and society. The 3<sup>rd</sup> mission of universities has a more direct relationship to the national innovation system than the first and second missions do.

The 3<sup>rd</sup> mission of universities strongly relates to its first (education) and second missions (research); however it has its own dimension. It tells something about how university capabilities are integrated into the economy and into society. Some points of this chapter overlap with the topics of the other chapters (human resources, funding) but the present focus is slightly different from them.

The 3<sup>rd</sup> mission is multifaced, as it examines several issues of both the economic and societal dimensions of universities, such as transfer of competencies through fresh graduates to industry, contracts with industry and public bodies, involvement in social and cultural life.<sup>4</sup> The 3<sup>rd</sup> mission of Humboldtian universities is different from the 3<sup>rd</sup> mission of 21st century universities. The progress in 3<sup>rd</sup> mission from traditional Humboldtian universities towards a new type of university touches upon mission 1 (teaching) and mission 2 (research).

Traditional 3<sup>rd</sup> mission is out-reaching activity: universities engage with society at arm's length, as they use various channels to communicate results of research to organisations beyond the university, such as continuing education opportunities for the wider community; serving industrial development through research management, technology transfer, involvement in commercialisation through start-ups. These activities have hardly any impact on the ethos of the university, on organisations and managements.

Since the mid-20th century, out-reach activity has been expanding but in-reach activity is occurring as well. The ethos of universities has also been changing significantly.

In-reach activity exists if:

- The intensity of interaction with society and science increases significantly;
- Knowledge circulates among the different actors;
- Demand of university research moves from reliable knowledge to produce socially robust knowledge that is valid beyond the laboratory because it has been tested in a range of other contexts (Gibbons 2005).
- The transformation of traditional curricula and the emergence of ties between disciplines to fit the general labour market, local employment needs and emerging multidisciplinary research needs.

In-reach 3<sup>rd</sup> mission requires a fundamental transformation in research methods and practices. It also requires that new competencies be developed and new career paths be established. For European universities, one of the necessary modernisation tasks is

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<sup>4</sup> The view of 3<sup>rd</sup> mission is much broader than term of 'entrepreneurial university'. See details on entrepreneurial university in Etzkowitz 2003. See also Gulbrandsen and Slipersaeter for comparing the meaning of economic dimension of 3<sup>rd</sup> mission and entrepreneurial university. (2006)

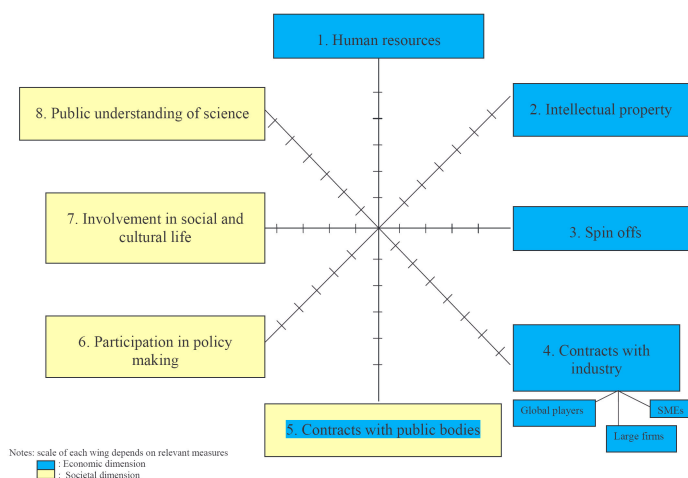
to introduce training in intellectual property management, communication, networking, entrepreneurship and team-work. In other words, graduating professionals have to fit industry needs. Other new demands for universities are non-degree retraining courses for adults or gap courses for students not coming through the traditional routes. To meet in-reach 3<sup>rd</sup> mission requirements, university organisational structures and management need to be restructured and new incentives and rewards have to be introduced.

The challenge for universities is to develop the competencies required to become production sites of socially robust knowledge. The characterization of the 3<sup>rd</sup> mission as both a traditional and a new mission of universities is considered a crucial element in the assessment of an institution’s capabilities and performances as well as in the transformation process of Humboldtian universities.

The 3<sup>rd</sup> mission of a university depends on the character of the institution. Higher education organisations differ by the level degrees which they issue: specialised on basic professional higher education (bachelor) or professional higher education (master), and research university. Hence, different types of universities have different types of 3<sup>rd</sup> missions.

The university 3<sup>rd</sup> mission profile, along with its different dimensions, can be described schematically as a radar. As institutions of higher education have social and economic roles, the PRIME OEU research team has identified two main dimensions of 3<sup>rd</sup> missions: economic and societal ones. Each main dimension has 4 sub-dimensions. The economic dimension focuses on human resources, intellectual property, spin-offs and contracts with industry, while the societal dimension deals with public understanding of science, involvement in social and cultural life, participation in policy-making and contracts with public bodies. Borderline issue is discussed later. (Figure 1) The radar model is a user-friendly illustration that helps to visualize the different types of 3<sup>rd</sup> mission. Each axis is built with a limited number of indicators that are aggregated in an index and which deliver a composite mark. (A more detailed presentation is developed in Annex 1.)

### 1. Issues for mapping the “third mission” (Radar)



Out of 5 transversal issues, the radar covers only two and a half issues: (3) Attractiveness, (4) Differentiation profile (partially) and (5) Territorial embedding. Although the importance of the other issues (autonomy, strategic capabilities) is undisputed, this guide does not deal with them. The reason is simple and very pragmatic: we had no opportunities to test the framework that was developed for mapping these issues. More empirical evidence and a larger number of pilot universities are needed to develop meaningful indicators on these issues. Some of the indicators are related to transversal issues, such as attractiveness. The positioning indicators relating to transversal issues are not discussed in this paper.

### **3. *The methodological attempt for the characterization of 3<sup>rd</sup> mission***

The multiple dimensions of the 3<sup>rd</sup> mission open many methodological avenues. Several types of 3<sup>rd</sup> mission have significant literature and some traditions in measuring, while some other types are scarcely covered by literature at all and there is no established practice for their measurement. The accumulated knowledge focuses much more on measuring outreach activities than on the relatively new in-reach activities. Records bearing on the economic dimensions of the 3<sup>rd</sup> mission are much better than those on societal activities. There is a paucity of quantitative information, good classifications, and descriptions.<sup>5</sup>

Thus, in several avenues, our work is guided by good definitions, indicators and accumulated data, while in other avenues these kinds of guideposts are missing. In the latter case, our task is to construct them. This section concentrates on methodological issues by each type of 3<sup>rd</sup> mission. It will discuss these types as follows:

- a) put each dimension into context and explain the meaning and policy relevance of indicators and markers,
- b) define the type and related topics,
- c) describe the relevant indicators and markers,
- d) design data collection schemes, including various quantitative tables to help university administrators to position their institution in a competitive environment.

In a university where teaching, research and 3<sup>rd</sup> mission cover various activities articulated in many different faculties, it is very important to collect disaggregated data by faculties and activities. The role of indicators is changing: from a demonstrative role to policy makers to a facilitative role for university decision-makers. In these cases, aggregated data would not be very significant.

Each type of 3<sup>rd</sup> mission indicators and markers relating either to the dimensions or to the transversal issues may be expressed schematically.

In the arena of higher education indicators, measurements for the 3<sup>rd</sup> mission are a new field. International diversity of available data and indicators are very common in new fields of indicator development.

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<sup>5</sup> One of the recent attempts was initiated by the OECD to map types of university-related museums. The OECD pilot project has identified the categories of university museums. (OECD 2001) The university museum issue is a part of the sub-dimension ‘involvement in social and cultural life’.

The way towards well-established indicators will require many disaggregated indicators and new database development. The suggested indicators are a mix of classical and non-classical input, output and outcome indicators. This methodological guide deals with the disaggregated indicators by activities (sub-dimensions). This guidebook describes the indicators that are very important for university administration.<sup>6</sup> The descriptions of indicators differ by their maturity. Indicators and data collection have a longer tradition relating to economic dimension than relating to societal dimension.

There are several common methodological topics for most of the dimensions. Before detailing the activities, we discuss two disaggregation issues – field of science and level of investigation – that are important for majority of 3rd mission’s activities.

- Field of science

Most European countries use the OECD classifications. New developments in existing fields of science and emerging new lines are making research activities more and more interdisciplinary and transdisciplinary. As the European Commission highlighted (2006, 208) these changes require that the focus to be “less on scientific disciplines and more on research domains (e.g. green energy, nanotechnology) associating them more closely with related or complementary fields (including humanities, social sciences, entrepreneurial and management skills).” For strategy formulation, managing and assessing university performance in 3rd mission it is useful if the disaggregation of indicators by field of science can go beyond the traditional single disciplines data and include research domains. Several countries are employing more frequently updated classifications for higher education fields of science than those of the OECD.

Beside the OECD classifications, several others exist that are important for measuring 3rd mission (patent classification, Thompson ISI classification for publications and citations.) Even if the reasons of differences in classifications are clear, increased harmonisation between these standard classifications (OECD field of science, patent classes, and classes of publications) could be more user-friendly. However, the issue of harmonisation is beyond the scope of the present guidebook.

- Different levels

The level of indicators and analysis as well as data collection can be (1) University, (2) Faculty, (3) Department (4) Research group and (5) Individuals. The level of investigation depends on the strategy issue and management of university. At the multi field of science universities, many indicators are not meaningful at the university level. Very few universities achieve excellence across a wide spectrum of areas. Faculty or department levels of investigation support the individual universities in the identification of the particular fields where they can achieve excellence and attract both the academic and non-academic worlds. Different kinds of 3rd mission – contracts with industry, licensing or creation of spin-offs – might be going on within a

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<sup>6</sup> This chapter neglects indicators and breakdowns that are important mainly for policymakers or innovation policy researchers. This limitation relates to the focus of this guidebook.

few faculties or departments at large, generalist universities. The indicators are much more meaningful at the level of department, faculty or by field of science. (Licensing activity might be interesting only for the administration at patent-poor universities. Disaggregation by faculties is crucial for patent-rich universities.) If faculties or departments have autonomous policies, the level of analysis will be by faculty or department for one or another dimension of 3rd mission.

Level of analysis can be different from the level of data collection. Sometimes the level of data availability limits the choice of analysis.

The following sections investigate the methodological issues of the 3<sup>rd</sup> mission by dimension. The University administration can choose among dimensions that are interesting for strategy development, monitoring the performance, or benchmarking in any given periods. The section on the economic dimension includes several examples of data that we suggest collecting. Beside suggested data and indicators, several alternative types of data may be used as a second-best solution for several reasons:

- Some different indicators can be relevant for university administrators in the context of the national innovation system
- In the event of a lack of direct information, indirect information may be substituted.

Besides the description of indicators, the majority of sections provide sample-tables. The sample-tables usually contain the ideal breakdowns. Universities can select the relevant detailed breakdowns for investigation. Few sample tables are followed by illustration. The illustrative tables show the relevant data from one or another European university.

### **3. a. 3<sup>rd</sup> mission by economic dimension**

In the context of economic dimension of 3rd mission two modes of commercialisation may be distinguished<sup>7</sup>: (1) user-directed commercialisation, such as contracts with business (2) science-directed commercialisation, such as patenting, licensing, creation of spin-off companies. Although the borderline between user-directed and science-directed commercialisation is not blurred, the distinction is important.<sup>8</sup> Data on science-directed commercialisation are less available than on user-directed commercialisation.

In the field of the economic dimension, several international classifications, data collections and indicators support the development of 3rd mission indicators. However, micro-level investigation causes some differences in employing these tool-kits.

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<sup>7</sup> See more details in: Gulbrandsen and Slipersaeter, 2006.

<sup>8</sup> The borderline is changing by time and space. Generally speaking, in the era of knowledge economies, some traditional science-based commercialisation is becoming user-oriented or mixed-oriented commercialisation. In the countries or regions where firms are not very innovative and/or have low outside knowledge absorptive capacities (such as post-socialist countries), user-directed commercialisation is narrower than in countries with more innovative firms. In countries with a scarcity of user-directed commercialisation and good science capabilities, science-directed commercialisation may substitute for user-directed commercialisation. Of course such substitution is less effective than the broader scope of user-oriented commercialisation.

The section on the economic dimension tries to use standard definitions and classifications, based on relevant OECD manuals. If non-standard classifications/definitions seemed feasible in the testing stage of the PRIME-OEU project, they were included in this guidebook. However, they must be taken as ‘interim definitions / classifications’. For standardising them, further testing exercises will be needed.

Each activity / sub-dimension can be measured in absolute terms (number of firm members in supervision, number of patents owned by university) and in shares (of university licence revenues, % of PhD students going to industry, etc.). They may be calculated by various scales and classes (e.g. geographic scale such as regional share, national share; by fields, by faculties etc.).

### 3.a.i Human resources

Rationale: The integration of graduates in the labour market is the shared responsibility of universities, employers, professional bodies and governments. More and more universities are interested in following-up their students’ careers. The flow of knowledge from university is a sign of acceptance of the teaching curricula, and quality of education by the labour market. The attractiveness of a university as a teaching and research organisation is closely related to the job opportunities for their graduates.

Indicators on labour market success are rough measures of the quality of university performance. These indicators also provide some information on the responsiveness of a university of the changing world. They show if in-reach activities have occurred in teaching curricula.

Focus: on transfer of embodied knowledge in PhD students and graduates. This axis screens the transfer of “competences trained through research” to industry, public bodies and utilities. The transfer occurs through different channels such as joint supervision of PhD students by members of universities and firms / public bodies; student involvement in performing contracts for industry; job inflow from university into the non-university sector.

The indicators are simple for mapping knowledge flow through human resources of university. However, it is not an easy task to prepare them. The flow of knowledge from university to economy through various channels may be measured with different indicators. The availability of data is better for some channels than for others.

Borderline: Teaching outcome, the number of qualified brainworkers is the outcome of the first mission (education) of universities. The penetration of these brainworkers into the economy and society belongs to the 3<sup>rd</sup> mission of universities.

Relating classification to indicators: The first task is to identify the relevant categories by jobs and employers for a university, which starts an exercise to characterize the position of its graduates on the job market.

Transfer of embodied knowledge into job-worthy skills is split by two major categories: jobs and employers. A job is a defined set of tasks and duties carried out (or meant to be carried out) by one person. (Canberra Manual 1995, p. 17.) ISCO, the International Standard Classification of Occupation provides the major groups of occupation with corresponding skill levels.

The distribution by sector of employers and by size of companies is also an important measure for knowledge transfer. The NACE classification is available for breakdown

by sector while the Eurostat/National Statistical Offices provide size categories of companies. The best option to disaggregate business organisations: multinational companies (MNCs), large firms, medium firms and small and micro firms. In this section, the category of “external bodies” is also used. Disaggregation by external bodies means: industry, non-profit institutions; national, regional, and local government; foreign institutions, utility organisations and public bodies.

Four indicators are suggested as measures for human resources. These indicators may be used together to build a characterization profile of the 3<sup>rd</sup> mission relating to knowledge flow through and after graduation.

Suggested indicator 1: Number and proportion of PhD students going to external bodies before or right after degree (by fields)

This indicator gives information on knowledge flow from university to economy. ‘Flow into highly skilled job’.

Alternative indicator to 1: the time frame is different from the previous one: 5 years after graduation

The alternative indicator may be employed to prepare indicators if the previous one cannot give relevant information to university administrators. The reason for introducing an alternative indicator is that the labour market situation has an impact on the flow of graduates into different sectors and jobs. Often, graduates only obtain skill-relevant jobs a few years after graduation. In that labour market situation, the picture on transfer of embodied knowledge is more realistic if the information is available not only on the first job/occupation before or right after graduation but on the job/occupation performed 5 years after graduation.

Table 1 focuses on the employer organisations in graduation relevant sectors. It suggests investigating the distribution of employers by faculty or by field of science. It does detail which kind of highly skilled jobs are performed by recent graduates. The crucial information for university is whether their graduates can obtain degree-related jobs somewhere.

**2. Flow into highly-skilled jobs (Reference year: 1 year or 5 years after graduation)**

Faculty (F)/ Fields (Fi)	Sector 1						Sector 2			Total
	MNCs	Large firms	Medium firms	Small & micro	Public bodies	Utilities	MNCs	Large firms		
Employer organisation by size of firms										
F/Fi 1	Number and proportion									
F/Fi 2										
F/Fi 3										
Total										

This kind of table provides information to university leaders on jobs for their graduates in different sectors of the labour market, and about the differences by faculties/ fields. It also gives information for entering students on their future opportunities.

*Illustration:* The systematic survey of a university can result in data for this table. More and more universities are organising data collection on this issue. Among partner universities of this project, illustrative data are still only in the pipeline.

Suggested indicator 2: Joint supervision of PhD theses by university and firm members or members of other external bodies (by fields)

Joint supervision is a two-way channel of knowledge flow. Joint supervision means regular consultations and discussions during the thesis writing process with both supervisors. The supervisor from the firm brings in his/her knowledge relating to the student thesis while the student can provide her/his fresh knowledge from graduation to the supervisor. The presence of joint supervision varies by field of discipline. It is worthwhile to break down the number of joint supervisions by discipline. As the supervisor is a potential employer, it is also important to investigate the sectoral breakdown and size of companies represented by supervisors.

Table 2 illustrates the ideal case if data is available at the university level.

**3. Collaboration - Involvement of firm members in supervision of PhD theses (Reference year: previous academic year)**

Faculty (F)/ Fields (Fi)	Sector 1						Sector 2			Total
	MNCs	Large firms	Medium firms	Small & micro	Public bodies	Utilities	MNCs	Large firms		
Employer organisation by size of firms										
F/Fi 1			Number and proportion							
F/Fi 2										
F/Fi 3										
Total										

Joint supervision is one type of industry-university collaborations, and as such constitutes a sign of attractiveness.

Suggested indicator 3: Number and proportion of PhD students supported by industry (by fields)

This indicator might have a different meaning for different countries. In several countries, industry maintains an active relationship with students as they go to the supporting organisations for internships. In some other countries, industry supports students as a general investment in producing educated people. In latter case, the

indicator has only an indirect relationship with flow of knowledge. Only in the first case is the indicator a relevant measure of human resources related to the 3<sup>rd</sup> mission.

*Illustration:* The following two tables illustrate the diversity of European universities have no influence on the availability of data on PhD students. The university with either few or multi faculties can provide this data and they are meaningful for both of them. Breakdown of data is different. The University Ca' Foscari has detailed data by faculties, classes of PhD education and sources of support. University of Szeged has data on industry supported PhD students by doctoral schools.

**4. Number and proportion of PhD Students supported with external bodies by faculties at University Ca' Foscari (academic year 2004/2005)**

Faculties	Number of PhD Students		
	Total	Supported by Industry	% of industry supported PhD students
Economics	92	1	1.1
Maths, Physics and other			
Natural Sciences	89	8	9.0
Literature, Philosophy	149	0	0.0
Foreign Languages	48	0	0.0
Total	378	9	2.4

The proportion of supported PhD students by faculties tells administrators which faculty is the most attractive for industry. (or for other external bodies). At the University Ca' Foscari, the most attractive faculty is Natural sciences for industry (as well as for other external bodies).

**5. Number and proportion of PhD Students supported with external bodies by doctoral schools at University of Szeged (academic year 2004/2005)**

Accredited doctoral schools	Number of PhD students			% of industry supported PhD students	
	Total	funded by the state	supported by industry	to state supported	to total PhD students
Faculty of Law	45	12		-	-
Medicine	33	27		-	-
Interdisciplinary medicine	12	12		-	-
Clinical medicine	16	16		-	-
Multidisciplinary medicine	24	14		-	-
Pharmacy	28	22	4	18.3	14.3
Literary studies	67	37		-	-
Educational sciences	26	5		-	-
Linguistics	23	16		-	-
History	31	17		-	-
Economics	32	6		-	-

Biology	102	37	2	5.4	2.0
Physics	30	20	1	5.0	3.3
Soil science	39	20		-	-
Chemistry	32	19	3	15.8	9.4
Environmental science	53	16	4	25.0	7.6
Mathematics and computer science	51	32		-	-
Total	644	328	14	4.3	2.2

The proportion of PhD students supported by industry by doctoral schools illustrate only few doctoral schools are attractive for industry. Disaggregation by more detailed disciplines provide better information to university management where do they have to attract other external supporters for PhD students; where ethical issues may emerge.

Both University Ca' Foscari and University of Szeged the disaggregated data by faculties are available by year of PhD graduation. The disaggregation by years may illustrate both the changes in attractiveness of PhD education over time and changes in supporting policy of industry, other external bodies.

*Suggested indicator 4: Number and proportion of PhD students under contract with external bodies (by fields)*

The indicator on PhD students under contract with industry is also one type of industry-university collaboration. If the university has a contract with industry, PhD students may participate in performing the tasks. Their scholarship or additional salary may originate from these contracts.

This indicator has to be handled carefully to avoid double-counting for attractiveness. When we are preparing an indicator on attractiveness, the whole contract with an external body has to be included. This kind of disaggregated indicator has its own importance in analysing the character of the 3<sup>rd</sup> mission, its impact on PhD education, university research activities, and so on.

Table 4 is relevant here.

**Human resources indicators linked to transversal issues:**

Autonomy

- Number of permanent staff in transfer offices

Strategic capabilities

- -

Attractiveness

- See above

Differentiation profile

- Number of research staff concerned by these main 3<sup>rd</sup> mission focus

Territorial embedding

- Number of staff moved from university to new firms
- Number of PhDs and Post Docs involved in new firms
- Number of staff members participating in norms/standards/regulation committees

### 3.a.ii Intellectual property

Focus: These indicators focus on a class of codified knowledge produced by the university and its administration. Intellectual property owned by the university is a joint product of the inventors / professors and university administration. The output type indicators relating to this issue give information together on the codified knowledge produced and realised by the university. The indicators discussed in this section are proxy measures of the capability of university inventions.

Patents, while representing only one class of intellectual property rights, remain the most important form of IPRs at the majority of European universities. (For several specialized universities, other kinds of intellectual property rights such as trademarks and copyrights can also be of interest).

There are fields (IT, engineering, SC&H) where patenting activity remains marginal even if they produce economically useful R&D results. In these fields, non-patent type measures can characterize the relevant output.

The OECD Patent Manual (1994) provides good guidelines to solving many measuring and analytical problems relating to patents. The Manual deals with patent classification, patent databases, patent indicators and analysis of patenting activity at different levels. It discusses the strengths and weaknesses of patent indicators that have to be taken into account in any application. The OECD manual focuses on patent and innovation, and on patent and firm relationships. Although it gives many details on the issue of ‘patenting by inventor’, the university as an organisation of inventors is not within its scope.

European universities as a site of inventions vary by their regulations on patent ownership. They are also different by their capabilities to manage intellectual property.

Without listing specific regulations, national innovation systems usually offer 3 main approaches for universities:

1. Institutional ownership
  - Patent owned by university
  - Owned jointly by university and other organisation(s)
2. Individual ownership
  - Patent owned by inventors (faculty members)
  - Joint patent owned by university professors and other individuals or organisations.
3. Mixed individual and institutional ownership

Many practical examples showed that inventor faculty members avoid registering their invention through the university if the incentives are not relevant for them. Patents granted to university employees mean the person is the legal owner of the patent. The number of patents produced by the university can be 10 or 20 times higher than the number of university-owned patents.

In the practice there is a fourth opportunity to patent a university-related invention: the research funding company may be the single owner of the patent. These research

contracts or licence agreements between university/faculty members and company may regulate the role of inventors in two different ways: include or exclude the name of professors from the list of inventors in patent application.<sup>9</sup> The literature discusses this issue from many points of view. This section focuses only on the measuring problem of ‘indirect’ university patents.

The information on any kind of university-linked patents is important for university administrators because the inventions represent the university’s inventing capabilities. Patents not owned by the institution are forgone benefits for the university. Administration can play a significant role if patents are owned fully or partially by the university. In these cases, the administration’s goals are twofold: to support the exploitation of scientific results and to make the university attractive for future research investments.

The administration also has some options if the patent can potentially be owned by faculty members, as they can modify the rules, incentive system and can draw the faculty members / inventors towards university patenting if legislation allows these changes.

The administration has some room for manoeuvre if research funding companies or partners in licence agreements wish to be single owners of the patents and keep the university involvement secret. They can improve the position of university in negotiations. Large, well-funded universities are usually in a better bargaining position than small, under-funded universities.

If we take into account the number of patents relating to the university as a measure of capabilities and a sign for attractiveness, the universities are interested in owning all patents created at the university.

Data sources, measures, availability of data and their reliability vary according to the above mentioned groups of ownership. They are discussed in the following sections.

This section suggests four indicators to measure any kinds of university-linked patents. The importance of these indicators varies according to university patent ownership regulations and inventing capabilities, and whether the university is poor or rich in patenting. At patent-poor universities, direct returns from licenses, patents or copyrights are very rare. For further methodological improvement, the experiences of « patent rich » universities have to be included. (The proactive universities are poor in the field of patenting.)

#### **Measuring patents owned partially or fully by the university**

In the case of a patent owned fully or partially by the university, OECD methodology guides us as to how to count them.

#### *Suggested indicator 1 Number of active patents owned by the university (by fields)*

*Number of patents granted to the university means institutional ownership, making the university the legal owner.*

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<sup>9</sup> The compensation of inventors is usually generous if they are excluded from the list of inventors. However, the university itself is usually not compensated.

**6. Visibility - Number of granted and valid patents by year**

Faculty/Patent fields	2000			2001			2002			2006		
	Granted	Still valid	Together	Granted	Still valid	Together	Granted	Still valid	Together	Granted	Still valid	Together
F/Patent fi 1												
F/Pfi 2												
F/Pfi 3												
Total												

In any given year, a university may have new granted patents and several patents that were granted earlier and which the university continues to maintain. Together, they represent the university’s intellectual assets; however it is worth disaggregating them. “Freshly granted” means the university was able to produce new patents. Maintained patents indicate that the patent was evaluated as a valuable asset, worthy of further investment to keep the right alive. However, the ‘still valid patent’ indicator also shows that the university has not been able to licence its patent yet. (Because non-exclusive licence agreements are so scarce, they can be excluded from this study.)

*Alternative indicator to 1: Number of national applications by university*

For universities which are new to patenting activities, an alternative indicator can be better in initial years. The indicator on applications can illustrate the birth of patenting activity. But the application does not tell anything about the novelty of research results since many applications are not granted in practice. We suggest using this alternative indicator in early stages of patent activity and replacing with granted patent in a later stage.

*Illustration 1:* The Autonomous University of Madrid started to focus on patent application and extended the observation on granted patents. Nowadays the Technology Transfer Office archives contain data not only on submitted applications and granted patent but application by patenting organisations (national, PCT and non-national domestic applications. Time series are available by faculties. (Technology Transfer Office provides the diagrams on changes regularly to university management.) The illustration provides a time series on the level of university and one-year data by faculties.

**7. Yearly Number of Applications and Granted Patents at the university level of the Autonomous University of Madrid, 1984-2005**

Year	Applications submitted	Patents Granted
1984	1	0
1985	3	2
1986	0	2
1987	0	0
1988	0	0
1989	5	0
1990	2	3

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1991	2	3
1992	3	3
1993	4	0
1994	5	0
1995	4	2
1996	8	2
1997	6	6
1998	5	2
1999	7	3
2000	13	3
2001	9	4
2002	11	4
2003	16	5
2004	23	4
2005	15	0

*From the archive yearly data are available by faculties of UAM*

**8. UAM Number of Applications and Licenses by department in 2005**

Department	Applications	Granted
Applied Phisycal-Chemistry	1	1
Psychology	1	0
Geography	1	0
Morphology	1	0
Analitical Chemistry	1	0
Surgery	7	5
Patologycal Anatomy	2	0
Biology	3	3
Theoretical physics	3	0
Farmacology	3	0
Organic chemistry	8	0
Agro chemistry	10	0
Physics	8	0
Applied Physics	10	0
Inorganic chemistry	12	0
Material physics	12	0
Biochemistry	12	8
Medicine	17	7
Molécula biology	28	11
Computer engineering	2	0

Illustration 2: Two labs of a large French University are observing the patent performance by employment categories.

**9. Number of Inventions by Employment Status**

Employment status	Number of person	Number of invention occurrences		
		Lab1	Lab2	Total
Full time permanent researchers before mid career promotion	9	9	6	15
Full time permanent researchers after mid career promotion	8	9	6	15
Junior research engineer	2	5	1	6
Senior research engineer	5	6	5	11
Assistant professor (tenured)	6	2	7	9
Tenured university professor	15	45	24	69
Total	45	76	49	125

*Suggested indicator 2: Number of patents produced by the university (by fields)*

This indicator tries to measure university invention capabilities apart from ownership. If the regular owner of the patents is the university, this indicator is the same or very near to the previous number of granted patents.

At those universities where the faculty members are frequent owners of patents, the ‘number of patents produced by university’ can be significantly different from the previous one.

**10. Granted patents produced by the university (by fields)**

Faculty/Patent fields	2000			2001			2002			2006		
	Owned by university	Jointly owned by U	Owned by faculty									
F/Patent fi 1												
F/Pfi 2												
F/Pfi 3												
Total												

*Note: owned by faculty members includes fully or partially owned by them excluding the university*

This indicator can be useful from time to time for those universities that regularly obtain patent ownership.

At those universities where legal owners can be the faculty members, this indicator is much more effective than the previous indicator in highlighting the university’s inventing capabilities. The difference between university-owned and university-invented patents can draw attention to lost revenues for university.

**This section describes how to measure patents owned by faculty members to the exclusion of the university.**

*Illustration 2:* Between 2000 and 2004 the number of patents produced by a Hungarian University was 18 against 13 active patents owned by the university. The structure of patent classes was also different in the case of produced patents from owned patents.<sup>10</sup>

Suggested indicator 3: University revenues from the licensing of patents, copyright, (total amount, ratio to total funding and ratio to non-core funding)

Only licensed patents produce innovations. This indicator measures both the strength of patent/copyright and the performance of the administration. This indicator also characterises the attractiveness of the university.

### 11. Attractiveness - Revenues from licensing

Faculty/Patent fields	Total amount			Ratio to total funding			Ratio to non-core funding		
	Licensed patent	Licensed copyright	Together	Licensed patent	Licensed copyright	Together	Licensed patent	Licensed copyright	Together
F/Pfi 1									
F/Pfi 2									
F/Pfi 3									

The amount includes any revenues from any sources paid to the university from the utilisation of patents or other IPRs held by the university. Ratio to total funding and ratio to non-core funding shows the importance of licensing among other sources of university revenue.

The amounts earned from licensing revenues are usually only a small fraction of non-core funding at most European universities. At those universities the most relevant level for regular investigation is university-wide. Every 5 or 10 years it is worth collecting data by faculties, patent fields or fields of science.

*Suggested indicator 4 Joint IPRs by university professors and firm employees (by fields)*

This indicator is a good measure of research collaboration and its output. A joint invention can be patented jointly by a university and a firm, or only by a firm and by individuals in different settings.

<sup>10</sup> Because of on-going changes in university patent regulation, neither the name of university nor data on patent classes can be disclosed.

**12. Collaboration - Number and proportion of joint IPRs by university professors and firm employees**

Faculty / Patent fields	Joint IPRs owned by U-F	Joint IPRs owned by F	Joint IPRs owned by individuals	Together	Joint IPRs owned by U-F	Joint IPRs owned by Firm	Joint IPRs owned by individuals	Together
	Number				Ratio to total IPRs			
F/Pfi 1								
F/Pfi 2								
F/Pfi 3								

*Note: U=University; F=Faculty*

As was mentioned earlier, collaboration with industry may result in “grey patents” from the university’s point of view. If the research funding company is the single owner of a patent, the university administration can measure these ‘indirect’ university patents but cannot disclose the figures. It is worth completing Table 7 from time to time, including the column of “indirect” or “grey” joint patents to learn for future contracting. There are always some pros and cons for a university to support or stop this kind of contracts.

**Measuring patents owned by individuals**

Counting is a delicate issue when the question arises as to whether or not the invention has been reported to the university.<sup>11</sup> The identification of university-linked patents is difficult if the patent is owned by faculty members. It is much more difficult if patents are jointly owned by a company and faculty members. These solutions may be based on formal university regulations or on informal decisions. The bulk of university-linked patents may be counted in two different ways:

- a. Surveying faculty members
- b. Matching a patent database with a register of faculty members / research personnel

Identification of university-linked patents owned by individuals is based on name matching from two different sources: patent register (national or Triad) and university register of faculty members. Name matching must be carried out in two rounds. The first round helps to screen the possible inventors from a given university. Several false matches may occur because of misspellings, name changes and similarities between names. The second round is required to sort out non-university related inventors cleaning from this matched mass. The sorting exercise is time-consuming, as a large number of uncertain matched names must be checked individually.<sup>12</sup>

<sup>11</sup> The patents might be owned by faculty members even if a part of the invention procedure relates to the university.

<sup>12</sup> If patent survey of faculty members exists its finding may be used for cleaning the name matching results. Norwegian practice is using an interim step for the verification of name-matched data by survey

*Illustration to (a): Surveying faculty members*

The central administration Office of University Ca' Foscari of Venice is carrying out a survey of patents produced by professors and researchers of the University with the European Patents. This university is a good illustration for those universities where the regulation makes more frequent the individual patenting than university patenting. The profile of university is also an influencing factor when considering the importance of information on patenting. The survey showed that a professor participated in two patented inventions. The main fields of this university are not belonging to traditionally patenting fields of science (literature, philosophy, foreign languages, economics).

In Norway, they use a mail survey, carried out every ten years, targeting all tenured faculty members at Norwegian universities. According to the 2001 university census, 29 respondents reported patents from a 1967 strong sample. Out of 29 the vast majority (24) originated from research funded by industry. Hence, industry-funded collaborative research leads to a more significant incidence of patents than ones not funded by industry. (Gulbrandsen and Slipersaeter, 2006)

*Illustration to (b): Matching a patent database with a register of faculty members / research personnel*

In Hungary the name-matching exercise was done for university 'A', focusing on the years of 2002, 2003, 2004. From the domestic individual patents, the names of inventors were listed and matched with a list of university faculty. Several false matches (name sameness because of frequently occurring Hungarian surnames) were checked individually. The number of individually owned patents by faculty members was 10 times higher than the number of patents owned by the university. From the point of view of university invention capabilities, the difference is so remarkable that it may lead to the re-regulation of patent revenues between inventors and university in order to encourage faculty members to patent through the university. (IKU mimeo, 2005)

**Measuring patents owned by company (excluding university)**

When the patents are owned neither by the professors nor by the university, it is hard to identify them as university-linked inventions. If the name of a professor is listed among the inventors data collection, these patents may be treated in the same way as university-linked individual ownership. Even if the measuring technique is the same, it is much more difficult to identify university-linked patents. The internationalisation of research and development may cause some difficulties in matching the company-owned patents to the relevant universities. Multinational companies may apply for patenting in a country other than that from which the invention originated. In order to cover all company-owned patents linked to the names of faculty members, the Triad database must be used instead of the national patent register. This solution is more time-consuming and the cost-benefit ratio does not make the exercise worthwhile for most universities. The information that is useful to university administrators can be

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provided data to get more accurate population. Then only a limited number of matches have to be checked individually where no survey responses. (Norway is doing this exercise for the whole university population. Iversen et al. 2006)

obtained faster and cheaper by surveying a targeted group of faculty members who have research contracts with industry.

If the names of professors are excluded from the patent application, the only sources for identifying inventors from the university are closure contracts, and secret deals. Name-matching cannot be used, nor is a survey a promising solution to identify this population, as the non-response rate will likely be very high.

### Intellectual property indicators linked to transversal issues

Autonomy	-
Strategic capabilities	-
Attractiveness	see above
Differentiation profile -	
Territorial embedding	
	<ul style="list-style-type: none"> <li>• Number and volume of licences</li> </ul>

Markers: Proactive policy (patent office / experts in patents, existence of formalised rules to distribute licence revenues, technology transfer office)

#### *Illustration:*

Ca'Foscari University delegates patents procedures to its central administration (General Affairs and Legal Section). At a central level the University is implementing a patent office to help professors and researches in the IPR procedure. An incentive policy will be set up to increase the number of patents from the university. Besides, the University is directing its endeavours to implement new patent co-ownerships.

Measuring university-linked patents will significantly improve with the development in legislation and university regulations and by strengthening technology transfer offices.

### 3.a.iii Spin offs

Focus on knowledge transfer through entrepreneurship. Spin-off formations of new enterprises are an important channel for the flow of knowledge. University-related spin-offs can vary by their ownership and by their founders. European universities have varying spin-off policies, as these depend on national regulations as well as on the directives of the individual institutions. Several universities do not support or fund any spin-offs, though some national initiatives have been undertaken to facilitate their creation. Regulation strongly influences the occurrence of spin-off firms funded by academic personnel. It might be the single way of establishment or only of marginal importance to university-funded spin-offs. A typology of university-related spin-off firms is currently in progress.<sup>13</sup>

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<sup>13</sup> See some progress in PRIME-REBASPINOFF project.

University involvement and support in forming and running spin-offs can be very diverse: dedicated teams, incubators, funds provided (in whatever form, including shareholding).

For practical reasons it is not important to investigate spin-offs on a disaggregated level. Aggregated information is sufficient for the purposes of university management. Two simple indicators are suggested here. As a result of the testing period, we concluded that the indicator on Number of current works with involvement of universities would be excluded. This indicator has a very limited analytical value, as it only answers a yes/no question about collaborative work with the university.

Suggested indicator 1: Number and % of spin-off firms funded by universities and/or faculty members

Spin-off companies which are formed as a direct result of the institution’s research activities, and fall under the university’s institutional ownership. Faculty members may form spin-offs without official university involvement, albeit with strong informal linkages.

**13. Visibility - Number and % of spin-off firms funded by universities**

Spin-off firms	Number	% total
-funded by university		
-funded by faculty members/ academic personnel		
Total university-linked		100

Suggested indicator 2: Number of permanent staff involved

Size of spin-off companies may be characterized by the number of permanent staff.

**14. Collaboration - Number of permanent staff involved in spin-off activities**

Spin-off firms	Number	% total staff of spin-off
-funded by university		
-funded by academic personnel		
Total		

Markers: Proactive policy (existence of formalised rules for establishing spin-offs with or without university ownership, technology transfer office, presence of incubators, incentives for creation, funds for seed capital, presence of strategic alliances with venture capital, existence on courses in entrepreneurship for Master’s and PhD students)

Spin-off markers are more important than indicators in this stage of the guidebook preparation. More research is needed in order to develop relevant definitions, classifications and indicators.

*Illustration:* University Ca' Foscari has proactive policy of spin off, though does not support them directly.

- The University is launching the START CUP, a call to induce start ups. START CUP is a competition to grant entrepreneurial innovation based projects presented in a business plan form by groups. The winning team will receive a money prize and opportunities of knowledge exchange will be offered to all competitors. The aim of START CUP is to boost and promote the realisation of new enterprises based on innovation. The scientific committee is composed by professors and experts operating in the fields of research, enterprise, financial business and institutions.
- In 2002 the university launched the company “Ca' Foscari Formazione e Ricerca” whose aim is to promote matching points between the University and the world of production. The society offers consultancy, research and formative programmes in topics relevant for industry with the employment of university forces. The commitments are both private and public bodies.
- Although a proper fund for seed capital has not been arranged yet the University Ca' Foscari set up its first mutual fund for research based projects for found raising purposes in cooperation with the University of Padua.
- The University Ca' Foscari, with the academies of Padua, Verona, the Italian Ministry of University, Education and Research and other national research institutions, give active scientific support to the Nanotechnology District. This project aims to develop research and entrepreneurial initiative in the strategic field of nanotechnologies and is financed, for a total amount of 52 millions of Euros, by the Veneto regional administration (public), the Venetian association of entrepreneurs, the Italian ministry of university and the Fondazione Cassa di Risparmio di Padova e Rovigo (private foundation of bank origin).

Although proper spin offs were not implemented so far, the University Ca' Foscari is trying to intensify its efforts to tie the academy to business activities, obeying to the idea of integration between education, business and governance world.

- The university is also one of the creators of the Vega scientific park situated in Mestre, the land side of the city of the city of Venice. This institution is an enterprise incubator and a research centre in various scientific fields, from biotechnology to art restoration and. Vega can benefit of the collaboration of about 90 public and private institutions.

All initiatives are strictly embedded in the territory of Venice.

### **Spin-off indicators linked to transversal issues**

Autonomy -

Strategic capabilities

- Investment/involvement: existence of support staff funded by university,
- Incentives for creation, funds for seed capital,

Attractiveness

- Number and amount of co-investment with large firms in spin-off

Differentiation profile

- See above

## Territorial embedding

- Number of incubators
- Number of new firms
- Strategic alliances with venture capital

## 3.a.iv Contracts with industry

Focus: linkages at different stages of the capitalisation of knowledge. This part of the 3<sup>rd</sup> mission indicates the university's attractiveness to economic actors (global players, large firms, SMEs). The 3<sup>rd</sup> mission includes any kind of contract with industry. It includes the institution's revenues from private companies for doing research, providing research services or testing for industry. Contracts with industry may have a "soft" dimension: large companies may pay (directly or through the university) faculty members' membership fees to professional associations, or their travel costs to participate in conferences, or funds to cover the cost of professional publications. This soft dimension is interesting not only as additional input but also as an ethical issue for the university.

Borderline: in this field there are several issues for discussing their borderlines.

- Contracts with all economic actors (industry, water, electricity, waste management) may focus on several other activities besides research and research services. For example, PhD students might be supported by industry. The amount of the grants and other funds for students from industrial sources should be taken into account as 3<sup>rd</sup> mission either here or at human resources.
- The firm may contract with the university for training courses (general or tailor-made) for their employees. The revenue from such training activities should be counted here and not under education.
- If industry covers its employees' tuition fees for regular courses of the university, that belongs to education income and is not considered as 3<sup>rd</sup> mission income under contracts with industry.
- Very often, public authorities provide incentives for cooperative research. The government programs are the initiators of private business demand. The demand (contract) is included in 'contracts with industry' regardless of the incentives and original sources behind it. The mushrooming public-private partnership in financing means more shared contracts with industry and public authorities. Drivers are an issue for policy analysis, but they are less important for university administrators. (They are interesting for administrators as many other environmental issues.) If a university can obtain public funding relating to a business contract, it does not count here. It has to be taken into account as 'contract with public bodies'.
- New EU programs may also combine university revenues from public and private sources. For example, technology platforms use EU and private business money for performing research and development. The university has to handle these revenues in the same way as national government programs and public-private partnerships.

- In calculating the number of contracts and revenues, contracted confidential reports to industry, revenues for inventions that are patented by firms excluding university ownership also have to be taken into account. These items raise methodological problems in counting them as 'contracts with industry'. In general terms, they also affect the autonomy of universities.

Contracts with industry have effects on both the input and the output side. From suggested indicators, four refer to the input side (1-4) and the other three to the output side.

Suggested indicator 1: Number, amount and duration of contracts with industry

The number of contracts must be disaggregated by their aims (research, research services, training, consultancy and expert advice to industry, university facility development, supported research chairs) and by types of partners (global, large firms, SMEs). The suggested level of investigation is faculty/field of science and university.

**15. Key characters of the contracts - (Number and amount)**

Type of partners	Faculty 1							Faculty 2							
	Aims of contracts								Total						
	Research	Research services	Training	Consultancy and Expert advice	Facility devel.	Supported Res chairs	Comprehensive								
MNCs															
Foreign country			Number & Amount												
Home country															
Large firm															
Foreign country															
Home country															
Medium firm															
Outside region															
In the region															
Small & Micro															
Outside region															
In the region															

*Note: Term 'consultancy and expert advice' includes grey literature and confidential reports to industry. For administrative purposes, no more disaggregation is needed.*

The basic important knowledge is to get a picture on the purposes of contracts. The availability of the number by aims provides important information for management on varieties of outreach 3<sup>rd</sup> mission activities and pays attention to the potential influence on university agenda.

Another important breakdown is the aims of contracts by type of contractors, the value of contracts by these disaggregations and the duration of contracts.

*Illustration:* University Ca' Foscari has data by aims of contracts and faculties. Number of contracts is available from its archive by aims. The amount of contracts is available as total funded by industry.

The university investigates together the contracts with any kind of external bodies

### 16. Number of contracts with Industry and Public Bodies by aims in 2004

Faculties	Research	Research services	Training	Consultancy	Expert advice	Facility level.	Supported Res. chairs	Comprehensive	Total
	Aims								
Economics	4	0	0	0	0	0	0	0	4
Maths., Physics & Natural Sciences	12	7	0	7	0	16	0	1	43
Literature & Philosophy	0	1	0	0	0	1	1	0	3
Foreign Languages & Literatures	11	0	33	1	0	0	0	0	48

### 17. University Ca' Foscari of Venice's Amount of Contracts with industry and other external bodies (2004) in €

Faculty	Total Amounts	Funded by			
		Industry	Private Bodies	Third Sector	Public Bodies
Economics	88 600.0	0.0	3 000.0	75 600.0	10 000.0
Mathematics, Physics and Natural Sciences	939 318.7	131 387.3	0.0	300 125.8	507 805.6
Literature and Philosophy	10 975.8	0.0	0.0	0.0	10 975.8
Foreign Languages and Literatures	462 848.7	0.0	146 282.0	0.0	316 566.7
Total	1 501 743.3	131 387.3	149 282.0	375 725.8	845 348.1

*Notes: private bodies mean banking foundations (CARIVE), Foundations like (Chin-kuo) and private schools.*

*Third sector means: public associations like Ascom (SME Association for Commerce and Tourism), ALCOA Foundation, non profit research consortiums like Consorzio Venezia Ricerche and CO.RI.LA.*

Another category may be important for several European universities: exchange the graduates with industry.

Alternative indicator to 1: Number and amount of private funding

Private funding is more than that from the business community. This category includes research, development, consultation, expert advice, non-commercialisation services contracted by business organisations, grants and contracts from private non-profit organisations, donations of alumni and philanthropists. Employing the number and amount of private funding by faculties can provide information on the size of private sources which have been attracted, and on the changing proportion of private funding to total university and faculty revenues. This indicator is a very rough measure of the university’s business contracting capabilities. This indicator can be used as a starting point for further analysis in the development stage of a more detailed university databank.<sup>14</sup>

**18. Key characters of the contracts 2 - (Duration in years)**

Type of partners	Faculty 1							Faculty 2						
	Aims of contracts													
	Research	Research services	Training	Consultancy and Expert advice	Facility devel.	Supported Res chairs	Comprehensive	Total						
MNCs														
• Less than 1 year														
• 1-3 years														
• More than 3 years														
Large firms														

Longer contracts can provide more stability in research agendas and in financing. The national environment can influence this indicator. In some countries, the regulatory framework may make it more advantageous for industry to divide a comprehensive collaboration in smaller pieces and make it on a yearly basis.

*Illustration:* University Ca Foscari can produce some data by the duration of contracts.

<sup>14</sup> According to AQUAMETH data-set at 4 Norwegian, 8 Swiss and 105 UK universities private funding is the only available indicator for commercialisation. (Gulbrandsen and Slipersaeter 2006)

**19. Number of contracts with Industry and Public Bodies by Duration in years**

Faculties	Aims and years										Total						
	Research			Research Services			Consul- tancy			Facility Devel.		Compre- hensive			Kno- wn		
	<1	1-3	3>	<1	1-3	3>	3>	1-3	3>	<1		1-3	3>	<1		1-3	3>
Informatics	0	0	0	0			0			0			0			2	2
Economics		2			0			0		0			0			2	4
Maths, Physics & Natural Sciences	2	10	0	2					2							24	43
Foreign Languages & Literatures	3	5			0				0				0			8	48

As table illustrates much less data are available on the duration of contracts by aims than known number of contracts by aims. Just few departments of University Ca' Foscari were able to give data on the duration in months of the contracts signed.

*Suggested indicator 2: Number of partners who regularly acquire university research*

The regularity of a partner as outsourcer or collaborator in joint research is a sign that the partner is innovative and has a strong motivation to regularly acquire new knowledge. Returning partnership is also a sign of satisfaction with the collaboration. A one-off partner of the university may become a regular one. In that sense, this indicator is a measure for attractiveness.

**20. Proportion of recurrent contractors over a ten-year period**

Faculty Fields	1	2	3	4	5 or more
	Contracting frequency				
F/Fi 1					
	Number of firms				
F/Fi 2					
F/Fi 3					

*Suggested indicator 3: Level of concentration (sectoral and/or on a few partners).*

The degree of concentration (on thematic and/or on given teams) is also often of strategic interest. It is very important for each research group to approach the critical mass in research. If they can reach it, they can be more competitive. However, if a lab focuses only on a narrow research issue, it may miss the opportunity to follow evolving trends in major research fields. Another concentration problem may arise if the number of partners is too limited. If the partner's interest in collaboration declines, the lab may suffer as a result.

Sectoral concentration is a very important indicator if the university's field of research is strongly linked to declining sectors. (In the last few decades, the world-class labs,

and universities working in the fields of coal mining, nuclear energy, and steel research have had to cope with declining demand.) University administration may initiate the reallocation of resources from declining sector research labs to emerging ones. It also may encourage the transformation of accumulated research capabilities and skills. For the deliberation on funding and human resource allocation, the university management needs this type of information.

### 21. Concentration

Sectoral		Thematic		Partner	
% of largest sector		% of thematic		% of largest partner	

Suggested indicator 4: Access to special equipment of firm/university with or without assistance of owner’s organisations

The access to special research equipment increases the university’s research capabilities without huge investment efforts. Generally, special research equipment are not used very frequently, but it is crucial that they be up-to-date in order to perform their special research tasks.

The use of special equipment needs relevant capabilities and skills. For this reason, access may include lending the equipment to the university to develop relevant skills.

### 22. Collaboration for upgrading research capabilities

Faculty fields	University access to firm’s research equipment			Firm access to U research equipment	
	At firm		Posted to University	With assistance	Without assistance
	With assistance	Without assistance			
F/Fi 1					
F/Fi 2					
F/Fi 3					

Albeit important, this information may be difficult for the university to obtain. It requires going into every contract and seeing whether special facilities are provided. Despite these difficulties, this indicator is important for universities where research is based on special, high valued equipments.

*Illustration:* One of the faculties of University Ca’ Foscari has collaboration for upgrading research capabilities.

### 23. Access to Equipments

Faculty Fields	University access to firm research equipment			Firm access to U research equipment	
	At firm		Posted to University	With assistance	Without assistance
	With assistance	Without assistance			
Mathematics, Physics and Natural Sciences	0	0	0	4	

The University access to firm research equipment has not occurred yet. Firm access to university research is known in 4 cases. However there is no distinction between access with assistance and without assistance of University.

*Suggested indicator 5: Co-authorship between faculty members and industrial researchers*

This and the next output indicators are good signs of collaborative performance.

*Suggested indicator 6: Co-invention between faculty members and industrial researchers/employees*

See more discussion in section 3.a.ii

*Suggested indicator 7 (for patent rich universities) number of research results cited in patent applications by faculties/field of science.*

This output indicator helps evaluate the strength of the university, and allows university administration to distinguish between faculties/field of science with strong and weak patents. The mapping of strong patents and their fields is important for strategy-making.

Grey literature or confidential reports to industry are also measurable outcomes of contracts with industry. However, it has been suggested that they be taken into account among the aims of contracts and incomes of university.

#### **‘Contracts with industry’ indicators linked to transversal issues**

Autonomy -

Strategic capabilities -

Attractiveness

- Number of companies, R&D laboratories and mission-oriented laboratories located on the university premises
- Number of collaborations with large firms and amounts of contracts
- Number of co-publications

Differentiation profile

- Types of collaboration: joint teams, multi-annual conventions, non-financial inputs
- List of original/unique facilities and/or services located on the university premises.

- Numbers of external users for these facilities or services

#### Territorial embedding

- Share of regional, national, international actors in contract research (large and SME), in licences.
- Number and volume of contracts with private economic actors (large and SME)

### **3. b. 3<sup>rd</sup> mission by societal dimension**

In the field of the societal dimension, there are no international classifications, data collections or indicators that can support the development of measurement. The exploratory work has to be based on narrative description, information accumulated through interviews for developing typologies by various societal activities / dimensions.

Several sub-dimensions can easily be quantified, while some others cannot in this stage of the exploratory indicator development.

In this section we also mark the indicators relating to transversal issues.

#### **3.b.i Contracts with public bodies**

Focus: Contracts with public bodies cover university involvement in public services requested by public bodies for solving its problems and arranging research and training activities for public bodies.

Contracts with public bodies may have similar implications for research as do contracts with industry. Several types of contracts with public bodies do not raise any conflicts of interests for contracting with industry (such as professional training for new standards).

Another group of contracts with public bodies arise from the conflict of interests issue. Services for the immediate environment and for a much wider environment range from safety standards (nuclear safety, food safety) to rules on clinical trials. It includes participation (and reporting) in Standardisation/Safety Committees, expertise in problematic cases, consultancy and preparation of technical guides, professional training for new standards and new safety regulations. The participation in safety or regulation committees may exclude doing research for industry. The latter cases not only raise very important ethical issues but also crucial strategic questions for universities. Universities have to choose among potential clients, and between contracts with public bodies or industry. That is the main reason why it is worthwhile to investigate separately contracts with industry and with public bodies. Another argument to investigate the contracts with public bodies separately from contracts with industry relates to their different behaviour as economic actors.

Borderline: The faculty members of university community may participate in policy formulation. This activity may be included under contracts with public bodies (such as background studies for a Ministry), such as participation in public debates as invited lecturers, discussants, rapporteurs or moderators. It may participate just as a simple “voice of science”. The latter case does not involve any borderline problems. It belongs to III. 2. 2. (participation in public debates...) The former case is more difficult to classify. However double-counting of this kind of contracts under the heading of ‘contracts with public bodies’ and ‘participation in policy-making’ will not misinform the university’s administration. The best solution is to include those

contracts relating to policy formulation in the contract with public bodies as a source for university, sign of attractiveness and collaboration. When management wishes to learn about university involvement in policy-making and public debate it has to count them again.

Suggested indicators: See in the section III. 1. 4. The disaggregation is different here. Instead of size and location of firms, the contracts are disaggregated by various public bodies. The treatment here is the same as for contracts with industry: number, volume, ratio, and duration.

### **‘Contracts with public bodies’ indicators linked to transversal issues**

- Autonomy -
- Strategic capabilities -
- Attractiveness -
- Differentiation profile -
- Territorial embedding
  - Share of regional, national, international actors in contract research
  - Number and volume of contracts with local and public bodies
  - Number of staff member participating in norms/standards/regulation committees

#### **3.b.ii** Participation in policy-making and public debate

Focus: university involvement in policy formulation and policy-making. ‘Expertise’ includes policy studies; participation in formulating long-term programmes; participation or guiding/moderating formalised debates on S&T&I policy issues, rules and regulations. Other important aspects include university involvement in the design, development and implementation of public debates on developmental and safety issues (urban planning, new infrastructures, environmental protection, safety issues, and bioethical issues). Faculty members can be important actors in standard-setting committees, in committees on safety rules, etc.

Participation as a university activity and kind of output is debated in Europe. Arguments for pro-participation relate to intelligent policy-making. This kind of policy-making needs more knowledge than the previous one, and the involvement of knowledgeable people is crucial. Arguments against participation based on the judge of this type of activities above the scope of university, in the sense that they may be carried out to the detriment of the main traditional activities (teaching and research).

Suggested indicator: Work in progress

At this stage of research, interviews are important as a means to map the importance of university participation in policy-making and public debate. The common mode is to consider a description in the annual report. Interviews can highlight several other activities that are hidden in the annual report. Both of them can serve to identify the categories and develop classifications. Simple counting by type of involvement is not enough. In order to build an indicator, both the presence and ‘relative importance’ (number of different activities and entities, number of persons involved) have to be taken into account. The crucial problem is that some researchers may prefer not to provide detailed information about these activities in order to avoid criticism.

**‘Participation in policy-making and public debate’ indicators linked to transversal issues**

- Autonomy -
- Strategic capabilities -
- Attractiveness -
- Differentiation profile -
- Territorial embedding
  - Number of advice for regional / national / international policies from university
  - Number of reports and publications regional / national / international policies

**3.b.iii Involvement into social and cultural life**

Focus: radiation of intelligence in a formal way, involvement of the university in “societal” (mostly “city”) life. The involvement has many modes; numerous activities can be included here. Universities vary by their available facilities. A number of universities have lasting “facilities” that participate in the social and cultural life of the city (museums, science centres, theatre buildings, and music halls, sport facilities, libraries open to schools or citizens, churches, botanical gardens, ecological parks, publishing companies).

Universities may have important facilities and may have activities that serve social and cultural life. The activities are often linked to facilities but this linkage is not a prerequisite. For example, the University of Sussex has a theatre building in which it hosts different travelling theatre groups.

Universities also vary by their intellectual and organisational capabilities that serve society, such as theatre groups, orchestras, choirs, “social services” (like legal clinics), and volunteer work. Besides these “structural” investments, a number of labs get involved in social and cultural events (expos, concerts, urban development projects, etc.). Faculty members or labs publish ‘popular’ articles, professors give interviews, appear on TV programs, etc. The labs or universities organise science weeks, or summer courses for the general public.

A facility can be qualified as “involvement” if it is open for public use and activities that involve the university in public life.

Three categories of involvement may be distinguished here: cultural, social and sport activities / facilities. There is little accumulated knowledge on how to account for such activities. Two approaches are being tested: accounting for relative importance in all university investments and/or activities, and positioning these within their own environment.

OECD (2001) has focused on one of the traditional facilities: university museums and investigated from the management point of view. The SWOT analysis was the most important methodological tool beside the description and classification of university museums.

*Suggested indicators for initial stage:*

For activity:

- Running costs of activity / total budget of the University (by classification of activities).

- Composite index built on special events serving social & cultural life of the community
- Number of dedicated research teams to social and/or cultural life

Involvement in specific cultural and social developments For facilities:

- Total investment per year / total budget of University (by classification)
- Yearly running cost / total budget of University (by classification)

Borderline: The facilities are issues of 3<sup>rd</sup> mission if they are serving the society in one way or another. If the university has an interesting building that is rented by film-makers, it does not belong to the 3<sup>rd</sup> mission. However it can be a good source of income for the university. The same building may contribute to the 3<sup>rd</sup> mission if the university is performing theatre performances or concerts for the public.

**‘Involvement into social and cultural life’ indicators linked to transversal issues**

Autonomy -

Strategic capabilities -

Attractiveness -

Differentiation profile -

Territorial embedding

- Typology and number of cultural structures
- Volume of cultural investments
- Typology and number of social structures
- Volume of social investments
- Typology and number of services for local community

**3.b.iv Public understanding of science**

Focus: impact of science on present and future society depends on how the living generation accepts accumulated scientific knowledge and new discoveries, on how universities are supporting this acceptance by initiating public debate on science-related matters, and finally, on how universities are participating in popularising science. The focus of this dimension covers the classical involvement of researchers in dissemination and other forms of public understanding of science

Two typologies are important to data collection:

- Typology of events, such as:
  - Annual open days of science;
  - Scientific fairs and exhibitions
  - TV and radio lectures and news on science
  - Press releases: popular articles on science
  - Articles into general press and science journals for the public
  - Constructing and running “interactive” websites
- Categories of initiators, such as:
  - Individual initiatives of faculty members

- Labs or university (as a whole or through its departments) initiatives.

Borderline: public understanding of science includes the 'dissemination' and 'interaction with the general public'. All growing aspects upon involvement in public debates are considered to be part of the dimension of 'participation in policy-making and public debate'.

Suggested indicators / descriptors: work in progress

#### **'Public understanding of science' indicators linked to transversal issues**

Autonomy -

Strategic capabilities -

Attractiveness

- (From above) Annual open days of science; Scientific fairs and exhibitions
- Differentiation profile - Territorial embedding
- Scientific study groups for secondary school students
- Involvement into activities directed towards children and secondary schools

#### **4. The Availability of Data**

The difficulty now – and the agenda for the PRIME - OEU researcher team on the 3<sup>rd</sup> mission – is to collect data and produce indicators which have been deemed relevant to characterizing the profile of the 3<sup>rd</sup> mission of universities.

The first step was to identify data sources and test their availability. The investigation of the availability of data for selected indicators helps to judge their reliability, and to investigate pros and cons of the cost and time required to prepare them.

This procedure served to verify whether the identified types of information are important to potential audiences, and whether the selected indicators are feasible.

According to the results of the pre-testing period, the overview by dimensions is the following:

- Economic dimension: The topics and indicators are relevant for the future of strategic management for universities that were involved in this project. They are ready to invest in data collection for management purposes. The universities may produce some database (by exploiting existing administrative sources) for several data and indicators listed in chapter II, in a relatively short-term period. The participating universities have either accumulated information or plan to prepare databases in this field. In the short-term (1-2 years), it may produce some quantitative information in radar categories 1-4.
- Societal dimension: The topics covered are doubtless important at European universities. However, there is no tradition of mapping, monitoring or benchmarking these activities. There is anecdotal evidence and several markers that may identify impact on the societal dimension. But few databases exist for investigation.

The PRIME-OEU task is more research-oriented here than monitor-driven. In this field, more investment is needed to develop classifications for various societal types of the 3<sup>rd</sup> mission. In this process, it is crucial to fill each type of mission with

examples in order to develop clear classifications and durable typology. The monitoring task can follow the development of classification.

This chapter examines the feasibility of indicators, discusses the mode of availability of data and presents some real data and indicators for illustration from few universities. These pieces of information serve to support further development.

The first step toward real data has been the screening exercise of internal and external statistical and non-statistical data sources in order to identify ‘available’ and ‘non-available’ data and indicators. If data were somehow available, the next question was to identify in what form they exist. They have a different analytical value if spot data or time series are available.

This careful searching process on the availability of data resulted in more refined responses than ‘yes’ or ‘no’. The result of the searching process may disaggregate in 5 categories of availability:

1. Available (readily)
2. Available through data-mining
3. Availability in the pipeline (i.e. not available yet, but data collection has been decided on and resources have been allocated)
4. Wanted but not planned (data judged as important but no sources for data collection)
5. Not available (and no information on any plans)

For the indicator development process this data screening is very important. It can shed light on several issues. The bulk of these questions relates to generally available data. They are available as a whole, but not classified by subgroups (such as field of study, field of industry). The deliberation can result in: (1) initiation for more detailed data collection and administrative recording (2) omission of disaggregated levels.

Table 15 summarizes the results of the data screening exercise.

## 24. Availability of data by screening Economic dimension

Axis	Data & Indicators	Available	Data mining	Pipeline	Wanted	Not available*
1.1	Nr & % of PhD students going to external bodies before or right after degree (by fields)			UE		UA UV
1.2	Joint supervision of PhD theses by university and firm members or members of other external bodies (by fields)				UV	UE UA
1.3	Nr.& % of PhD Students supported by industry (by fields)	UV		UE		UA
1.4	Nr. & % of PhD students under contract with external bodies (by fields)			UE UV		UA
2.1	Nr. of active patents owned by the university (by fields)	UA UV				UE
2.2	Nr. of patents produced by the university (by fields)	UA	UV			UE
2.3	University revenues from licensing of patents, copyright, (total amount, ratio to total funding and ratio to non core funding)	UA UV				UE UA
2.4	Joint IPRs by university professors and firm employees (by fields)				UV	UE UA
3.1	Nr. and % of spin-off firms funded by universities and/or faculty members	UA UV		UE		
3.2	Nr. of permanent staff involved			UE	UV	UA
4.1	Number, amount & duration of contracts with industry	UA UV	UE			
4.2	Number of partners who regularly acquire university research	UV	UA	UE		
4.3	Level of concentration (sectoral and/or on a few partners)					
4.4	Access to special equipment of firm/university with or without assistance of owner's organisations		UV	UE		UA
4.5	Co- authorship between faculty members & industrial researchers					
4.6	Co-invention between faculty members and industrial researchers/employees					
4.7	Nr. of research results cited in patent applications by faculties/field of sciences (only for patent rich universities)					
Total number of indicators by their availability from 17		7	4	7	3	10

Note: UE= UMLV and ENPC

UA= UAM

UV= University Ca Foscari of Venice

\*= not available, or no comments received on the given item

As Table 15 shows, from 17 identified economic dimension indicators, 7 are available for at least one of the responding universities. There are not any indicators that are available at all of them. The availability is the best for the “contracts with industry” axis: the indicators are available, data mining has basis or they are in pipeline. The situation is worse with the “human resources” axis, as only one indicator is available; no chances for data mining but three other indicators are in the pipeline.

**25. Availability of data by screening Societal dimension**

Axis	Data & Indicators (Societal Dimension)	Available	Data mining	Pipeline	Wanted	Not available*
5	Contracts with public bodies: number, volume, ratio, duration; Contracts by various public bodies	UV	UA			UE
6	Participation in policy-making and public debates Work in progress				UV, UE, UA	
7	Involvement into social and cultural life (by activities and by facilities) Work in progress					
8	Public understanding of science Work in progress					

Note: UE= UMLV and ENPC

UA= UAM

UV= University Ca Foscari of Venice

\*= not available, or no comments received on the given item

The majority of social dimension indicators are work in progress as table 16 shows. Several marginal indicators are available by this dimension. But these pieces of information are scattered.

Tables 15 and 16 have shown that very little data are available readily or through data mining. For the characterisation of a university, the investigation of time length of available data is meaningful. Table 17 gives a rough overview on the available spot-data and time series at least one of the proactive universities.

**26. Time Dimension of Data**

Axis	List of somehow available data	Spot-data	Time series
	• Available readily		
1.3	Nr.& % of PhD Students supported by industry		
2.1	Nr. of active patents owned by the university (by fields)	X	
2.2	Nr. of patents produced by the university (by fields)	X	
2.3	University revenues from licensing of patents, copyright		
3.1	Nr. and % of spin-off firms funded by universities	X	
4.1	Nr., amount & duration of contracts with industry		X
4.2	Nr. of partners who regularly acquire university research		
4.3	Level of concentration		
4.5	Co-authorship between faculty members and industrial researchers		
4.6	Co-invention between faculty members and industrial researchers/employees		
4.7	Nr. of research results cited in patent applications by faculties/field of sciences (only for patent rich universities)		
5.1	Contracts with external bodies: number, volume, ratio, duration; Contracts by various public bodies	X	

#### 4. a. Sources of data

Sources of data can be internal from university archives and can be external. The main internal sources are: Annual reports and other university documents, human resources management, technology transfer / project management office, patent office. Many data are usually at the hand of university administrators, and are available from university archives. However, data might be available only at the department level if there is no obligation for the supervisor to report to the university databank. University management usually has access to relevant data, which are available from university archives.

Emerging need for new information (first job of PhD graduates, time length between graduation and first relevant job, individual patenting activity of faculty members) may lead to special surveys for data collection initiated by the management. (More and more universities are launching mini-surveys to map the places of their students in the economy.)

Illustration: The main data source for the University Ca' Foscary of Venice is the Annual Report compiled by the Planning, Studies and Research Division. The Division collects data through an annual survey addressed to each single department of the four faculties. Issues at stake are the following: research and didactic activities, project management, financial situation and contractual activities. Table X provides information on the origin of the data. The other illustration on University of Venice based on 2004 /yearly data/ and 2004/2005 /academic year data/ reports.)

#### 27. Sources of Data at University Ca' Foscari of Venice (2004/2005)

Dimension	Source	Format
I, Human Resources	Annual Report	Academic Year (N. of PhD supported by industry and Public Bodies)
II, Intellectual Property	Annual Report (Special integrations provided on specific demand by the Planning, Studies and Research Division)	Year of Registration (Nr. of active patents owned by the university by fields) Yearly data (Returns for the university; licences from patents, copyright)
III, Spin Offs	Annual Report (Special integrations provided on specific demand by the Planning, Studies and Research Division)	Academic Year
IV, V, Contract with Industry and Public Bodies	Annual Report	Yearly data (Number of contracts) Yearly data (Formal R&D co-operations such as contract research) Yearly data (Formal R&D co-operations such as joint research projects)

*The key external sources are: statistical surveys, patent office data, Thompson-ISI data and various national surveys.*

## 5. *Final Remarks*

The role of the discussed indicators is to a facilitative role for university decision-makers. In the arena of higher education indicators, measurements for the 3<sup>rd</sup> mission are a new field. The multiple dimensions of the 3<sup>rd</sup> mission call for indicators by issues. Most of the economic dimensions of 3<sup>rd</sup> mission have significant literature and some traditions in measuring. These indicators are focusing on outreach activities. Records bearing on the economic dimensions of the 3<sup>rd</sup> mission are different by various economic dimensions.

This study could identify the relevant indicators and markers by economic dimensions. Some progresses were reached with indicators in societal dimensions during the investigation period. But these indicators are still premature to include them into a guidebook. So the guidebook focused on economic dimensions. The accumulated knowledge focuses much more on measuring outreach activities than on the relatively new in-reach activities. Even the out-reach indicators are more advanced than any other types of 3<sup>rd</sup> mission indicators there is a scarcity of quantitative information, good classifications, and descriptions for them.

The limited number of illustrative tables occurs in this chapter because of scarcity of 3<sup>rd</sup> mission data. International diversity of available data and indicators and the various breakdowns of data for the same indicator draw attention on the lack of harmonisation in the data collection. Data of European universities are different by their definition, coverage and so on. Such kind of diversity is very common in new fields of indicator development.

The indicators were tested at very limited number of universities. This sample was not able to cover the variety of European universities. The further steps of methodological work has to cover not only more but each types of European universities to get a standard guide for the characterization of university 3<sup>rd</sup> mission by economic dimension. The pilot exercise highlighted that the administration of a small university prefers to prepare data together on private and public sources as ‘external sources’. Different faculties are attractive for different external sources. Their attractiveness may be compared if the information on external sources are together at the hand of university management. If the experiences from a small university are similar at other small and medium universities or even at large European universities we have to revisit the coverage two issues: ‘contracts with public bodies’ and ‘contracts with industry’. In mapping exercise it may broaden the issue ‘contracts with industry’ with other external bodies. And ‘contracts with public bodies’ may focus only on contracts for regulation, safety issues and so on.

The indicator development for societal dimension has not reached the experimental stage, it is still in the blue sky phase. If the information on societal dimension of 3<sup>rd</sup> mission is important for any kind of European universities investment into the research in this field is needed. Without exploratory work sound information may not be expected.

This chapter has illustrated the feasibility of measuring 3<sup>rd</sup> mission at least by economic dimensions. The increasing worldwide competition among higher education organisations creates demands to a greater extent for detailed information on universities 3<sup>rd</sup> mission. The pilot indicator development highlighted the importance of further investment in developing somehow harmonised 3<sup>rd</sup> mission measurement and efforts for data collection serving the management of universities.

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## VI. Governance

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## 1. Introduction

Academic research, along with the other activities of Universities, is considered as a key factor of the evolution of any societies and civilisations. But production process and productivity in research is extremely difficult to measure. The black box of production of new knowledge has been kept closed for a long period. At the origins, public commitment toward education and research went through endowment in kind and in money (land grant colleges in the United States, public real estate funding, and public university budget in every country). Public and private funding of universities has been primarily established according global political considerations, more than according to the realised or expected productivity of any individual protocol. Liberty of researcher is supposed to be a key factor of its productivity. Nevertheless, an increasing share of research public funding is established under a competitive process and depends from the quality of projects, the previous recognition of researchers (Nobel prizes ... ) and of research labs. Public financing is decided according to global socio-economic consideration and suppose specific research projects in relation with global objectives such as the eradication of diseases. Such projects need very precise protocols. The growing involvement of private funding increases the criteria of expected output into funding decision process. All this evolution emphasises the need for adequate evaluation of research.

The first evaluations that have been made focussed on the measure of the various INPUT dedicated to research activities. The next step arrived when it became important to evaluate the relations between these inputs and the expected results. New evaluations have been made of the various OUTPUT of the university activity. This has been done through a set of partial direct indicators, such as number of graduated students in each field, articles, patents..., and marks of recognition of the quality of these output such awards and article citations. The evaluation that limits itself to output culminates into the various rankings of universities activities (national, international and worldwide; such as the well known *annual Universities ranking of the Times* along with the one of *Jao Tong University in Shanghai*). There is a worldwide increasing concern for ranking. But ranking remains limited very few dimensions of university life and missions. In any case ranking may be significant for the very few leading universities in the world, but not for the majority of good universities.

A more comprehensive approach has resulted from various ratio built between inputs and outputs. What do you get compared to what did you put into make sense for every payer: enterprise, politician and tax-payer. Within the Observatory of the European University, we gather the relevant data that make possible, for each university, to evaluate how much efficient it is and to compare it to other universities including specificities in size, assets and objectives. In this context ranking makes way to self evaluation, with consideration about efficiency and productivity.

This input-output method is useful. But, it gives no indication on the way various input are put together to provide the given output. As for any organisation, the same assets never end into the same output. The final competing result between comparable companies is very often related to their difference in their management processes. The basic observation is that the same inputs never provide the same output, even when the external context is stable.

At this stage, University governance is the way the organisation is managed on a long, medium and short term basis. In other words, the way strategic goals are considered

and decided on one side; the way innovations are aroused and accepted; and the way means are daily used, distributed and organised. The triple dimension of daily, of innovation and of strategic management is a joint issue.

This chapter enters into the black box of the University. We will develop **four** different sections. The objective is to provide a general framework for individual governance analysis and benchmarking. Each section will be enriched by examples taken from three main universities in order to illustrate a framework for other universities.

- The first section discusses the notion of governance, its implication for higher education and research institutions and how this theme is related to the four other themes dealt with by the OEU project.
- The second section presents the specific problems raised by the governance issue and how it is suggested to cope with them.
- The third section describes the items that can be informed by the available data, the key questions it documented, and the evaluation tool that could be used. We will apply each set of items to a sample of three Universities : the University of Lausanne (UNIL), the autonomous University of Madrid (UAM) and the University of Paris –Sud (UPS). At each level, one example will be provided within the plain text and the others will be found in the annex to the chapter
- The last section identifies the topics that will be covered by each key question and the indicators that could be developed.

## **2. The Governance of a university**

The concept of governance is easy to define but complex to analyse and to implement. Governance is the way an institution is managed and capable to link the day to day action to the implementation of strategic objectives. It includes the decision making process at all levels of management (from day to day to strategic management). It includes also the way unexpected questions are considered and answer (management of innovation). It includes finally the way conflicts are addressed.

The central component of governance is the manner in which power is exercised in the management of the organisation. Good governance reflects the degree of efficiency of the organisation in the process of putting together stakeholders within the organisation.

The narrowest conception of governance within business limits its frontier to the relations between **shareholders**, represented by the board of governors, and the firm, represented by its executive staff.

The widest conception of governance includes the management of relations between the diversity of **stakeholders** within the organisation.

Governance is complicated by the fact that it involves multiple actors. Its legitimacy is to put together heterogeneous stakeholders with complementary assets and capabilities, and to make them work toward a common objective. Cooperation and competition (“coopetition”) constitutes the internal context of governance. They articulate their interests, influence how decisions are prepared and made, who the decision-makers are, and, at the end, what decisions are taken.

At the university level governance will concern students, researchers, professors and administrative staff. Each of these components can be divided into infinite categories

according to their goals and their interests. The PhD students and researchers in mathematics will find very limited interest in heavy experimental equipment that are needed by experimental physicists and mobilise a large part of the university budget. On the reverse, if physicists do not get these funding, they will have no possibility to do any research and if they get it, it will be very difficult to measure the best use of the expenditures. These partners, considered as identified groups, are characterized according to their specific interests. More precisely, governance will define the roles of university direction compared to the faculty, the lab and the department.

The ultimate common interest remains the survival or the organisation on a long term basis.

In any organisation (enterprise, public body and university), the group members (stakeholders or share holders) delegate a portion of the decision-making responsibility to government and sub-governments (the board of directors of the University, the dean of the faculty, the direction of the lab). In that respect, decision-making process within the organisation becomes a key issue of governance. Governance is about the more strategic aspect of steering, making the larger decisions about both direction and roles. It is the process through which a group of people make and implement decisions that direct their collective efforts.

This definition covers a complex and ever moving process. It includes the conceptualisation of common long term objectives, the decision processes the management of the day to day life in accordance with the strategic objectives, the evaluation, and the process of change and innovation. If we keep this definition of governance, it will include, at the university level:

- The mode of choice of the governors
- The way laws and regulations are prepared, passed and implemented
- The way management decisions are taken and implemented (including the answer to unexpected events)
- The way change is organised and permitted
- The way conflicts are discussed and solved
- The evaluation and the accountability of the work and actions of the organisation. In that respect, how much the management can be considered as effective, honest, equitable and accountable.

Because the final goals of the organisation are complex and because the coherence between these goals and the management behaviours is not linear, the evaluation of governance is never simple, nor neat. It includes basic ideological questions such as the legitimacy of governing people, the management capabilities, the quality of effective management and the evaluation of efficiency through the coherence of the group as much as through the outputs.

By nature, governance may be messy, tentative, unpredictable and fluid. But, because of the increasing openness of societies; because of the role of universities as central actors of the future competitiveness within an high-tech economy; because of the possibilities of benchmarking between universities, governance becomes also a key instrument for their differentiation.

### 3. *Methodological problems to address governance issue*

Given the fact that we consider governance is a key issue for the present and for the future of each university, there is a necessity to identify, to measure and to analyse its extension and its efficiency. What are the data to be collected; how do they transform them into quantitative indicators; how can we benchmark them through time and through space.

The first question is to identify the data to be collected. We have to face a triple problem.

The first problem is that governance addresses directly power issues. While any input or output event can be attributed to external causes (when the news are bad) and to internal causes (when they are good); governance issues present very few possibilities to escape the fact that an event occurred in your own space of responsibility. Governance deals with the power of leaders, the way they use it and the way they articulate with other powers.

The second problem is that it is a new political concern in most countries and universities. So there is very few data systematically collected about it. The information about governance is scarce, and widely hidden.

The third problem is the qualitative nature of governance. Governance is the most immaterial product of the service economy. Unlike marketable services (telephone call, lawyer advice, doctor consultation), there is very limited possibility for the stakeholders to measure the degree of their satisfaction (strikes and resignation are poor indicators). The main problem faced by governance is related to the collection of data and their transformation into more quantitative information.

As a result of these 3 characteristics, data about governance will be a direct part of governance itself. We cannot address this key issue on a general basis here. We will limit ourselves to the two following challenges.

#### 3. a. **From available data to data to be built**

**The first step is to make relevant data available.** Either they do not exist and have to be produced, or they are at hand in one or the other sub-division of the university and have to be identified and collected into a coherent set of information. Once they exist they have to be worked out in, i.e. to be analysed and, then, to be transformed into more quantitative data.

At this point, a **clear pre-evaluation of the key questions** related to the governance of the university is necessary. It will allow **to identify** the key issues and **the data that would inform at best** to each of them. Then, it will be necessary to distinguish the set of data **according to their nature and availability**. In any case data will be then hierarchised from what is the most feasible to what will be the most difficult (in terms of access to data and of their processing).

**The second step is to go from available data to manageable data.** Data have to be analysed, interpreted, converted in order to become relevant. This work is typically an observation that can not be conducted only by internal or by external partners of the University. The evaluation cannot be achieved by the institution's staff **on their own**, nor by a consultant or a researcher **alone** (as Prime researchers involved in the OEU project). The process to create manageable governance data must be a cooperative process that includes a clause of confidentiality along with a clause of liberty for critical assessment on behalf of the analyst (consultant-researcher).

In any case, the collection of data on governance will require two different sources :

- Document analysis (relating the processes through which the institution prepares, takes, applies and adjust its decisions) ;
- Interviews of a limited number of selected actors (with special care to interview key actors, but diversified and contradictory actors)

Last but not least, **indicators on governance cannot only be static**. Each institution experiences its own model of governance that must be identified. But it does not exist an ever “good” or “bad” model of governance. At a given point, a governance model is more or less satisfying for the concerned stakeholders, and more or less efficient for the goals of the organisation. Governance model evolves because it affects a living body. In a context of fast and permanent change the way governance adapts itself to the occurring domestic and external events is of a key importance. The process of governance ability to manage change must be taken into account. The last five years, or the period of time adopted by the strategic plan (4 years for the government-university contract for example) is a workable standard. For that reason, measuring the dynamics (or the evolution) of each item will be central in this methodological paper.

At last, a comparison between University objectives and its existing practices must be considered. This comparison must be accompanied by another comparison between the observed evidences concerning governance and the University self claim and presentation. Once again, comparisons must not lead to the listing of static categories such as “good” and “bad” ones. When an organisation pretends to be more (or less) than what it is in the real world, it provides corner stones for dynamic analysis and improvement of leadership.

### 3. b. Specific evaluation tools

The next problem is related to the diversity of methodologies that can be used to collect the data and to analyse them. The basic problem is to turn from qualitative data to more quantitative one. Most of the classic Input-Output methods cannot be used at this level.

Social sciences already addressed this question in many ways. The following evaluation tools can be used to exploit qualitative data.

“**Change**” = degree of change between 2 periods. For each data, we suggest to compare the most recent observation available to the one that concerns the preceding significant period (mainly the 3-4 years period that is already used for the strategic plans or equivalent).

“**Likert Scale**” = from 1 to 5 including the extreme, medium and medium-medium possibilities (an other possibility is to use A, B, C, D, E). Each mark will result from an internal-external evaluation (i.e. ranking to be done by 2 persons and not one) including a minimum of benchmarking (an “expert” approach)

“%” = as the proportion of one item compared to a more general one

“%+%+%+%” = A repartition of various possibilities, giving the fact that the total must be limited to 100%.

The UAM has experienced methodological drawbacks when asking for percentages of participation: many interviewees found themselves unable to assign percentages to each group, and preferred to address each group one item of the scale low-medium-high.

“**SWOT**” = build up of a table that selects a limited number of indicators that are listed according to a decreasing order and put face to face as the STRENGTHS and WEAKNESSES of the university on one side and as the OPPORTUNITIES and THREATS on the other. Because of the widely subjective appreciation about governance and the necessary partial point of view of each actor (for example the interviewed partner), the analyst must be aware to collect a roughly equal number of items for the comparative columns and identify possible links between them. Very often a given strength of a university (multidisciplinarity or monodisciplinarity) can go along with a strong weaknesses and vice-versa.

In a general manner, we must avoid YES/NO type of answer, as much as possible. The Likert scale, and SWOT approaches will be used as often as possible.

#### **4. The build up of a first set of indicators**

We will suggest in this section how to proceed, according to the data at hand. Starting with a characterization of the concerned higher education and research institutions and its environment, five steps will be distinguished, in order to build a first set of indicators :

- 1<sup>st</sup> step: **characterization** of governance in a given University
- 2<sup>nd</sup> step is based on the analysis of the available strategic documents
- 3<sup>rd</sup> step refers to **quantitative data** that reflects the strategies of the institution and the coherence between strategic documents and “facts” (= the capacity to transform strategic decisions into actions)
- 4<sup>th</sup> step refers to instruments to monitor the strategy implementation
- 5<sup>th</sup> step refers to **governance style** (assessed through field study and interviews)

For each of step of this section, specific examples deriving from pilot universities will be included.

##### **4. a. First step: characterization**

The governance autonomy and strategic capacity of higher education and research institutions is strongly related to the characteristics of the national system they are part of. The first objective of the characterization items is therefore to describe this system along with the formal structure of the concerned institution. Each university will be identified as a collection of overlapping groups of interests. These groups are composed of researchers, faculty members, administrative staff and technicians spread through faculties, groups, disciplines... The characterization aims at identifying the various stakeholders involved into the governance of the university along with their main interests and behaviors.

The governance characterization is strongly connected to the characterisation of the preceding input and output issues.

**1. Governance characterization table for University Paris-Sud (UPS)**

Issues	Comments																																								
<p><b><i>Above the university</i></b> Public authorities in charge of steering research within universities and at what levels</p>	<p>University signs a 4 years contract with the ministry of higher education, based on report and projects at every level (labs, faculty and the University). The other levels of steering research are the national Agencies (CNRS, INSERM, INRA, INRIA...) that represent the most comprehensive evaluation system and the major part of research budget New emphasis is given to research funding based on a competitive basis: ANR; AII, Poles de compétitivité, RTRA réseaux thématiques de recherche avancée, PRES ... Growing importance of European research funding</p>																																								
<p><b><i>Within the University</i></b> Existing devices to: evaluate the Strategic Research Plan (frequency, description of the formal procedures) allocate public research funding (frequency, description of the formal procedures) ask the university to produce Strategic Research Plan (frequency, description of the formal procedures)</p>	<p>Most of strategic research projects continue to be established at the level of labs (mostly 50 to 300 researchers). The research department within each Faculty (mainly the Faculty of Sciences) do not have “a strategy” but to promote the labs activity The University Research Plan is produced by the vice president in charge of research with interaction with the scientific council.. The Presidency uses 2 instruments: a specific procedure of 4 years tripartite contract with Region (Ile de France) and State for 5 major research projects. + some specific instruments : BQR employment BQR finance (developed in the next part)</p>																																								
<p><b><i>University structure</i></b> faculty Number of Teachers by families of disciplines, by disciplines, by projects, by study programs?</p>	<table border="1"> <thead> <tr> <th>scientific field</th> <th>Professors</th> <th>Full time Researchers</th> <th>TOTAL</th> </tr> </thead> <tbody> <tr> <td>MATHEMATICS</td> <td>156</td> <td>46</td> <td>202</td> </tr> <tr> <td>PHYSICS</td> <td>183</td> <td>297</td> <td>480</td> </tr> <tr> <td>CHEMISTRY</td> <td>164</td> <td>91</td> <td>255</td> </tr> <tr> <td>SCIENCES OF THE UNIVERSE</td> <td>53</td> <td>32</td> <td>85</td> </tr> <tr> <td>BIOLOGY, MEDICINE ENGINEERING</td> <td>496</td> <td>398</td> <td>894</td> </tr> <tr> <td>AND STIC</td> <td>233</td> <td>105</td> <td>338</td> </tr> <tr> <td>AGRONOMY</td> <td>31</td> <td>143</td> <td>174</td> </tr> <tr> <td>SOCIAL SCIENCES</td> <td>285</td> <td>31</td> <td>316</td> </tr> <tr> <td>TOTAL</td> <td>1601</td> <td>1143</td> <td>2744</td> </tr> </tbody> </table>	scientific field	Professors	Full time Researchers	TOTAL	MATHEMATICS	156	46	202	PHYSICS	183	297	480	CHEMISTRY	164	91	255	SCIENCES OF THE UNIVERSE	53	32	85	BIOLOGY, MEDICINE ENGINEERING	496	398	894	AND STIC	233	105	338	AGRONOMY	31	143	174	SOCIAL SCIENCES	285	31	316	TOTAL	1601	1143	2744
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<p>Within them: existence of departments? Are they responsible for Teaching and Research, only for Teaching,</p>	<p>There is a strong distinction between research and teaching. Labs are the main actors in research and disciplinary Departments (physics, Chemical, Economy, Law...) are responsible for teaching. Full time researchers depends from a lab, professors depend from 2 entities. In facts, they rely mainly to one or the other.</p>																																								
<p>Existence of labs: within the departments or not?</p>	<p>No</p>																																								

<p>About those labs/departm. Number and size Number of teams within each Formal decisional capacity (on paper)</p>	
<p>University research structures (independent from faculties) Number Nature (Federation of research labs for instance, research labs...)</p>	<p>Some labs are independent from the University The majority of labs have double accreditation (University/CNRS or an other body)</p>
<p>Deliberative / decisional bodies dealing with research issues At the university level: Size and composition, Formal attributions</p>	<p>Scientific Council (40 members; mainly elected all categories of personnel + 4 external representatives (CNRS, INRA, CEA, IRD) Attribution: consultation from presidency Decision about <i>BQR emploi</i> and <i>BQR financier</i> Promotion of professors (half of the annual allocation provided by the government)</p>
<p>At the faculty level: Size and composition, Formal attributions</p>	<p>Faculty decisions are mainly related to teaching and to the maintenance of the existing buildings</p>
<p>At the department level: Size and composition, Formal attributions</p>	<p>No</p>
<p>At the lab's level: Size and composition, Formal attributions</p>	<p>Most often, a strong structure including an executive group and a scientific comity</p>
<p><b>At the presidency / rectorate level</b> persons in charge of the research policy issues Number Statutes Mode of nomination</p>	<p>Officially, the President is in charge with all the academic issues (Teaching, research and governance). There are 3 elected committees: Administration committee (60 members) Scientific Committee (40 members) Teaching and university life committee (40 members)</p>
<p>structure in charge of the research policy issues type (administrative office, cabinet,...) number of staff level of qualification of the staff</p>	<p>The Vice president in charge of Research is helped by one person. Each Faculty has some office in charge with the management of research The University administration takes care of current administrative responsibilities (expenditures) Most of the management or research is done at the labs level</p>
<p>Existence of a Transfer office Formal Attributions Staff and qualification / origin of staff</p>	<p>SAIC 20 people including 3 <i>chargés de mission</i> under private contracts</p>
<p>Who is the landlord of the estate o the university? Who is in charge of their maintenance Who pays for the maintenance?</p>	<p>The French State  The State and the University  The state and the University Not any autonomy at this level.</p>

The characterisation of the Autonomous University of Madrid and of the University of Lausanne (UNIL) will be found in the annex 2.

#### **4. b. Second step: analysis of the existing strategic documents**

In most institutions, there exist some documents (more or less official, more or less compulsory), in which some strategic views have been developed (strategic plans, activity reports...). The first objective is to point out the most significant of these documents. Then the content analysis of these documents will identify what they tell about the governance of research within the institution and in its various components. A special care will be provided on the identification of what the University wants to do (or pretends to do) and what is done in the real world. Contradictory analysis is delicate at this level but brings a fruitful view.

### **Strategic documents about research in UAM**

The UAM authorities have developed several documents to plan and manage the research activities at the university. They are the documents where the rest of the information is taken from:

1. Legal Statutes.
2. Research Plan 2003-2006\*,
3. Follow-up of the Strategic Plan 2003-2006,
4. Report about UAM Research Activities 2005,
5. Annual University Senate (Claustro) Reports.
6. Web page ([www.uam.es](http://www.uam.es)) which provides some statistical data
7. Reports (formal or informal) made by organizations at different level (i.e. Research Commission).
8. "Por la Autónoma 2010". Rector's programme - Angel Gabilondo. UAM 2006.

\*The Strategic Plan develops four thematic actions, each of them involving several projects. One of these actions is related to the research and innovation activities in the UAM. This part of the Strategic Plan is called Research Strategic Plan.

Strategic documents about research in the University of Lausanne<sup>1</sup>

At the University of Lausanne, more than six different strategic documents that have been identified :

1. « Vision stratégique ». This document includes strategic choices/goals with respect to the general university profile, the situation in the local and national higher education area, the collaboration with other higher education institutions, education and research.
2. « Loi sur l'Université de Lausanne (LUL) ». This University law includes information about the relationships between University and State (canton), rectorate and University Council, rectorate and faculties. Moreover, there is an article about an innovation fund that allows to develop research.

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<sup>1</sup> Since 2004 University of Lausanne has got a new law that is implemented in several steps. Practically its implementation is not finished yet. Furthermore a new direction is in place since september 2006. This direction has got the possibility to change the internal organisation to a certain extent. Therefore, we would like to underline that information we introduced in the different indicators vary according to these potential future or even very recent changes. Information is actualized at least until the 1st of January 2006.

3. « La charte de l'Université de Lausanne ». Includes ethical values on which is based the strategic vision.
4. « Rapport d'activité 2004 ». This activity report makes an assessment of the achievement of the goals defined in the strategic vision.
5. « Convention Sciences-Vie-Société (SVS) ». This document defines one of the main programs of the University that includes research. It also defines the relationship between the three higher education institutions involved in this program, i.e. Universities of Lausanne (UNIL) and Geneva and the Federal Institute of Technology of Lausanne (EPFL).
6. « Accord de collaboration ». This document defines the enlargement of the scientific subjects of the program SVS, and of the collaboration between UNIL, EPFL and the academic and cantonal hospital (CHUV).
7. Other documents from Internet : [www.unil.ch](http://www.unil.ch)

This university shows a great interest into governance issues. Above all these official documents, we find various working groups in charge of this question. Usually, the working groups are the best place for contradictory, precise, and efficient evaluation of a problem <sup>(2)</sup>

The analysis of University strategic documents (RSP Research Strategic Plan)

The analysis of these documents is always complex. Strategic documents are as important through what they don't tell, than through what they tell. A series of items to be looked at has been listed. For each item, the key questions related to it are mentioned. The next column specifies the evaluation tool that should be used and a description of how it could be used. The last column documents the trend (dynamics) for each item.

Important methodological remark: At this point, as well as at the following steps, it should be noted that for each item “yes” or “no” or “x” answers should be avoided. As soon as you care about governance the risk to get a positive (and sometime a negative) answer to every question is important. Most of universities are aware about the necessity to have strategic behaviour. So there is almost always a “strategic” office, even if this office does not interfere with the real policy of the university.

- if key themes can be identified the analyst should list them
- if references are made to other institutions in the strategic documents, their name should also be listed, etc.

When no systematic answer can be given, a short narrative answer (2-3 sentences) will be written.

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<sup>2</sup> In 2006, a document has been issued on Governance of Research Activities: University of Lausanne. This document provided a detailed analysis of the problems of identification of research strategy. Among the main findings were:

The lack of important documents defining and evaluating university strategy

The fact that existing document defining strategic goals were too general and not especially focused on research

4. c. The analysis of University strategic documents

2. University of Lausanne (UNIL)

	Items to document thanks to the analysis of the university strategic documents	Key questions concerned	Evaluation tools	Measuring the dynamics
1	References being made to the strategies or orientations, choices of other Higher Education Institutions (which ones)	Profile	<ul style="list-style-type: none"> <li>• Federal Institute of Technology of Lausanne (EPFL): <i>Local (neighbour), Research and teaching instit. Quite specialized (engineering, basic sciences, computer and communication sciences, life sciences, civil engineering, architecture and the environment).</i></li> <li>• University of Geneva : <i>Regional (other french speaking canton), Research and teaching inst. Diversified</i></li> <li>• (Hospital CHUV : <i>Local Hospital/Research ? Specialized</i></li> <li>• University of Neuchâtel: <i>Regional (other french speaking canton) Research and teaching instit. Diversified</i></li> </ul> <p>Identify the references which are made to other institutions and position them on the following continuums International -----→local Research inst. ----→ teaching inst. Specialised inst→ diversified</p>	<p>Convention SVS signed in 2001 (UNIL-UNIGE-EPFL).</p> <p>Convention SVS signed in 2001 (UNIL-UNIGE-EPFL).</p> <p>Convention UNIL-CHUV signed in 2004</p> <p>Triangle AZUR since 2002.</p> <p>In the documents available in the last five years were the references alike ? If not describe what changed (reference to more/less international/research/specialized) institutions</p>

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	<b>Items to document thanks to the analysis of the university strategic documents</b>	<b>Key questions concerned</b>	<b>Evaluation tools</b>	<b>Measuring the dynamics</b>
2	Degree of specificity/diversity of the Strategic Research Plan of the university	Profile	<p>Faculties less explicitly involved in priorities/Faculties explicitly involved in priorities</p> <p>Theology and Religious Studies Law and Criminal justice Arts Social and Political Sciences Economics and Business Administration</p> <p>Earth Science and Environment Biology and Medicine</p> <p>-&gt;On a likert scale UNIL could be situated as diversified.</p> <p>Comparative list in 2 columns, including the list of disciplines within the university and the list of disciplines covered in the RSP</p> <p>Then position the RSP on a likert scale Very specialized/ specialized/ diversified/very diversified</p> <p>Assess the degree of specialisation by discipline (radar with a scale for each discipline)</p>	<p>Compare with the RSP elaborated within the last five years</p> <p>-&gt; The actual Strategic Vision is the first document of this type that has been elaborated. Therefore, there is no possibility of comparison.</p>

	<b>Items to document thanks to the analysis of the university strategic documents</b>	<b>Key questions concerned</b>	<b>Evaluation tools</b>	<b>Measuring the dynamics</b>
3	Degree to which the Strategic Research Plan intends to develop what already exists within the university or on the contrary explicitly put emphasis on specific sectors (degree of	Profile Strategic capacities	<p>Faculties less explicitly involved in priorities/Faculties explicitly involved in priorities</p> <p>Percentage of Researchers from all UNIL-Researchers (state 2003)</p>	<p>RSP five years ago : Evolution : The RSP were more conform with the existing</p>

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	<p>concentration or dispersion in the priorities compared to the degree of concentration or dispersion of the university)</p>	<p>Theol. and Rel. Stud. 2%                  Law (4%) and Crim. Just. (3%) 7%                  Arts 15%                  Social and Pol. Sci. 10%                  Econ. and Business Adm. 10%                  Earth Science and Environ. 7%                  Biology and Medicine 49%</p> <p>The percentages seem to respect quite well the place of the different priorities as exposed in the Strategic Vision. The part of Researchers of Economics seems not to be very adequate. However, it could be explained partly by the fact that research has not the same importance in each priority exposed in the Strategic Vision.</p> <p>-&gt;General assessment: close to the existing structure.</p> <p>Create two comparative column, one with the structure of the research fields in the university classified by the number of researchers involved in each, the second evaluating whether the relative importance of each field is respected or not in the RSP</p> <p>Position the RSP on a likert scale                  Very close to the existing structure/                  close to the existing structure/                  distant from the existing structure/                  very distant from the existing structure</p>	<p>situation</p>
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	<b>About key themes/priorities in the RSP</b>			
	<b>Items to document thanks to the analysis of the university strategic documents</b>	<b>Key questions concerned</b>	<b>Evaluation tools</b>	<b>Measuring the dynamics</b>
4	Clear expression of a limited number of priorities versus multiple priorities in RSP	Profile + Strategic capacity	Likert scales Capacity to set few priorities Very low / low / high / very high -> High (or between low and high).	Evolution over the last 5 years : The previous RSPs had more focused/as less focused priorities

5	Transversality of the priorities	<p>Objectives of the research priorities:          - fundamental, applied for business, applied for society          - local/national/international</p> <p>Identified priorities:</p> <ul style="list-style-type: none"> <li>▪ functional genomic (génomique fonctionnelle)</li> <li>▪ the biomedical imagery</li> <li>▪ Finance</li> <li>▪ Economy and Health Management</li> <li>▪ Technology and Innovation Management</li> <li>▪ Integration, Regulation and Social Innovations (IRIS)</li> <li>▪ Anthrôpos</li> </ul> <p>% of research transversal themes (=2 disciplines or more)</p> <p>-&gt; At least 4 out of 7. First two?</p> <p>List the transversal (interdisciplinary priorities and evaluate their weight :</p> <p>-within the RSP</p> <ul style="list-style-type: none"> <li>▪ (ev. the biomedical imagery): strong in SP</li> <li>▪ Economy and Health Management: middle in SP</li> <li>▪ Technology and Innovation Management: middle in SP</li> <li>▪ Integration, Regulation and Social Innovations (IRIS): middle in SP</li> <li>▪ Anthrôpos: middle in SP</li> </ul> <p>- compared with their weight in the university</p> <p>-How to measure the weight of projects in university?</p> <p>list the horizontal cooperation between the existing university structures announced in the RSP and position the RSP: many cooperation/ some cooperation/ few cooperation/</p>	<p>Evolution over the last 5 years :          more transversal --          → less transversal priorities</p> <p>more cooperation -          -→ less cooperation</p>
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P R I M E - O E U G U I D E - G O V E R N A N C E

			<p>no cooperation</p> <p>-&gt; Many cooperation (SVS, Triangle AZUR).</p>
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	Items to document thanks to the analysis of the university strategic documents	Key questions concerned	Evaluation tools	Measuring the dynamics
6	Link between the key research themes identified in the RSP and innovation issues		<p>Number of research themes of the RSP related to innovation issues / number of research themes in the RSP</p> <p>-How to define innovation issue?</p> <p>List the research themes related to innovation issues and the disciplines concerned</p> <p>Assess the degree of concern for innovation in the RSP Very low/ low/ high/ very high</p>	<p>Evolution over the last 5 years : Higher concern for innovation/equal concern/ lower concern</p>
7	To what extent is the Strategic Research Plan a mere juxtaposition of the research units' projects	Autonomy / strategic capabilities	<p>Compare the structure of the RSP with the existing structure of the university and assess whether they are very close/ close/ distant/very distant from one another</p> <p>-&gt; Close</p> <p>Assess the % of new projects involving new structures or re-structurations announced in the RSP</p>	<p>Evolution over the last 5 years : Assess whether the structure of the preceding RSP closer, as close, less close to the university structure?</p> <p>-&gt; Although there has been no SP before, one can say that two important changes in terms of structure have been done :</p> <p>-3 domains have been transferred from UNIL to EPFL (2) and UNIGE (1).</p> <p>-2 Faculties have been created/restructured (Faculty of Biology and Medicine ; Faculty of Geosciences and Environment)</p>

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	Items to document thanks to the analysis of the university strategic documents	Key questions concerned	Evaluation tools	Measuring the dynamics
8	Degree by which the strategic research plan is part of a broader strategic developments	Autonomy / Territorial embedding	<p>For each research theme of the RSP, list the arguments justifying it and identify whether they refer to</p> <ul style="list-style-type: none"> <li>- research issues developed by the international/European/national research communities (1)</li> <li>- priorities set by the national authorities (2)</li> <li>- priorities set by the territorial authorities (3)</li> <li>- priorities expressed by stakeholders (4)</li> <li>- priorities linked to the strategy of the university (5)                             <ul style="list-style-type: none"> <li>▪ functional genomic (génomique fonctionnelle)</li> <li>▪ the biomedical imagery</li> <li>▪ Finance</li> <li>▪ Economy and Health Management</li> <li>▪ Technology and Innovation Management</li> <li>▪ Integration, Regulation and Social Innovations (IRIS)</li> <li>▪ Anthrôpos</li> </ul> </li> </ul> <p>Then assess the degree to which the RSP is presented as following the priorities/orientations expressed by the territorial level Low -----&gt; high</p> <p>-&gt; Low</p> <p>expressed by the national level Low -----&gt; high</p> <p>-&gt; Middle</p> <p>expressed by other stakeholders Low -----&gt; high</p> <p>-&gt; Middle</p> <p>expressed by the research communities Low -----&gt; high</p>	<p>Evolution over the last 5 years :</p> <p>Impact of territorial strategic developments increasing—&gt; decreasing</p> <p>Impact of national strategic developments increasing—&gt; decreasing</p> <p>Impact of other stakeholders strategic developments increasing—&gt; decreasing</p> <p>Impact of the research communities increasing—&gt; decreasing</p> <p>Impact of the strategy of the university increasing—&gt; decreasing</p>

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			<p>-&gt; High</p> <p>Conformed with the university strategy</p> <p>Low -----&gt; high</p> <p>-&gt; High</p>	
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	Items to document thanks to the analysis of the university strategic documents	Key questions concerned	Evaluation tools	Measuring the dynamics
9	<p>Collaborations announced in the RSP</p> <p>List collaborations announced with other HEIs</p> <p>List the collaborations announced with public authorities and at which level (local, national, international)</p> <p>List the collaborations announced with business partners and the scope of the latter (local, national, international)</p>	Profile Territorial embedding	<p>For each category of collaborations:</p> <ul style="list-style-type: none"> <li>- UNIGE-EPFL-UNIL</li> <li>- CHUV-EPFL-UNIL</li> <li>- UNIGE-UNINE-UNIL</li> </ul> <p>compare between the already existing collaborations and those announced in order to assess whether the RSP: limits/replicates/emphasises previous trends</p> <p>-&gt; These collaborations began formally max. 3 years before or in the year of the elaborating of the Strategic Vision (2004). Globally, it can be considered that the existing collaboration trends have been emphasised.</p> <p>position the university on the following scale: many collaborations, some collaborations/ few collaborations / no collaborations</p> <p>-&gt; Many collaborations.</p>	<p>Evolution over the last 5 years :</p> <p>For each category of collaborations :</p> <p>The university is developing more/as much/ less collaborations</p>

	Items to document thanks to the analysis of the university strategic documents	Key questions concerned	Evaluation tools	Measuring the dynamics
10	Indicators included in the documents about the achievement of the strategic plan	Autonomy Strategic capabilities	List the indicators and assess: whether there are: a lot/ some/ few/ none	Evolution over the last 5 years : more indicators—

			-> Few  whether they are decided by the university on its own/ imposed by some public authorities (which)/ imposed by stakeholders (which)	→ less indicators
11	Follow-up and evaluation devices included in the documents about the	autonomy	List the follow-up and evaluation devices announced in the RSP and assess  ->In order to measure quality, evaluation of research is installed.  Whether they are: a lot/ some/ few/ none  -> That is difficult to say because evaluation is not defined precisely.  Whether they are decided by the university on its own/ imposed by some public authorities (which)/ imposed by stakeholders (which)	Evolution over the last 5 years :  more follow-up and evaluation devices—→ less follow-up and evaluation devices

### 3. Universidad Autónoma de Madrid<sup>3</sup>

	Items to document thanks to the analysis of the university strategic documents	Key questions concerned	Evaluation tools
1	References being made to the strategies or orientations, choices of other Higher Education Institutions (which ones)	Profile	
2	Degree of specificity/diversity of the Strategic Research Plan of the university	Profile	No specificity intended at the UAM.
3	Degree to which the Strategic Research Plan intends to develop what already exists within the university or on the contrary explicitly put emphasis on specific sectors (degree of concentration or dispersion in the priorities compared to the degree of concentration or dispersion of the university)	Profile Strategic capacities	RSP intends to improve existing capabilities and, among others, ameliorate research administrative procedures.

<i>About key themes/priorities in the RSP</i>			
	Items to document thanks to the analysis of the university strategic documents	Key questions concerned	Evaluation tools
4	• Clear expression of a limited number of priorities versus multiple priorities in RSP	Profile + Strategic capacity	No research priorities defined, although some implicit lines can be identified in the budget regarding funding distribution.
5	• Transversality of the priorities		

<sup>3</sup> In the case of the UAM, it is not possible to add the row « Measuring the Dynamics » since the current RSP is the first one.

6	• <b>Link between the key research themes identified in the RSP and innovation issues</b>		<i>No key research themes established</i>
	<b>Items to document thanks to the analysis of the university strategic documents</b>	<b>Key questions concerned</b>	<b>Evaluation tools</b>
7	To what extent is the Strategic Research Plan a mere juxtaposition of the research units' projects	Autonomy / strategic capabilities	Research priorities at the UAM are the implicit results of individual and labs projects.
8	Degree by which the strategic research plan is part of a broader strategic development	Autonomy / Territorial embedding	The RSP is part of a broader document, which contained four big blocks: 1. Teaching. 2. Research, development and innovation. 3. Infrastructures, personnel and supporting systems . 4. Opening-up and society orientation.
9	Collaborations announced in the RSP  List collaborations announced with other HEIs  List the collaborations announced with public authorities and at which level (local, national, international)  List the collaborations announced with business partners and the scope of the latter (local, national, international)	Profile Territorial embedding	Collaborations are really important at the UAM, though these collaborations are not always explicit in the RSP and other documents.
10	Indicators included in the documents about the achievement of the strategic plan	Autonomy Strategic capabilities	Not yet available
11	Follow-up and evaluation devices included in the documents about the	autonomy	Document produced after a follow-up meeting

**4. d. Third step : data reflecting the strategies of the institution and the coherence between strategic documents and “facts” or output**

A further step shall consist in confronting what is announced in the strategic documents and what is done. This supposes to have access and to exploit another type of documents such as: **budget, follow-up reports, activity reports, auto-evaluation reports, “framework” for the budget, “following” or “previous” RSP...**

As for the first step, the group identified some items to be looked at and for which information should be gathered (again, “no/yes” or “X” answers should be avoided).

### Documents identified in UAM

1. Follow-up of the Strategic Plan 2003-2006,
2. Report about UAM Research Activities 2005,
3. Annual University Senate (Claustro) Reports.
4. Web page ([www.uam.es](http://www.uam.es)) which provides some statistical data

### Documents identified in Lausanne

1. Annual activity report 2005 (“rapport annuel 2005”)
2. Annual “management” report 2005 (“rapport de gestion 2005”)
3. Statistical report 2005-2006 (“annuaire statistique 2005-2006”)

### Documents identified in Paris-Sud

1. 4 years project for the strategic plan 2002-2005
2. Follow-up of the Strategic Plan 2002-2005,
3. 4 years project for Research Activities 2006-2009,
4. Various official Reports on global issues including research and governance of the university (4 reports during the last 2 years 2005-2006).
5. Web page ([www.u-psud.fr](http://www.u-psud.fr)) which provides some statistical data

These documents will be analysed in order to answer the following items and construct the following data (items 12 to 16)

	Items to document	Key questions it informs	Evaluation tools	evolution
12	Budget dedicated to the strategic priorities of the RSP	Autonomy and strategic capacity	<p>%of the whole university budget that the university can freely affect (i.e. on which the university can make decisions and which is not affected to unavoidable expenses such as heating, etc. )</p> <p>which % of this “free” budget has been allocated to the priorities announced in the RSP</p> <p>distribution of the budget allocated to the RSP priorities compared to the distribution announced in the RSP and % of similarity</p> <p>Congruence between the priorities announced in the RSP and the budget allocation: very high (&gt; 80%)/ high (79 to 50%)/ low (49 to 20%)/ very low (&lt;19%)</p>	<p><b>All questions raised in this page must be evaluated through time (what exists now compared to the preceding RSP)</b></p>

	Items to document	Key questions it informs	Evaluation tools	evolution
13	Allocation of new or vacant positions the years following the last RSP	Autonomy and strategic capacity	<p>Number of creations/reallocations/suppression during the years following the last RSP</p> <p>% of positions allocated to the key-themes announced in the strategic plan</p> <p>distribution of the positions allocated to the RSP priorities compared to the distribution announced in the RSP and % of similarity</p> <p>Congruence between the priorities announced in the RSP and the allocation of positions: very high (&gt; 80%)/ high (79 to 50%)/ low (49 to 20%)/ very low (&lt;19%)</p>	
14	Buildings/equipments allocated to the key-themes announced in the strategic plan	Autonomy and strategic capacity	<p>Number of new buildings/equipments during the years following the last RSP (budget and spread off of the fund providers)</p> <p>5 years investment plan as a % of total investment budget</p> <p>average time spent between the strategic decision to launch a new building/equipment and the starting of its build up</p> <p>distribution of the buildings/equipments allocated to the RSP priorities compared to the distribution announced in the RSP and % of similarity</p> <p>Congruence between the priorities announced in the RSP and the creation of new buildings/equipments: very high (&gt; 80%)/ high (79 to 50%)/ low (49 to 20%)/ very low (&lt;19%)</p>	
15	<p>Evaluation processes : use of the indicators present in the strategic plan in the follow up documents</p> <p>use of the follow-up and evaluation devices</p>	Autonomy and strategic capacity	<p>Narrative</p> <p>narrative</p>	

	Items to document	Key questions it informs	Evaluation tools	evolution
16	<p>Collaborations which have been effectively developed according to the strategic documents</p> <p>Distinguish collaborations with other HER institutions, with public authorities, with economic partners</p>	<p>Autonomy strategic capacity, profile and territorial embedding</p>	<p>For each category of collaborations:</p> <p>List the effective collaborations</p> <p>Assess the degree of congruence between the collaborations announced in the RSP and the effective ones (very high if over 80% are effective, high between 79 and 50%, low between 49 and 20%, very low below 20%)</p> <p>When collaborations are not achieved, identify the reasons why (narrative)</p>	

#### 4. University of Lausanne

	Items to document	Key questions it informs	Evaluation tools	evolution
12	<p>Budget dedicated to the strategic priorities of the RSP</p>	<p>Autonomy and strategic capacity</p>	<p>% of the whole university budget that the university can freely affect (i.e. on which the university can make decisions and which is not affected to unavoidable expenses such as heating, etc. )</p> <p>After the transfer of 4 disciplines to its two partner institutions, UNIL had 30 millions (Swiss francs), i.e. about a tenth of the whole budget, on which UNIL could freely affect. Nevertheless, these 30 millions were only freely affectable for once. Once the decision taken about where to invest it, it was as good as “unchangeable”.</p> <p>Besides these 30 millions, it is difficult to say what is the % of the budget that UNIL can freely affect.</p> <p>Which % of this “free” budget has been allocated to the priorities announced in the RSP</p> <p>Regarding the 30 millions, almost 100%. 20 millions for life sciences, 10 millions for humanities.</p> <p>Distribution of the budget allocated to the RSP priorities compared to the distribution announced in the RSP and % of similarity</p> <p>Congruence between the priorities announced in the RSP and the budget allocation:</p>	<p>All questions raised in this page must be evaluated through time (what exists now compared to the preceding RSP)</p>

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			<p>very high (&gt; 80%)/ high (79 to 50%)/ low (49 to 20%)/ very low (&lt;19%)</p> <p>Regarding the 30 millions, very high.</p>																						
13	<p>Allocation of new or vacant positions the years following the last RSP</p> <p>2003 2005</p>	<p>Autonomy and strategic capacity</p>	<p>Number of creations/reallocations/suppression during the years following the last RSP</p> <p>% of positions allocated to the key-themes announced in the strategic plan</p> <p>Distribution of the positions allocated to the RSP priorities compared to the distribution announced in the RSP and % of similarity</p> <p>Faculties less explicitly involved in priorities/Faculties explicitly involved in priorities</p> <p>Percentage of personnel: comparison 2003-2005</p> <table border="0"> <tr> <td>2003</td> <td>2005</td> </tr> <tr> <td>Theol. and Rel. Stud.</td> <td>2.6% 2.6%</td> </tr> <tr> <td>Law and Crim. Just.</td> <td>8.4% 8.4%</td> </tr> <tr> <td>Arts</td> <td>17.3% 16%</td> </tr> <tr> <td>Social and Pol. Sci.</td> <td>12.5% 15.3%</td> </tr> <tr> <td>Econ. and Business Adm.</td> <td>12.4% 13.5%</td> </tr> <tr> <td>Earth Science and Environ.</td> <td>7.6% 7.7%</td> </tr> <tr> <td>Biology and Medicine</td> <td>35.7% 36.5%</td> </tr> <tr> <td>(Sciences until 2003)</td> <td>3.5% 0</td> </tr> </table> <p>Total Number of full time positions:</p> <table border="0"> <tr> <td>2003</td> <td>2005</td> </tr> <tr> <td>1458</td> <td>1640.31</td> </tr> </table> <p>Congruence between the priorities announced in the RSP and the allocation of positions: very high (&gt; 80%)/ high (79 to 50%)/ low (49 to 20%)/ very low (&lt;19%)</p> <p>Low to high. In percentages, the</p>	2003	2005	Theol. and Rel. Stud.	2.6% 2.6%	Law and Crim. Just.	8.4% 8.4%	Arts	17.3% 16%	Social and Pol. Sci.	12.5% 15.3%	Econ. and Business Adm.	12.4% 13.5%	Earth Science and Environ.	7.6% 7.7%	Biology and Medicine	35.7% 36.5%	(Sciences until 2003)	3.5% 0	2003	2005	1458	1640.31
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(Sciences until 2003)	3.5% 0																								
2003	2005																								
1458	1640.31																								

			<p>congruence seems not to be high. Nevertheless, the absolute number of personnel has quite strongly increased in the priorities but also in other fields, especially in social and political sciences.</p>
14	Buildings/equipments allocated to the key-themes announced in the strategic plan	Autonomy and strategic capacity	<p>Number of new buildings/equipments during the years following the last RSP (budget and spread off of the fund providers)</p> <ul style="list-style-type: none"> <li>-Adaptation of pharmaceutical building to needs of the “centre integrative de génomique (CIG)”(Key theme)</li> <li>-Transformation of the “Château de Dorigny”for needs of new Human Resources service (finished December 2005)</li> <li>-Transformation of the “Ferme de la Mouline” for needs of different services (end spring 2006)</li> <li>-Beginning of construction of a new building for Faculties of Economy and Human Sciences</li> </ul> <p>4 transformed or new buildings/equipments.</p> <p>5 years investment plan as a % of total investment budget</p> <p>Average time spent between the strategic decision to launch a new building/equipment and the starting of its build up</p> <p>Distribution of the buildings/equipments allocated to the RSP priorities compared to the distribution announced in the RSP and % of similarity</p> <p>To a very large part.</p> <p>Congruence between the priorities announced in the RSP and the creation of new buildings/equipments: very high (&gt; 80%)/ high (79 to 50%)/ low (49 to 20%)/ very low (&lt;19%)</p> <p>Low -&gt; Although the pharmaceutical building has been transformed in a building for the CIG, not all plans have been achieved. A large project for a animal house could not be realised because of the rejection in a cantonal votation.</p>

	Items to document	Key questions it informs	Evaluation tools	evolution
15	<p>Evaluation processes : use of the indicators present in the strategic plan in the follow up documents</p> <p>use of the follow-up and evaluation devices</p>	Autonomy and strategic capacity	The “Rapport de gestion” is a instrument of examination of the UNIL for the University Council, the (cantonal) parliamentary commissions and the cantonal department of education. This reports wants to give a <i>narrative</i> overview about he achievement of its mission and strategic objectives.	
16	<p>Collaborations which have been effectively developed according to the strategic documents</p> <p>Distinguish collaborations with other HER institutions, with public authorities, with economic partners</p>	Autonomy strategic capacity, profile and territorial embedding	<p>For each category of collaborations: List the effective collaborations Assess the degree of congruence between the collaborations announced in the RSP and the effective ones (very high if over 80% are effective, high between 79 and 50%, low etween49 and 20%, very low below 20%) When collaborations are not achieved, identify the reasons why (narrative)</p> <p>-The cantonal govenment ratifies the regulation about the collaboration between UNIL and the « Centre hospitalier universitaire vaudois (CHUV) ». All research and teaching activities are entrusted to the Faculty of Biology and Medicine. Very high congruence. -Programme « SVS » in collaboration with UNIGE and EPFL began in 2001 and will end in 2006. A new programme between these partners is examined. It may include new partners, such as the two university hospitals from Lausanne and Geneva. Seems to be very high congruence. However it is difficult to say because no time limit is visible in the first convention. -Triangle Azur : Collaboration between UNIL, UNINE and UNIGE. This collaboration has been concentrated on certain activities compared to the declaration of 2002. High congruence.</p>	

### 5. Universidad Autónoma de Madrid

	Items to document	Key questions it informs	Evaluation tools
12	Budget dedicated to the strategic priorities of the RSP	Autonomy and strategic capacity	No strategic priorities. The UAM is regarded as having a low degree of autonomy because of the amount of funding of free use.
13	Allocation of new or vacant positions the years following the last RSP	Autonomy and strategic capacity	Allocation of new or vacant positions mostly based on teaching needs.
14	Buildings/equipments allocated to the key-themes announced in the strategic plan	Autonomy and strategic capacity	Important way to detect implicit research priorities.
15	Evaluation processes : use of the indicators present in the strategic plan in the follow up documents  use of the follow-up and evaluation devices	Autonomy and strategic capacity	Not yet enough developed.
16	Collaborations which have been effectively developed according to the strategic documents  Distinguish collaborations with other HER institutions, with public authorities, with economic partners	Autonomy strategic capacity, profile and territorial embedding	Main achievement: Scientific Park.

#### 4. e. Fourth step: monitoring of the activities (existing instruments) :

This step shall focus on (un-)existing instruments, follow-up methods, evaluation procedures that the institution use (or not) in order to implement its research strategy. That might be found within the administrative status of the institution, within an internal administrative document referring to evaluation or ad-hoc procedures, etc. (items 17 and 18).

	Items to document	Key questions it informs	Evaluation tools	Evolution
17	Instruments (tools) that the research manager (or president, or board) use to implement the institution strategy.	Autonomy and Strategic capabilities	Description of the tools: list them and tell how they are managed and by whom  For each instrument/tool tell whether it was imposed by external partners (indicate which ones), proposed by external partners (indicate which ones), freely	Evolution over the last 5 years :  Assess whether such tools are more: frequent/less frequent More used / less used than five years

			<p>designed/chosen by the university</p> <p>Assess whether those instruments are used (distinguish among them if necessary): very much / much/ rarely/never</p> <p>a) The “Rapport de gestion” is a instrument of examination of the UNIL for the University Council, the (cantonal) parliamentary commissions and the cantonal department of education.</p> <p>b) Creation of a new evaluation concept (mentioned as example by European University Association. It is going beyond a simple quantitative approach. The faculties of Economy and law are the first two faculties to be evaluated this year (2006) by this instrument.</p> <p>The evaluation is composed of four steps:  1. Every four years each faculty prepares an auto-evaluation and the planned actions for the next four years.  2. Expertise of this auto-evaluation by a committee of external experts.  3. University direction pronounces its opinion about the documents issued from this process.  4. Each faculty finalises its actions plan by considering the recommendations of the experts and the direction.</p> <p>This process should be achieved by the faculties of Economy and Law at the end of July 2006.</p>	<p>ago (distinguish among them if relevant)</p> <p>The production of this type of document has been approved by the University Senate in 2004.</p> <p>This is a new instrument and that is applied by two faculties. Afterwards it should be used by all faculties.</p>
18	Follow-up indicators or data used as a research evaluation assessment	strategic capacity	<p>Description of the existing indicators</p> <p>The “Rapport de gestion” evaluates research roughly. The faculties describe a bit their research activities.</p> <p>The new evaluation concept is not yet known by us but may go more in detail.</p> <p>Congruence (in %) between these indicators and those announced in the RSP  Explain the differences if possible</p>	<p>Evolution over the last 5 years :</p> <p>Assess whether such indicators are more: frequent/less frequent  More used / less used than five years ago (distinguish among them if relevant)</p> <p>The fact that a new evaluation concept has been created</p>

			<p>(narrative)</p> <p>The SRP did announce evaluation of research, without precising any details.</p> <p>Assess whether those indicators are used (distinguish among them if necessary): very much / much/ rarely/never</p>	<p>shows that much evolves in this domain since the last years.</p>
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### 6. Universidad Autónoma de Madrid

17	<b>Instruments (tools) that the research manager (or president, or board) use to implement the institution strategy.</b>	<b>Autonomy and Strategic capabilities</b>	<b>The implementation of the Research Strategic Plan has differed between issues. Some initiatives that were not planned in the Plan are being implemented, since they were considered necessary for the adequation of the UAM to the European control mechanisms.</b>	
18	Follow-up indicators or data used as a research evaluation assessment	strategic capacity	The UAM Strategic Research Plan does not establish priority lines, but general objectives such as: to strengthen the recognised excellence in research of the UAM, to improve the management of the Research Service, or to foster the Scientific Park. These objectives are applied through projects and actions. However, the lay out of this first Plan is considered generic, mainly based on principles. Due to the lack of measurable objectives, the evaluation appears to be complicated and the necessity of objective indicators to use along time was highlighted.	

### 4. f. Fifth step : practices and styles of governance

This fifth step can not rely on existing and accessible data. It requires creation of data through field work. Each university PRIME team would be responsible for leading 10 to 15 interviews in its university, to exploit them and to construct the results.

The interview guide remains to be elaborated and should be rather formalised and standardised in order to be sure that it will allow the documentation of SWOT analysis and Likert scales. All the following questions will be used as a guide by the Prime researcher in order to be able to assess the strengths, weaknesses, opportunities and threats.

The interviews should deal with four domains to qualify/characterize the governance of each university: style of governance + constraints + role of evaluation + degree of uniqueness. For each of them we identified the issues to be raised in the interviews and the related key questions. The complete guideline for the interviews is available in annexe.

### 5. Styles of governance

On this first domain, the following questions will be asked. Italics have been used to precise the kind of information which should be collected.

- in this university, who is involved in, who participates to the governance of the university? More specifically, on research issues, which are the more influent, more

active levels ? (distinguish between (individuals researchers, research centres, faculty, university managers, stakeholders, others?)

- in this university who is consider as part of the leadership? Can you qualify the type of leadership they mobilise? Can you describe the relationships they have one with another (*solidarity, conflicts, etc...*)
- can you describe how the RSP plan is prepared in this university? Who has been involved? How much? How ? (individuals researchers, research centres, faculty, university managers, administrative staff, university bodies, stakeholders, others?)
- Can you describe the nature of the process: many conflicts or not? Many compromises/negotiations or not? A final document made of the juxtapositions of the individual projects or the result of collective choice / of authoritarian decisions from the top / other

## **NARRATIVE FROM THE UAM:**

### **1. STYLE OF DECISION MAKING: DEMOCRATIC UNIVERSITY.**

Spanish universities are, in general, characterised by collective styles of governance. These styles are based on the existence of plural decision committees that act as organs of government. The main organ of government is the University Government Board. Besides, Spanish universities incorporate the presence of society through the Social Council. This is formed by the Rector (president), the General Secretary, the Management Director and other 50 members of the academic community. The Social Council supervises the strategic lines of teaching, research, human resources, and financial resources and the approval of the budget. Although the role of the Social Council appears to be very important, in practice it plays a more reduced role than desirable.

This organisational structure assures the representativity of all the groups of the institution. One of the most outstanding characteristics of the collective model in Spanish universities is that the Rector and the rectoral team are democratically elected by the academic community for four years. The candidates are academics with a recognised prestige in their disciplines and an active role in the academic life. The organisational structure has similar characteristics when referring to the Government Council of the faculties (Faculty Board) or the Departments Councils.

In summary, this collective model is a democratic system of government that endeavours to assure the participation of all the groups of the academic community and to avoid concentration of power.

In this line, all the interviewees have considered that the UAM has a democratic style of governance and, in many cases, this decision was explained historically by the Spanish dictatorial past. As every organisational model, the selection of a democratic style has direct consequences over the management of a university. Therefore, some interviewees consider that, nowadays, the democratic style is not the most appropriate way to select and nominate university authorities, despite being crucial in a previous historical moment. This model does not assure criteria of efficiency and rationale in decision making, since the top authorities are not selected because of their management capacities, but because of their academic prestige. Besides, the process generates a series of micro-political pressures that directly affects the autonomy and the margin of manoeuvre of the people in charge.

## P R I M E - O E U G U I D E - G O V E R N A N C E

According to some opinions, this model also affects negatively the articulation of a suitable hierarchical structure in the research activities. It would be necessary to assume the existence of different roles, categories and functions within the academic community. However, this idea radically clashes with the egalitarianism extended in the academic community. For example, in many cases assistant teachers and professors take the same tasks in spite of their different categories and experience, and these teachers are requested to do administrative duties that should be done by administrative personnel.

### 2. STYLE OF CONFLICT RESOLUTIONS: MEDIATOR OR STABILISER.

The interviews reveal that the UAM is generally oriented towards negotiation, the stabilisation and the conciliation of interests. In this sense, it has been highlighted that the rectoral team tries to maintain a balanced position, though final decision making is always affected by the social and political risk that poses each option. This stabiliser behaviour is perceived by some to hinder new approaches in management, since the university tries to reach an intermediate position in order to avoid negative responses from the different groups.

From the exploitation of the answers, the following indicators will be built

19	<b>Degree of participation to the governance of the university</b>	<i>Very participative/ decentralized</i>	<i>Rather participative/ decentralized</i>	<i>Rather not participative/ centralized</i>	<i>Not participative/ centralized</i>
		Autonomy			Degree of cooperation %+%+%+% = 100%
20	Degree of participation to the governance of the research issues in this university	<i>Very participative/ decentralized</i>	<i>Rather participative/ decentralized</i>	<i>Rather not participative/ centralized</i>	<i>Not participative/ centralized</i>

21	<b>Degree of participation to the preparation of the RSP</b>	<i>Individual researchers</i>	<i>Directors of labs</i>	<i>Department chairs</i>	<i>Deans</i>	<i>Administrative staff</i>	<i>University bodies (which ones)</i>	<i>University managers (president+ team)</i>	<i>Others (who?)</i>
	In % and %+%+%+% = 100								

22	<i>Sentence characterizing the best the RSP</i>	<i>completely</i>	<i>More or less</i>	<i>Not really</i>	<i>Not at all</i>
	<p>The RSP is made of the collection of individual projects</p> <p>The RSP defines the research priorities of the university as built through an internal collective process</p> <p>The RSP defines the research priorities of the university as set by the university managers</p>				

### 7. University of Lausanne

From the exploitation of the answers, the following indicators will be built <sup>4</sup>					
19	Degree of participation to the governance of the university	Very participative/ decentralized	Rather participative/ decentralized	Rather not participative / centralized	Not participative/ centralized
		X (University Council with equal representation of different university members)			Degree of cooperation %+%+%+% = 100%
20	Degree of participation to the governance of the research issues in this university	Very participative/ decentralized	Rather participative/ decentralized	Rather not participative / centralized	Not participative/ centralized
			X (The power is quite centralized. As a consequence, conviction of involved partners is very important in order to start important research project.)		

(The RSP has been built on existing things. However, it was the rectorate that decided to concentrate on certain domains and to develop them more strongly. The concrete implementation of this strategy, i.e. the development of the concrete projects has been made by a bottom up action.)

### 8. Universidad Autónoma de Madrid

19	Degree of participation to the governance of the university	<i>Very participative/ decentralized</i>	<i>Rather participative/ decentralized</i>	<i>Rather not participative/ centralized</i>	<i>Not participative/ centralized</i>
		X			Degree of cooperation %+%+%+% = 100% (1)
20	Degree of participation to the governance of the research issues in this university	<i>Very participative/ decentralized</i>	<i>Rather participative/ decentralized</i>	<i>Rather not participative/ centralized</i>	<i>Not participative/ centralized</i>
		X (2)			

(1) As mentioned above, the UAM has not gathered information in percentages. The UAM has experienced methodological drawbacks when asking for percentages of participation: many interviewees found themselves unable to assign percentages to each group, and preferred to address each group one item of the scale low-medium-high.

(2) This activity is developed through both the 'Research Administrative Office', which assist the administration of regional, national or European competitive projects, and the TTI<sup>5</sup>,

<sup>4</sup> We base our answers to the following indicators on the interviews with responsables of the Center of Integrative Genomics (CIG). The answers could vary for other entities. However, the CIG has got a big priority within the Strategic Research Plan of UNIL. That is the reason why we have chosen it.

<sup>5</sup> Technology Transfer Institution.

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which assist the management of non-competitive projects and contracts. The Scientific Park can also assist the administration of research activities funded by external agents.

21	<b>Degree of participation to the preparation of the RSP</b>	<i>Individual researchers</i>	<i>Directors of labs</i>	<i>Department chairs</i>	<i>Deans</i>	<i>Administrative staff</i>	<i>University bodies (which ones)</i>	<i>University managers (president+ team)</i>	<i>Others (who?)</i>
	In % and %+%+%+%+=100	High	Low	Low (3)	Low (3)	Low (4)		High	

22	<i>Sentence characterizing the best the RSP</i>	<i>completely</i>	<i>More or less</i>	<i>Not really</i>	<i>Not at all</i>
	The RSP is made of the collection of individual projects The RSP defines the research priorities of the university as built through an internal collective process The RSP defines the research priorities of the university as set by the university managers				

21	<b>Degree of participation to the preparation of the RSP</b>	<b>Individual researchers</b>	<b>Directors of labs</b>	<b>Department chairs</b>	<b>Deans</b>	<b>Administrative staff</b>	<b>University bodies (which ones)</b>	<b>University managers (president+ team)</b>	<b>Others (who?) Cantonal Government</b>
	In % and %+%+%+%+=100		20% (at least the initiative concerning the CIG have come from a lab director, W.Wahli)		20% (discussions about orientation took place at faculty level too)			40% (took important strategic decisions: 1. distribution of 30 millions on domains. 2. Attract new researchers.)	20% (had to be convinced and agree)

22	<i>Sentence characterizing the best the RSP</i>	<i>completely</i>	<i>More or less</i>	<i>Not really</i>	<i>Not at all</i>
	The RSP is made of the collection of individual projects  The RSP defines the research priorities of the university as built through an internal collective process  The RSP defines the research priorities of the university as set by the university managers			X  x	

(3) In general, they are considered more dedicated to teaching and internal management than to research management.

(4) Except the Research Administrative Office.

### 5. a. Types of constraints

On this second domain, the following questions will be asked. Italics have been used to precise the kind of information which should be collected.

- describe the role and influence of the different stakeholders in the elaboration of the research strategic plan ?

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*stakeholders (national – regional – local authorities / business representatives – representatives of funding agencies, etc)*

- how far should the research strategic plan respect some compulsory priorities ? Where were they coming from?
- must the RSP be discussed with /negotiated with/ agreed upon from external stakeholders or public authorities ? Describe how it works?  
stakeholders (national – regional – local authorities / business representatives – representatives of funding agencies, etc)
- which stakeholders (name and identify) exercise some influence (and how) on the definition of the public policies (*at supra national/ national/ territorial levels*) concerning research issues and constraining the definition of the university research strategies ?
- What is the capacity of the university in influencing the definition of the public policies (*at supra national/ national/ territorial levels*) concerning research issues
- Can you explain how the university management can implement the RSP? How much leeway does it have on the allocation of positions/budget/buildings and equipment? What limits does it meet? Where are those constraints coming from? From internal resistance/opposition? From external constraints (which ones ? How)
- Can you describe how and how far is the present RSP implemented? Which problems are met? Why ?

From the exploitation of the answers, the following indicators will be built

23	<b>Sentence characterizing the best the RSP (to be added to the sentences identified on the first domain)</b>	<i>completely</i>	<i>More or less</i>	<i>Not really</i>	<i>Not at all</i>
	The RSP defines the research priorities of the university as imposed by the supra national/ national/ territorial public authorities  The RSP defines the research priorities of the university as imposed by the stakeholders (which ones?)				

24	<b><i>How independent from the following actors is the university in the definition of its priorities</i></b>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	Supra national public authorities  National public authorities  territorial public authorities  stakeholders (which ones)				

25	<b><i>Capacity of influence of the university on</i></b>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	Supra national public authorities  National public authorities  territorial public authorities				

26	<b>How independent is the university in the implementation of the RSP</b>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	In budget allocation  In the management of positions  In the decision about building and equipments				

### 9. University of Lausanne

23	<b>Sentence characterizing the best the RSP (to be added to the sentences identified on the first domain)</b>	<i>completely</i>	<i>More or less</i>	<i>Not really</i>	<i>Not at all</i>
	The RSP defines the research priorities of the university as imposed by the supra national/ national/ territorial public authorities  The RSP defines the research priorities of the university as imposed by the stakeholders (which ones?)		x (indirectly yes)  x (not the precise content but indirectly by the federal demand to cooperate with other HEI in order to create strong centers)		

24	<b>How independent from the following actors is the university in the definition of its priorities</b>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	Supra national public authorities  National public authorities  Territorial public authorities  Stakeholders (which ones)		X (competition)  x (demand to cooperate and build strong center)  x (university needs the general and sometimes financial agreement)		

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25	<i>Capacity of influence of the university on</i>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	Supra national public authorities	x			
	National public authorities			x <sup>6</sup>	
	Territorial public authorities			x	

26	<i>How independent is the university in the implementation of the RSP</i>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	In budget allocation			X (Rectorate could decide how to distribute the 30 millions)	
	In the management of positions			x (rectorate decided to pay only new researchers by the money SVS projects)	
	In the decision about building and equipments	X (the animalery project had to be approved/rejected by the cantonal population)			

<sup>6</sup> Its influence can be considered important thanks to the « Rectors' Conference of the Swiss Universities ».

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23	<b>Sentence characterizing the best the RSP (to be added to the sentences identified on the first domain)</b>	<i>completely</i>	<i>More or less</i>	<i>Not really</i>	<i>Not at all</i>
	The RSP defines the research priorities of the university as imposed by the supra national/ national/ territorial public authorities  The RSP defines the research priorities of the university as imposed by the stakeholders (which ones?)				

24	<b>How independent from the following actors is the university in the definition of its priorities</b>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	Supra national public authorities		X (5)		X (5)
	National public authorities		X (5)		X (5)
	territorial public authorities		X (5)	X (6)	
	stakeholders (which ones)		X (7)		X (8)

25	<b>Capacity of influence of the university on</b>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	Supra national public authorities		X (11)		
	National public authorities		X (11)		
	territorial public authorities				

26	<b>How independent is the university in the implementation of the RSP</b>	<i>Very low</i>	<i>low</i>	<i>Important</i>	<i>Rather important</i>
	In budget allocation	X	X (9)		
	In the management of positions	X	X (10)		
	In the decision about building and equipments	X	X (9)		

(5) The agents that affect the most are the European Commission, the Science and Education Ministry (MEC) and, in the case of the UAM, the Madrid Regional Government (CAM). These agents, as the main financial backers, turn out to be crucial in the definition of priority lines: they indirectly influence the definitions of priority lines since they grant researchers to carry out research.

(6) The president of the Social Council is elected by the Territorial Government. The Spanish university has included the presence and participation of society in its organisational structure through the Social Council. This Council is formed by the representatives of the

main trade unions, the town council, foundations and some firms, as well as by external prestigious experts and university representatives<sup>7</sup>. This organ is engaged in the supervision of the university economic activities and the performance of its services, the attraction of university funding from society and the involvement of the university in the cultural, professional, economic and social environment. Accordingly, the Social Council is also responsible for the approval of the university budget and the two-year scheduling. Moreover, the territorial government is currently implementing a new system for the distribution of governmental funds based on productivity issues and results-focused.

Besides, the autonomy of the university is also affected by the regulations coming from the regional government that regulates some actions and consequently limits the independence of these institutions. For example, the construction of new buildings for old faculties is not allowed if the existing ones have not been maintained and repaired.

- (7) Other entities, like the business associations, individual companies or city councils influence the university in a lesser degree.
- (8) Regarding different stakeholders, the trade unions exercise an important pressure upon the autonomy of the UAM. They are perceived as limitations for the university to develop its real autonomy and its decision making capacity. Their egalitarianist principles make the creation of incentive systems impossible. Policies of incentives and punishments would imply a differentiation in wages (through bonuses) or even in the steering of research careers. These initiatives could foster research by creating means to be aware of excellence. However, trade unions consider that these initiatives would act against the egalitarianist principle that they defend. In this respect, interviewees state that, when the objective is the excellence search, trade unions could be impeding forces.
- (9) Regarding the real capacity of the university to mobilise and allocate resources of the research activity, most interviewees consider that there is not a real autonomy over resources since most of the funding is articulated through research projects and the main researcher is subsequently the one who decides how to use it, bearing in mind the project objectives and the financial backers restrictions. Moreover, the percentage of the research budget that can be freely managed (that is, at central level) by the rectoral team is considered low.
- (10) It is perceived that the autonomy of the university regarding personnel allocation is high but is not being exercised in order to foster research.
- (11) In general, the capacity of influence of the UAM on public authorities is low, excepting the institutional participation in the definition of the strategic lines of the National Plan and the Framework program of the European Union through the Rectors Commission -CRUE-.

## **5. b. Role of evaluation and follow-up in governance**

On this third domain, the following questions will be asked. Italics have been used to precise the kind of information which should be collected.

- Is there some evaluation/ follow-up of the implementation of the RSP? If no : why ?
- If yes, can you describe the instruments/indicators/devices the university management use in order to follow-up the implementation of the RSP? How frequent is the follow-up procedure ? Who uses this information?

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<sup>7</sup> Rector, Management Director and representatives of teachers and administrative personnel.

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- What happens when/if the follow-up reveals delay/deviation in the implementation of the RSP? To what extent do correction mechanisms exist? Can the university management decide or them on its own? Should it be negotiated with some actors internally (*which ones and what happens ? Does it work?*) Should it be negotiated with some external actors (*which ones and what happens ? Does it work?*)
- Are the projects announced as priorities in the RSP significantly better treated (funded, staffed...) that the projects which were not in the RSP ? If no : why? If yes : How ad how much?

From the exploitation of the answers, the following indicators will be built

27	Is the implementation of the RSP followed-up?	<i>carefully</i>	<i>Rather carefully</i>	<i>superficially</i>	<i>Not at all</i>

28	<i>Do the results the follow-up provoke corrective measures</i>	<i>systematically</i>	<i>Most of the time</i>	<i>rarely</i>	<i>never</i>

29	<i>Is the university management independent in the definition of these measures?</i>	<i>Yes, completely</i>	<i>Has to negotiate them internally</i>	<i>Has to negotiate them with (indicate with whom)</i>

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27	Is the implementation of the RSP followed-up?	<i>carefully</i>	<i>Rather carefully</i>	<i>superficially</i>	<i>Not at all</i>
			x (big projects by administration; smaller projects perhaps more superficially)		

28	<i>Do the results the follow-up provoke corrective measures</i>	<i>systematically</i>	<i>Most of the time</i>	<i>rarely</i>	<i>Never</i>
					X (for the moment not at all because the following indicators are just about to be introduced. But it will change)

29	<i>Is the university management independent in the definition of these measures?</i>	<i>Yes, completely</i>	<i>Has to negotiate them internally</i>	<i>Has to negotiate them with (indicate with whom)</i>
		?	?	?

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27	Is the implementation of the RSP followed-up? (12)	<i>carefully</i>	<i>Rather carefully</i>	<i>superficially</i>	<i>Not at all</i>

28	<i>Do the results the follow-up provoke corrective measures</i>	<i>systematically</i>	<i>Most of the time</i>	<i>rarely</i>	<i>never</i>

29	<i>Is the university management independent in the definition of these measures?</i>	<i>Yes, completely</i>	<i>Has to negotiate them internally</i>	<i>Has to negotiate them with (indicate with whom)</i>

(12) As there are not many measurable objectives in the RSP, a structured evaluation appears to be complicated. The evaluation of the Strategic Research Plan has been done basically by the Rectoral team. There have been a few meetings of free access for the whole academic community. Besides, an Office for the Strategic Plan was created in order to deal with all the issues related to the Plan: design, implementation, evaluation and follow-up. Also, it has been created a web page specifically devoted to the Strategic Plan, aiming at being a tool for communication and debate.

**5. c. Degree of Uniqueness**

On this last domain, the following questions will be asked. Italics have been used to precise the kind of information which should be collected.

- Would you say that the RSP of your university is very different from the RSP of other universities comparable with yours? In what ? How far? If not: why? How far was “being special” or “being different” a motto during the construction of the RSP?
- Would you say that the construction of the RSP took into account the existing situation/power balance/research structure within the university and try to replicate it, or would you say that in the contrary it tries to identify new fields, to promote new perspectives?
- Would you say that the research strategy of your university is to cover as many domains as possible or to identify a limited number of specific sectors for which it looks for excellence? If yes, is it a recent orientation? Where does it come from? Who pushes for it? If yes: same questions?
- How far did you take into account the local/territorial situation, or your position on the national/international scene in the elaboration of the RSP?

From the exploitation of the answers, the following indicators will be built

30	Complete each of the following sentences	<i>crucial</i>	<i>important</i>	<i>secondary</i>	<i>absent</i>
	Being different from other comparable universities was a ..... preoccupation in the elaboration of the RSP				
	Taking distance with the present research structure of the university was a ..... preoccupation in the elaboration of the RSP				
	Promoting a limited number of sectors of excellence was a ..... preoccupation in the elaboration of the RSP				

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30	Complete each of the following sentences	<i>crucial</i>	<i>important</i>	<i>secondary</i>	<i>absent</i>
	Being different from other comparable universities was a ..... preoccupation in the elaboration of the RSP	X (differentiation is a important factor in Swiss HEI policy)			X
	Taking distance with the present research structure of the university was a ..... preoccupation in the elaboration of the RSP			X (CIG has certainly a priority status, however other domains are also part of SRP)	
	Promoting a limited number of sectors of excellence was a ..... preoccupation in the elaboration of the RSP				

14. Universidad Autónoma de Madrid

30	Complete each of the following sentences	<i>crucial</i>	<i>important</i>	<i>secondary</i>	<i>absent</i>
	Being different from other comparable universities was a ..... preoccupation in the elaboration of the RSP				
	Taking distance with the present research structure of the university was a ..... preoccupation in the elaboration of the RSP				
	Promoting a limited number of sectors of excellence was a ..... preoccupation in the elaboration of the RSP				

If we consider some objective data, such as international rankings<sup>8</sup>, the number of ‘six year periods’<sup>9</sup> granted or the tenure positions obtained by UAM applicants at national level, the UAM is the first university in the country. However, no institutional document reflects the qualities that differentiate and distinguish the UAM from other Higher Education Institutions.

**6. From data to key questions and synthetic indicators**

The previous aimed section aimed at constructing data and indicators from different types of available documents (3.1, 3.2 and 3.3), from the analysis of evaluation/follow-up instruments and devices (3.4) and from information collected by interviews (3.5). The next step consists in using this data and indicators to position the concerned universities on four key questions: **autonomy, strategic capacities, profile and territorial embedding.**

At this stage, it seems to early to go very far into the methodology issues. This question shall be addressed by the analysts, during the implementation of the preceding stage (“3. From existing data to a set of indicators”). But we can point out that some of the key questions will be subdivided into different dimensions. At the end of the process, the governance for each university, should be characterized by 12 synthetic indicators.

**6. a. Autonomy**

Data and indicators about the autonomy of the institution can be gathered through many of the different items developed above. It seems moreover useful to distinguish four main domains of autonomy. For each of them, the items allowing to built a synthetic indicator will be mentioned.

- Autonomy of the university towards its external environment : items 8; 23; 24.

<sup>8</sup> For example, it has been considered the best university of Spain by the ‘Ranking of World Universities’ done by the Shanghai Jiao Tong University.

<sup>9</sup> A positive ‘six year period’ is granted to those who show an adequate productivity in research in terms of publications.

- Autonomy of the university management towards the university sub-units: items 7; 21; 23
- Autonomy of the university in the use/definition of the instruments/devices it uses : items 10; 11; 15; 16; 17; 29
- Autonomy about the management of resources: items 12; 13; 14; 25

### **6. b. Strategic capacities**

Again, data and indicators about the autonomy of the institution can be gathered through many of the different items developed above. It seems moreover useful to distinguish four main domains of autonomy. For each of them, the items allowing to build a synthetic indicator will be mentioned.

- Capacity in defining priorities: items 3; 4; 7; 30
- Capacity in constructing collective projects: items 19; 20; 21; 22
- Capacity in acting according to the decisions made: items 12; 13; 14; 28
- Capacity in evaluation owns action: items 10; 11; 15; 17; 18; 27.

### **6. c. Profile**

Two main dimensions will be measured here.

- Construction (or not) of a distinctive profile: items 1; 2; 3; 4; 5; 6; 30
- Characterization of the collaborations the university is involved in: items 9; 16.

### **6. d. Territorial embedding**

Again two dimensions will be measured on this issue.

- Capacity of the university to develop the collaborations it intends to achieve: items 9; 16
  - Influence of the university on its environment: items 8; 16; 23; 24; 25; 29

## 7. Annex

### 7. a. Annex 1 – Guidelines for the interviews

This guideline collects the questions developed in the fifth step of the process. Some more general questions have been added.

Introduction : Presentation of the study to the interviewee: goals, means and expected results. Confidentiality issues.

- Can you describe your function and your role in the governance of this university (including the 10 main partners for your work)?
- Considering your university, who is involved in, who participates to the governance of it ? If we focus on research issues, which are the more influent partners and the more active levels ?

(individuals researchers, research centres, faculty, university managers, stakeholders, others?)

- In this university who is considered as part of the leadership? Can you qualify the type of leadership they mobilise? Can you describe the relationships they have one with another (*solidarity, conflicts, etc...*)
- Can you describe how the RSP plan is prepared in the university? Who took the initiative? Who has been involved in (individuals researchers, research centres, faculty, university managers, administrative staff, university bodies, stakeholders, others?) ? How much? How ?
- Can you describe the nature of the process of research governance (long term strategy and short term management): many conflicts or not? *Many compromises/negotiations or not? A final document made of the juxtapositions of the individual projects or the result of collective choice / of authoritarian decisions from the top / other*
- Describe the role and influence of the different stakeholders in the elaboration of the research strategic plan (national – regional – local authorities / business representatives – representatives of funding agencies, etc)
- How far should the research strategic plan respect some compulsory priorities ? Where were they come from ?
- Must the RSP be discussed with /negotiated with/ agreed upon from external stakeholders or public authorities ? Describe how it works?

stakeholders (national – regional – local authorities / business representatives – representatives of funding agencies, etc)

- Which stakeholders (name and identify) exercise some influence (and how) on the definition of the public policies (*at supra national/ national/ territorial levels*) concerning research issues and constraining the definition of the university research strategies ?
- What is the capacity of the university in influencing the definition of the public policies (*at supra national/ national/ territorial levels*) concerning research issues
- Would you say that the RSP of your university is very different from the RSP of other universities comparable with yours? In what ? How far? If not: why? How far was Was “*being special*” or “*being different*” a motto during the construction of the most recent RSP?

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- Would you say that the construction of the RSP took into account the existing situation/power balance/research structure within the university and try to replicate it, or would you say that in the contrary it tries to identify new fields, to promote new perspectives?
- Would you say that the research strategy of your university is to cover as many domains as possible or to identify a limited number of specific sectors for which it looks for excellence? If yes, is it a recent orientation? Where does it come from? Who pushes for it? If yes: same questions?
- How far did you take into account the local/territorial situation, or your position on the national/international scene in the elaboration of the RSP?
- Is there some evaluation/ follow-up of the implementation of the RSP? If no : why ?
- If yes, can you describe the instruments/indicators/devices the university management use in order to follow-up the implementation of the RSP? How frequent is the follow-up procedure ? Who uses this information?
- What happens when/if the follow-up reveals delay/deviation in the implementation of the RSP? To what extent do correction mechanisms exist? Can the university management decide or them on its own? Should it be negotiated with some actors internally (*which ones and what happens ? Does it work?*) Should it be negotiated with some external actors (*which ones and what happens ? Does it work?*)
- Are the projects announced as priorities in the RSP significantly better treated (funded, staffed...) that the projects which were not in the RSP ? If no : why? If yes : How and how much?
- From your point of view what could be done to improve the elaboration of the RSP of this university?
- From your point of view what could be done to improve the implementation of the RSP of this university?
- From where do the main obstacles come from? The other way round what are the main strengths of this university? What are the main weaknesses? What are the main opportunities and threats?
- When have you been recruited at this university? Can you describe the main steps in your career? When did you decide to be involved in the university governance? What are the next steps you would consider as your responsibility in improving a better governance of your university?

7. b. Annex 2 - First step: Characterisation

15. Characterisation tables for Lausanne UNIL

Issues	Comments
<p><i>Above the university</i></p> <ul style="list-style-type: none"> <li>• Identification of all stakeholders of the university (nature, interests, tools for action, effective participation...).</li> <li>• Public authorities in charge of steering research within universities and at what levels</li> <li>• NGO and for profit organisations involved into the university</li> <li>• National research structures and description of their role with regard to university research: funding (projects/structures/staff), steering, evaluating</li> </ul>	<p>The « cooperative » federalism that is characterizing Switzerland's political system has also its impact on the Swiss system of research: there is some overlap between the tasks of the cantons and the tasks of the Confederation.</p> <p><i>At the federal level</i>, the research policy is managed by two offices which are part of two different departments:                  In the Federal Department of Home Affairs:  <b>State Secretariat for Education and Research (SER)</b>.                  In the Federal Department of Economic Affairs: <b>Federal Office for Professional Education and Technology (OPET)</b>. At present, the question of merging of both offices within one department is (again) on the agenda.</p> <p><i>At the cantonal level</i>, the governments are politically responsible for universities, especially the <b>directors of the departments for education</b>. The latter are united at the national level in the <b>Swiss Conference of Cantonal Ministers of Education (EDK)</b>.</p>
<p><i>Within the University</i></p> <ul style="list-style-type: none"> <li>• National research structures and description of their role with regard to university research: funding (projects/structures/staff), steering, evaluating</li> </ul>	<p>Funding: There are several funding sources for public research.<sup>10</sup> We can distinguish between different territorial levels and two types of funding (project funding, institutional funding<sup>11</sup>).</p> <p>At the federal level<sup>12</sup>:</p> <p>The Swiss National Science Foundation (SNSF) supports essentially (80%) fundamental and free research (Project funding).</p> <p>The Commission for Technology and Innovation (CTI) supports industrial and applied research (Project funding).<sup>13</sup></p> <p>Based on the number of students and their duration of studies<sup>14</sup>, the SER allocates, on a block grant basis, resources to the universities for teaching (70% of the whole funding). The other part (30%) is allocated according to universities' achievements in research (attraction of funds from SNSF, EU projects, third or private means, and CTI funding). (Institutional funding, based on the LAU).</p> <p>Federal offices also mandate researcher for getting valuation.</p> <p>(The Swiss Federal Institute of Technology Board decides about the operational budgets of the two Institutes of Technology (ETHZ, EPFL) and four other research institutes (institutional funding).)<sup>15</sup></p> <p>At the cantonal level:                  The University home cantons finance their own university (institutional funding, based on the different cantonal university laws).                  All cantons pay for their inhabitants studying in another canton (institutional funding, based on the intercantonal university agreement (AIU<sup>16</sup>)).</p>

<sup>10</sup> 75% of research are private and 25% are public. Source: Lepori, Benedetto. *La Politique de la Recherche en Suisse. Institutions, acteurs et dynamique historique*. p. 88. Juin 2004.

<sup>11</sup> 75% of public research funding are institutional, 25% are project funding. Source: Lepori, Benedetto. *La Politique de la Recherche en Suisse. Institutions, acteurs et dynamique historique*. p. 195. Juin 2004.

<sup>12</sup> Perellon, Juan-F.. *The Governance of Higher Education in a Federal System: The Case of Switzerland*. Tertiary Education and Management. Vol. 7, Number 2, 2001.

<sup>13</sup> Until now, over 60% of project costs were covered by industry, with the Confederation funding the rest. Thus, unlike in projects financed by the SNSF, private partners are involved in funding of CTI projects. Source : <http://www.bbt.admin.ch/kti/aufgaben/e/index.htm>.

<sup>14</sup> See « loi fédérale sur l'aide aux universités et la coopération dans le domaine des hautes écoles (LAU) ». In English: Federal Law on Financial Aid to Universities and Cooperation in Matters Relating to Universities

<sup>15</sup> Three types of Higher Education Institutions exist in Switzerland: Cantonal Universities, Federal Institutes of Technology (EPF) and Universities of applied Sciences (UAM). As the University of Lausanne is a cantonal University, we focus on this type of Higher Education Institution and do not treat the other two types in this document profoundly.

<sup>16</sup> Accord intercantonal universitaire.

	<p>Both levels: The Swiss University Conference (SUC) is the joint organization of the cantons and the Confederation for university policy.<sup>17</sup> It finances research projects by means of its program « Cooperation and innovation » (project funding).<sup>18</sup></p> <p>Private actors: Private foundations, industrial and other enterprises also finance sometimes public research projects, chairs of universities or give prizes, etc.</p> <p>Steering: As we can see in the paragraph above, several actors at different levels finance the Swiss HE&amp;R institutions. Special funding for research activities does exist (SNSF, CTI, european research funding and research funding of extra-university funding by SER). However, it is almost impossible to identify, among the important funds allocated through the LAU and the cantons, which part of the funds is used for which type of activity (research or teaching). This is the consequence of the interrelation of teaching and research in the Swiss HE landscape.<sup>19</sup></p> <p>This interrelation of teaching and research makes that the steering of research cannot be thought separately from the steering of teaching. Moreover, as we have seen, Swiss HE institutions are, on the basis of different legal frameworks, funded, thus steered, by actors at different levels. This makes the Swiss HE&amp;R system a relevant case of multi-level governance<sup>20</sup>.</p> <p>The steering of research, thus the entire Higher Education system depends also on the varying balance of power between the federal and cantonal authorities, the cantons having an university and the cantons without university, the different types of Higher Education Institutions, etc.</p> <p>Evaluation: The Center of Accreditation and Quality Assurance of the Swiss Universities (OAQ) carries out quality evaluations on behalf of the SER under the qualifying procedure for financial support stipulated by the federal law LAU. The qualifying procedure stipulated by the LAU requires quality audits at all cantonal universities to be carried out every four years which focus on the quality assurance systems operated by the universities.</p> <p>“The purpose of the independent Center of Accreditation and Quality Assurance of the Swiss Universities is to assure and promote the quality of teaching and research at the universities in Switzerland.”<sup>21</sup></p>
<ul style="list-style-type: none"> <li>Existing devices to: evaluate the Strategic Research Plan (frequency, description of the formal procedures)</li> </ul> <p>Allocate public research funding (frequency, description of the formal</p>	<p>The SRP plan, in the case of the University of Lausanne the « Strategic Vision », seems not to be evaluated regularly as such. However, the elements of the Strategic Vision appear also in the « Strategic Plan ». <sup>22</sup> And the direction of the UNIL has to emit “periodically” a report about the follow-up of this Strategic Plan for the cantonal Government.<sup>23</sup> This report has to be adopted by the University Council.<sup>24</sup></p> <p><i>At cantonal level (case of the University of Lausanne):</i> The canton provides to the university the funding that is necessary to its functioning and development. This funding is provided in the form of an annual subsidy.<sup>25</sup> (Between 2000 and 2004, there has been a convention of objectives which has been replaced by a strategic plan. This strategic plan is established by the university but must be validated by</p>

<sup>17</sup> Source: <http://www.cus.ch/wEnglisch/portrait/index.php>

<sup>18</sup> Benninghoff, Martin, Perellon, Juan-Francisco and Jean-Philippe Leresche. *L'efficacité des mesures de financement dans le domaine de la formation, de la recherche et de la technologie*. Perspectives européennes comparées et leçons pour la Suisse. Les Cahiers de l'Observatoire, n° 12, 2005.

<sup>19</sup> Perellon, Juan-F.. *New public management discourse and network-governance organisation in the Swiss higher education and research system : budget structure and doctoral training*. Unpublished.

<sup>20</sup> Idem.

<sup>21</sup> Source : [http://www.oaq.ch/pub/en/01\\_00\\_00\\_home.php](http://www.oaq.ch/pub/en/01_00_00_home.php)

<sup>22</sup> Interview with Nathalie Janz, associated (to the rectorate) of research.

<sup>23</sup> LUL, art. 24, al. m.

<sup>24</sup> LUL, art. 29, al. h.

<sup>25</sup> LUL, art. 37.

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<p>procedures)</p> <p>Ask the university to produce Strategic Research Plan (frequency, description of the formal procedures)</p>	<p>the State).</p> <p>For the rest: see “national research structures and description of their role with regard to university research”</p> <p>There is no mean to ask the university of Lausanne to produce a SRP. However, the elements of the Strategic Vision appear also in the « Strategic Plan ».<sup>26</sup> The latter must be developed between the cantonal government and the university on the beginning of the legislature<sup>27</sup>, i.e. each four years.</p>														
<p><i>University structure</i></p> <ul style="list-style-type: none"> <li>• faculty</li> </ul> <p>Number of Teachers by families of disciplines, by disciplines, by projects, by study programs?</p>	<p>Number of professors (prof. ordinaire, associé, assistant, extraordinaire) in full time (31.12.2004):</p> <table border="0"> <tr> <td>Theol. and Rel. Stud.</td> <td>11.6</td> </tr> <tr> <td>Law and Crim. Just.</td> <td>21.2</td> </tr> <tr> <td>Arts</td> <td>55.2</td> </tr> <tr> <td>Social and Pol. Sci.</td> <td>34.4/35.4 (with décanat)</td> </tr> <tr> <td>Econ. and Business Adm.</td> <td>56.4</td> </tr> <tr> <td>Earth Science and Environ.</td> <td>16.7/18.7 (with décanat)</td> </tr> <tr> <td>Biology and Medicine</td> <td>88.2/91.3 (with décanat)/ 173.3 (with Hospital CHUV)</td> </tr> </table>	Theol. and Rel. Stud.	11.6	Law and Crim. Just.	21.2	Arts	55.2	Social and Pol. Sci.	34.4/35.4 (with décanat)	Econ. and Business Adm.	56.4	Earth Science and Environ.	16.7/18.7 (with décanat)	Biology and Medicine	88.2/91.3 (with décanat)/ 173.3 (with Hospital CHUV)
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<p>Within them: existence of departments? Are they responsible for Teaching and Research, only for Teaching,</p>	<p>The faculties are organized in different manners. Generally, they are rather oriented towards research, teaching or both. Certain are structured in institutes, others know, beside institutes, (sometimes interfaculty) departments and sections or also centers. As good as all units are responsible for teaching and research. Although certain units strongly concentrate on research, no official list of laboratories exists about the University of Lausanne.</p>														
<p>Existence of labs: within the departments or not?</p>	<p>The research intensive units mentioned above may be part of institutes<sup>28</sup> or constitute an unit inside the same faculty but without being part of an institute or a department, etc.<sup>29</sup> Sometimes, labs are even inter-institutional. They result of a collaboration between different Higher Education Institutions. The research projects called “IRIS (intégration, régulation et innovation sociale)” are the fruit of such collaboration.</p>														
<ul style="list-style-type: none"> <li>• About those labs/departments</li> </ul> <p>Number and size Number of teams within each Formal decisional capacity (on paper)</p>	<p>We do not have a complete view of all labs existing at the University of Lausanne for the moment. This is due to the lack of formal existence of labs. However, research is often organized by labs. To take an example that corresponds to a laboratory we can cite the “Center for Integrative Genomics” (faculty of Biology and Medicine).</p> <p>This research centre is structured in ten research groups and one affiliated research group.<sup>30</sup> The research centre is composed of 139 people (technical and administrative included). The number of people per research group varies between 4 and 24.</p>														
<ul style="list-style-type: none"> <li>• University research structures (independent from faculties)</li> </ul> <p>Number Nature (Federation of research labs for instance, research labs...)</p>	<p>The University of Lausanne has several associated institutions (such as IDHEAP) and extra-university institut that are not included in faculties, but financially independent.</p>														
<ul style="list-style-type: none"> <li>• Deliberative / decisional bodies dealing with research issues</li> </ul> <p>At the university level: Size and composition, Formal attributions</p>	<p>The university council</p> <p>Composition: 18 members of the professoral body, 8 members of the intermediate body, 6 members of the administrative and technical staff body, 12 students.<sup>31</sup> Each body elects its representatives separately in each faculty.<sup>32</sup> The (renewable)</p>														

<sup>26</sup> Interview with Nathalie Janz, associated (to the rectorate) of research.

<sup>27</sup> LUL, art. 9.

<sup>28</sup> For example: « CRAPUL » (centre de recherche sur l'action politique de l'Université de Lausanne) is part of « IEPI » (Institut d'études politiques et internationales).

<sup>29</sup> For example: « Observatoire Science, Politique et Société » is part of the faculty of SSP but not

<sup>30</sup> Source: [http://www.unil.ch/cig/page7533\\_en.html](http://www.unil.ch/cig/page7533_en.html).

<sup>31</sup> LUL, art. 26.

<sup>32</sup> LUL, art. 27.

	<p>mandate lasts 3 years, except the students' mandate which lasts only 2 years.<sup>33</sup></p> <p>Formal attributions: There is no explicit competence in research matters for the University Council. Nevertheless, it has the possibility to influence research issues indirectly via a certain number of other competencies:                  To adopt the internal regulation about the general organisation of studies and research.<sup>34</sup>                  To deliver an opinion (in advance) about the pluriannual strategic plan and to adopt the report about its follow-up.                  To propose to the cantonal Government a candidate for the rector's position.                  To ratify the academic members of the direction chosen by the rector.<sup>35</sup></p> <p>Moreover, it exists a research commission that has got the competence to allow research fellowships for one year to doctoral students. These fellowships are funded by the National Science Foundation.</p>
At the faculty level: Size and composition, Formal attributions	<p>Although there are councils and different types of commissions at the faculty level, research does not seem to be one of their main themes.</p> <p>Generally speaking, the faculties organize teaching and research in the framework defined by the direction and the University Council.<sup>36</sup> Therefore, their autonomy in the organization of research seems to be restricted from at least a legal point of view.</p> <p>As an exception, the faculty of biology and medicine has got a vice-dean for research.</p>
At the department level: Size and composition, Formal attributions	
At the lab's level: Size and composition, Formal attributions	<p>Each professor is formally obligated to devote approximately 30% of his working time to research. In Humanities, the choice of research projects is tendentiously related to the chair holder. Except for certain collective projects such as projects "SVS", collective strategy with respect to research does not exist. The situation is different for Natural Sciences where a collective strategy can be often observed (see "Center for Integrative Genomics").</p>
<p><i>At the presidency / rectorate level</i></p> <ul style="list-style-type: none"> <li>persons in charge of the research policy issues<sup>37</sup> Number Statutes Mode of nomination</li> </ul>	<p>The <i>direction</i> has some general competences with regard to research: create structures of valorisation for research, conclude research mandates, etc.<sup>38</sup> It is composed by one rector and other (max.6) academic<sup>39</sup> and administratif members who are responsible of a certain sector.<sup>40</sup></p> <p>There is a <i>vice-rector in charge of research</i>. Like the other members of the direction, this vice-rector is chosen by the rector.<sup>41</sup> The latter is chosen by the cantonal Government after proposition by the University Council.<sup>42</sup></p> <p>At central university administration, there are two people in charge of the two main research projects, i.e. « <i>Anthropos</i> » and « <i>Science, Vie, Société (SVS)</i> ». Another person is in charge of european research projects, i.e. « <i>Euresearch</i> ».</p>
<ul style="list-style-type: none"> <li>structure in charge of the research policy issues type (administrative office, cabinet,...) number of staff level of qualification of the staff</li> </ul>	
<ul style="list-style-type: none"> <li>Existence of a Transfer office Formal Attributions Staff and qualification / origin of staff</li> </ul>	<p>PACTT is the joint office of Technology Transfer of the University and the University Hospitals of Lausanne. Its mission is to promote the transfer of the Institutions' technologies to the marketplace for society's use and benefit, by licensing its patented inventions.</p> <p>PACTT reports quarterly to a Managing Committee composed of the Director of</p>

<sup>33</sup> LUL, art. 27.

<sup>34</sup> LUL, art. 10.

<sup>35</sup> LUL, art. 29.

<sup>36</sup> LUL, art. 19.

<sup>37</sup> The composition of administration is something that may change according to the direction.

<sup>38</sup> LUL, art. 24.

<sup>39</sup> Academic members constitute the majority of the direction. They may be chosen from outside the university and work full time for this mandate. The mandate lasts 5 years and can be renewed. LUL, art. 23.

<sup>40</sup> LUL, art. 22.

<sup>41</sup> LUL, art. 23.

<sup>42</sup> LUL, art. 23.

	<p>the University Hospitals of Lausanne and the Rector of the University of Lausanne. An annual report is published.<sup>43</sup></p> <p>Both legal frameworks about the UNIL (i.e. LUL and RALUL) do not mention this transfer office. By this point of view, there seems to exist no formal (legal) attribution.</p> <p>The PACTT Team of Lausanne is composed by three people:<sup>44</sup></p> <ul style="list-style-type: none"> <li>• 1 person with a Ph.D. in molecular biology</li> <li>• 1 lawyer with a DEA in intellectual property</li> <li>• 1 person responsible for communication</li> </ul>
<ul style="list-style-type: none"> <li>• Who is the landlord of the estate of the university? Who is in charge of their maintenance Who pays for the maintenance?</li> </ul>	<p>The State (canton) places at the disposal of the University the needed buildings. The State deals with construction, big renovation and transformation of university's buildings.</p> <p>The University is in charge of servicing. (Source : University of Lausanne law (LUL), 2004 : art.43)</p>

### 16. Characterization tables for Universidad Autónoma de Madrid

Issues	Comments
<p><i>Above the university</i></p> <ul style="list-style-type: none"> <li>• Identification of all stakeholders of the university (nature, interests, tools for action, effective participation...).</li> <li>• Public authorities in charge of steering research within universities and at what levels</li> <li>• NGO and for profit organisations involved into the university</li> <li>• National research structures and description of their role with regard to university research: funding (projects/structures/staff), steering, evaluating</li> </ul>	<p>Although schools and colleges have the power to make their own rules, they have to obtain authorization from Public Authorities at regional levels for their internal organization and their Statutes.</p> <p>The University Autonomous of Madrid Statutes were approved in October 2003 by the Education responsible and the President of the Madrid regional Government.</p>
<p><i>Within the University</i></p> <ul style="list-style-type: none"> <li>• Existing devices to: Evaluate the Strategic Research Plan (frequency, description of the formal procedures) Allocate public research funding (frequency, description of the formal procedures)</li> <li>• Require the university to produce Strategic Research Plan (frequency, description of the formal procedures)</li> </ul>	<p>There are five main public organizations that define or help develop research activities in the university:</p> <ul style="list-style-type: none"> <li>- University Senate ("Claustro": Representatives of teachers, students and administrative staff),</li> <li>- Social Council (with representatives of Third Parties, such as companies),</li> <li>- Government Council,</li> <li>- Faculty Boards and</li> <li>- Department Councils.</li> </ul> <p>Among the tasks of the University Senate is to prepare the University Statutes and the Strategic Plan.</p> <p>The Government Council must analyse and approve both Statutes and Strategic Plan. This organization delegates the support and encouragement of research activities to a Research Commission.</p> <p>The Rector (president of the University Senate, the Social Council and the Government Council) chooses a Research Vice-Rector to manage and control the research activities in the university. The Vice-Rector is the president of the Research Commission.</p> <p>The above organizations have developed both the Statutes of the Autonomous University of Madrid (16/10/2003) and the Strategic Plan 2003-2006. This Strategic Plan develops four thematic actions, each of them involving several projects. One of these actions is related to the research and innovation activities in the UAM. This part of the Strategic Plan is called Research Strategic Plan.</p>

<sup>43</sup> Source : [http://www.pactt.ch/pactt\\_home/pactt\\_about.htm](http://www.pactt.ch/pactt_home/pactt_about.htm)

<sup>44</sup> Source : [http://www.pactt.ch/pactt\\_home/pactt\\_about.htm](http://www.pactt.ch/pactt_home/pactt_about.htm)

<ul style="list-style-type: none"> <li>National research structures and description of their role with regard to university research: funding (projects/structures/staff), steering, evaluating</li> <li>Existing devices to: evaluate the Strategic Research Plan (frequency, description of the formal procedures) allocate public research funding (frequency, description of the formal procedures) ask the university to produce Strategic Research Plan (frequency, description of the formal procedures)</li> </ul>	<p><u>National levels:</u> the research activities at the UAM are affected by the programs developed by the Ministry of Education and Culture (MEC). The MEC defines the priority lines of research which deserve funding.</p> <p><u>Regional levels:</u> There is a Regional Research Plan developed by the Madrid Regional Government (CAM). This Plan allows a part of the funds obtained by the UAM to be allocated the priority lines decided by the university. It confers more autonomy to the UAM regarding research activities.</p> <p><b>Follow-up about the Strategic Plan 2003-2006.</b> This first report was finalized in February 2005. It tried to analyze if everything went according to the plan. This report analyses the degree of advance of each project within the four actions and the objectives that were planned in the Strategic Plan.</p> <p><b>Annual Claustro Report.</b> It is an annual report that shows the activities developed every year by the UAM with respect to:</p> <ul style="list-style-type: none"> <li>Programs to support research activities</li> <li>Research Management system</li> <li>Fostering excellence in libraries</li> <li>Mechanisms of technology transfer</li> </ul>
<p>University structure</p> <ul style="list-style-type: none"> <li>Faculty Number of prof/researchers by families of disciplines, by disciplines, by projects, by study programs?</li> <li>Labs and departments Number and size Number of teams within each * Formal decisional capacity (on paper)</li> <li>Departments: Are they responsible for Teaching and Research, only for Teaching; Relations with Faculties and Labs</li> <li>Labs</li> <li>University research structures (independent from faculties) Number Nature (Federation of research labs for instance, research labs...)</li> <li>Deliberative / decisional bodies dealing with research issues At the university level: Size and composition, Formal attributions</li> </ul>	<p>Suggested level of breakdown: Large disciplines (in the UAM case more or less coincident with Faculties) The UAM does not have information to show the number of teachers by projects.</p> <p>There is no published information about Labs (only is possible to show both number of teachers and students by disciplines). To gather information about Labs would need manual procedures.</p> <p>The Departments are responsible for both teaching and research. The teaching duties are defined by the Department. The time devoted to research is decided by teachers regarding individual considerations.</p> <p>To gather information about labs would need manual procedures. There are Labs which belong only to the UAM and Labs which are part of the Spanish Research Council (CSIC) located at the UAM Campus. These latter make difficult to define the University perimeter in relation to research.</p> <p><b>At the university level:</b> University Senate (Claustro). It defines the research areas. It has 303 members. Its composition is represented by: Rector, General Secretary, University Manager, 153 Civil Servants, 36 Non Civil Servants, 84 students and 27 administrative staff representatives. Social Council. It is the organization that represents the society participation in the university activities. It has approximately 20 members. It is comprised by: Rector, General Secretary, University Manager, Trade Union representatives, Business Association representatives, Local Council representatives, and prestigious people at national and regional levels. Government Council. It is the organization of the university that plans the budget</p>

<p>At the faculty level: Size and composition, Formal attributions</p> <p>At the department level: Size and composition, Formal attributions</p> <p>At the lab's level: Size and composition, Formal attributions</p>	<p>and research activities of the UAM. It has 53 members (Rector, General Secretary, University Manager and other 50 members).</p> <p><b>At the faculty level:</b> Faculty Boards. There is one for each Faculty. It does not define research areas. Its task is to allocate funds among the faculty departments. Each faculty is constituted by a number of departments according to the knowledge areas. Its composition is comprised by: Faculty Dean, Vice-Deans, Secretary Faculty, Directors of each Faculty department, Manager of the Faculty. The total number of the Board depends on the number of Faculty departments.</p> <p><b>At the department level:</b> Department Council. Their functions are to elaborate and to plan the teaching activities. This council is comprised by all the professors and representatives of associate and assistant professors, plus representative of the, administrative staff and representatives of the students.</p> <p>To gather this information would require manual procedures.</p>
<p><i>At the presidency / rectorate level</i></p> <ul style="list-style-type: none"> <li>• persons in charge of the research policy issues Number Statutes Mode of nomination</li> <li>• structure in charge of the research policy issues type (administrative office, cabinet,...) number of staff level of qualification of the staff</li> <li>• Existence of a Transfer office Formal Attributions Staff and qualification / origin of staff</li> <li>• Who is the landlord of the estate o the university? Who is in charge of their maintenance Who pays for the maintenance?</li> </ul>	<p><b>Rector.</b> He/she is the president of the three main organizations at the university (University Senate, Social Council and Government Council). His/her tasks are stipulated in the university statutes and he/she represents the main academic authority at the university. The way of nomination is under universal suffrage of all Claustro members. He/she is in office for four years.</p> <p><b>Vice-Rector of Research.</b> He/she helps the Rector in the definition of research activities. He/she has to prepare the plan for the strategic projects and their budgets.</p> <p><b>Research Delegate Commission.</b> This is the organization of the Government Council to coordinate and manage the research activities at the university. It has 22 members: -Vice-Rector of Research -Vice-Rector of Infrastructure and Technological Promotion -8 Faculty Deans -2 Civil Servant representatives -1 department directors' representative -6 Non Civil Servant representatives -1 administrative staff representative -1 students representative - The Director of the Administrative Research Office</p> <p><b>Research Transfer Office (OTRI).</b> This organization is part of the General Foundation of the UAM (FUAM). It maintains links with the Vice-Rector of Research of the University to support the collaboration between the UAM researchers and external institutions (private and public). It has 12 members. - OTRI Director - 11 administrative staff representatives allocated to four areas: -Knowledge management -Technology Diffusion -Promotion of Innovation in firms -Biotechnology Innovation</p>

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## VII. The Intellectual Capital Report For Universities

Paloma Sánchez, Rocío Castrillo – Autonomous University of Madrid  
 Susana Elena – Pablo Olavide University

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### ABSTRACT

This document has been designed as a chapter to the Observatory of European Universities (OEU) Guidelines for the management of research activities and its aim is to make recommendations for disclosure. Such disclosure will be made in an Intellectual Capital scheme in order to create the greatest potential impact. Disclosure is the next natural step after management, in order to increase the quality of research systems as well as their transparency and competitiveness as required by the Bologna process<sup>1</sup>

In this work, we propose the Intellectual Capital Report for Universities (ICU Report hereafter) that comprises three main sections. The last of these is a selection of indicators for disclosure taken from the OEU Strategic Matrix. The criteria for selection are based on the feasibility and ease of data gathering to ensure comparability and expected confidentiality concerns based on the Autonomous University of Madrid (UAM) experience.

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<sup>1</sup> Joint Declaration (1998), Bologna Declaration (1999), Prague Conference (2001), Communiqué of the Conference of European Ministers Responsible for Higher Education: Berlin (2003) and Bergen (2005).

## 1. Introduction

Intellectual Capital Reporting is gaining importance day by day as an approach for measuring intangibles. The OECD, the European Commission and the World Bank are some of its supporters. For example, in a very recent document, the OECD states that the contribution of unmeasured intellectual capital to economic growth was 10%-11% of gross domestic product (GDP) in the United States over the period 1995-2003, rivalling the contribution of tangible capital, and both types of capital contributed equally to labour productivity growth in those years (OECD, 2006, p. 11). Accordingly, the OECD states that an improved measurement of their contribution is not only highly desirable but necessary (*ibid.*, 2006).

For this reason, it is now considered evident that a common model for disclosure should be used in an Intellectual Capital scheme if the goal is to achieve the greatest potential impact.

In order to deal with this requirement, this work undertakes a proposal for the disclosure of Intellectual Capital in Universities, with the aim of completing the rest of the guideline. As the reader may have noticed the guideline is engaged in the creation of a management tool for the governance of research activities, which are mainly intangibles (Sánchez and Elena, 2006). We maintain that disclosure is the next natural step after management, in order to increase their quality and level of research systems as well as their transparency and competitiveness. The appearance of quality as a relevant issue in university discourse shows an initial, but important, awareness with respect to managing and publishing information about intangibles (*ibid.*, 2006). Moreover, the current financial systems for research link the funds received by university with their research performance. By doing that, the funding organisations are forcing higher education (HE) institutions to build indicators and disclose them. We also assume that no disclosure is possible without prior management of Intellectual Capital.

Therefore, we present the *Intellectual Capital in Universities* Report (ICU Report hereafter) in this chapter. This first approach to the issue looks for comparability among the OEU universities, and this is why indicators were selected mainly for their feasibility. One of our concerns in designing this Report was to relate it closely to the strategy of the university. Above all, the ultimate goal of the measurement of Intellectual Capital is to produce a tool for management, and an IC Report is the logical conclusion of the Intellectual Capital Management process: informing stakeholders of the institution's abilities, resources and commitments in relation to the fundamental determinant of the institution's value.

## 2. Framework for the Disclosure of Intellectual Capital

### 2. a. Basic Overview of Intellectual Capital

There is a high degree of consensus on the idea that, under the new paradigm of the Knowledge-based Economy, wealth and economic growth are “*driven primarily by intangible (intellectual) assets*” (Lev, 2000; p.1). According to this, during the last decade, intangibles and Intellectual Capital have become a major issue not only for academics but also for governments, regulators, enterprises, public organisations, investors and other stakeholders.

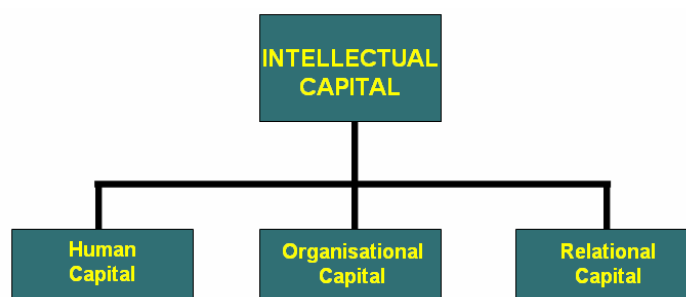
Intellectual Capital (IC) has been defined as the combination of intangible resources and activities that “allows an organisation to transform a bundle of material, financial and human resources in a system capable of creating stakeholder value” (European Union, forthcoming, p. 4). IC can be both the product of R&D activities and the enabler for creating greater value from R&D; IC is more than the sum of these three elements; “*it is about how to let the knowledge of an organisation work for it and have it create value*” (Roberts, 1999).

Intellectual Capital is the combination of an organisation’s Human, Relational and Organisational resources and activities (European Commission, 2006). Firstly, **Human Capital** is defined as the knowledge that the human resources (teachers, researchers, PhD students and administrative staff in this case) would take with them if they left the institution.

Secondly, **Organisational Capital** is defined as the knowledge that stays within the institution at the end of the working day. It comprises the governance principles, the organisational routines, procedures, systems, cultures, databases, publications, intellectual property, etc.

Finally, **Relational Capital** is defined as all resources linked to the external relationships of the institution such as “customers”, “suppliers”, R&D partners, Government, etc. The Relational Capital is very similar to what the OEU has called the Third Mission, which includes all the activities and relations between university and non-academic partners: firms, non-profit organisations, public authorities, local government, and society as a whole (Sanchez and Elena, 2006).

### 1. Breaking down of IC



Within each category we distinguish between financial and non-financial indicators, as well as between resources and activities. This last one is a most interesting classification (European Commission, 2006) since each group focuses on different issues and gives different types of information. MERITUM (2002) defines these two categories as follows:

- **Intangible resources (static notion)** are the stock or current value of a given intangible at a certain moment in time. They may or may not be expressed in financial terms. The resources can be both inputs (researchers, for instance) or outputs (publications).
- **Intangible activities (dynamic notion)** imply an allocation of resources aimed at:
  - a) developing internally or acquiring new intangible resources,
  - b) increasing the value of existing ones, or
  - c) evaluating and monitoring the results of the former two activities.

## 2. Intangible resources and activities.

<i>STATIC NOTION</i>	INTANGIBLE RESOURCES		
	ASSETS	SKILLS	
<i>DYNAMIC NOTION</i>	INTANGIBLE ACTIVITIES		
	TO DEVELOP OR ACQUIRE NEW INTANGIBLE RESOURCES	TO INCREASE THE VALUE OF THE EXISTING INTANGIBLE RESOURCES	TO EVALUATE AND MONITOR INTANGIBLE ACTIVITIES

Source: MERITUM, 2002, p. 65.

Intuitively, we can say that resources show what an institution is like (a frozen image at a given moment) while activities may show how an institution is going to be (a dynamic vision). The activities give revealing insights into the expected evolution of Intellectual Capital linked with the strategic objectives. For example, patents, publications or spin offs are the results of previous activities. At a given moment, they are the resources (the assets) of the institution. However the mechanisms to encourage researchers to patent, to publish or to create spin offs are activities that may improve such resources. The investment of the University to foster these activities reveals its strategy and provides some hints about its future prospects.

It is worth mentioning that the OEU project has been working mainly on resources, and has not proposed indicators on activities. This limitation was set for mainly one reason: that indicators should be selected according to the ease of data collection for the project. This was, in fact, the main criterion for selecting indicators to obtain information in universities. As Pöyhönen states, activities are apparently much more difficult to measure and quantify (Pöyhönen, 2005, p.3). Subsequently, this work should be considered an initial step that will be taken further in the future.

This limitation is also reflected in our proposal for disclosure because of the goal of this work: creating a list of indicators that identify comparability among institutions. If we consider this comparability as our main aim, then using indicators of resources would seem the most advisable. Moreover, they help overcome potential reluctance to reveal strategic activities. In our view, how a university is planning to improve a certain situation throws invaluable light on the strategic decisions that have been made internally. On the one hand, this will be of great value to attract, for example, the best researchers or students, but, on the other, may give away sensitive information. A careful selection of the indicators on activities to be publicised is therefore needed.

From managing Intellectual Capital, the next logical step is the Intellectual Capital Report. The disclosure of information on Intellectual Capital is a powerful tool for communicating to stakeholders the institution's abilities, resources and commitments in relation to the fundamental determinant of the institution's value. Subsequently, an IC Report contains information on the work carried out by the institution in order to develop, maintain and manage its intangible resources and activities (MERITUM, 2002). Referring to universities, disclosing IC information has become mandatory if we assume that nowadays HE organisations are multi-functions and their relation with society, and particularly with industry, is increasingly important. In addition, less public funds for research in Western economies is intensifying the level of competition among institutions which are forced to search for alternative funds, both public and

private. For these reasons, having a comparable battery of indicators is of utmost relevance..

### **3. The State of the Art**

In the attempt to build an effective tool for the disclosure of IC within universities, we have selected four main documents of reference, which are, in our view, the most representative works of the current trends in IC that can be applied to Universities:

- A. Danish Ministry of Science, Technology and Innovation (2003). “Intellectual Capital Statements – The New Guideline”. It is the most contrasted document in companies at an international level.
- B. MERITUM (2002). “Guidelines for Managing and Reporting on Intangibles”. It is the only experience on Intellectual Capital for companies at a European level.
- C. European Commission (2006) “RICARDIS. Reporting Intellectual Capital to augment research, development and innovation in SMEs”. It is the most recent document on Intellectual Capital issues of the European Commission, with some interesting recommendations for universities and attempts for homogenisation.
- D. Austrian Research Centers ARC (2005). “Intellectual Capital Report 1999-2004”. It is the most outstanding and longest experience in reporting Intellectual Capital in research centers. Actually, the ARC model and principles have become the main foundations for ICR in Austrian universities and became mandatory in 2006.

#### **3. a. Danish IC Guidelines**

The first guideline, which was published in 2000, was tested by 80 Danish firms in a follow-up project organised by the Danish Ministry of Science, Technology and Innovation in 2001-2002. This group of firms included both public and private sector organisations and firms of all sizes including several large companies listed on the stock exchange. Based on the experiences from those firms, a revised guideline was published in Danish in December 2002 (and later translated into English in February 2003).

The Danish IC guidelines are very thorough and can be immediately applied as an instrument for the management and reporting on Intellectual Capital. They also acknowledge the need for knowledge management, a set of initiatives to improve it and a set of indicators to define, measure and follow up initiatives.

#### **3. b. MERITUM Experience.**

The MERITUM Project was funded by the European Commission V Framework Programme between 1999 and 2001. It developed 77 case studies in six European countries (Spain -coordinator-, France, Finland, Sweden, Denmark and Norway) and the main result was a set of Guidelines for measuring and reporting on intangibles in companies (MERITUM, 2002).

This document is a practical guide focused on the best practices of the participant firms and tested among experts through a Delphi analysis. It provides detailed suggestions for disclosure.

#### **3. c. RICARDIS**

In December 2004, the European Commission set up a High-Level Expert group to propose a series of measures to stimulate the reporting of IC in research-intensive

SMEs. The result was the document RICARDIS (Reporting Intellectual Capital to Augment Research, Development and Innovation in SME's). The goal of the RICARDIS document was to look for ways to promote the use of IC Reporting, on the assumption that this will increase R&D activities. In the RICARDIS report, Intellectual Capital is considered a crucial factor in the Knowledge-based economy, and subsequently its reporting by companies and other organisations becomes paramount.

In the same way, RICARDIS is tackling universities. One of the recommendations that the RICARDIS document proposed is to promote the elaboration of IC reports at universities and research centres (European Commission, 2006).

### 3. d. ARC Experience

Among the different research institutions and universities reporting on IC, the most important one is probably the case of ARC in Austria. ARC (Austrian Research Centers) has been publishing an IC Report for the last 7 years. Taking advantage of such experience the Austrian Government decided in 2002 that IC Reporting will be mandatory for all universities by 2007. (Leitner, 2005). The Universities Act 2002 (Section 13, subsection 6) states that “*each university shall submit an intellectual capital report [...]. This shall, as a minimum, present in itemised form:*

- the university's activities, social goals and self-imposed objectives and strategies;
- its intellectual capital, broken down into human, structural and relational capital;
- the processes set out in the performance agreement, including their outputs and impacts.” (European Commission, 2006; Appendix C).

Anticipating events, the University of Vienna is currently developing a trial of the Intellectual capital Report in two departments in order to analyse both the advantages and potential problems when applying the law (Altenburger & Novotny-Farkas, 2005).

IC reporting may become mandatory for universities in the near future probably due to the fact that they are considered critical institutional actors in national innovation systems within the knowledge-based economy. From the evolutionary perspective, the Mode 2 of Knowledge creation proposed by Gibbons et al. (1994) and the Triple Helix Model described by Etzkowitz & Leydesdorff (1996) are good theoretical bases for such an argument. “*If a knowledge-based economy is characterised by the production, transmission and dissemination of knowledge, universities are unique in all these three processes*” (Sánchez and Elena, 2006).

Analysing all these initiatives and endeavours, we believe that the European Union will follow a similar path to the one opened by Austria, as is suggested by the RICARDIS document (Sánchez and Elena, 2006). In this changing context, the need for measuring and managing intellectual capital in universities becomes crucial.

## 4. The ICU Report

### 4. a. Structure of the ICU Report

The ICU Report has three different parts which in one way or another depict the logical movement from internal strategy (design of vision and goals of the institution) and management to the disclosure of a system of indicators for disclosure. This chapter

focuses on the presentation of a new system of indicators of Intellectual Capital for Universities, although we include a brief summary for the first two stages<sup>2</sup>. These first two stages focus on coherently relating the strategy of an institution to the IC Report. Besides MERITUM and the Danish IC Guidelines, both the Australian and Japanese Guidelines (REFERENCES!!) strongly recommend including a narrative of the institution’s strategy at the very beginning of the document.

It is important to state that many indicators do not provide new information: most universities have been gathering information of some indicators (such as the number of publications or patents) for many years. However, it has not usually been done systematically or on a regular basis, and IC information is spread over various documents. Therefore, the ICU Report must be regarded as a **new model to provide homogenised information, presenting IC information in a single document.**

The inclusion in the ICU Report of “something else” rather than quantitative information responds to a very important aim. Consequently, the descriptive elements become crucial to contextualize and better understand the information provided by the indicators. This narrative complements the quantitative information and is crucial to accurately assessing the meaning of each indicator. For example, the financial indicators that discriminate between fixed and free budget can be misleading. If a university has historic buildings (which is frequent in old universities), its fixed expenses in maintenance will be higher, and therefore, the weight of free budget will appear smaller.

#### 4.a.i Vision of the institution

The mission statement of the institution (strategic objectives, strategic capabilities and key intangible resources) presents the institution’s main objectives and strategy and the key drivers (or critical intangibles) to reach these objectives.

Prior to the selection of indicators, the academic authorities should be aware of the necessity of defining the strategic objectives. As we will see, they will be the axes for the organisation of the ICU Report.

This section, also called the knowledge narrative (DMSTI, 2003), expresses the institution’s ambition to increase the value a user receives from their services. In this regard, the first section should answer some general questions such as the following: :

- What main services does the organisation provide?
- What are the main objectives of the institution?
- What makes a difference with respect to other institutions?
- What resources (human, organisational and relational) are necessary to be able to reach the objectives and to provide the target services while ensuring quality?
- How are those intangible resources related to the *value* of the institution?
- What is the combination of tangibles and intangible resources that creates *value*?

Although the ICU Report is engaged in the disclosure of Intellectual Capital, it is also important to take into account the tangible resources that participate in the process of

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<sup>2</sup> For a detailed explanation, the reader may see MERITUM (2002) and the Danish IC Guidelines (2003).

creating value. Moreover, it is the interaction among the different types of capital (Physical, Monetary and Intellectual Capital) what creates wealth within an organisation (Marr and Roos, 2005).

#### 4.a.ii Summary of intangible resources and activities

It describes the intangible resources the institution can mobilize and the different activities undertaken to improve the value of those resources. The goal of this part is to highlight the knowledge resources that need to be strengthened and to list the initiatives that have been taken, are in process or planned to improve these resources. The questions that this second section should answer are (DMSTI, 2003):

- ✓ Which existing intangible resources should be strengthened?
- ✓ What new intangible resources are needed?
- ✓ What activities can be launched?
- ✓ What activities should be prioritised?

This section deals with the definition of priority lines in university terms. In this case, the section is of crucial importance, since each university must define areas of interest, in order to focus on areas of excellence or diversify into various areas of knowledge. .

#### 4.a.iii A system of indicators for the intangible resources and activities

The system of indicators endeavours to allow the members of the university and external parties to estimate the future of the institution correctly. In this sense, it is useful to both external parties and management alike, to disclose not only the indicator but also its expected trend and its relation to the institution objectives. In this way, a university engages with measured and clear objectives that can be assessed over time. Moreover, a system of indicators makes it possible to follow up whether the activities have been launched or whether these objectives are being met. We consider a system of indicators essential in order to develop follow-ups in the university.

Regarding the system of indicators, we should keep in mind that the ICU Report does not provide activities-related indicators. As we defined above, activities are actions to (somehow) improve the situation of Intellectual Capital in an institution. They reflect how an institution is going to be rather than how it is now. They really show what the main strategic goals of the institution are. The RICARDIS document also emphasises the importance of distinguishing between resources and activities. As stated above, there are several reasons: the OEU Strategic Matrix (where the indicators came from) does not include indicators of activities which may reveal sensitive information in terms of confidentiality. On the contrary it includes indicators of resources which may better perform for comparison. Notwithstanding the above, we consider that a first approach to IC disclosure with indicators of resources could be very useful for both internal management and external disclosure, as they are also able to identify university priorities and their research interests.

Both the Danish guidelines and the MERITUM project consider the creation of a system of indicators the last section of an IC Report. Up to here, the methodological differences between public and private sectors are not very evident. In this last section, we present a list of indicators designed exclusively for universities and research centres.

The indicators are useful in providing comparison in two ways:

1. Comparison among institutions, through comparing different organisations in a given period of time. To fulfil this aim, the OEU project has succeeded in getting fifteen universities from eight different European countries to work together.
2. Comparison over time, by comparing two different periods of time. As a result of this comparison, the community will be able to see an evolution in the performance, objectives and fulfilled goals of an institution. However, as has happened in other kinds of organisations, universities might experience changes over time, either through contextual pressures or because of their own evolution. This means that the report should be flexible enough to introduce new indicators or remove those less representative.

As mentioned above, the system of indicators is not self-explanatory since each indicator can denote or imply different things depending on the person who receives the information. Consequently, we consider it crucial to take into account the literature of the first two sections to fully understand each indicator and to avoid a set of meaningless indicators.

The system of indicators of our ICU Report is organised as follows. There is a first classification into the three subcategories of Intellectual Capital: Human, Organisational and Relational Capital. Within each of these subcategories, indicators are organised under different headings. These headings or transversal issues correspond to the strategic objectives that the university may have.

The reason why the system of indicators is organised by strategic objectives responds to a very important aim: to link the measurement of IC with the vision of the institution. Not everything is worth measuring. ARC proposes an IC Report with the same focus. In the 2002 Report (the last available in English), ARC organises it around five “knowledge goals”: Knowledge Transfer, Interdisciplinarity, Research Management, Internationality and Spin-offs & Investments. This decision of linking the system of indicators with some strategic objectives was made to emphasise that the three parts are interrelated. The indicators show what resources are prioritised and subsequently what activities are launched. The activities and resources show what the main strategic interests are and how the institution wants to be in the future. The vision of the institution communicates and re-orientates what the organisation is and wants to be.

Hereafter, the proposal of a template for the ICU Report is presented. It comprises the three parts explained above, with the key questions to be answered in each part. The indicators are marked by an F or a NF depending on whether they are financial or non-financial indicators. We present a selection of indicators taken from the OEU Strategic Matrix, which was conceived for management. Therefore, all the indicators shown in this selection were initially devised as a management tool and should be particularly useful for university governance.

4.a.iv LIST OF SUGGESTED INDICATORS

HUMAN CAPITAL		
		<b>EFFICIENCY</b>
1	F	Total funds for R&D / Number of researchers
2	NF	Number of PhD students / Number of Researchers
3	NF	Number of Researchers / Number of Administrative Personnel
		<b>OPENNESS</b>
4	NF	Number of visiting fellows from other universities/Number of Researchers (per field) (A. National, B. International)
5	NF	Number of PhD students coming from other universities/Total number PhD students (per field) (A. Nat., B. Internat.)

ORGANISATIONAL CAPITAL		
		<b>AUTONOMY</b>
6	F	Amount of resources devoted to R&D / Total Budget (personnel cost is not included)
7	F	Structure of the Research Budget by scientific fields (by disciplines)
8	F	Amount of budget constraints (personnel cost + equipment cost) / Research Budget
9	F	Amount of research budget managed at the central level / Research Budget
10	F	Lump-sum for Research (A. Governmental funding, B. Non-governmental funding) / Total Funding for Research
11	F	Share of staff appointed through autonomous formal procedure (at the University level + by type, by field and by units) (consider procedures dealing with positions and academics)
12	F	Non-core funding / A. Total budget, B. Budget for Research
13	NF	Thresholds imposed to fund-raising (including weight of tuition fees on total budget and incentives given to private donors to support research activities)
14	NF	Structure of non-core funding
		<b>CODIFICATION OF KNOWLEDGE THROUGH PUBLICATIONS</b>
15	NF	Number of publications by disciplines / Total publications of the university
16	NF	Number of copublications per field (6 Frascati levels) (A. National, B. International)
17	NF	Number of citations of publications by discipline / Total publications of the university
18	NF	Share of specialisation publication in a discipline compared to the total publication of the university.
19	NF	Indicators of Production for books, chapters, e-journals, etc.
20	NF	Indicators of Visibility for books, chapters, e-journals, etc.
		<b>CODIFICATION OF KNOWLEDGE THROUGH INTELLECTUAL PROPERTY</b>
21	NF	Number of active patents owned by the university (by field)
22	NF	Number of active patents produced by the university (by field)
23	F	Returns for the university; licences from patents, copyright, (sum & % to non public resources)
24	F	Joint IPRs by university professors and firm employees
		<b>STRATEGIC DECISIONS</b>
25	NF	Existence of a Strategic Plan for Research

26	NF	Existence of mechanisms to evaluate the Strategic Research Plan
	NF	- Frequency
	NF	- Brief Description of the process

**RELATIONAL CAPITAL**

		<b>SPIN OFFS</b>
27	NF	Number of Spin-offs supported by the university
28	NF	Number of Spin-offs funded by the university and % above the total number of Spin-offs (funded + supported)
		<b>CONTRACTS AND R&amp;D PROJECTS</b>
29	NF	Number of contracts with Industry (by field and by a competitive/non competitive classification)
30	NF	Number of contracts with Public Organisations (by field and by a competitive/non competitive classification)
31	F	Funds from Industry / Total budget for Research
32	F	Funds from Public Organisations / Total budget for Research
		<b>KNOWLEDGE TRANSFER THROUGH TECHNOLOGY TRANSFER INSTITUTIONS</b>
33	NF	Existence of a Technology Transfer Institution
34	NF	Checklist of activities of the TTI
		- Intellectual Property Management
		- Research contract activities
		- Spin-offs
		- Others
35	F	Budget of TTI / Total budget of the university
		<b>KNOWLEDGE TRANSFER THROUGH HUMAN RESOURCES</b>
36	NF	Number of PhD students with private support / Total PhD students
37	NF	Number of PhD students with public support / Total PhD students
		<b>PARTICIPATION INTO POLICY MAKING</b>
38	NF	Existence of activities related to policy making
39	NF	Checklist of activities related to policy making
		- Involvement into national and international standard setting committees
		- Participation in the formulation of long-term programmes
		- Policy studies
		<b>INVOLVEMENT INTO SOCIAL AND CULTURAL LIFE</b>
40	NF	Existence of special events serving social and cultural life of society
41	NF	Checklist of special events serving social and cultural life of society
		- Cultural activities
		- Social activities
		- Sport activities
		- Others
		<b>PUBLIC UNDERSTANDING OF SCIENCE</b>
42	NF	Existence of specific events to promote science

43	NF	Checklist of specific events to promote science, to classical involvement of researchers into dissemination and other forms of public understanding of science
		- Researchers in Media
		- Researchers in Forums
		- Others

F = Financial indicator - NF = Non-financial indicator

## 5. Basic Considerations of the ICU Report

### 5. a. Selection of Indicators

In this document, we present a set of indicators selected from the OEU Strategic Matrix, which was conceived for the management of research. Therefore, all the indicators shown in this selection were firstly devised as a management tool and should be particularly useful as a tool for university governance. This list of indicators was basically selected because of the accumulated experience in data gathering that we acquired in the OEU project. From the 141 indicators that the OEU Matrix had, only 43 were pre-selected.

The pre-selection of indicators was developed in three phases:

#### 5.a.i Selection of Strategic Objectives

First of all, we selected a list of strategic objectives that any university may set. Our concern was to provide a shorter list of indicators that would cover all the objectives selected. With this aim and regarding the previous definitions, we have selected a list of strategic objectives that would be, in our view, interesting enough to make a university organise and systematize all the IC data (some of them already available) in a single and homogenised document. These strategic objectives may represent the main concerns of universities and their communities. They are:

#### ***Human Capital:***

##### **Efficiency**

It is worth mentioning that the OEU project does not consider efficiency indicators in its Strategic Matrix. However, as we saw before, many indicators may have different uses since they are able to provide information on different categories. Efficiency indicators are obviously interesting for the community and stakeholders, who want to ensure that their contributions in funding and resources are well invested.

##### **Openness**

Universities are requested to be more open to the external world, regarding the new requirements of the knowledge-based society and the “Third Mission” approaches, and this mentality would appear to begin with university academics. The openness or open mentality of the institution, and especially of its academics, seems to be a crucial factor in avoiding the traditional isolation of these institutions concerning society as a whole.

***Organisational Capital:*****Autonomy**

Autonomy has been one of the main concerns of universities in recent decades, and it is not easy to identify what the autonomy of a university is. The indicators presented here only focus on financial autonomy, and, although we consider them an important first step, they are not able to capture the whole complexity of the autonomy issue in universities. Mora stated that “*despite formal statement on autonomy, most universities in continental Europe have a very limited autonomy*” (Mora, 2001, p.103). The issue of autonomy should be addressed using a non-quantitative approach in order to differentiate formal autonomy from the real autonomy that different management levels may have. For this reason, the Governance chapter will deal with this issue using a more in-depth approach.

**Codification of Knowledge through publications**

There is no doubt about the importance of the codification of knowledge for universities. Indeed, publications are one of the most important groups of university outputs. For this reason, university productivity and its quality in this regard is a basic issue to address in order to manage resources and activities better.

**Codification of Knowledge through Intellectual Property**

Apart from the academic outcomes (ah, this word again, you know better than I do!), Intellectual Property is the other main output of a university. It includes patents and licensees and represents the ability of universities to commercialise their research.

**Strategic Decisions**

Though assuming that most of the information on strategic decisions will be confidential, this issue must be undertaken in order to allow the community to assess how management is run in general terms. Therefore, very few indicators are taken into account under this heading.

***Relational Capital:*****Spin-offs**

The spin-offs are defined as companies that commercialize the result of university research. This research can be exploited by university academics, on their own or together with companies. These spin-offs focus on the development of a highly innovative business.

Therefore, the number of spin-offs that originate in a university indicates somehow the capacity to commercialize research, together with Intellectual Property.

**Contracts and R&D projects**

Contracts and R&D projects are another way for universities to interact with two important external actors: government and industry. This strategic objective does not take into account the interaction of the university with society as a whole, which will be included in the last three objectives within Relational Capital: participation into policy making, involvement in social and cultural life and public understanding of Science.

### **Knowledge Transfer through Technology Transfer Institutions**

Technology transfer institutions (TTIs) are defined as “institutions which provide, continuously and systematically, services to publicly funded or co-funded research organisations in order to commercialise their research results and capacities. They are instruments to further the dissemination and the uptake of new technologies by enterprises. TTIs are organizations or parts of organizations which help the staff at public research organizations (PROs) to identify and manage intellectual assets. This includes the protection of intellectual property and the transfer of such rights by way of licensing to other parties. In addition to IPR management, TTIs can also help PROs to create or support new firms (for example technology parks and incubators) or to carry out collaborative research” (European Commission, 2004, p.10). At an operational level, an organisation is defined as a technology transfer institution, if it

- a) provides services connected to the development and transfer of technology, rather than other (scientific) knowledge; and
- b) provides one, several or all of the following types of services:
  - Patenting and IP management, including activities that are necessary for the filing of the patent, such as invention disclosure and evaluation, as well as management of other forms of IP, such as copyright, software, databases etc.;
  - Licensing of intellectual property rights;
  - Liaison for collaborative and contract research including client recruitment, contracting, legal issues, or contract management;
  - Support of spin-offs including services such as business planning, setting up, raising funds, etc.;
  - Financing of spin-offs by providing seed capital or by holding shares; and
- c) is connected to one or several PROs.

The technology transfer institutions are gaining importance day by day as intermediaries between the university and the external world. Currently, the “Third Mission” approaches clearly benefit the inclusion of this issue, as well as the following objectives.

### **Knowledge Transfer through Human Resources**

The transfer of knowledge from universities to society is probably the most traditional method of interaction. Despite this not being a new issue, it is still very important.

### **Participation in Policy Making**

The intention of this objective is to encourage academics to participate in decision making, which is another way for a university to interact with its environment.

### **Involvement in Social and Cultural life**

The new approaches formulated in the Third Mission of universities have set interaction between universities and society as a primordial objective. In this way the significant involvement of a university in the social and cultural life of its area of influence is expected to benefit the development of the region.

### **Public Understanding of Science**

From the Third Mission approach mentioned above, universities should be active in spreading knowledge throughout society. This heading deals with measuring the benefits that universities provide to the public in general, instead of focusing on a reduced and specialised public, which is the norm.

Regarding these four last categories (Knowledge Transfer through Human Resources, Participation into Policy Making, Involvement in Social and Cultural life and Public Understanding of Science), indicators are very new and difficult to collect, since there is no previous experience in this area. As the reader may note, indicators are less accurate regarding information gathering and they focus on identifying the existence of related activities and checking what kind of activities and events take place in a university.

After defining the measurement goals that a university may set, we grouped the indicators into these categories, in order to ensure a minimum number of indicators within each category. In the next stages, initial pre-selection and subsequent cutting was made.

#### **5.a.ii** Selection of Indicators regarding Availability of Data and Perceived Willingness to Disclose

Within each strategic heading, we selected a number of indicators. For this selection, we took into account as a main criterion the availability of data at the Autonomous University of Madrid and the available information from other universities within the OEU group. Unfortunately, the information on other universities is still very scarce, and we had to base our selection mainly on the UAM availability. Subsequently, we tried to select the indicators that were more easily collected.

#### **5.a.iii** Initial Checking against the MERITUM Characteristics

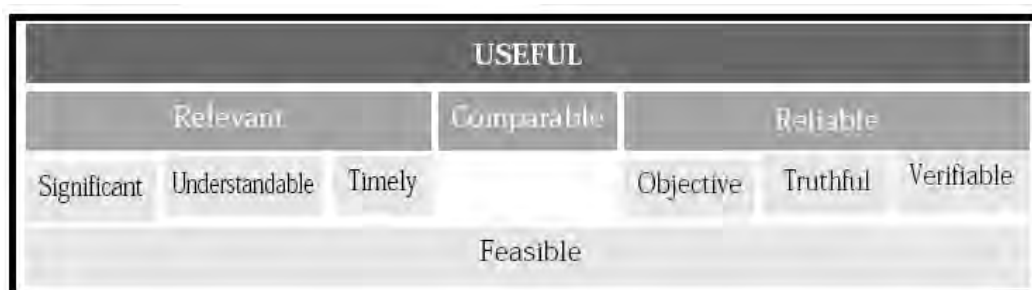
The definitive list of indicators actually published by universities should all be part of the internal document developed for management and decision making. If an indicator is not useful for internal management, its disclosure may make no sense. The more useful the indicator is internally, the better it will be for the community.

The third phase in the selection of indicators for disclosure was initially checking them against the MERITUM characteristics of indicators. In 2002, the MERITUM project carried out a panel analysis to point out the most important and valuable characteristic that an indicator should have. The result was the following list of characteristics (MERITUM, 2002):

- **Useful:** an indicator is useful if it facilitates decision making both to internal and external users.

- Relevant: they are relevant when providing information that can modify or reassure the expectations of decision makers. To allow this, they should be:
  - Significant: related to issues critical for universities.
  - Understandable: presented in a way they are easily understood by potential users.
  - Timely: available when required for analysis, comparison or decision making purposes.
    - Comparable: presented following general accepted criteria, so that users may make comparisons over time and across institutions, and
    - Reliable: trustworthy. This requires the indicators to be:
      - Objective: the value is not affected by any bias arising from the interests of the parties involved in the preparation of the information.
      - Truthful: the information reflects the real situation.
      - Verifiable: it is possible to assess the credibility of the information it provides<sup>3</sup>.
- Feasible: the information for their elaboration can be obtained from the University's information system, or the cost of modifying those systems to obtain the required information should be lower than the benefits (private or social) arising from the use of the indicator.

### 3. Characteristics of indicators.



Source: MERITUM, 2002, p. 72.

However, and even though we have considered these characteristics to pre-select this battery of indicators, university managers should do the same exercise in order to assess each indicator taking into account their own management purposes and objectives.

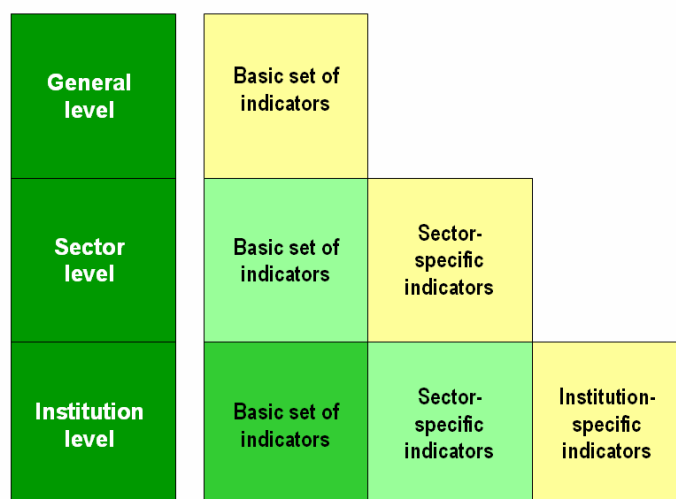
## 6. Scope of the ICU Report

According to RICARDIS, standardization on the measurement of intangibles is at the same time an important and delicate issue. The document explains how standardization is paramount to provide comparability, interpretability and credibility of information. On the other hand, such standardization is difficult since IC Reports are designed

<sup>3</sup> Regarding the verifiability of the indicators, the Community of Madrid is currently implementing a new system for the distribution of governmental funds based on Intellectual Capital issues. As the lump sum of funds is set in advance, the increase in the share of one university unavoidably means a decrease in the share of another one. In this situation, the verifiability of the data will be the main concern in the process of selecting the indicators, in order to avoid misappropriations.

around the specific characteristics of each organisation. The European Commission proposes three levels of indicators, as shown in the following graph:

#### 4. Levels of standardization of IC indicators. Adapted from European Commission, 2006



Regarding the RICARDIS proposal for standardization, we should consider the basic or general set of indicators as those that will be useful for all organisations and institutions. Using the same thinking, there would be a set of sector-specific indicators (only useful for those in a specific sector, universities and research institutions in this case). Institution-specific indicators can be chosen by each university allowing for individual considerations.

Apart from the effort that the European Union is making for the standardization at the first level (the basic set of indicators), **this chapter attempts to set standards for clearly identifying, defining and describing indicators at the second level** (sector-specific indicators for universities). The third level indicators should be developed by each institution individually. Assuming that every organisation is idiosyncratic in nature, the creation of a more open framework (with some homogenised categories to ensure consistency and comparison) can allow new and attractive possibilities. The model that RICARDIS proposes is narrow enough to assure a certain degree of comparison, and open enough to allow institutions to include their main concerns.

### 7. *Breaking down by Scientific Fields*

The great differences in scientific fields concerning expected outputs (mainly patents and publications) make it crucial to avoid aggregate comparisons regarding productivity. Although there is a clear need for providing disaggregated data for certain indicators, there is no consensus about the number of scientific fields that the OEU group should use for the breaking down of indicators. It is our aim to outline an initial approach to adapt the diversity of European Universities and categorise the great number of disciplines into six large scientific fields, following the recommendations of the Frascati Manual (OECD, 2002).

With this aim, we undertook a comparison of nine European universities<sup>4</sup> in order to unravel the heterogeneity existing in the various scientific fields and the availability of disaggregated information. By doing this, we had to assume the number of faculties as the minimum unit of analysis possible. In principle, the breaking down of information by department, lab or research group would be highly costly (if possible). For example, this information is not available in the UAM and because of this, we have decided to make a breakdown by faculties for this first comparison. However, we consider that a breakdown at a lower level will be very interesting for managing Intellectual Capital internally, and this could be thought about in the future.

In this regard, we have used the classification of fields provided by the Frascati Manual that is showed below:

### 5. Fields of Science and Technology. Source: OECD, in Frascati 2002, p. 67.

<p><b>1. NATURAL SCIENCES</b></p> <p>1.1. Mathematics and computer sciences [mathematics and other allied fields: computer sciences and other allied subjects (software development only; hardware development should be classified in the engineering fields)]</p> <p>1.2. Physical sciences (astronomy and space sciences, physics, other allied subjects)</p> <p>1.3. Chemical sciences (chemistry, other allied subjects)</p> <p>1.4. Earth and related environmental sciences (geology, geophysics, mineralogy, physical geography and other geosciences, meteorology and other atmospheric sciences including climatic research, oceanography, vulcanology, palaeoecology, other allied sciences)</p> <p>1.5. Biological sciences (biology, botany, bacteriology, microbiology, zoology, entomology, genetics, biochemistry, biophysics, other allied sciences, excluding clinical and veterinary sciences)</p>
<p><b>2. ENGINEERING AND TECHNOLOGY</b></p> <p>2.1. Civil engineering (architecture engineering, building science and engineering, construction engineering, municipal and structural engineering and other allied subjects)</p> <p>2.1. Electrical engineering, electronics [electrical engineering, electronics, communication engineering and systems, computer engineering (hardware only) and other allied subjects]</p> <p>2.3. Other engineering sciences (such as chemical, aeronautical and space, mechanical, metallurgical and materials engineering, and their specialised subdivisions; forest products; applied sciences such as geodesy, industrial chemistry, etc.; the science and technology of food production; specialised technologies of interdisciplinary fields, e.g. systems analysis, metallurgy, mining, textile technology and other allied subjects)</p>
<p><b>3. MEDICAL SCIENCES</b></p> <p>3.1. Basic medicine (anatomy, cytology, physiology, genetics, pharmacy, pharmacology, toxicology, immunology and immunohaematology, clinical chemistry, clinical microbiology, pathology)</p> <p>3.2. Clinical medicine (anaesthesiology, paediatrics, obstetrics and gynaecology, internal medicine, surgery, dentistry, neurology, psychiatry, radiology, therapeutics, otorhinolaryngology, ophthalmology)</p> <p>3.3. Health sciences (public health services, social medicine, hygiene, nursing, epidemiology)</p>
<p><b>4. AGRICULTURAL SCIENCES</b></p> <p>4.1. Agriculture, forestry, fisheries and allied sciences (agronomy, animal husbandry, fisheries, forestry, horticulture, other allied subjects)</p> <p>4.2. Veterinary medicine</p>

<sup>4</sup> Part of the OEU project from France, Switzerland, Spain, Italy, Portugal and Netherlands.

5. SOCIAL SCIENCES
5.1. Psychology
5.2. Economics
5.3. Educational sciences (education and training and other allied subjects)
5.4. Other social sciences [anthropology (social and cultural) and ethnology, demography, geography (human, economic and social), town and country planning, management, law, linguistics, political sciences, sociology, organisation and methods, miscellaneous social sciences and interdisciplinary, methodological and historical S&T activities relating to subjects in this group. Physical anthropology, physical geography and psychophysiology should normally be classified with the natural sciences]

6. HUMANITIES
6.1. History (history, prehistory and history, together with auxiliary historical disciplines such as archaeology, numismatics, palaeography, genealogy, etc.)
6.2. Languages and literature (ancient and modern)
6.3. Other humanities [philosophy (including the history of science and technology), arts, history of art, art criticism, painting, sculpture, musicology, dramatic art excluding artistic "research" of any kind, religion, theology, other fields and subjects pertaining to the humanities, methodological, historical and other S&T activities relating to the subjects in this group]

Therefore, we considered six scientific fields in order to group the great variety of existing disciplines<sup>5</sup>. In this exercise, we undertook an initial comparison of nine universities in the European Union. We obviously assume that the number of universities considered will be much reduced, but it may be interesting as an initial approach. The goal here was to group the areas in which a university is involved, considering the faculties (as the minimum statistical feasible unit of study). This approximation by faculties is considered as a proxy to the areas in which a university researches.

In the first instance the comparison was not considered very difficult. Nevertheless, it can be very confusing if the Frascati fields presented on the previous page are not thoroughly broken down. Titles of each scientific field are not enough to assure the right inclusion in one or other field.

### 6. Scientific fields disclosure.

	UMLV Univ. Marne-la- Vallée	UNIL Univ.de Lausanne	Univ. Autónoma de Madrid	Unive. de Aveiro	Univ. Paris- Sud	Univ. of Maastricht	Univ. of Bologne	EPFL Ecole Polytech. Fédérale Lausanne	Univ. Ca' Foscari
1. Natural Sciences	X	X	X	X	X	X	X	X	X
2. Engineering and technology	X		X	X			X	X	
3. Medical sciences		X	X	X	X	X	X		
4. Agricultural sciences							X		
5. Social sciences		X	X	X	X	X	X		X
6. Humanities		X	X	X		X	X		X

Source: Gathered from the information presented at Budapest meeting (December 2005). OEU Project.

<sup>5</sup> It is important to note that the Spanish Government does not separate the field of Agricultural Sciences (there are only five fields) and this can pose a problem when universities have to decide how to report their information. Homogenising the way of grouping information is therefore very much needed.

Another issue to be addressed in relation to scientific fields is the **nomination of a university as generalist or specialised**. We define a university as specialised when a large of its degrees is concentrated in one area or a few related areas. We define it as generalist if there is a broader spread covering a number of different areas of knowledge.

At first glance, only two of the nine universities in the table seem to be clearly specialised: UMLV Université de Marne-la-Vallée and EPFL Ecole Polytechnique Fédérale de Lausanne. Both of them are only engaged in Natural Sciences and Engineering and Technology. At the other extreme, we could identify three generalised universities: University of Bologna, Autonomous University of Madrid and University of Aveiro. However, even in this small sample, there are three universities that are between being specialised or generalised. In order to classify them, a clear definition of limits should be set down.

It has been difficult to set the limit between a generalist university and a specialised one. The OEU project undertook this goal but no definitive solution has been found. In order to show the complexity of this issue, we have drawn up some proposals for this separation with its correspondent problems and limitations:

1. Breaking down by the number of areas of knowledge.

We could consider specialised universities as those that are present in, for example, three or less scientific fields. This is, in our view, a naive approach, since being present in a specific area does not mean to be active from a research point of view. Moreover, some areas can remain only as historical objective. For example, a university could have lost all the good researchers in a field and still maintain the same research institute, even if it is not very productive.

2. Breaking down by the resources dedicated to some areas.

We can also consider the specialisation of a university according to the resources dedicated to each area. This approach can result in misleading conclusions for many reasons. One of which could be that the university authorities do not have the power of reallocating resources in a given period of time. For example, in Spain, personnel cannot be reallocated, and this is the largest research-related expense that universities have. There are also scientific fields that usually need more fixed investment, such as labs, equipment, etc.

3. Breaking down by the outputs of areas.

Another option may be to discriminate the most important fields by regarding them as the most productive ones, ie; those producing the most outputs. One of the problems with this approach is that not enough is known about the outputs of a university (excluding publications and Intellectual property, which usually benefit the Science areas<sup>6</sup>). Another problem is related to new areas of knowledge, which may not give results in the short-term, but can be a source of excellence in the future.

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<sup>6</sup> Measuring the quality of publications through the ISI database, or any worldwide criterion, seems to benefit general discoveries but hinder applied discoveries. This obviously benefits Science fields, since the breakthroughs made in these areas are easily tested and applied everywhere. On the other hand, very important discoveries in other areas, such as Social Sciences, may be applied only in the research centre/place of research.

#### 4. Breaking down by the priority lines of a university.

This is, in our opinion, the most coherent way to break down specializations. As the university decides how many areas it invests in, its strategy is indirectly stated: looking for a specific areas of excellence or a broader spread over a number of different areas of knowledge.

Although this breaking down can seem logical in theory, it also poses a number of limitations. First, there are universities that do not have priority lines (like the UAM). Second, the mere number of priority lines is not enough to assess the specialization of a university. It would be necessary to go much deeper to find out which area each specific priority is in and this would require information on a greater disintegrated level.

### 8. *Methodological Shortcomings*

In our view the practical approach taken in this document has one particular limitation, which will be tackled in future work: the lack of activity-related indicators. As we formally defined above, activities are actions aimed to improve the situation of the IC in an institution. They reflect how an institution is going to be rather than how it is at the moment. They really show what the main strategic goals of the institution are. The RICARDIS document also emphasises the importance of distinguishing between resources and activities.

Despite the fact that the lack of activities-related indicators clearly represents a limitation to this work, there was a crucial reason for this. The OEU project has been mainly working on resources, and it has not proposed indicators on activities. Within the project, indicators were selected according to the ease of data collection: indeed, the feasibility of obtaining information in Universities was a major criterion when selecting indicators.

This limitation is also closely related to the goal of this work: creating a list of indicators that aims for comparability among institutions. If we consider comparability as the chief aim, it may well be advisable to use indicators of resources. Moreover, we selected resource indicators bearing in mind the possible reluctance to reveal strategic moves. In our view, how a university is planning to improve a certain situation throws invaluable light on the strategic decisions that have been made internally. On the one hand, this will be of great value to attract, for example, the best researchers or students, but, on the other, may give away sensitive information. A careful selection of the indicators on activities to be disclosed is therefore needed.

Nonetheless, we can state that the scanning of indicators that provide information on activities will be paramount in ICU Report development. Subsequently, this work should be considered an initial step that will be developed in the future.

A second shortcoming of this proposal is that some indicators were not clear enough. In order to make indicators comparable among institutions, **a very precise and clear definition is essential**. Even with this, indicators can mislead depending on the person or institution that gathers them. We consider that this limitation should be understood as a structural characteristic of a novel science, which will become more precise over time by the process of standards setting. For example, the indicator number 9 (*Amount of research budget managed at the central level / Research Budget*) seems easy to calculate in theory, but is extremely difficult in practice, for these reasons:

- a) The classification of items in the budget does not meet the criterion of autonomy in the use of funds, so someone external to the university would find it impossible to calculate

- this indicator which subsequently means that it does not fulfil the requirement of verifiability.
- b) There are items that have one part that is managed at the central level and the other that is not. It is paramount to know the proportion of each part. This is the case, for example, of funds coming from a regional government.
  - c) The situation could change over time, so the criteria used in one given period might not be useful in another.
  - d) Even if we can solve all the problems mentioned above, some limitations of definition may still remain. For example, are the expenses in libraries part of the budget managed at central level? In whole or in part? There is a number of acquisitions that are financed by research projects and in consequence cannot be used freely by the university authorities. The same would apply to new infrastructures.
  - e) Overheads incurred on research projects and contracts (15-20%) are considered part of the external funding. This amount is not clearly identified, but it is in fact part of the budget managed at central level since it may be freely used by the university authorities.

For these reasons, only a member of the university with access to internal accounting could calculate this indicator. In general, the top authorities should be aware of the importance of these indicators and dedicate enough resources to calculate them appropriately. Each indicator would have specific problems and we may only be able to identify part of them. In some cases, we could observe that the data was available, but manual procedures would be required to gather information useful for management.

Another methodological shortcoming can result from the different levels of development in universities of their definitions of strategic goals. This difference can hinder a comparison of universities. As argued when analysing Intellectual Capital models at firm level, the starting point to implement a research measurement system, is the discussion and definition of corporate goals and strategies, because “*the process of acquiring, applying and exploiting knowledge starts with the definition of specific goals*” (Leitner and Warden, 2004; p.8). Accordingly, the culture of quality and transparency in the higher education system started some years ago has pressed universities worldwide to define a Mission Statement or Strategic Plan. Even so, not all universities are at the same stage of development.

Besides, most European universities follow a functional and disciplinary internal structure, which makes it difficult to manage university research activity as a whole. Indeed, most managers of individual faculties have little knowledge about research activity in other disciplines. Moreover, this organisational structure is not flexible enough to assess and measure multidisciplinary actions and joint research (Sanchez and Elena, 2006).

## **9. Practical Issues on ICU Reporting**

In this section, we undertake three main concerns regarding IC Reporting on Universities: how to collect the data needed, who should be responsible for this data gathering, and how frequent the Report should be.

### 9. a. Data Gathering: How?

The data gathering process could vary from one institution to another, depending on the development of their internal databases. It is important to highlight that the information on IC should be collected in a systematic way, to ensure consistency in data. The main sources of information could be the following (MERITUM, 2002, p. 84):

- The institution's databases. In this regard, the UAM is endeavouring to implement a data warehouse comprising the variety of different databases, in order to improve its efficiency.
- Internal documents and reviews. As we mentioned before, much of the information requested here has been collected for a long time. However, it is spread over many different documents.
- Questionnaires. They can be used to adapt an ICU Report to the idiosyncrasy of a university and to identify conflicting positions and potential problematic groups.
- Interviews. It is now clear that there is an important part of qualitative information in an ICU Report. Therefore, it may be necessary to carry out a survey on different levels at a university to capture it.
- External sources. It is important to take into account the perception that external actors have of a university, and identify external opportunities and barriers.

When presenting the system of indicators, both internally and externally, using data averaged over a 3-year period appears to be significant. In this way, one year averaged with the last two will be compared to the previous year also averaged with its last two. Consequently, these data can reveal general trends better and avoid temporal behaviour and situations. We consider that both methods (the direct and the averaged comparison) provide complementary information.

### 9. b. Data Gathering: Who?

With regard to companies, MERITUM guidelines highlight the need to distinguish between the individuals in charge of the development and design of the measurement system as such, and those engaged in the actual development of the indicators. In the case of data gathering, information must be obtained from the different departments of the institution, since the data needed is of a diverse nature. In universities, the ideal situation would be a central data-gathering office that contacts the various departments. The individuals in charge of developing the measuring systems may be embedded in the preparation of the Strategic Plan, since we consider these documents closely related..

Regardless of who is responsible for the preparation of the ICU Report, the top academic authorities should be committed to and engaged in the preparation of the Intellectual Capital Report of the institution.

### 9. c. Frequency of Reporting

In the private sector, international practices have set the frequency of reporting at once per year at least. Nonetheless, the tendency is to shorten the reporting period as a result of the demands of interested third parties. For universities, we suggest that the preparation of the ICU Report should coincide with the publication of the Strategic

Plan, since these documents are complementary. In this way the complete ICU Report can be published every two to three years, with annual follow-ups .

MERITUM states that it is advisable to carry out a cost-benefit analysis to establish the frequency with which periodic information should be prepared, both for internal and external use (MERITUM, 2002, p.85).

## **10. Conclusions and Ways Forward**

European universities and research centres are considered crucial for the creation of the *Europe of Knowledge* and for the development of modern societies in general. Considering the importance of intangible assets for this kind of organisation, intellectual capital approaches seem to be essential in order to improve internal management and facilitate benchmarking analysis. Moreover, Intellectual Capital managing and reporting are gaining importance day by day as an approach for measuring intangibles not only at firm level but within universities and research organisations. Supranational organisations such as OECD, the European Union or the World Bank are showing an explicit interest in this issue organising working groups, international conferences, etc. Proof of this is the RICARDIS document, which strongly recommends the disclosure of IC information, and the changes that have been adopted in Austrian university sector, where ICR will be mandatory for all HE institutions by a Federal Law

This work endeavours to create the basis for a homogenised IC Report specifically designed for Universities. Many recommendations concerning the structure of the report as well as the nature of indicators, the descriptive and more qualitative aspects and some methodological shortcomings have been highlighted in the document so as to achieve this aim.

As we commented above, the lack of activities-related indicators is the main perceived limitation of this work. This was mainly due to the fact that the indicators were selected from the OEU Strategic Matrix, which prioritises the comparability and feasibility of data gathering over other possible benefits. Also, we intuitively foresee that since activities-related indicators reveal more strategic information, academic authorities will be more reluctant to make disclosures.

Notwithstanding this limitation, our main conclusion is that this experience has been a valuable initial step towards the creation of a homogenised model for the disclosure of IC in universities. However, even assuming that there is much work left to be done, the main benefits of this chapter are:

1. It provides a framework of comparison among institutions.
2. It emphasises the relation between Intellectual Capital and the strategy of an institution and recognises the importance of involving the top academic authorities.
3. The internal management of IC is considered the first natural step before any attempt at disclosure.

Because of the mentioned limitation, this study should be regarded as essentially being exploratory in nature. Therefore, the way is open for further research. Intellectual Capital Reporting is gaining importance every day, as it is now openly acknowledged that there is a crucial need for measuring and managing intellectual capital in universities.

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## *Conclusion*

The University is challenged by a worldwide globalisation and faces today one of its biggest changes in history. The “EU University” is a system of systems. Each university is embedded in a strong and specific national innovation system. It should itself be analysed as a systemic component of the European Research Area. Universities are therefore bound to evolve in a complex system of governance.

Higher education institutions in Europe therefore face a double layer of public policies: at the Member State and at the EU levels. National governments and the European Commission have recently expressed and shown significant commitment for accompanying and for steering the transformations of the EU University system. Such measures will have a significant impact on the universities' future. For instance, the implementation of higher overheads ratios within EU Framework Programmes, may foster universities' long term investments. And the new European Research Council will most probably change the funding patterns for those universities most active in research.

But the bulk challenges for the EU University remain at the level of the institutions themselves. Universities evolve into an increasingly open context. Their educational function, as well as their research activity must link local responsibilities within open worldwide competition. It is up to the universities' managers to select the relevant strategic options to orient their institutions on a sustainable development path and to acquire the technical and political capabilities to do it.

This task may seem daunting when one compares the complexity of the multidimensional choices to be made and the paucity of managerial skills which still largely impedes European universities. One should not ignore the prospect of witnessing bankruptcy for some institutions. Even if it is clear that universities, which rank amongst the very old social institutions, have demonstrated through the centuries their ability to change and to survive.

Public policies may provide universities another very important - and not competition distorting - support for helping them to navigate through the radical changes they face. They should promote a common tool with which universities could assess their position in a competitive environment.

This PRIME-OEU methodological guide for the Strategic Management for University Research should be seen as an attempt at fulfilling this mission. The OEU project has been the largest project carried out within the PRIME NoE, involving dozens of researchers and 15 universities across Europe.

The participating universities provided the opportunity to test a large part of the methodologies proposed in this guide; chiefly for data collection procedures and for the compilation of indicators. In this regard, this guide is not a "Blue Sky" exercise. But it has proven to be beyond the reach of this project to produce a complete profile, which should include all the thematic dimensions covered within the corresponding chapters. This task requires a significant involvement from the universities' administrative services and from the researchers in charge of producing such a profile.

The OEU methodological guide's objective was to build a common framework that allows universities to implement their own strategies taking into account their specificities. Some substantial work remains to be done before the tools proposed in this guide can easily be used by universities managers. The next steps of this endeavour will depend upon two elements.

The first one is the utilisation of this framework by the universities themselves. They are the only ones that can use and refine this methodological proposal in order to make it a shared framework.

The second element pertains to an involvement of European institutions. Up to now, the results have been limited, due partly to the amount of resources available for developing such an ambitious methodological framework. A long term institutional commitment and support are now needed to overcome this well identified bottleneck. An international or supra-national body could lower this hurdle through a scheme which would provide a financial support to universities for engaging in a specific data collection process within a common methodological framework in order to enhance the comparability of data between institutions and to foster the exchange of best practices. The PRIME-OEU guide could be a starting point for such a project.





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