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Table of Contents

Part One Plenary Lecture **1**

Empires of Knowledge: The Challenges of World-Class Research Universities in Developing Countries 3

Philip G. Altbach

Part Two Conceptual Aspects of World-Class Universities **5**

About Evaluation of World-Class Universities: Respect of Differences Between Nations in the Definition of Evaluation Criteria 7

Monique Canto-Sperber

Rankings, Governance and Attractiveness: The New French Context 22

André Siganos

Identifying the Best: The CHE Ranking of Excellent European Graduate Programmes in Natural Sciences 31

Sonja Berghoff, Uwe Brandenburg, Detlef Müller-Böling

Part Three National Strategies for Building World-Class Universities **47**

Quality Assurance and Promotion of Excellence in the Swiss University System 49

Hans Weder

Main Principles of the Strategy on Building World-Class Universities in Russia 59

Irina Artyushina, Vladimir Troyan

The Restructuring of the National French System of Research and World-Class Universities 72

Bertrand Bellon

Swedish Strategies for World-Class Status in the Context of University Rankings - Metrics for Academic Science ... 99
Anders Flodström

Improving Quality of Universities by World-University-Ranking in Slovenia and the Danube Region ... 109
Ivan Rozman, Marko Marhl

The New Direction of Japanese Higher Education Policy: Conflicts Between Global and Domestic Logic ... 126
Akiyoshi Yonezawa

Strategies Towards the World-Class Universities of Thai Higher Education Institutions ... 137
Kampechara Puriparinya

Part Four Institutional Practices for Building World-Class Universities ... 161

Combining the Vision, Mission and Actions: Tsinghua's Experience in Building World-Class University ... 163
Jing Huan Shi

Strategies for Developing a World-Class University in a Complex Context: The Case of the Valencia University of Technology ... 181
Juan-Miguel Martinez, Francisco-José Mora, José-Ginés Mora

A Step Toward a World-Class Research University: Seoul National University ... 198
Gil Sun Song

Implications of World University Rankings for National and Institutional Research Strategy of Small Developed Nations ... 211
Tony Sheil

The Pursuit of "Scale and Focus" at the University of Adelaide ... 233
Tim Scroop, Alan Johnson AM , Richard Russell AM

Class Universities in Developing Countries: German-Jordanian University Model 249

Salem Al-Agtash, Labib Khadra

Part Five Cooperation and Competition Among Research Universities.................... 263

Educational Exchanges: What World-Class Universities Should *Not* Adopt from U.S. Higher Education.. 265

Kathryn Mohrman

Global Portfolios and Strategic International Partnerships of a Major Research University 287

Anatoly Oleksiyenko

Elite Scientists and the Global Brain Drain.. 314

Showkat Ali, Giles Carden, Benjamin Culling, Rosalind Hunter, Andrew J Oswald, Nicola Owen, Hilda Ralsmark, Natalie Snodgrass

Part Six World-Class Universities – International Perspectives................................ 363

The Challenge of Establishing World-Class Universities 365

Jamil Salmi

The Impact of "Seeking World-Class Status" from the Point of View of Internationalization/Globalization... 407

Jan Sadlak

Part One

Plenary Lecture

Empires of Knowledge: The Challenges of World-Class Research Universities in Developing Countries

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Part Two

Conceptual Aspects of World-Class Universities

About Evaluation of World-Class Universities: Respect of Differences Between Nations in the Definition of Evaluation Criteria

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Abstract

Evaluation and ranking of higher education institutions have become a part of national accountability. Evaluation criteria of universities have to take into account the academic institutional specificities and traditions. Market-based procedures of evaluation have to include student selection, quality of training, alumni performance, and connections between training and research. In addition, more weigh should be given in evaluation to criteria shaped by fundamental sciences and institutional specificities, given the plurality of university models. At last, evaluation criteria for human and social sciences have to be revised. More generally, weighing the size factor is a decisive issue for evaluation of universities.

About Evaluation of World-Class Universities: Respect of Differences Between Nations in the Definition of Evaluation Criteria

1. Preamble

UNESCO's International Ranking Expert Group (IREG) acknowledges that evaluations and rankings of higher education institutions have become a part of the framework of national accountability and quality assurance processes. The ranking of world universities produced by the Institute of Higher Education of the Shanghai Jiao Tong University ("the Shanghai ranking") is recognized as a leading international table, having large impact both on the international and national levels. It is routinely consulted by intergovernmental and local educational bodies, as well as widely publicized in mass media, academia, and among future university students.

In May 2006 IREG established international guidelines for evaluations and rankings of higher education institutions, known as the Berlin Principles. Although these Principles are obviously not mandatory for autonomous institutions that are responsible for their own evaluation and the creation of rankings, they are broadly considered as an established set of principles of quality and good practice. According to the IREG declaration, it is expected by the international community that the Berlin Principles set a framework for the elaboration and dissemination of evaluations and rankings that ultimately will lead to a system of continuous improvement and refinement of the methodologies used to conduct these evaluations and rankings.

The Berlin Principle A3 states that "Institutions that are being ranked…should be consulted often." In addition, their criteria of evaluation, drawn partly from the specificity of academic tradition, which are diverse and cannot be reduced to a single model, should be taken into account. Following this UNESCO guideline, and in the spirit of mutual trust that would lead to the elaboration of a faithful representation of different educational traditions and systems for evaluations and rankings, ENS would like to provide the following feedback with the idea that the evaluation criteria of universities have to take into account the institutional specificity of universities all over the world. Awareness of the characteristic features of universities evaluation will be a way to improve the evaluation methodology used to compare universities of different countries and academic tradition.

2. Evaluation criteria: research performance and selection of students

Educational systems compete between each other, and different educational institutions within one national system also compete in recruiting students. According to the Berlin Principle A1, "Rankings provide a market-based perspective." Indeed, the market of higher education obeys the usual laws of economics, where institutions with strong competitive power flourish while weak institutions fail to reach the critical level needed for a continuous quality improvement. The market perspective, although limited in its application, provides an adequate picture of the general competition between educational systems and institutions.

However, this perspective is irreducibly linked to such market-based procedures as student selection and alumni performance. Indeed, student selection is perhaps the only procedure with which every institution operates on a regular basis, i.e. yearly, and that directly supports the market analogy. In selecting its future students, educational institutions rely on a series of steps all based on a market perspective, such as sociological studies of potential candidates, marketing and advertising campaigns, striving for transparency of selection procedures, etc. At the end, institutions are evaluated by individual students who choose the one where they will continue their studies, much in the same way customers choose the products that they will buy. All this makes the process of student selection a major manifestation of the market-based perspective in education.

This is the reason why selection of students is a very important evaluation criterion for assessing higher education performance. The institution which is very keen to recruit the best students will be the institution which the best students will want to attend. To live up to its reputation, the institution will have incentives to deliver the best training because it guarantees that the flow of excellent students will continue.

Selection of students and qualities of training are so decisive criteria of evaluation for institutions which compete for the best students that it cannot be disregarded, especially when education is completely tight to research. To make this point, this example of the Ecole Normale Supérieure in Paris, also known as ENS, will be used.

2.1 Student selection

French system of higher education consists of two major components: 1) large, open-access universities and 2) selection-based, small but much more prestigious *grandes écoles* (Grand Schools). The elitist *grandes écoles* educate the leading representatives of French industry, finance, science, and government. On the other hand, universities, which in France are all public and open access, do not have admissions based on selection and, in general, recruit large numbers of students who leave after the first or second year. The situation at ENS differs radically from the situation in French universities.

Ecole Normale Supérieure (ENS) is a highly competitive and extremely selective educational institution in France. It has about 384 science students ("élèves" = pupils),[1] who are recruited through the most competitive system of all that exist in France and arguably anywhere in Europe. Upon graduation from *lycée* (secondary schools), students enroll at *classes préparatoires* (preparatory classes) where they remain for 2 years (between the ages of 18 and 20), studying intensively the subjects chosen for entrance exams to *grandes écoles* with their exceedingly low *numerus clausus*. The competition between students is such that one who succeeds by the end of *classes préparatoires* would have typically studied for 12 to 16 hours a day without holidays for 2 or 3 years. From these best students of *classes préparatoires*, only the top few are allowed to enter the Ecole Normale Supérieure. Among twenty-year-olds, to be admitted to ENS is considered to be the greatest intellectual achievement.

Every year, around 80,000 students in France enroll in preparatory classes in science, representing the most brilliant *lycée* graduates in the country. Of these, only 94 are admitted to ENS in science, of whom 40 in mathematics, representing a unique group of the best young scientists in France. These numbers give a glimpse of the extremely high selection level at the ENS. In their turn, the two years at preparatory classes are themselves only a first selection phase, as they are followed by the four years at school, which are also marked by a tight competition among students.

Thus, ENS is the most selective educational institution in France, and its students pass by the most competitive selection process of all. This stands in sharp contrast to be completely non-existent selection procedures (i.e., everyone who applies is admitted) at such institutes as University of Paris VI or University of Paris XI, both appearing in the Shanghai ranking.

Very severe student selection guarantees the presence of excellent students and constant competition among students. The quality of an university is based on its own procedures of student selection. Therefore,

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[1] ENS has 384 sciences students (94 per year) and many PhD students (around 400). At the same time, ENS has around 200 teachers and 900 researchers.

the criterion of student selection has to be considered for the evaluation of universities. Modalities and procedures of student selection must be an essential part of university evaluation.

2.2 Training and alumni

Selection of the best students have to be followed by a competitive training and high requirements. Both criteria are the basis of university excellence. For example, intellectual training at ENS includes four years of top-level on-campus lecture courses and seminars. The students live on campus in central Paris and, by the time of graduation, receive a training that attains levels significantly higher than any other program offered by a French educational institution.

ENS excels in education in mathematics, where ENS stands among the top world mathematics departments. Eight Fields medalists are among the ENS alumni: more than any other institution in the world. After the United States, France ranks second in the world with 8 Fields medals, obtaining one medal at both recent occasions (in 2002 and 2006). All the French holders of the Fields medal were students of the École Normale Supérieure[2].

The quality of the Department of Mathematics is comparable with the top-level Department of Computer Science. For instance, in 2006 its director, Professor Jacques Stern, received the CNRS Gold Medal, the highest French scientific distinction, for his internationally renowned work in cryptography.

In physics, chemistry, earth sciences, climate studies, and life sciences ENS alumni and faculty have received top national awards and international recognition, including Nobel prizes (10). Among current scientific faculty, twenty-five ENS Professors are members of the French Academy of Sciences as well as members of numerous foreign academies.

ENS's exceptional performance in mathematics, along with its 10 Nobel prize winners in areas such as literature, physics, economics, and chemistry, places ENS well beyond the average value of 8.5 awards calculated by the authors of the Shanghai ranking for the universities ranked from 1 to 20 (Liu & Cheng, 2005, p.8).

High score of Nobel Prizes and Fields Medals among alumni are obviously due to the quality of training provided by the institution to very good students. Therefore the quality of training, to which testifies the

2 Laurent Schwartz (1950), Jean-Pierre Serre (1954), René Thom (1958), Alain Connes (1982), Pierre-Louis Lions (1994), Jean-Christophe Yoccoz (1994), Laurent Lafforgue (2002), Wendelin Werner (2006). In addition, Alexandre Grotendieck, famously made his first serious steps in contemporary mathematics by attending Henri Cartan's seminar at the Ecole Normale Supérieure

number of alumni Nobel Prizes and Fields Medals, must be regarded as a very important criterion of university evaluation.

2.3 Education means research

Evaluation criteria for higher education institutions have traditionally considered research performance as the main basis for a sure and reliable evaluation. But in some cases, it is artificial to disconnect research performances from the type of student training which is an essential part of the environment of research and without which research objectives are very difficult to attain. This is especially important in view of the Shanghai methodology, where research is given a prominent place. Authors of the Shanghai ranking stress that “If one wants to construct a reliable ranking of world universities, the only possible ranking will be a comparative display of research performance” (Liu & Cheng, 2005, p.9). For example, at the Ecole Normale Supérieure, education is so closely tied with research that, literally, teaching at ENS is teaching through research. From the very start of their studies, ENS students are routinely involved in the work of ENS research laboratories and are assigned to research projects that constitute an integral part of the teaching curriculum. At ENS research performance is a keystone and benchmark of education and the quality of research is partly due to the quality of the student environment.

A very strong connection between education and research is required to train excellent student who will become excellent researchers. For that reason, the articulation between teaching and research must be considered as an decisive criterion of university evaluation.

While the Shanghai ranking takes the alumni performance into account, and while it embraces the analysis based on a market perspective, it dramatically excludes the process of student selection, the quality of training and the articulation of education and research from the ranking methodology. Meanwhile, the quality of students, the quality of training and the connections between education and research remain very important criteria for university evaluation. Consequently, those criteria are first-class indicators of the institution’s relative position with respect to other universities that compete to recruit the same students upon their graduation from secondary schools.

The quality of students, measured in terms of the difficulty of entrance barriers, the quality of training measured through the number of alumni winners of the highest distinctions, and the links between training and research must be manifestly taken into account by anyone willing to follow a market-based perspective in the evaluation of universities.

3. Respect of the Difference Between Nations and Systems

According to the Berlin Principle A5, "Not all nations or systems share the same values and beliefs… and ranking systems should not be devised to force such comparisons." The same reasoning should be used for the evaluation of universities. This accepted international Principle has long-reaching consequences for the current methodology of evaluations and rankings. Several such consequences are listed below.

3.1 The French System

In the relevant definition of criteria evaluation of world universities, the specificities of the institutional system they belong must be taken into account. This issue is not only relevant to the criteria of university evaluations but also to the definition of evaluation criteria in university rankings. To give a idea of the problem, the example for French institutions will be taken.

Two features of French system are here relevant in the evaluation methodology French universities are using: multiple affiliation and the place of fundamental sciences.

3.2 Multiple affiliations

In France Public Research Organisations (CNRS, CEA, INRA, etc.) have a particularly important role along with other characteristic elements, such as large universities. They overlap in many hybrid forms; most French laboratories are joint laboratories affiliated with several different institutions, these usually being Public Research Organisations as well as universities. Some laboratories are hosted at university campuses, and some have multiple locations so that they are hosted at campuses of several universities simultaneously.

Groups or institutes of a national research organization (such as the French CNRS) are often mentioned without reference to the university where the research actually takes place. For instance, if a research group uses as address 'CNRS, Orsay', it is in fact a CNRS-financed research group working at the University of Paris 11 (or: Université Paris-Sud; or: Université d'Orsay; Orsay being a suburb of Paris). An individual member of such a group may at the same time be Lecturer at the Ecole Normale Supérieure and, also simultaneously, Lecturer at Ecole Polytechnique. It will then be the case that he or she works at, and is paid a salary by, both the CNRS and the institutions where he or she teaches, but not by the hosting university like Paris-Sud (unless this person teaches there as well). According to the definition used in Dr. Liu's and Dr. Cheng's methodology, "Staff is defined as those who work at an institution at the time of winning the prize" (Liu & Cheng, 2005, p.3). In France as well as in some other European countries, cases of multiple workplaces abound, and the correct institutional affiliation for such individuals can only be double or triple.

For example, in September 2007 Fields medalist Wendelin Werner, previously part-time employed by University of Orsay and simultaneously teaching at ENS, has become a full-time professor at the Ecole Normale Supérieure.

It is a matter of first importance for the correct appreciation of the French national performance that the Shanghai ranking accurately accounts for this tradition. Contrary to the Berlin Principle A5, current and widespread methodology of evaluation of universities forces a comparison between the US/UK systems of institutional affiliation, where cases of multiple affiliation are exceedingly rare, and systems used in other countries, such as France. Such a comparison is only partly justified, and it can lead to distorted evaluation. A detailed consideration of what the notion of “affiliation” means with respect to every national system increase the accuracy of the evaluation of French higher education institutions. Furthermore, it will contribute to the accuracy of comparisons between world-wide institutions and remove the undesired aspect of forced comparison between national traditions, all of which, according to the Berlin Principles, must benefit from equal respect, and all of which deserve detailed analysis.

3.3 Different models of university

In most countries, the criteria of university evaluation are construed in such a way that a preference is given to all-encompassing universities with well-developed engineering and medical schools. It is a university model which is widely represented, for example, in Great Britain and United States. But it does not fit at all the definition of a university in other academic traditions all over the world.

To take the example of France, all-encompassing universities with engineering and medical schools are merely non-existent. It is a particularity of the French educational system that training in medicine and engineering is fully disassociated from education in fundamental sciences or humanities. Only special schools prepare future engineers (e.g., Ecole Centrale, Ecole nationale supérieure des télécommunications, Ecole des ponts et chaussées). Medical schools exist within some universities only. In addition, science universities are separated from humanity and social science universities.

So the criteria evaluation of a world university cannot take for granted that any university will unite both a science school and humanity and social science school. It cannot take for granted either that it will include engineering school or medical school. Therefore, it is very important that the criteria of evaluation of university be more diverse, and take into account the fact that university can be specialized, and that in most cases they don’t include engineering and medical schools.

This issue has an obvious impact on international evaluations of universities and on rankings among world universities. The more striking point in case is related to the evaluation of the performances in medical and engineering schools which are rated higher. For universities which don't include medical or engineering schools, not due to a scientific decision but as the result of an academic tradition, evaluation must be distorted. So for the definition of evaluation criteria of world university it is important that a balanced solution be reached, where, first, different models of academic institutions, and a fair evaluation could be given to universities without medical or engineering schools.

3.4 Fundamental sciences, medical sciences, engineering sciences

The evaluation criteria for universities must give equal weight to fundamental sciences versus medical and engineering sciences. In most cases, the criteria of evaluation rank higher research in medical and engineering schools than in fundamental sciences. For example, it is emphasized by the authors of the Shanghai ranking that "The nominal performance of institutions with medicine faculties appears to be better in the ranking" (Liu & Cheng, 2005, p.10). This can also be seen in the fact that journals such as *Nature* and *Science*, both being given a drastic preference in the Shanghai ranking, publish significantly more articles in experimental sciences and applied domains, including most prominently medicine and engineering, than in mathematics, fundamental physics or fundamental theoretical computer science.

As to criteria evaluation, fundamental research must be given an opportunity to rise in importance to the same level as medicine and engineering; second, coefficients for research performance in mathematics and computer science will be calculated on a fair basis as compared with other disciplines.

4. Human and Social Sciences VS. Exact and Natural Sciences

In their own evaluation, universities take into account many aspects of the specific way of assessing the value of human sciences production. Research in humanities and social sciences is not done the same way as in sciences. So evaluations which do not take that fact into account will be flawed.

4.1 Journals and books

In many areas of the social sciences and humanities, scientific publication practices are less standardized than they are in the natural and life (including biomedical) sciences. Particularly, the role of international peer-reviewed journals is less important. Scholars in human sciences, especially in non-English-speaking traditions, often tend to take extended periods of time for elaborating their thoughts and developing them into a book, rather than publishing excerpts in the form of articles.

At the same time, the disciplines where such practice occurs tend to attract equally many, if not more, students than the disciplines where article publication in peer-reviewed journals is considered to be a standard. As a consequence, methodologies that are based on the model of the exact sciences fail to account appropriately for the variety of methods of scientific research in social sciences and humanities.

So we need criteria evaluation which do not include indicators that have been created for one scientific area and which are not relevant to a different area that is not set by the same standards.

4.2 Influence of books and citation of papers

For instance, the impact of book publication in human sciences can be enormous, as witnessed by many influential volumes in such disciplines as anthropology or philosophy that have never been published in the article form prior to their publication as a book; at the same time, books in exact and natural sciences tend to be compendia of articles and results previously published by the author in scientific journals.

Hence, while in today's world most evaluation methodology does not take into account books in evaluating sciences publication, procedure which is perfectly justified, not taking into account books published in human and social sciences introduces a fatal error that leads to a major inaccuracy in the evaluation of universities which have a large component in social sciences. Indeed, studies have been made in bibliometric analysis that show that countries like Germany and France, where book publication in human and social sciences is hardly ever preceded by journal publication, 'suffer' from this bias in the evaluation of university methodology (van Raan, 2005).

4.3 Differences of languages

According to the same studies, countries like France and Germany also 'suffer' due to fact that journals are published in French and in German respectively (van Raan, 2005). While scholars in exact and natural sciences tend to use English as language of written communication, scholars in human and social sciences frequently use other languages. Indeed, some journals are linguistically mixed, accepting submissions and publishing articles in a variety of languages. French-language journals in, e.g., philosophy or anthropology are often as influential as English-language journals, while in exact and natural sciences this is not the case. A faithful ranking methodology should accurately consider the factor of linguistic difference.

The difficulty of accounting for the difference between, on one hand, exact, natural and life sciences, and, on the other hand, human and social sciences is exceedingly high. It is not easy to develop an evaluation methodology that would accurately measure this difference within one given research culture; it is merely impossible to develop a methodology that would faithfully represent this divergence across national and linguistic barriers.

It is our suggestion that policy of university evaluation, which strives to objectively assessing strengths of various universities around the globe, focus its attention on exact, natural and life sciences and put aside human sciences from its analysis, for a while, till proper criteria of evaluation for human and social sciences can be considered fit for evaluating the research performance and receive a large agreement.

5. The Size Effect

There are several models of excellence. Small institutions (around 2000 students) can have excellent evaluation. The proper way of weighing the size factor must be an decisive issue for the evaluation of universities.

5.1 Size dependent criteria

If we take the Shanghai ranking, we will observe that excellence measures, which account for 70% of the weight in the Shanghai ranking methodology, are defined by the number of items (such as articles or authors) achieving a required level. Another 20% of the weight is represented by citation indices, which also depend on the number of items. Thus, 90% of the criteria used in the Shanghai ranking are size-dependent.

The composition of a university, however, and hence the factors that play a decisive role in determining its size, are not the same in the American tradition as compared with most European systems, including the one of France. Human and social sciences typically represent a smaller proportion of activity in each of the major American universities that are among the leaders of the Shanghai ranking, while in Europe the situation is utterly diverse: in some universities human and social sciences can be totally absent or play a minor role (e.g., many Technical Schools in Germany or Engineering Schools in France); in others they serve purely educational rather than research purposes (e.g., Ecole Polytechnique in France); and in others yet, they form, on the contrary, a major theme (e.g., London School of Economics in Great Britain, or Sciences Po in France). A science university reaches in most cases a better score in citations and research performance, while institutions specialized in human and social sciences or without medicine school are penalized by the procedures of evaluation. Therefore, the size effect but be given more weigh in order to compensate for the disadvantage they suffer in standard evaluation for not having a medical or engineering school.

5.2 Activities and size of institutions

A particularly problematic case is the middle role of human and social sciences, i.e., their presence at an institution as a purely educational activity while the research component of the same institution focuses on exact and natural sciences only. To a large extent, this is the case of Ecole Normale Supérieure. Highly developed educational activity in human sciences dissolves the size effect and brings a significant error in the values of the institution’s size-dependent indices, which comprise a very important element in the methodology of university evaluation.

A choice has to be made in evaluation procedures. Either quality of education (as input to research) is taken into account, and evaluation relies on the size of the institution. Or if the quality of research is only to be measured, education-only activities should be subtracted from the total size of the institution. While for most American universities, where such activities are small compared to the overall size of the institution, correcting this error in the methodology will not influence the evaluation significantly, for many European institutions introducing such a correction represents a crucial step in a fair evaluation of their performance.

References

N.C. Liu, Y. Cheng. (2005). The Academic Ranking of World Universities. *Higher Education in Europe,* vol. 30; no. 2; pp. 8, 9, 3, 10.

Anthony F. J. Van Raan (2005). Fatal attraction: Conceptual and Methodological Problems in the Ranking of Universities by Bibliometric Methods. *Scientometrics*, vol. 62 ; no. 1 ; pp. 133-143.

Suggestions for evaluation criteria of universities and recommendations for rankings

Researchers' affiliations

In many countries, particularly in Europe, multiple researchers' affiliations are common practice. Evaluation methodology ought to be amended so as to account for this fact appropriately.

Linguistic differences

In many research disciplines, particularly in social and human sciences, equal significance of publications in languages other than English (e.g., in journals edited in France and Germany) ought to be recognized.

Differences between domains

Research practice in different domains can include, or not, frequent submission of articles. In some areas, particularly in social and human sciences, articles are not a major form of scientific expression and communication. Book-writing is a dominant method in areas such as, e.g., anthropology or philosophy. This radical divergence in the scientific habit ought to be taken into account.

Human and social sciences

Given a tremendous difficulty to establish uniform criteria for human and social sciences that would also apply to exact and natural sciences, we recommend to consider proper ways to evaluate human and social sciences.

Calculating the size

For evaluations which are first and foremost, of the scientific performance of universities, when calculating the size of a particular institution, purely education-oriented activities that may exist within this institution should not be taken into account

Rankings, Governance and Attractiveness: the New French Context

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Abstract

We would like to show how the French University landscape is advancing by considering the main publications on the Shanghai Ranking and the reactions of French institutions. Examining the interactions between rankings, governance and attractiveness will lead us to question the definition of a world-class university in a French context: in particular, what strategies institutions influenced by the Shanghai Ranking are carrying out to improve their international legibility and visibility, oriented in this sense by our new government. We will look in passing at the reasons why the Jiaotong ranking has now become indispensable, despite the weakness of some of its indicators. More generally, we will emphasise the fact that giving it the importance that some institution strategies do, with the sole aim of reaching the top, is most likely to be harmful to the ranking itself.

Rankings, Governance and Attractiveness: the New French Context

I. The Shanghai Ranking's Reception in France

Everyone is today agreed that the University has three essential functions: higher education, research and professional training, but it is also recognised that these three functions together, even when taken to a level of excellence, are not however sufficient to define a university, still less one of world class. This means that the Shanghai Ranking is perhaps even more interesting for the questions it poses and the global strategic responses it invites than for its results alone.

As regards the ranking itself, Nian Cai Liu and Ying Cheng very recently pointed out once more that the Academic Ranking of World Universities does not fairly represent the teaching function, a basic function of all universities, that it favours universities of English-speaking countries and those specialising in science, and that the history or size of an institution are not properly taken into account. As we have just remarked, the problem of how to define a higher education institution, as well as those of how to take into account departments affiliated to institutions, and the attribution of publications, not to mention the current impossibility of accurately representing the social and human sciences, also still remain unresolved. (*AIU Horizons*, May 2007, p.5, col.b).

Jamie P. Merisotis and Lacey H. Leegwater (respectively President of the Washington Institute for Higher Education Policy and manager for programmes) while recalling their institute's collaboration with UNESCO's CEPES and the subsequent creation of the IREG (International Ranking Expert Group), emphasise that one of the consequences of the 2006 Berlin conference should have been to "conduct, commission and encourage research that evaluates ranking systems and contributes towards a better understanding of the impact of rankings on improving the quality of higher education." (*AIU Horizons*, May 2007, p. 7)

Every publication of the Shanghai ranking is greeted by an abundance of commentaries in the main French newspapers. Knowing for example that France is ranked 4th in microbiology, 5th in clinical medicine and pharmacology, 6th in neuroscience and behaviour for the last ten years, according *Essential Science Indicators* in terms of the number of papers and citations (*In-cites*, June 2006), there is consternation that no

French institution is in the top 100, while the generalist press continues to denounce the mediocrity of the French position ("*French universities still trailing behind", Le Figaro, 4 August*), or damn it with faint praise ("*French universities creep up a few places in the world ranking", Les Echos, 2 August*).

Despite all its imperfections, recognised by its own creators and analysed at length during the first ARWU symposium, the legitimacy of the Shanghai Ranking is no longer constantly being questioned, even in France, despite the many biases that those involved are seeking to correct. Neither is the issue of whether or not it should be taken into consideration: the media pressure exerted by the ranking in France has been such since its first publication that the idea now generally emerging from French specialists and decision makers, despite the very deep seated resistance in French universities to anything that might cause large national discrepancies (which have nonetheless existed in reality for a long time), is to make the best use of the Shanghai ranking by combining it with other ranking systems to help universities redefine themselves based on their essential mission goals, in such a way as to position themselves as well as possible internationally.

The President Sarkozy himself sent to the new ministry of higher education a mission letter in which one of the target is to rank 2 French establishments in the top 20 and 10 in the top 100.

II. The Impact of the Shanghai Ranking on French University Policy

It is nevertheless clear that making use of international rankings, on the one hand, and ranking French universities nationally, on the other, mean quite different things. The universities themselves, most often supported by local elected representatives, have up to now opposed the latter idea, however it is expressed, in the name of national unity and nationwide equal access to higher education. Everyone in France is however aware that this system is breaking up of its own accord under the staggering blows of globalisation, and that failure to adapt rapidly might penalise French higher education institutions, including the most prestigious, in terms of attractiveness. Germany, for example, recently abandoned this egalitarian myth and took the next logical step by creating seven, very heavily state subsidised, centres of excellence.

In fact, the worst danger faced by French universities today is that poor performances in certain rankings, particularly that of Shanghai, will result in an artificial rearrangement of the French university landscape involving merging already existing institutions to achieve significant size, without that corresponding in reality to a profound change of governance, a real pooling of resources, or the confirmation of a common history resulting in a unique culture. This is why, although the Shanghai ranking today plays an important role in accelerating the transformation – first of all mental – that French university staff as National decision makers are currently undergoing, it is imperative that we do not today demand more from this ranking – as from others – than it can provide.

In other words it is most likely to be harmful to the ranking itself to give it an importance such as certain institution strategies do, with the sole aim of reaching the top.

If what can be likened to a bypass can be taken, in other words if institutions achieve an administrative merger and a unified signature to reach a critical mass in teaching and research, and thereby climb the Shanghai Ranking, this demonstrates that the latter does not always rank real entities but amalgamations of already existing entities, and can sometimes encourage mere signature effects. To cite two examples, Paristech, the amalgamation of nine of the most prestigious engineering colleges, or *grandes écoles,* in France, is more like a holding company, whereas the planned merging in 2009 of three Strasbourg universities is based around a site and a history : the figure 1 is displaying the current ranking of Paristech, the Paristech ranking after merging, and the same ditto for Strasbourg. It is obvious that, in spite of two very different ways of achieving a merger, these two institutions will fully benefit of a new critical mass.

CAMPUS FRANCE campusfrance.org

French Universities alliances and mergers : impact on ARWU global rankings

Alliances		Individual ranking	Alliance ranking
Universitas*	*(since 2005)*		**7**
Univ. Paris 6		39	
ENS Paris		83	
Univ. Paris 9		378	
ParisTech*	*(since 1991)*		**38**
Ecole Polytechnique - Paris		252	
Ecole des Mines - Paris		359	
ESPCI - Paris		327	
Strasbourg	*(planned for 2009)*		**Better than 99**
Univ. Louis-Pasteur		99	
Univ. Robert-Schuman		ND	
Univ. Marc-Bloch		ND	
Marseille-Aix*	*(in 2007)*		**116**
Univ. Méditerranée		272	
Univ. Aix Marseille 1		399	
Lyon	*(virtual alliance)*		**130**
Univ. Lyon 1		265	
ENS Lyon		484	
Bordeaux	*(virtual alliance)*		**141**
Univ. Bordeaux 1		314	
Univ. Bordeaux 2		458	
Grenoble	(agreement signed 2006)		**Better than 183**
Univ. Grenoble 1 (J. Fourier)		183	
Univ. Pierre Mendès France		ND	
Univ. Stendhal		ND	
Institut Polytechnique de Grenoble		ND	

* *Only members listed in ARWU 2007 are taken into account.*
Source: Jiao Tong University, ARWU 2007.
Computation: Edouard Mathieu (Invest in France Agency)

Figure 1 Here show a table. Source Mathieu, C. (AFII)

This is the reason why we subscribe totally to the way the Shanghai ranking is perceived intellectually and ethically today by experts as regards its capacity to progressively define a world class university: "A WCU should see its high status also as a responsibility and as such it should serve as a "role model" for other higher education institutions, not only with regard to the research performance but also in other fields such as ethical conduct, and adherence to meritocratic and transparent student admission and career policies and practices." (Sadlak, Liu, 2007, 21-22)

III. What is a University?

If the definition of a major university consists essentially of the three afore-mentioned mission goals of teaching, research and professional training, it is all the more important that these should be properly exercised at the regional, national and international levels.

A – The regional positioning: this position is based on the history of the university site, a history comprising many interdependent regional networks which make up the university community as a "pool of knowledge" ("*bassin de la connaissance*"). The regional positioning means a university's setting in its town and Region, its relationship with the business world, neighbouring competitiveness clusters, and regional managers of national research organisations, the existence or otherwise of large scientific research instruments, health research facilities etc. in the immediate vicinity. This whole fabric created over time and on the basis of patiently constructed partnerships is what contributes towards giving the university a unique legitimacy and a distinctive culture.

The ingraining in regional territory is also linked to the campus idea, that of a setting as unique as possible, bringing together all university mission goals and the facilities required to fulfil them. The university at this regional level is first of all a "body" with a history, which has gradually created pedagogical, academic and scientific practices resulting in a way of being. Despite 'state orientations', it is this way of being which in the end acts as a break or an accelerator on the body's necessary and constant effort to adapt to worldwide university developments.

What French teacher-researchers most probably lack is very much this feeling of belonging to a university and a university site before belonging to a training and research unit (UFR) or laboratory. This explains in large part the problems of signatures (41 different ones for the University of Lyon 1 alone!).

It is here that governance intervenes most fully, and it is probably at this first, essential level, that the new universities Bill may give the French university President the necessary powers to decide quickly, recruit the personnel he wants on his own terms, create foundations, seek links with private research, build partnerships with industry, attract international researchers and students. And all for the long-term, since his reduced mandate of four years will be immediately renewable once.

B – The National Level: involvement at the local regional level is a necessary condition of national success. Merged institutions must, as we have seen, firstly be united at the geographic, historical, cultural and economic level. From this point of view the merging of universities being prepared in the main regional centres will achieve significant results all the more quickly if they possess a shared site history. That amounts firstly to reuniting what 1968 dispersed, including on a single campus or in a single major university town, and also validating federal governance, which sometimes existed for decades, up to the merger. It is highly likely therefore that the Research and Higher Education Clusters of Toulouse and Bordeaux for the South-West, Rennes for the West, Lille the North, Strasbourg the East, and Aix-Marseille, Lyon, Grenoble and Montpellier for the South-East should without major difficulty become world-class university candidates in the years to come. To which will be added four or five Parisian centres for which the difficulties of merging are far greater. The international ambition of regional local authorities, to which may be added the recent creation by the French Government of global competitiveness, or globally orientated, clusters, is such that decentralisation by means of the creation of real "pool of knowledge" can only accelerate (fig. 2).

Here show a map displaying the global competitiveness clusters and main globally orientated university sites.

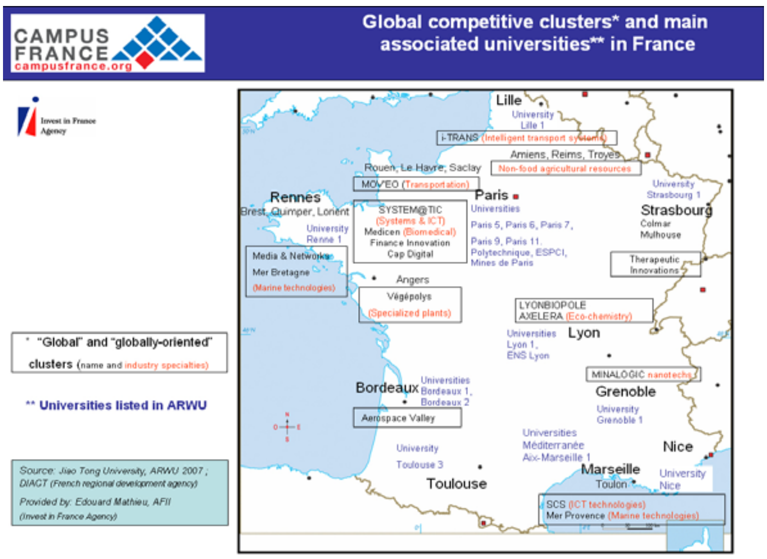

Figure 2 Global competitiveness clusters and main associated universities in France

C – The Global Level: does this mean that these merged groups correspond to world-class universities and that the Governments concerned should support them?

"It is legitimate to pose the question: how many such elite institutions do a given country or region not only need but also can support [and support only through public funding]? " (Sadlak, Liu, 2007, p.20)

Christian Saint-Etienne (member of the French CAS (Strategic Analysis Centre) and a university Professor), argues in *Le Monde* of 13 March 2007 for a "differentiated excellence" rather than accepting "average mediocrity". *"This would involve having about ten universities specialised in the pursuit of excellence, ranking among the highest worldwide, with a permanent evaluation of teacher-researchers, each teaching and research department able to select students for admission, and about seventy professional universities for all students wishing to study, on the condition of a pre-entry orientation session based on students' abilities."*

Actually, we don't yet know the design of the landscape, but the immediate future will show if we are organizing a sort of "educational Darwinism", and carrying out the capitulation of the republic of universities as said very recently Christophe Charles, in *le Monde diplomatique* of september 2007), or if we pull off altogether the best globalization of knowledge we need.

Conclusion

I have two final remarks. The first is about the Jiaotong ranking itself: if this ranking seems to be nowadays perceived as a sort of modern fate, it is necessary to express very clearly the spirit with which this ranking is conducted, insisting in its unavoidable bias and at the same time in its possible evolutions. It is certainly thanks to this ethic that this ranking can be respected (Everyone knows that recently in USA the Annapolis Group, representing 115 universities boycotted a ranking questionnaire because of intentional bias).

The second is about the necessity to link research indicators more directly with real conditions of research and research training. In this thinking, it would be perhaps interesting to consider to what extent, for example, the European PRIME programme (which developed the *Observatory of the European University* project) would not be inspiring for the improvement of ARWU.

References

Charles, C. (september 2007), Faut-il coter les facultés européennes ? *Le Monde Diplomatique.*

Essential Science Indicators (September 2006), http//: www. in-cites.com.

Liu, N.C. & Cheng Y. (May 2007), Classement académique des universités mondiales, *AIU Horizons, 13 (2-3).*

Merisotis, J.P. & Leegwater, L.H. (May 2007), Initiative de l'UNESCO-CEPES/IHEP relative aux classements : les principes de Berlin pour le classement des établissements d'enseignement supérieur, *AIU Horizons,* 13 (2-3), Paris : Maison de l'UNESCO.

Sadlak, Y. & Liu, N.C. (2007). The World-Class University and Ranking : aiming beyond status, *Bucarest : UNESCO-CEPES* .

Saint-Etienne, C. (13th march 2007).Pour des universités de rang mondial, *Le Monde.*

Identifying the Best: The CHE Ranking of Excellent European Graduate Programmes in Natural Sciences

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Abstract

The Centre for Higher Education Development (CHE) has designed a "Ranking of Excellent European Graduate Programmes". In its first round, this ranking concentrated on the natural sciences and mathematics. The centre applied a two-step approach for analysis. First, four general indicators were identified for all European universities. Second, for those universities that excelled in at least three out of these four indicators with a gold or silver medal, an in-depth analysis was run based on institutional questionnaires and on-line surveys. The results show that Europe in general provides a very high level of research and graduate teaching in the academic fields that were analysed. This project is intended to be transferred to other academic fields in the near future.

Identifying the Best: The CHE Ranking of Excellent European Graduate Programmes in Natural Sciences

Genesis and Philosophy

The Centre for Higher Education Development (CHE) has created a "Ranking of Excellent European Graduate Programmes" (in short: Excellence Ranking) in the fields of mathematics, biology, chemistry and physics. The ranking is meant to provide orientation to undergraduates, helping them find their way through the European Higher Education Area (EHEA) while assisting them in choosing a suitable university for their graduate studies (master's and PhD). Additionally, the Excellence Ranking offers guidance to different funding organisations regarding the top science departments in Europe. Lastly, the Excellence Ranking wants to help institutions represented in the guide to further improve their excellent programmes.

On the basis of our longstanding experience with European ranking of higher education institutions in Austria, Switzerland and Germany, and currently extended to the Netherlands and the Flemish universities in Belgium, the CHE intends to contribute to the European Higher Education Area while demonstrating the competitive strength of European universities. First and foremost, however, the Excellence Ranking is designed as a tool for prospective top students in the sciences who are looking for interesting and excellent institutions offering high quality master's and PhD programmes.

Target Groups

The Excellence Ranking targets the following groups:

1. Undergraduates from European and non-European universities intending to earn a master's or PhD degree or equivalent in the sciences and mathematics:

The Excellence Ranking's objective is to fill the existing gap of information sought after by students who are in their final stage of (or just finished) their undergraduate studies and who intend to pursue a master's or PhD. Besides general information on the institutions with one or two top group places[1] in the ranking, these students will benefit by receiving more in-depth information on a highly selective group of top

[1] The methodology of the Excellence Ranking described later is based on a differentiation between European HEIs according to their top performance in up to four indicators.

class, Higher Education Institutions (HEIs) in the fields of mathematics, physics, biology and/or chemistry. The information will be divided into the different disciplines and according to the multidimensional approach of CHE. This approach will not show a league table but rather, depending on different indicators, groups of particularly excelling HEIs.

2. Higher Education Institutions (HEIs):

The HEIs with three or four gold or silver medals which will be presented will benefit from the Excellence Rating in various ways. Firstly, being selected out of nearly 4.000 HEIs in the whole of Europe may be regarded as a highly useful marketing tool. Secondly, the Excellence Ranking will inform prospective master's and PhD students and thus can be perceived by the included HEIs as an excellent and outstanding opportunity for student recruitment. Finally, the HEIs will be able to compare their performance in a broad variety of aspects to that of other European HEIs of similar excellence. This will allow them to identify areas in which they may be able to increase their as of yet high-level standards.

3. Organisations and the society at large

Organisations such as foundations and other funding institutions are continuously in need of information regarding excellent programmes which might best serve their grantees. The Excellence Ranking will provide such information with the awareness of the limitations of certain indicators. Moreover, it will allow the public to get an inside view into the research abilities and teaching capacities in the fields of the sciences of the finest higher education institutions in Europe. Thus, the ranking will help to promote the knowledge society and will also prepare the science fields for the increasing demand for life-long learning.

Methodology

The Excellence Ranking follows the sound and internationally recognised methodological principles[1] which have been developed by CHE. These principles include a discipline-oriented and multidimensional approach, abstaining from a comparison of institutions as a whole and taking the heterogeneous preferences of students into account. In doing so, we emphasize the importance of considering different perspectives

[1] See for example: (1) EUA Report by François Tavenas (2004). Quality Assurance: A Reference System for Indicators and Evaluation Procedures, EUA: Brussels. (2) Van Dyke (2005). Twenty Years of University Report Cards. In: Higher Education in Europe, Vol. 30, No. 2, pp. 103-124. (3) Usher/Savino (2006). A World of Difference: A Global Survey of University League Tables. Toronto, ON: Educational Policy Institute. (4) Marginson, Simon (2006). "Australian universities in the global context." Financial Review Higher Education Summit, 22-23 March, Sydney.

from inside the university. Additionally, we highlight our preference to classify institutions in three broad quality clusters, rather than assigning individual ranks that focus on a limited number of universities per subject. Of course, the methodology will be adapted to differences deriving from the heterogeneity of countries as well as to the specialities of the fields of analysis. The Excellence Ranking also adheres to the *"Berlin Principles on Ranking of Higher Education Institutions"*[1] as launched during the meeting of the International Ranking Experts Group (IREG) in Berlin in May 2006.

The Excellence Ranking differs from the established CHE University Ranking in that it looks for examples of excellence throughout the whole of Europe rather than presenting each institution in the context of the entire European higher education setting. In the first phase, this search focuses on the fields of biology, chemistry, mathematics and physics; in follow-up phases it will be extended to other academic fields such as political science or engineering.

The analysis of the European higher education institutions (HEIs) concentrated on measures for research achievements. Thus, in the first "pre-selection" step, European HEIs were identified as excelling in one of four indicators. The top group for each indicator was identified depending on the distribution of its values. A steep distribution produced a small top group, a smooth distribution, a larger top group. In a second step, this top group was divided into two subgroups by applying the same method as for the first grouping. So each indicator shows three groups which are named gold, silver and bronze medal.

Of course, CHE is aware that every selection of indicators, however carefully set up, carries the risk of overlooking individual research teams or of not taking into account a specific department with a particular expertise.

The classification is based on four indicators[2]:

- **Number of publications in the web of science (1997 – 2004)**

This is the number of publications found in the web of science with a query by institution and subject: Chemistry, Mathematics, Physics and Biology, with the publishing year from 1997 to 2004. The top group for each subject includes those universities which have the largest publication output and contribute to at least 50% of all publications counted. The gold group is derived by applying the same procedure again to the HEIs in the top group. It contains the largest HEIs covering 25% of the output. The silver group comprises those

[1] see: http://www.che.de/downloads/Berlin_Principles_IREG_534.pdf

[2] The publication and citation indicators were computed by Prof. Dr. van Raan from the CWTS Leiden.

HEIs which were in the first step's top group but not in the second.

This indicator is meant as a “size” indicator describing the overall impact of a science department.

- **Citations (normalized to the international standard)**

This indicator compares the average number of citations received by the papers of a research unit (CPP) with its international reference value, namely corresponding the field-based mean citation score (FCSm) by calculating the ratio. It was developed by Anthony van Raan and the CWTS as a measure for the visibility of a department compared to an international standard. Self-citations are excluded in the calculation of the ratio to prevent the ratio from being affected by divergent self-citation behaviour.

If the ratio CPP/FCSm is above (below) 1.0, this means that the papers of the research unit are cited more (less) frequently than an ‘average’ publication in the field(s) in which the research unit is active. FCSm constitutes a worldwide field-specific average in a specific (combination of) field(s). In this way, one may obtain an indication of the international position of a research unit in terms of its impact compared to a world average. This world average is calculated for the total population of articles published in CI journals assigned to a particular field.

The citations top group is computed in a similar way to the publications top group. The universities with the highest citation indices covering 50% of the sum are chosen for the top group. The same procedure applied to the top group yields the gold group containing those HEIs which managed to get into the top group in both steps. The rest of the HEIs of the first step's top group receive a silver medal.

This indicator focuses on the “reception” impact of such a department in its scientific community.

- **Highly cited authors, nobel prize winners or field medalists**

This indicator identifies institutions with outstanding researchers. Only researchers that are still teaching at the specific institution are counted. Thomson Scientific provides a list of “Highly Cited Researchers,” each of whom are among the 250 most cited researchers for their published articles within a specific time period.[1]

To identify highly cited researchers, ISI begins with all articles indexed in the Thomson Scientific Citation Databases over a 20-year rolling time period; the period 1984-2003 was used for HEI pre-selection. Each article in the database is assigned to one or more of the 21 categories in ISIHighlyCited.com based on the ISI classification of the journal in which the article was published. Categories counted were chemistry,

[1] See: http://hcr3.isiknowledge.com/home.cgi

mathematics, physics, and biology, especially biology & biochemistry, microbiology, molecular biology & genetics, and plant & animal science.

The top group is built of those universities with at least one highly cited author working in the respective field. The gold group consists of those HEIs where more than one highly cited author is working, except for biology, where a HEI needs two highly cited authors to qualify. This takes into account that for biology four subfields were analysed and thus more highly cited authors were found. The limits given here were computed using the same 50% approach applied to the above mentioned two indicators. The silver group again comprises of those HEIs which did not get into the gold group of the second step, but where at least one highly cited author is a staff member.

This indicator stresses the “lighthouse” factor of a department within its community.

- **Number of projects in the Marie Curie programme**[1]

This indicator measures European activity. The Sixth Framework Programme's Human Resources and Mobility (HRM) activity is largely based on the financing of training and mobility activities for researchers. These activities, known as the Marie Curie Actions, are aimed at the development and transfer of research competencies, the consolidation and widening of researchers' career prospects, and the promotion of excellence in European research. The following activity lines were taken into account relative to their financial impact and availability (i.e. EXCs are very scarce but heavily funded whereas EIFs or IIFs are rather abundant but substantially less funded):

- Marie Curie Intra-European Fellowships (**EIF**)
- Marie Curie Incoming International Fellowships (**IIF**)
- Marie Curie Research Training Networks (**RTN**)
- Marie Curie Host Fellowships for Early Stage Research Training (**EST**)
- Marie Curie Excellence Grants (**EXT**)
- Marie Curie Chairs (**EXC**)

In computing the top group in this indicator, the intra-European fellowships (EIF) and Incoming International fellowships (IIF) received a single weight, the research training networks (RTN) and the host fellowships (EST) a double weight, and the excellence grants (EXT) and chairs (EXC), a triple weight. The method used to identify the top group was similar to the method used for grouping the publication indicator.

[1] See: http://cordis.europa.eu/fp6/projects.htm

By applying this method again for the second step, the HEIs fulfilling the top group requirements form the gold group, and the remaining HEIs form the silver group. This indicator highlights the European dimension of the departments.

The results of the allocation of gold, silver or bronze medals in any of the four indicators resulted in a table containing all those universities which managed to receive at least one bronze medal in one of the four indicators. It should be mentioned again that even those HEIs which received only bronze medals in any indicator performed very well in the respective indicator in the academic field compared to the rest of the European HEIs.

In a second step, those institutions with at least three silver medals in the four indicators in each academic field were chosen for the next phase of the project. These institutions were considered for an in-depth analysis and presentation. Study conditions, programmes and other criteria were taken into consideration. In order to ensure the best possible quality of the endeavour as well as the utmost intercultural awareness, a group of HEIs covering different countries and academic fields was chosen to test the questionnaires and methods. Since education and research systems differ considerably within Europe, the Excellence Ranking was interested in giving these aspects of the research proper consideration. The testing partners were selected according to a variety of indicators, including performance level in as many of the analysed fields as possible and regional spread, to help identify “cultural” differences in the various university systems.

In the next project phase, the data collected from the institutions and the information gathered from on-line questionnaires were analysed and, depending on the statistical validity, ranked according to the CHE principals. If such validity could not be stated, the data were presented without groupings.

After the returned questionnaires were analysed, it became clear that not all of the information obtained from the institutions could be used for the ranking. In certain areas, it seemed difficult for institutions to mine the necessary data. Examples were the number of exchange students in each subject or even the exact number of doctoral students within a department. Those indicators which fulfilled the following criteria were identified:

1. A sufficiently high percentage of institutions (at least 50%) were able to provide reliable and dependable data.
2. The data provided could be comparable between countries within reasonable boundaries. E.g.,

funding proved to be impossible as an indicator because budgeting systems varied too much; the calculation of staff costs and the level of detail that could be shared by the HEIs was also too diverse.

3. Student evaluations were only taken into account if the sample group size for each indicator was at least 10 students.

As a result, the following indicators were chosen to be ranked:

- students' judgements on the doctoral and master's level such as
  the overall situation, aspects of training and courses, counselling and advise, the computer equipment, the laboratories and the library. For doctoral students, more research oriented aspects were judged, e.g. the possibility to take part in the scientific community by attending conferences or workshops and by publishing papers.
- the percentage of international and female staff within the group of staff with a doctorate.
- the percentage of female and international doctoral and master's students.

Due to the fact that a lot of data are missing or were given in a way that made the numbers incomparable, many facts cannot be compared in the ranking. In addition to the ranked indicators, the on-line version of the CHE Excellence Ranking will contain a considerable amount of supplemental information for interested students. Facts on the size of the departments, admission conditions, and details on academic programmes (such as study abroad or course offerings) will also be outlined. One central feature of the on-line version will be the possibility to access the departments/faculties via research categories. Each department was asked to name their research groups and to assign them to one or more research categories. This allows for the option to search for a subfield of a subject and to identify those departments working on a student's own field of interest.

Findings

The findings should be divided into two sections: findings for the entire sample and findings from the in-depth analysis results for those HEIs which excelled in at least three out of four indicators, "excelling" thereby defined as receiving at least a silver medal. On the general level, the analysis shows that there are some commonalities as well as some considerable differences between the academic fields. Overall, in biology, 122 HEIs were spread over the four categories, with 6 that excelled in all four indicators, 17 in three, 33 in two and 66 in one indicator. In chemistry, 134 HEIs qualified with 7 excelling in four indicators, 18 in three, 36 in two, and 73 in one indicator. Physics showed an overall number of 117 HEIs with 6 excelling in four indicators, 18 in three, 23 in two, and 70 in one indicator. Finally, 129 HEIs in mathematics excelled with 6 in all four indicators, 13 in three, 28 in two, and 82 one indicator.

One can observe that the distribution seems to be rather comparable between the subject areas. It is, for example, striking that in three of the four academic areas, exactly 6 HEIs (in chemistry, 7) excelled in all four indicators. Also in terms of percentages, this group comprises between 4.65% and 5.22% of the entire sample in each of the four academic areas. Moreover, moving from one segment to the next higher segment leaves us with a decrease of somewhere in the range of 40-50%. There are some exceptions, such as in physics, where one can observe a rather equal distribution of 19.66% (two gold or silver medals) and 15.38% (three gold or silver medals).

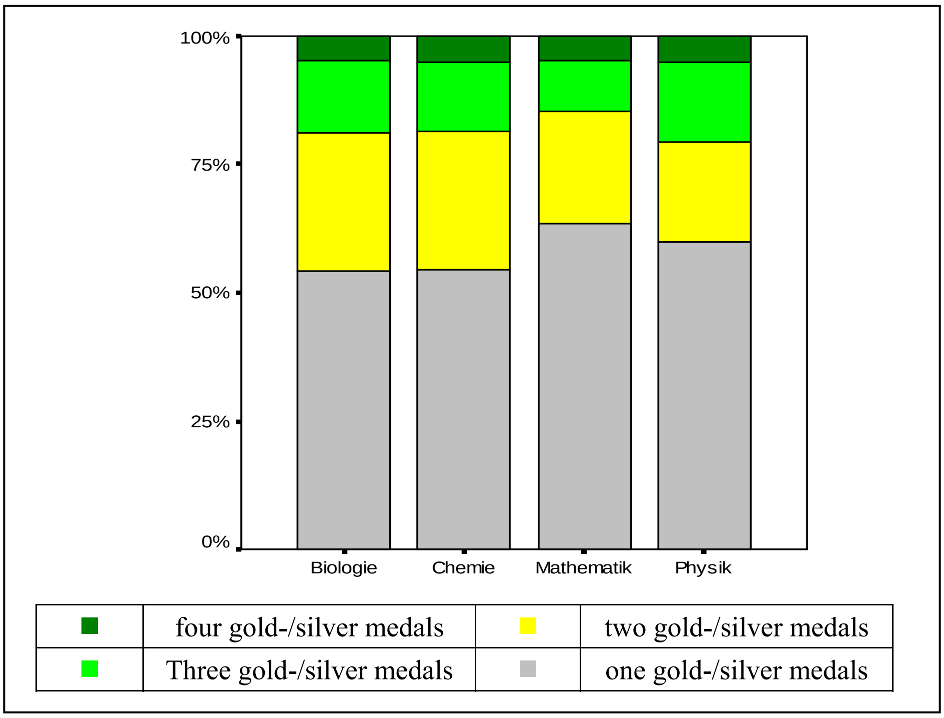

Figure 1 Distribution of groups over academic disciplines

In mathematics the distribution here is considerably steeper than in the other areas, leaving the group with only one gold or silver medal much stronger (with 63.57%) than the average of the other three subjects areas of 56.14% (and the overall average of 57.99%). Meanwhile, the group excelling in three indicators is considerably smaller (with 10.08%) compared to an average of 14.25% over the other three subject areas (and an overall average of 13.21%). With the group excelling in all four indicators comprising of the smallest percentage within the entire subject sample of all four subject areas, in mathematics the groups excelling in three and four indicators only comprise of 14.73% of the overall number of HEIs in the academic field, compared to an average of 19.34% for the other three and an overall average of 18.19%.

Another aspect of the findings is the distribution of countries of origin between the four indicator groups. Across all four subject areas, Germany and the United Kingdom dominate the groups in sheer numbers. 46% of all institutions across all subject areas are located in one of these two countries. France, as the third largest provider of universities excelling in one or more of the indicators, is far behind with less than 40% in chemistry compared to the UK and down to less than 20% in biology. However, in mathematics, France is on par with Germany and not far behind the UK.

The picture becomes more diverse if we take into account the number top group placements in each country. Whereas it is not very surprising to see the "large" countries (UK and Germany, and to some extent France) dominating the scene in absolute numbers, some smaller countries seem to produce excellence in abundance. The most striking examples are the Netherlands, Sweden and Switzerland which are levelling out with Italy, not far behind France, and indeed with more institutions successfully entering the larger picture than Spain or Poland.

Table 1 Top group placements (not institution-specific!)

	1 top group	2 top groups	3 top groups	4 top groups
AT	4	4	0	0
BE	9	4	3	0
CH	10	7	3	2
CZ	2	0	0	0
D	59	29	17	4
DK	11	2	1	1
EL	2	0	0	0
ES	17	7	3	0
FI	7	3	1	0
FR	31	13	5	1
HU	4	0	0	0
IE	8	0	0	0
IT	28	9	6	0
NL	14	8	10	1
NO	2	1	1	0
PL	5	1	0	0
PT	1	1	0	0
SE	14	4	7	1
SI	1	0	0	0
UK	61	28	8	14

Another observation is that only four countries from Central and Eastern Europe could place institutions within the Excellence Ranking and none of them managed to cross the line towards those excelling in three or four indicators. Indeed, only one single institution from Poland made it into the group excelling in two indicators; all other Central and Eastern European institutions remained in the one indicator segment. One explanation for this might be that two out of the four indicators heavily rely on publications in English run journals. The reception of these publications along with the fact that you have to publish in exactly these journals to become a highly cited author and to be widely received in the scientific community may partly explain the lack of presence of Central and Eastern European institutions in the Excellence Ranking. However, the participation in Marie Curie Projects is generally open to all countries so that there would have been a chance for Central and Eastern European HEIs to enter the scene via this indicator.

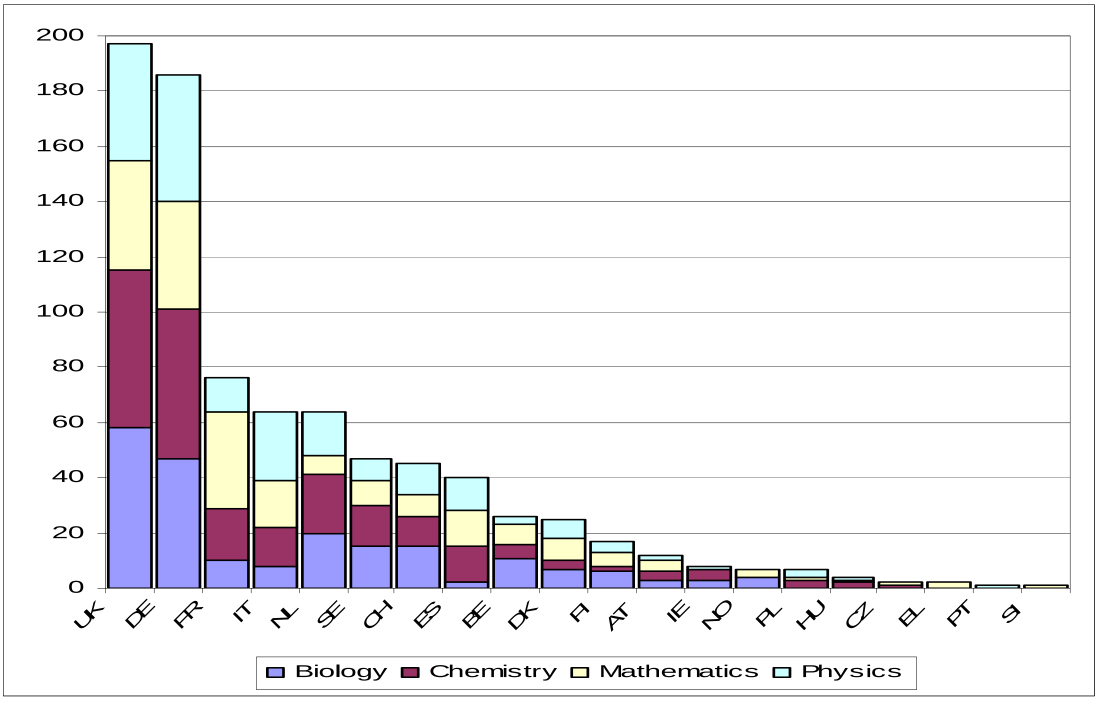

Figure 2 Spread of Institutions over Countries

The geographical spread seems to suggest that there is still a recognisable gap between Western and Northern European countries on the one hand and Southern and Central Eastern European countries on the other hand, particularly concerning the impact of the scientific work in the world-wide community. However, it is also remarkable that quite a number of Southern European HEIs made it into the three and four top segment. The analysis of the institutional data as well as the student surveys shows that they provide absolutely top-level research education.

For the groups excelling in three or four indicators, a relatively small number of higher education institutions (HEIs) remained. Less than 60 HEIs made it into these two groups. In the individual fields, the numbers dropped to 25 in biology, 25 in chemistry, 24 in physics, and a mere 19 in mathematics. Assuming that the number of universities eligible for ERASMUS comprises of more than 4.500 institutions[1], the top group comprise of the top 1,3%. Within this top segment, some countries are much more strongly represented vis-à-vis their share in population or even just in the number of HEIs selected from the country. The Netherlands (4), Sweden (5) and Switzerland (3) are striking examples. Considering the size of their populations, it is less surprising that the countries with the highest absolute number of selected institutions are Germany (13) and the United Kingdom (12). However, despite its smaller population, Italy is more strongly represented with 6 institutions than is France, with just 5.

Another interesting finding is the fact that most institutions (33) are selected in only one subject area, 15 in two subject areas, 4 in three and also only 4 in all subject areas. If, even in the relatively closely connected academic fields of the natural sciences and mathematics, only 14% of the very top institutions in one region are featuring three or all four subject areas, this can indeed be taken as an argument against institution-wide rankings. Obviously, even in closely defined areas in highly selective groupings, differences are quite substantial and general comparisons become difficult to make. Ranking within subjects therefore becomes a more logical method in order to compare specific programmes within disciplines.

As not all universities returned the questionnaire or could only fill out a portion, only two kinds of indicators were chosen for the ranking: 1) the students' judgements and 2) the percentages of international students/researchers and of women in different degree levels.

The questions on international staff or students were answered by about 50% of the universities. Looking at the numbers across subjects, in chemistry more than a third of both staff with a doctorate and students pursuing a doctoral degree come from abroad. In mathematics, only every fifth staff member with a doctorate comes from abroad, and only a quarter of the doctoral students are from abroad. Not surprisingly, the percentage of international master's students is lower than for doctoral students and staff; for all subjects the percentage is about 13%. This may in part be due to the fact that a lot of master's programmes started very recently or have not yet started.

[1] A complete list of institutions eligible for ERASMUS can be found under http://eacea.ec.europa.eu/eei/index.jsp

In biology, chemistry and physics, for about half of the departments there are enough judgements to make comparisons between results. For mathematics, the percentage is about a third. In many cases there were too few students to get higher numbers.

Student's were asked for their opinions on different aspects of their study situation. They were given several statements like “the study conditions are excellent” and were supposed to choose how much they agree with this statement from “I agree very much” to “I don't agree at all”. For computations and graphics these judgements were translated to a scale from 1 = “very much agreement” to 6 – “total disagreement”. This scale is used in the following figure.

Table 2 Details on the composition of the indicators

Overall study situation	**Comprehensive judgement looking at the overall situation.**
Organisation:	comprises judgements on the transparency of admission conditions, assistance regarding formal procedures, and the organisational framework.
Training	includes judgements on the quality of theory and methodology training, the level of interdisciplinarity, the variety of course content and quality of instruction.
Examinations	contains judgements on the transparency of study and examination requirements, whether the coursework is in line with the content of the examinations, the fairness of examinations and the awarding of marks and organisational aspects.
Advisor	comprises judgements on the availability of advisors, their assistance in career planning, their caring for the student's personal development and the quality of counselling.
Laboratories	considers the state of the laboratories as well as the space and the equipment of laboratories.
Career centre	judgements on the assistance in finding an adequate employment position by the HEI's career centre, on informational events, student initiatives, partnerships with companies or research institutes, and the possibilities of internships.

Looking at the judgements across subjects shows only slight differences; the profiles are rather similar. Figure 3 shows the level of agreement of the students with the listed aspects of their study situation as explained above. Students seem to be quite satisfied in general. As we have learned from the German university ranking, the career centre aspect is always judged to be weaker than the other aspects.

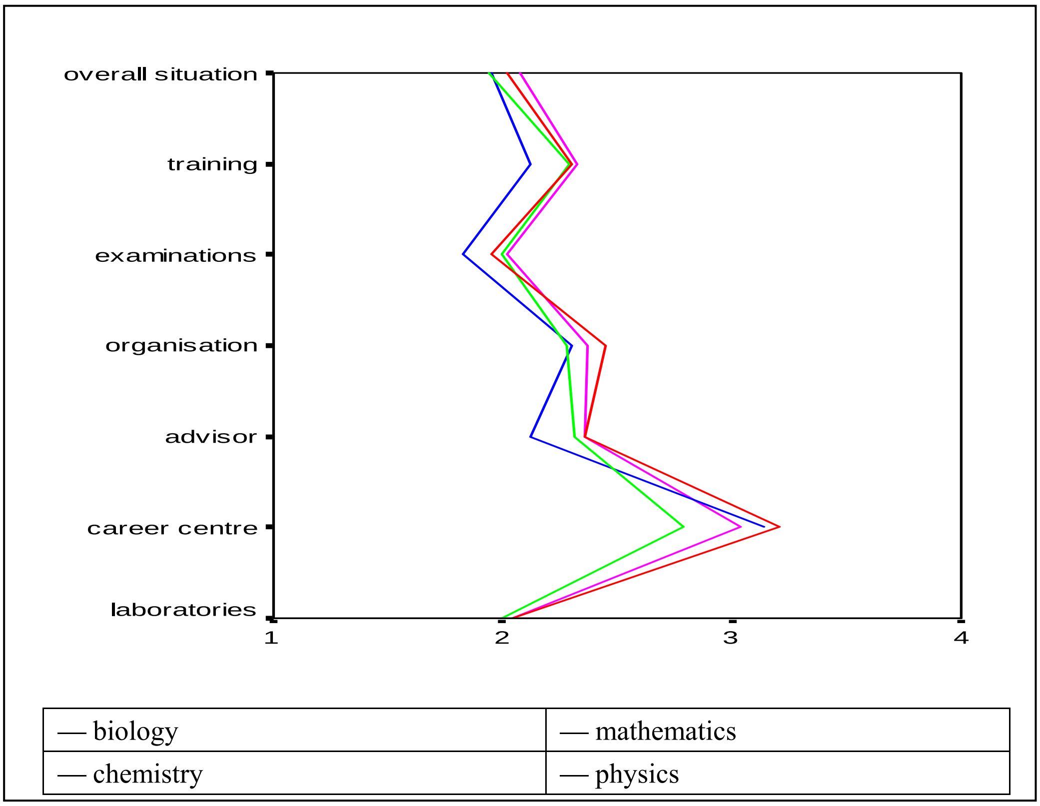

Figure 3 Average students' judgements across subjects

Outlook to the future

The Excellence Ranking is regarded as a first and tentative approach towards the identification of elite universities in certain academic fields. Methods had to be developed and tested and the first round shows the need to adjust these methods in follow-up rounds. One particularly interesting, although not surprising, finding was that the precise formulation of questions in the questionnaires posed many more difficulties than envisioned. Though the research team had been aware of the problem of definitions, understandings of the same word, and different payment systems, it was still possible to observe considerable extra need for explanation, especially concerning budget definitions and the nomenclature of academic positions. According to the philosophy of CHE, this adaptation will take place in co-operation with the institutions analysed.

The future direction of the Excellence Ranking is the extension into the field of engineering. The shortage of engineers in Europe calls for an initiative to highlight the strength of engineering education and research in the EHEA, particularly as a counterweight to the USA and Australia. The following Excellence

Ranking might then explore other academic fields such as political science and economics. In this way, the Excellence Ranking aims to support the idea of the European Higher Education Area (EHEA) to a considerable extent while at the same time satisfying the public's thirst for "discovering the best." It will, however, remain one of the major tasks of the project to always reflect the methodological stipulations and boundaries inflicted on any kind of ranking.

Part Three

National Strategies for Building World-Class Universities

Quality Assurance and Promotion of Excellence in the Swiss University System

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Abstract

Using the examples of Switzerland and the University of Zurich, the present article focuses on experiences, best practices and warnings against problematic approaches and proceedings in the field of quality assurance. It points out that the Swiss university system organises quality assurance in a twofold way: While there is an independent center that prepares the institutional accreditations, every university is in charge of taking measures of quality assurance and promotion of excellence itself. The University of Zurich has – as the first university in Switzerland – established an independent Evaluation Office that organises systematic evaluations of all academic and non-academic units.

Quality Assurance and Promotion of Excellence in the Swiss University System

There are two properties which are vital for any world class university: A concise system of quality assurance and the promotion of excellence. The quality of universities is assured in a twofold way: both by externally controlled accreditation procedures and by a set of measures established by the university itself; the latter aims at the promotion of excellence.

Quality assurance – be it in a single university, be it in a system of a certain number of universities – runs the risk of missing the appropriate relation between costs and benefits. There is a point where additional benefits can only be achieved by very high additional costs. However, politicians and managers are very much in favour of extensive quality assurance systems. This leads universities into the temptation to establish complicated and costly systems just to please those politicians. Universities and university systems have to be very careful to avoid that risk.

To be sure, universities are indeed obliged to regular reporting in order to gain the confidence of the public. And in this respect evaluations and assessments of the scientific performance play an important role. But still, universities cannot do without a certain amount of confidence given by the public in advance. Checks and balances are good, confidence is better. The core business of universities is to produce knowledge and understanding, not to convince the public of doing so, their core business is to deliver quality, not to prove to the public that it actually has been delivered. If we do not act according to that insight, our institutions will cause tremendous costs while creating rather little benefits.

Accreditation Procedure in the Swiss University System

There is a common conviction among all Swiss universities: they consider quality assurance to be their own business. Some of them, among them the University of Zurich, have established independent quality assurance units, similar to the independent review units in private companies. They think quality assurance to be a decisive competitive factor: the better the methods and procedures of quality assurance, the better the improvement of the quality of the respective institution. Due to this notion, Swiss universities have some objections against being reviewed by an agency that is reviewing some of their dearest competitors at the same time and in the same way. Thus, they are not in favour of establishing separate, privatised quality assurance companies carrying out such reviews. To add another difficulty, it should be mentioned that in recent years it was observed on many occasions that there is a considerable danger in private companies doing the job of quality assurance. The more they are competing for projects, the easier they are prepared to grant accreditation to the institutions buying their services. That danger should be avoided by creating suitable structures.

There is a second common conviction among all Swiss universities: The cost of quality assurance has to be kept as low as possible. Therefore, a system of quality assurance is needed which is able to reduce checks and balances to a minimum while having the most intense reviewing effect. The Swiss university system (consisting of 12 universities of different size) has recently developed a remarkable model for an effective and cost-sparing system of accreditation.

In general, accreditation is optional in Switzerland. There is one exception: By order of the Confederation, the Center of Accreditation and Quality Assurance of the Swiss Universities (OAQ) carries out every four years summary quality evaluations of the internal measures used by Swiss universities in their quality assurance checks. If this evaluation is positive, no further accreditation of academic courses and programs will be compulsory. As soon as the institution is accredited, it is allowed to accreditate its academic courses and programs according to its own rules. In other words: The quality audits conducted by the OAQ result in an institutional accreditation. This solution is cost-saving, and it corresponds to the autonomy of the universities. As an essential feature of this system, I should like to underline that the center is not a private company but rather an independent public institution, which is controlled by a supervisory board and which has full autonomy in carrying out the assessments. Such a structure has been chosen for the reason of avoiding the dangers private companies are exposed to in this field.

In Europe, the Swiss system of accreditation attracts a great deal of attention. There will probably be similar solutions in other countries.

In the following paragraphs I give a short description of the procedure as it has been designed by the Swiss political authorities. The quality audits are ruled in a document that was accepted by the political authority responsible for the university system in Switzerland. The subjects of the audits are the different instruments and measures of quality assurance of the respective university in the areas of education, research and services.

In the audits the minimal standards of an universitarian quality assurance system are checked. These are the following standards: (1) The university has a coherent strategy of quality assurance, which is published and university-wide known. (2) The system includes all relevant aspects (research, education, central services) and is well integrated in the general strategy of the university. (3) The procedures are legally defined, responsibilities are correctly assigned. (4) The university has established a system of systematic and comprehensive evaluations, checking all relevant fields of activity. (5) The university supports and fosters the personal and scientific development of academics, which includes academic career development and gender equality. (6) The decision making process of the university (concerning research, education and the improvement of capacities of the teaching staff) is based on a set of appropriate and robust information, both qualitative and quantitative. (7) Transparent information about procedures and outcomes of the measures taken is granted by the university; information about offered courses and delivered degrees is provided regularly.

The procedure of the audit runs as following: In the first phase a self-evaluation report is produced by the university according to the list of minimal standards mentioned above. That report is handed out to the peers responsible for the audit. In the second phase the peers visit the institution and collect information from a variety of stakeholders defined by the peer group. The third phase contains the final report of the Center (OAQ), based on a critical analysis of the findings of the peers and the self-evaluation report of the institution. The highest political authority, the Swiss University Conference (SUK), decides on what results are published in which form. The same procedure is repeated every four years (2004, 2008, 2012, and so on).

Promotion of Excellence at the University of Zurich

Of course, the measures taken and the instruments used by a university are of much greater importance not only for the assurance but rather for the ongoing improvement of the quality of all activities. The University of Zurich, which I am president of and which will serve as an example in the following considerations, consequently has given the quality aspects a great deal of attention and has developed a sophisticated system of quality checks. The core of our system is formed by a comprehensive and systematic evaluation procedure, conducting evaluations on a high scientific level. This is in so far essential for evaluations as the level of evaluations must not be lower than the level of the units evaluated. Any quality assurance not observing this rule does not create the added value expected by the institution. If evaluations are carried out as a more technical routine business, they soon lose the confidence of the academics and, at the same time, the acceptance within the institution.

According to its mission statement the University of Zurich is committed to academic excellence and strives to achieve the highest international standards. This mission statement is distributed to all employees, be it academics or support staff by electronic and by print media. So the commitment of the university is – hopefully – shared by the people doing all the work and providing high quality results. As a matter of fact, the University of Zurich holds rank no. 58 in the overall ranking of SJTU, no. 26 and 29 in the more detailed ranking 2007 in life sciences and medicine. This remarkable performance is largely the result of a set of measures which have been created at the University of Zurich in favour of fostering excellence in research, teaching and management on different levels.

A first example is our staffing policy. The University of Zurich aims at recruiting only the best candidates for academic as well as administrative positions. Quality improvement, in this respect, starts with a carefully designed procedure of searching the appropriate people and with a careful choice of the members of the search committees. The Executive Board of the University of Zurich keeps a vivid eye on the composition of the committees (for instance: prominent professors of the department are called to chair it, it is compulsory to include two external experts in the committee).

We encourage the committees to search for the best performing researchers and teachers within a field and to win them over for our university, and we concentrate all our efforts on providing them with an attractive offer. Finally, we try to establish clusters of excellence within our departments; if we succeed in doing so, it is much easier for us to get excellent appointments. Clusters of very good professors are acting like magnets for other professors. We have observed that the scientific environment and the appropriate conditions for research are much more important than other things, including wages.

The requirements of the survey justifying the choice by the committee are very rigid. The vice-president in charge of supervising the given department checks the survey carefully and writes a short assessment of its quality and state, which has to be accepted by the president. In some cases appointments are discussed in the meeting of the Executive Board. Quality improvement with respect to staffing goes on with making available excellent labs or other working facilities and substantial resources to support the individual research by the professor to be appointed.

A relevant number for analysing the outcome of our engagement to improve appointment quality is the ratio of successful appointments of the candidates first placed on the appointing list compared with the appointments of second or third placed candidates. As for appointments to professorships, we are happy to get almost 90 percent of our favoured candidates (that is the first placed candidates). Another indicator to measure the success is the intensity of internationalisation. In this respect, the Swiss university system as a whole is rather successful. Our university, for instance, has almost 50 percent of its professors from abroad. This may be the cause of political questions, but for a university it is clear evidence of its quality. Of course, our success relies on an attractive scientific environment and not least on a good quality of life and culture in Zurich.

Moreover, the University of Zurich has established different instruments for the promotion of research and teaching. In the field of research we have created our internal university research fund, consisting of two parts:

The strategic part serves the promotion of inter-university and inter-faculty projects such as centers of excellence. Those resources enable us to create attractive projects and to support our researchers in their competing for, let’s take as an example, national competence centers of research (the so-called NCCRs, which are financed in the manner of matching funds by the federation and by the university; a realistic perspective is to get additional funding from private companies, as it has happened with most of our NCCRs). The University of Zurich has managed to get 5 out of a total of 20 NCCRs funded in Switzerland at present.

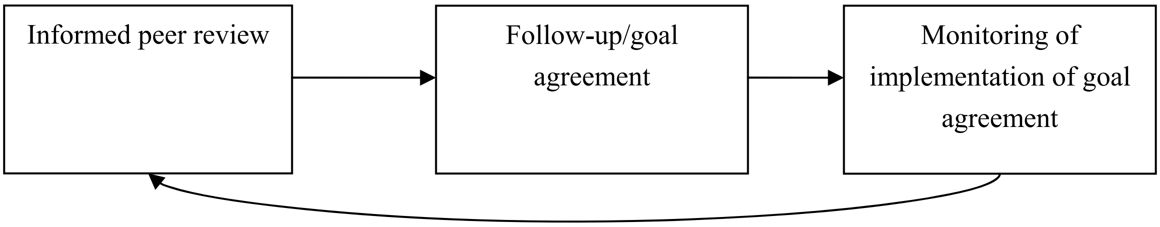
The competitive part of the research fund serves for the promotion of young scientists, in some areas particularly PhD students, in some other areas rather postdocs. A very important characteristic of the competitive part is that there are no institutional or scientific limitations or prerogatives; the only criterion a project must meet is quality. The fund was created in 2001, and during the past years it has become more and more attractive for the researchers. We appreciate this, but at the same time it causes some uneasy feelings in the university management. If the ratio between the number of applied and the one of funded projects becomes too big, it comes to a considerable frustration among academics, because excellent projects have to be turned down only for the reason of lacking resources. Two observations seem important to me with this competitive funding: There are many cases where the university-own funding has enabled researchers to succeed in the competition for projects funded by the Swiss National Science Foundation or the EU research funding programs. And, for the second observation, the competitive character of the funding has attracted a considerable amount of additional resources by private funding agencies or donations.

As far as teaching is concerned, we have recently introduced a specific award for good teaching. This idea could be realised thanks to the financial support of an external foundation. There are various aspects that make up good teaching, for instance the use of e-learning tools or the way the teacher deals with very large or very small groups. Therefore, the University of Zurich and the private donator determine a different main focus for the teaching award every year. The winner of the teaching award is chosen in a two-stage proceeding. At first, the potential winners are nominated by the students in an internet survey. Secondly, the results of this survey are checked by a special committee, which nominates the actual winner of the award. This nomination is finally approved by the Executive Board.

Student surveys are not only used to nominate the winner of the teaching award. At the University of Zurich student surveys also play an important role within the evaluation process, which I shall describe later in this paper. These evaluation surveys are carried out among the following groups: course participants, faculty students and students who have been on the labour market for five years.

Finally, the Executive Board of the University of Zurich has decided to implement a systematic and standardised student survey on the quality of courses and teaching performances of our academics. Therefore, a pilot study was conducted. I am confident that we will soon be able to do student surveys regularly within all fields and by means of standardised questionnaires.

One major instrument of promoting excellence is a well-functioning quality assurance process. The University of Zurich has – as the first university in Switzerland – established an Evaluation Office. This office is independent from the executive management; it works under the direct control of the strategic board of the university. The main goals of the evaluation process are: (1) Improvement of the quality of academic work in research, teaching, and services as well as improvement of management and administration. The goal we go for is very simple: We do not consider evaluations as a summative information tool, but rather as a formative tool. Together with the evaluated units we want to learn how we can improve our quality the most with the least amount of resources. We try to cultivate evaluations as a common instrument of improving quality, rather than of simply assessing strengths and weaknesses from a hierarchical point of view. However, one has to be quite sure that evaluations, while they are an appropriate tool for improving quality, cannot have the same powerful effect on quality as the very careful appointments of new professors and postdocs. (2) Evaluations, secondly, generate important clues in the decision-making process to support medium and long-term strategic planning. The self-evaluation report, to begin with, implies fundamental thoughts of the evaluated unit with regard to their strategic position and opportunities. The site visit of international leaders in their fields, to name a second important element, gives further valuable information about future perspectives and possibilities to develop a specific field. The follow-up-process, finally, is a very good occasion for the Executive Board to discuss strategic questions and to explore promising roads to choose. (3) The results of evaluations, thirdly, are a good basis for reporting performance information to the public. Such information has to take place in order to show the accountability of the institution. Information gained by external and independent assessments is highly appreciated by the public.



Re-evaluation

The evaluation is arranged for every organizational unit of the University of Zurich (i.e. departments, degree programs, institutes, sections, clinics, faculties, executive board, university administration) and takes into account research, teaching, services, academic career development, management and administration, structures, surrounding fields/cooperations and resources. The first phase, informed peer review, is a formally regulated process directed by the Evaluation Office. The peers receive a great number of reports and a lot of information: a self-evaluation report prepared by the unit under evaluation; surveys and analyses conducted by the Evaluation Office (e.g. third party resources, publications and their impact, student surveys, and so on). The external evaluation consists of a site visit of the peers and of a report prepared by the team of experts. This report is handed out to the unit under evaluation in order to create transparency and fairness, and the unit is given the opportunity to write a statement of response. This phase is completed by a comprehensive report written by the Evaluation Office. The Evaluation Office is obliged to assess all information as to correctness, fairness, appropriateness, and so on. In this report the Evaluation Office sums up all findings and recommendations which have occurred during the first phase. Here again, the unit under evaluation is given the possibility of handing in a statement of response. None of the mentioned reports is published in detail, as their primary purpose is to set in motion internal quality improvement processes.

The second phase is called follow-up and is targeted on the elaboration and the signing of a goal agreement between the Executive Board and the evaluated unit. Based on the comprehensive report the responsible vice-president communicates the results of the evaluation and the recommendations to the Executive Board. The Executive Board sets its appropriate goals and invites the evaluated unit to discuss the goals defined by the Board and to work out a goal agreement. The responsible dean takes part in this discussion, too, and with medical units, where the University Hospital Zurich is involved, the hospital management is included as well. As a basis for this follow-up discussion, the Executive Board of the University of Zurich adopts, upon recommendation of the respective vice-president, a catalogue of possible measures. After the discussion and the agreement on the implementation of measures, the president of the Board (Rector) and the director of the evaluated unit sign an agreement of objectives. This agreement defines contents, responsibilities and deadlines for the goals and measures to be taken. It can also have the character of a “Memorandum of Understanding”. After the signing of the agreement, the evaluated unit is responsible for implementing the measures it has agreed on.

In the third phase, which starts two years after the signing of the agreement, the Evaluation Office is assigned to report on the status and on the success or failure in the implementation of the agreed measures to the Board of the University (monitoring). For that purpose, the evaluated unit composes a report of implementation, which is commented by the dean and the respective vice-president.

Considering the wide range of measures that are listed in the many different agreements, there are six main focuses to be mentioned. The predominant measures are aimed at the intensification of research, creation of profile, academic career development, improvement of internal and external cooperation, the clarification of organisational structures in the university administration and the formulation of assignments of performance.

We look back at a six-year experience with this evaluation system. If we make up the balance, we can say: The evaluation procedure requires a lot of work, and it is time-consuming for all participants. However, the advantages and benefits are considerable. The evaluations find acceptance. They forge identity and they foster communication and transparency – within the university, but also in our relationship with strategic and political authorities. Evaluations uncover strengths and weaknesses. The mere announcement of an evaluation can contribute to performance improvement. Finally, the evaluations are indispensable for structure and development planning.

Main Principles of the Strategy on Building World-Class Universities in Russia

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Abstract

The economy globalization intensifies the specified changes in the external environment of the institutes of higher education as factors influencing their behavior. Emerging global markets of high technology products, intellectual labor and educational services create new competition conditions for universities, stimulating them to change the organizational management with higher orientation to the needs of a person and society under conditions of adherence to the state interests. The results of monitoring and inspection of the higher professional education system in Russia testify that the processes of transformations connected to changes in its external environment, are observed in Russian institutes of higher education also. In order to gain the competitive advantage on the modern markets of intellectual labor and educational services, the institutes of higher education should make certain changes, which could result in certain changes of the institute of higher education activity and in a new type of the institution of higher education – in the academic innovative or world-class university.

Main Principles of the Strategy on Building World-Class Universities in Russia

Introduction

Modern knowledge economy and social development create a new rapidly changing intellectual labor market. The institutes of higher education should constantly modify and upgrade the educational programs and technologies, update the equipment and lecturers' professional development. The institutes of higher education should adequately react to external environment challenges, switch to innovative development, follow the market, and even create it in a number of cases.

Now, the institutes of higher education in developed countries are disturbed by external environment changes, loss of former stability, reduction of government financing and, at the same time, prompt expansion of requirements from the direction of consumers of their primary activity products - scientific researches, technological developments, educational services and qualified experts. In Russia the delayed stage of social and economic reforms intensifies these factors influencing the whole higher education system and every institute of higher education.

The experts note significant asymmetry and imbalance of relations of the institutes of higher education with an external environment around them, which give rise to dissatisfaction of the institute of higher education with the organizational management and causes aspiration for transformations.

The analysis of adaptation of the leading USA and Europe universities to the changes of social and economic conditions of external environment in 1990s has shown, that basic transformations to the institutes of higher education were caused by changes in economy structure, in a role of the state and demographic situation, they were connected to development of technologies and globalization processes. Russian institutes of higher education go the same way with diminishing delay.

The changes of age groups, ageing of world developed countries population, internationalization of education, increase in academic mobility and expansion of need for continuous education lead to varying contingent of trainees in the institutes of higher education. It necessitates continuous perfection of programs, professional development of lecturers, update of teaching and methodical support and use of new teaching technologies.

The changes of technological development of a society, in particular in the field of information and communication technologies require the same. Wide application of new high technologies in modern production necessitates intensive fundamental scientific researches in the institutes of higher education, performance of applied developments, organization of technology transfer and use of the obtained newest results for educational process.

The economy globalization intensifies the specified changes in the external environment of the institutes of higher education as factors influencing their behavior. Emerging global markets of high technology products, intellectual labor and educational services create new competition conditions for universities, stimulating them to change the organizational management with higher orientation to the needs of a person and society under conditions of adherence to the state interests.

The results of monitoring and inspection of the higher professional education system in Russia testify that the processes of transformations connected to changes in its external environment, are observed in Russian institutes of higher education also.

The institute of higher education is continuously interacting with its environment - communicates, studies the needs, obtains financing, attract resources, develops cooperation, gains experience, delivers products, renders services and so forth. In order to hold and consolidate positions of the institute of higher education in the external environment, this interaction should be more and more active, intensive and effective.

In order to gain the competitive advantage on the modern markets of intellectual labor and educational services, the institutes of higher education should make certain changes, which could result in certain changes of the institute of higher education activity and in a new type of the institution of higher education – in the academic innovative or world-class university.

Criteria of the Selection of Innovation Russian Universities

The main principles of the strategy on building of world-class universities in Russia are presented in the criteria of the selection innovation (leading) Russian universities. With the purpose of solving problem of formation of the efficient national innovation system Ministry of Education and Science within frameworks of the program “Priority national projects” carried out competitive selection of universities (Innovation University of Russian Federation) . The program of financing of universities is aimed at provision of personnel necessary for innovative development of the enterprises, branches and regions; it is oriented to the improvement of quality of education in the sphere on natural science and engineering, provision of its compliance with modern requirements of labor and technologies market, support of modern scientific research works.

The selection was made mostly among Universities in the field of natural sciences and engineering-and-technical education, medicine and agricultural sciences, as one of the most recourse-intensive fields of education.

Competitive selection of universities was carried out in 2006 on the basis of the results of their activity in 2000-2005 academic years, and on the basis of current indices and perspective parameters which could be -achieved within 1-3 years. The criteria were the following:

1. The general results of University activity in 2000 – 2005 academic years:

- number and results of international, federal and regional projects implemented by University in a period of 2000 – 2005 academic years;
- number of scientific publications, total and mentioned by number of teaching staff;
- number of patents inventions and know-how, total and mentioned by number of teaching stuff;
- number of exhibits demonstrated at the exhibitions (including international ones), total and mentioned by number of teaching stuff;
- number of Russian and International awards, prizes in the field of science, culture and education, total and mentioned by number of teaching stuff.

2. Management of the University:

- availability of strategy development program of the University and average-term plan of actions for the period of 2006 – 2008 academic years;
- availability of public control authorities (for example, supervisory council), with significant level of representation of public and professional Communities;
- annual publication of reports on results of the activity, including those about structure of incomes and expenditures of budgetary and out-of-budgetary funds of the University;
- availability of system of educational process quality control (for example, ISO9000);
- availability of information systems of educational process control.

3. Educational programs:

- number of students (including bachelors, specialists, masters, post-graduate students, competitors, person working for doctor’s science degree (second degree in Russia));

- share of students studying under two-level programs of higher education;

- share of graduates who studied under Master, PhD, doctor Science and MBA programs in an aggregate number of graduates;

- share of disciplines chosen by student in the curriculum of the University;

- use of credit system (European Credit Transfer System (ECTS)) in management of educational process of the University;

- share of disciplines in the curriculum being taught with the use of active methods of training (case-study, training complexes, imitation systems, business games, design analytical sessions, etc.);

- share of winners of various educational competitions who were enrolled to the first year of study;

- average score of the Uniform State Examination (USE) among students enrolled to the first year of study under contractual and state-funded basis;

- share of teaching stuff and researchers younger than 40 years old;

- share of students and post-graduate students involved in realization of educational process;

- number of personal computers which are used in educational process;

- availability of a local information network;

- number of personal computers comparing to the number of students which have access to the Internet;

- availability of public domain site of the University;

- availability of access for students and employees of the University to electronic educational resources (electronic libraries, statistical information basis etc.);

- number of foreign periodicals, received by library of the University;

- relation of number of places for residing in hostels to the total number of students;

- share of educational programs which have passed public and professional accreditation including international;

- share of the graduates who graduated from the University within the framework of target training programs (for example, supported by industry and business).

4. Research, development and innovation activity:

- scope of research and development and design-analytical works, of mentioned by number of teaching and research stuff;

- scope of out-of-budget research and development and design-analytical works, mentioned by number of teaching and research stuff;

- number of teaching stuff and researchers with academic degrees in the field of professional programs, mentioned by number of teaching and research stuff;

- number of teaching stuff and researchers participating in work of scientific and implementation enterprises, joint design bureau, business incubators, technical parks, patent agencies, centers of technological advantages and other elements of innovations infrastructures on the base of the University or with participation of the latter, common and mentioned by number of researchers and teaching stuff.

5. International activity:

- share of citizens of the foreign states comparing to total number of students, including students from non-CIS countries;

- share of educational programs which have received an international accreditation;

- membership in the international educational organizations;

- number of international projects in the sphere of education and scientific research, common and mentioned by number research and teaching stuff;

- number of students, teachers and researchers who participated in the international exchange programs in 2000-2005 academic years;

- number of international conferences, symposiums, scientific seminars held in 2000-2005 academic years at the University;

- share of invited foreign professors and teachers;

- share of graduates studying under the programs with participation of foreign partners comparing to total number of the University graduates.

Additional criteria are also available:

- quality of graduates to an independent ranking of the Employers (in case of possibility of obtaining of objective evaluation;

- successes of career of graduates;

- share of graduates who passed public and professional certification;

- availability of scientific schools recognized at the world level;

- availability of design-analytical and scientific-and-research centers of national importance.

Competitive selection of Universities was carried out in two stages. At the first stage 17 Universities were selected on the basis of the basic criteria of selection (10 bln Rubles or 400 mln USD for 2 years). At the second stage 40 Universities have been examined by all set of parameters, according to the factors established for these parameters (20 bln Rubles or 800 mln USD for 2 years). This financial support will be used for the realization of the innovation educational program and research process.

It is very interesting to consider additional possibilities to evaluate the activity of the Universities by public estimations.

Methodic and Criteria of the Independent Ranking Agency “RatER”

We present the main principles which was used by the first Independent Ranking Agency “RatER” which was established in March 2005 in Moscow. The establishment of “RatER” is the critical need in publicly significant independent evaluation (Artyushina & Troyan, 2006).

There are the following aims and goals of “RatER” agency:

- Promotion to the development of higher education as the major resource of socio-economic development of the country;
- Development of methodology of public evaluation as the factor of raising quality and competitiveness of higher education;
- Information provision of applicants, students and their parents, investors, employers, administration of higher education institutions, public higher education authorities and society as a whole;
- Development and improvement of a system of public evaluation of quality of education and research in state and not-state higher education institutions and their ranking in accordance with the socially significant criteria;
- Promotion to the formation of the civilized and balanced labour market by forecasting and timely interpretation of aspects of its educational component.

Quality plays a central role in education due to the fact that the balance of interests of all stakeholders and users of an education system, legal and academic value of qualifications in the world and employability on the labour market underlie the requirements to quality.

As the international practice shows, the indicators of quality, on which the majority of rankings are built on, can be grouped into three categories: graduates' success on the labour market, achievements of academic staff and academic resources of a higher education institution. The values of indicators are calculated on the basis of the accumulated data.

Ranking can pursue very different purposes, i.e. to inform the public on the strong and weak sides of the activity of a higher education institution, to set the standards and benchmarks or to give an impetus to the improvement. Accordingly the potential consumers of rankings are changed, among which there can be students and their parents, higher education institutions or public at large. The selection of indicators and the choice of methodology also depend on the goals of ranking and its potential consumers. Naturally, each ranking will have its own conception.

Therefore, the methodological principles provide for elaboration of less complex rankings for applicants and students and more detailed and specific ones for other consumers.

The first rankings prepared by "RatER" in a short space of time have shown the necessity to participate in the European networks, as under the present conditions we were forced to prepare four rankings at once within one project: for applicants, for employees, for administration of higher education institutions and for public education authorities.

We carried out the comparative analysis of foreign and Russian approaches to the ranking of higher education institutions, and in particular, of the materials, published by UNESCO-CEPES on the results of the First international meeting in Warsaw on June 13-15, 2002. National developments and foreign experience have laid the basis of the methodological principles of our rankings.

We are especially interested in the rankings of private higher education institutions of Poland, where likewise in Russia the age of such educational institutions does not exceed 15 years. And in Russia these educational institutions enrol more than one million young people. We are also interested in the experience of Germany and the United Kingdom concerning such issues as the development of a decision-making model, indicators, acquisition of statistical data, as well as clear orientation of rankings toward consumers.

We have determined a set of minimum necessary (in our opinion) criteria of evaluation of quality of specialists' training for the pilot project:

1. The performance indicators of higher education institutions (12 indicators) and their conformity to the accreditation indicators, as well as the indicators certifying the existence of the scientific school in a higher education institution are the criteria, underlying the ranking.

2. Publicly significant criteria, characterising the quality of the process of provision of educational services and the quality of graduates' training:

- employers' opinion on quality of graduates' education;
- graduates' opinion on quality of the education received;
- career path of graduates characterized by such indicators as:
  - the dynamics of change of graduate's salary;
  - career development of a graduate.

When making up the ranking, we proceeded from the fact that only responsiveness to the opinions of various groups of stakeholders can give the objective picture on the quality of education and educational services worthy of the attention of society as a whole.

Therefore, our subsequent task was to organize and conduct expert survey, the purpose of which was:

- expert weighing of criteria;
- expert evaluation of the approach of Agency to the criteria of public evaluation of quality of education and educational services;
- determination of publicly significant indicators.

Three groups of experts were made up to achieve these goals:

- a group of employers;
- a group of academic community (representatives of administration and that of the academic staff of higher education institutions);
- a group of representatives of public organizations and mass media.

The data, submitted by members of the groups, were summarized and averaged in each group of experts (it has given us an opportunity to construct "fixed-target" publicly significant rankings, when weight coefficients received in each group of experts act as weight coefficients of the criteria of evaluation of quality of education and educational services).

In addition to that, the experts have presented their proposals on publicly significant indicators. The analysis of experts' proposals on publicly significant indicators allows extending the list of criteria. Further goal of the Agency is to determine the optimum set of criteria, methods of their determination and evaluation of practical implementation of these methods.

Comparative data on key competencies of youth and adults have numerous users and a wide range of application. This information is particularly important for decision-makers in two significant fields: economic and social policy, including education policy where human and social capital is built up.

In the field of economic policy this evidence allows to see to what extent the lack of key competencies is an obstacle to the achievement of high rates of economic growth resulting from high rates of technical, organizational and production innovations. The matter concerns a particularly disturbing fact of rapid growth of implicit demand for competencies in production technologies and in the advanced production structures based on broad application of information.

Comparative data on competencies are particularly important in the social policy. First of all, this information allows to understand to what extent competencies and the lack thereof are the obstacles to full and equitable presence on the labor market on the whole and the separate groups in particular. This information allows to thoughtfully analyze why competencies are favorable to the development of social capital. In the end, levels and social division of competencies built up in the education system are the important measures of education effectiveness.

Conclusions

We considered two kinds of criteria for the selection of the innovative Universities for the ranking of the Universities. These criteria help to select the Universities, which satisfy to the main strategic principals on the building of the world-class Universities:

- Competitiveness with the best Universities
- Reproduction of knowledge on the world level
- Excellent research and technology transfer
- Social responsibility
- Internationalization.

The criteria for the selection of the Universities content mostly numerical parameters, which could be very simply control. From other side many parameters of this kind characterize a readiness to transfer to the Bologna principles. This competition is a very important step to support the best Russian Universities on the way to the world-class Universities.

It is very important by this competition to take into account the public evaluation, provided by the Independent Ranking Agency, for example, “RatER”. In this case we have an opinion of the different groups: employers, academic community, graduates, representatives of public organizations and mass media.

The criteria, which are used in both systems, will promote to the innovative development of Russian Universities in the future. It will be very important basis for the transfer our country to the society with knowledge economy.

References

Innovation University of Russian Federation, 2006, http://www.mon.gov.ru.

Artyushina I., Troyan V. Experience of the first independent Ranking Agency “RatER” in Russia. Paper on the Conference of the Second International Ranking Expert Group in Berlin, 17.05.2006,

http://www.che.de

The Restructuring of the National French System of Research and World-Class Universities

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Abstract

This paper evaluates the ongoing restructuring of the National System of Research and Innovation in France. This process has been considered for decades, but it has been systematically implemented only very recently (2005). Research strategy always requires a long period of time to be conceived, to be implemented and to be evaluated. Decades are required to evaluate the effects of research and of higher education policies. Despite these long lasting processes, this paper will tempt to examine and evaluate the characteristics of a major and gradual change that is not only recent but still on its way. The change that we consider impacts university system at large, including higher education, research, and university third mission. Research and innovation are considered as two elements of one common dynamic.

The Restructuring of the National French System of Research and World-Class Universities

The short term analysis of structural institutional change of University is relevant for three reasons:

1. France has already developed an original and strongly structured National System of Research and Innovation in the past. This system is not limited to centralised and interventionist decisions. It has developed a strong collective dynamism and received important results on a world scale. But the same system faces the challenge to adapt itself to the new constraints of globalisation and its consequences on research activities, and, more generally, on knowledge societies. The adjustments between the old system and new international conditions require strong and specific abilities at every level of responsibility. That is to say not only at a national level, but also when coordination is required at regional and European levels.
2. After two decades of pertinent and multiple diagnosis, but poor related action, France, has just taken a coherent set of structural measures that respond to a global project of aggiornamento of its national system of research and innovation.
3. The high degree of complexity of this National System, and the way this reform is managed in real terms can be of some interest for most old NSI that face the same challenges, and, possibly, to newcomers within the world research landscape.

As long as we are concerned with a systemic approach of Science policy, we cannot limit ourselves to "world class research" along with a "world class university". Policy must take into account the strong relations between science and technology; between research and innovation. So, we are considering World Class University through the concept of National System of Research and Innovation (B.A. Lundvall, 1992; R. Nelson 1993). This wider perspective derives from the fact that, not only research and higher education are tightly linked, but that the legitimacy of research and its related funding, get their ultimate legitimacy through the improvement of general knowledge and of human abilities; both will end with an increase of well being for the relevant societies. A wide range of studies have enlightened the coherence between research, higher education and innovation. Among many arguments, the fact that science is financed by public money (i.e. by tax payers) and by private funding (i.e. for profit producers of market values), provides both parties with the right to consider the weight of expected and of realised output. Moreover, the openness of economies does not include a globalisation of research funding. Money comes primarily, and will continue to come, from taxpayers and from a limited number of foundations and businesses. The survival of research is increasingly dependant on its realized and its potential effects on day to day life through production and diffusion of new goods and services. One of the effects is the increasing concern about the relation between input and output of research. The two consequences of this concern are:

- The diversity of measures of the input and the output,
- The move of research behaviour toward a much shorter term basis and the related change in the profession of researcher.

The systematisation of professional research implies the settlement of strong rules for the implementation of this activity. In each field of research, people are increasingly aware of the clarification between goals and means. They increasingly evaluate their output, and in doing so, their practices, including their rules of ethics. At this point, the relation between fundamental and applied research is at stake. Research which explores the unknown edge of physics, chemistry or mathematics, cannot be determined by any applied output. Meanwhile, experience shows that one or the other of these discoveries - and nobody knows which one will be eligible - will surely be used within a future applied innovation: contemporary aerospace, micro-electronics and drugs would not exist as they are today, without fundamental discoveries such as quantum physics and genetic mapping.

Regarding recent national policy, this strong coherence is of new importance to western countries, where, for centuries, science has been considered mainly as a goal in itself; the only exceptions have been related to some national high-tech objectives deriving from wars, national health issues or political competition (aerospace conquest). In this domain, France has shown some expertise in big projects from Colbert manufactures up to telecommunications, high speed train, etc.

The period we consider focuses on the effects of a great change in national policy that has been summarized into a global initiative, the *Pacte national pour la recherche* implemented at the end of 2005. This project has been realised through a national *Orientation Law* (April 2006), and by a set of institutional measures, that are intended to reboot the creativity of the complete system. Such events may illustrate a new life cycle for the national strategy of universities.

Our presentation will start with the characteristics of the “traditional” French National System of Innovation (NSI) that remains the spine of today’s evolution (section 1). Then we will present the causes, the application and some evaluation of the reform that occurred during the most recent period (section 2). We will finish with the next steps that are represented by “the reform of the university” and the relevant dilemma that still challenge the French National Scientific System and world class universities (section 3).

Part I The Old, Structured “National Research System”

Analysing Europe’s leading universities, particularly where France is concerned, must be done in context, that is, taking into account **the national system of research and of innovation.** The starting point of this concept was tightly related to competition on technologies. During the 1980’s Christopher Freeman defined a National System of Innovation as “the network of institutions in public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies”. This network put together producers of knowledge, users of knowledge along with incentives and organisational measures that allow the work to be done and the ideas to be exchanged. SNI is primarily the result of the intensity and quality of interactions between people dealing with ideas. Ideas are specific goods that do not disappear while they are exchanged; on the contrary, they multiply when they are exchanged. Such a process is strongly embedded into each specific socio-economic environment. So the NSI creates specific collective competencies, and determines the rate and direction of technological learning in a country. Research, including the most fundamental, is a key part of this system, as well as world class universities that are leaders at this level. But the “excellence” in this case is determined by the coherence between fundamental and abstract theoretical models and their incorporation into the system as a whole.

1.1 Regarding research, what is the traditional French National Scientific System composed of ?

For centuries, scientific research in France developed as a kind of national luxury for the rich and powerful. Things changed during the XIXth and the XXth centuries when science became related to engineering in chemistry and physics. These were the periods of major national innovations (from the Eiffel Tower to the *Concorde* aircraft; from discovery of bleach to the one of aluminium) and the obligation to respond to the major external challenges that resulted from the two world wars. In 1946, an original model of specific national planning was designed (by Jean Monnet) in order to rebuild the country and to target national means toward a limited number of great national goals. This original “market economy planning” not only brought strong results during 3 decades up to early 1980’s, but designed the way science and technology are still considered today :

1. Research has been established as a key component of the national identity. Research is explicitly involved into three national concerns : military goals (national independence that requires high technologies in nuclear, aerospace, telecommunication and energy), industrial goals (independence of the country from foreign technology, such as telecommunications and drugs), and for political goals (build up of national organisations of scientific research, including emphasis on key fields such as health, agriculture, chemistry, physics and mathematics…) directly related to these objectives, that are considered national issues, the French research system has not only been funded but also managed by the state at the national level. The only universities are public universities, while specific institutions of research are created as public bodies with national objectives. These objectives ended in the creation of the CNRS (National Committee of Scientific Research, created in 1939), along with specialised bodies such as the CEA (Centre for Atomic Energy, 1945), INRA (Agricultural Research, 1946), CNES (Space research, 1961), INSERM (Medical Research, 1964) and other specialised bodies in each field of concern (transportation, climate, sea and water, telecommunications, computer…) Each of these organisations contributed towards building a strong, but fragmented public research system and apart from CNRS, each organisation of research is also involved in the promotion of it industrial sector.
2. In France, the relations between state, research, and industry are tight. Leadership is assumed by the State and it is common for many CEOs to be chosen amongst public servants. Many high ranking civil servants begin as young leaders within ministries, then go on to some ministry cabinet and move in the middle of their career to the private sector in order to take on business responsibilities. At this point, they cooperate with other people who are coming from the same leading “great schools” that exist in the country. Such personal relations are fuelled by an original planning process. Since the end of WW2, the *Commissariat Général au Plan* has been in charge of the successive 5 year plans that put together all parts of the society. From our point of view, the first effect of French planning was to provide the opportunity for 90 people round-tables with equal representation for Business, Unions and Government, including research and higher education. National Plans justified the launch of big research projects - fundamental and applied - that were

financed by national money and sometimes related to national industrial projects led by some "national champion". This became an original public-private partnership that was coherent with the management of strong class conflicts. The planning department has been, for a long period, the centre of the build up of a national coherence between Public research, Public Administration, Big corporations, Workers Unions, R/D bodies, and the "civil society" (1945-1985). We notice that all these partners shared the same ideology on humanities future, more related to scientific and technological progress than on cooperation and decentralised innovation.

3. A related key dimension of this national system is an original division of labour within higher education institutions. The university system is divided into 3 different types of organisations. The first ones are specialised as top level educational institutions; the *Grandes Ecoles* are primarily characterised by a difficult process of selection to enter and by heavy funding from government or other organisations (such as the Chambers of Commerce). These schools do not perform real activity in research. They train the elite of the nation and attract the best college students by providing them with a large diversity of jobs and positions. The institutions are the *Universités*, strictly speaking. Universities are jointly in charge of global higher education with no selection and of research at the highest level. This apparently contradictory situation is reinforced by the existence of a third category of institutions that are the Public Bodies for research (those named upward along such as CNRS) that are devoting their entire activity to research.
4. The fourth characteristic is the way research is financed. Tax payers' money is used by the government to finance directly the main national scientific organisations through a complex negotiation process (*contrat de plan* and *contrat quadriennal*) at the global level of the institution itself. The result is that the share of research projects financed under the competition process is very low. Most researchers are civil servants and the means they use are stable. Evaluation is a peer review type, but the consequences are limited. The best researchers get very little material advantage compared to the worst. Ideology of public good and public mission of research is very strong.

This system has proven in many ways, the ability to lead to success. This has occurred mainly in fields where the complexity of systems needed strong co-ordination : Telecommunications, Aerospace (Caravelle 1960, Mercure 1968, Airbus 1969, Ariane 1973), Medical research, High Speed Train (1977) and atomic energy. All these activities provided opportunities for world class research and they provided the opportunity for strong training, including a large number of PhD's that were financed under specific targeted projects. Regarding fundamental research, this activity has become strong in specific fields such as in Physics (the CNRS has been funded by the Nobel Price Frederic Joliot Curie) and Mathematics.

If we try to position this research on a global scale, the position of the French system of research is of a medium country within an increasingly competitive context. But international comparisons must be used with care. The comparisons between the US, Japan and Europe would suppose that Europe can be considered as a structured country, which it is not; and the comparisons between the US, Japan and France would suppose that Europe does not exist. Considering the research expenditures (GIRD), Europe represents 28.2% or the world research expenditures, while the US 33.9%, and Japan 13.2%. On their side, China represents 9.8% and France 4.5% (OST, 2006). That is to say that France must consider its position both as a member of Europe and of the world competition.

1.2 Steady handicaps and present challenges

The system we have described above has been challenged by two new events that are the globalisation of societies and the deep change in the conditions of research activities. At this point, some of the advantages of a well structured national organisation, occurred to be strong handicaps in regard to the adjustments that need to be made today. The new conditions require the ability, for each partner, to find a sustainable position within the new worldwide division of labour in research and higher education. This general condition not only requires "excellence" (that is to say, to be considered as being among the leaders, and compared to the other?) in its proper field, but also to be capable of great flexibility, to take global and local initiatives to innovate and to target specific fields and niches for research.

In this context, the French system occurred to be handicapped with a wide set of inertia and institutional rigidities. For more than twenty years there have been a multiplication of inquiries, round tables, symposiums and reports, that made clear the reasons for which the system could not respond and adapt itself to the change of global conditions for research and higher education.

Of course, the first and fundamental reason was chosen as the lack of ability of the individuals – researchers and professors ; administrative staff and students… - to react. And that reason still remains the key factor today. But a large portion of those individuals had already reacted through multiple initiatives, and very few of their endeavours were successful. Hundreds of individual initiatives produced no global success, unless the general structure gave space for them and possessed the absorptive capacities (Cohen & Levinthal, 1990, Zahra & George, 2002) to take advantage of them. This system is stuck within administrative rigidities, lack of means, and the excessive presence of centralised regulations. Let-us look at some characteristics such as the complexity, the rigidities, and the centralisation that are only some reasons, among others, that constitute this difficulty to react and adjust.

Complexity: The French higher education system is still composed of an extremely complex network of institutions, each with their own rationale and image, that work independently, creating a puzzle where each element is efficient without the benefit of global coherence. We found:

- 85 *Universités* (basic higher education and research leading to Degree-Master-PhD),
- 10 EPST (*Etablissement Public Scientifique et Technologique*) (CNRS, INSERM, INRA, INRETS, CEMAGREF…), for full time researchers, that we call later « Institutes »
- 10 EPIC (*Etablissement Public Industriel et Commercial*)(CEA for Atomic Energy…)
- 20 "*Grandes Ecoles*" that are selective universities with limited research activities" (X Polytechnique, ENA the National School for Administration, Centrale, Mines, Ponts et Chaussées…);
- And the private research sector which is mainly developing its own activity within a limited set of multinationals. The 20 largest business corporations in the country execute, by themselves 92% of their R/D.

We must note that there already exist a great number of cooperative projects that put together research groups belonging to these various organisations. But, instead of providing recognised joint activity to benefit their parent organisations, they more often appear as exceptions that are granted an independent management and that create de facto, new independent organisations. The case of the Mixed Units (*Unités Mixtes*) that multiply between University and Institutes such as Inserm or Cnrs, are good examples of those additional organisations that are more concerned with the need to be free of the rigidities of the two parent organisations than to reinforce them.

Administrative rigidities

Institutional setting is dominated by the necessity to fulfil precise pre-conceived administrative procedures, more than to provide the required means for research and to evaluate the result afterwards. A new organisation of global management of the public budget is on its way under the title of LOLF. The rational for this important reform is to rely upon management of public funding in terms of objectives and to evaluate results. The only limit of this reform is that most of the *a priori* requirements that are supposed to be replaced by *a posteriori* ones, have not been withdrawn. The result is that the system is heavier now than before. But it may be temporary, as we hope.

The second set of rigidities is related to the management of human resources. The system is mainly related to a conception of public-service and public-servant that was extremely developed during the 20th century. Applied to research activity, a majority of researchers are devoting their entire life to their job and spend a lot of time and energy within their lab. But their hiring is done under centralised procedures where good people are hired, but sometimes without any coherence with the lab specific expertise. The evaluation of researchers, as well as laboratories is implemented on a peer review basis that favours a self-reproduction of fundamental science. Simultaneously, there are very few incentives for the best researchers. Recent measures have been taken in this respect.

National government remains strongly at the centre of the national system:

The national system tends to be more flexible now than before, even if it remains a strongly centralised system. It is still centralised, despite the fact that international and European cooperation has increased; that decentralisation is at stake; and that public-private partnership is increasing.

We can observe this centralisation in the sharing of public funding of R/D :

- National funding of public R/D : 85%
- European funding : 12%
- Local : 3% (not including expenditures for R/D infrastructure)

Under these circumstances, the challenges that have to face the scientific system are fourfold:

1. Increasing the money devoted to research at the national level at a comparable level of other competitors (expenditures per university student (an average with strong differences between institutions) is of about 9 200 € in 2005 compared to 20 545 in the US; 11 720 in Japan, 11 000 in Germany and 11 820 in Great Britain and 15 712 in Sweden. Within the country there is a great difference between the grandes écoles, the IUT and the universities (from 1 to 2 and 1 to 3.5 according to the comparisons)
2. Changing the organisational structure towards a more competitive attitude within research (the university system provides very small opportunities for the best researchers to receive dividends

from the results of their work; meanwhile various initiatives have been taken during the last decade and there are some incentives that provide variation of wages up to 2 months of salaries a year. But public funding remains mainly negotiated at the level of the research institutions, directly with the government through four year contracts. This funding is very much egalitarian between institutions.

3. Innovating the cooperation within Europe and with other partners. This objective has already been addressed through European funding of research where cooperation between different partners belonging to different countries is required to get money. But French society is extremely reluctant with regards to this day to day implication of any cooperative behaviour.
4. Adapting the public and private institutions to attain these new goals. This will be the main tool used in this case.

These challenges will be addressed through a new organisation of the system. Compared to other national systems of research, the French one remains extremely complex, with the national Government still at it centre.

Part II Recent Initiatives and Policies 2005-2007

The very recent evolution that we consider did not occur without a slow, but steady change in many fields within research and higher education policy.

- France has experienced a continuous, change in public-private relations during the last 35 years. The country went from 70% of its R/D financed through public money in 1970 to 44% today. This result makes the country comparable to many other European countries. Having gone through a deep public withdrawal from big science and technology projects ("national champions"), to the benefit of indirect incentives on the model of the USA. Doing so, the concern about linkage between science policy and innovation policy increased. Simultaneously, the interest in intangible investments, including training and fundamental research, became an important issue for industrial competitiveness.
- This change was done simultaneously with a real "decentralisation" process (more than a "regionalisation" at this point) through 3 "Orientation Laws" in 1971, 1982 and 2003. New involvement in research and education has been developed by the regions, departments and cities

leading organisations. Because of the limited dimensions of these institutions, policies naturally favoured infrastructure and real estate of research more than funding of research in general. Up to now, the new local responsibilities for education kept the Universities away from regional and departmental supports; Universities remain basically dependant on governmental decisions. But regions themselves have taken many recent initiatives in that direction.

- University change has already been started; noticeably through the adoption, in 1999, of the European system of diplomas (licence- Master - PhD) instead of a national fragmented system.
- Simultaneously the preceding period has been marked by a wide set of national reports and commissions (Lesourne, Randet 2007) on these issues. Almost every report underlined some international benchmarking and the regular “decline” of the national system of scientific research. This concern was linked to an increasing interest for international comparisons regarding the evolution of science and technology competitiveness (… including Universities rankings).

2.1 The 2004 national shocks

The recent research policy can be considered an answer to the conjunction of two events that occurred in the same year of 2004:

1. Individual and collective revolt of researchers related to the regular decline of research funding in the country. Many initiatives were undertaken, amongst which the unprecedented and well publicised resignation of more than half of the 3000 directors of the research laboratories in the country. This resignation took place within the Paris Town-Hall in April 2004. While it had very limited effects on the day to day work of labs, this resignation was considered as a symbolic decision that brought a wide visibility to the decisive importance of research for the future of the country.
2. Next came the dissolution of the National Assembly by the President of the Republic, and new regional elections where the government lost most of its positions, in fact, twenty out of twenty one, all but one, of the Presidencies of the 21 Regions. This political decline of the government, showed a general dissatisfaction within the country, regarding the structural adjustments being done at this time. It was amplified by the negative vote for the referendum about the European Constitution in May 2005.

These events went through a general questioning within the research community that was not limited to claiming more means. Many issues were discussed such as the utility of science for the country or for the man in the street; the governance of research organisations; the status of researchers; along with the relations between fundamental and applied research and relations between science, Technology and Innovation.

2.2 The rationale of the new French science policy

This unorganised debate ended with a succession of public initiatives that were taken after the *Pacte pour la Recherche* was conceived as a programme for a comprehensive reform and launched by the government in 2005. The measures are composed of an *Orientation Law* in 2006, and by the launch of new institutions in 2006 and 2007; the movement is not completed at this time.

These initiatives are to be guided by common major concepts:

- **To introduce open competitive processes within the funding of new research projects ;**
- To develop the **concept of « excellence »**. This concept brings about a specialisation of research and of universities activities that is the opposite of many present objectives, such as the equalitarian access to knowledge. It also has a double consequence: on one side excellence is revealed through open evaluation and accepted criteria that must be clearly defined ; on the other hand, when the comparison does not include your output among the leaders, you must design and implement a restructuration of your activity.
- To target and agglomerate the **localisation of research**, through a geographic concentration of the new means.
- To act through projects and change the criteria for the allocation of means from an *a priori* evaluation to an ***a posteriori* evaluation**.

Because of the former difficulties met through any attempt to reform the University, this reform made the decision to keep the existing organisations as they are. Almost no existing institution has been dismantled. It started with the addition of new institutions that were given the responsibility to manage new funding. The new institutions had to adjust to the old ones, but escape the burden of managing the existing structures and their huge mass of recurrent activity. Doing so the new institutions have been able to concentrate their additional resources on a limited number of competitive projects and locations. They have helped the build up of critical mass at every level of research. The relevant risk has been to increase the complexity of an already complex system.

After less than 2 years of this experience, we can consider that the quality of output already achieved is related to the fact that:

- The national goals were clear and obvious,
- New money has been added on a significant scale (from 1,5 to 2,5 Billions € every year),
- Researchers approved the initiatives and applied massively to the new programmes presented within the call for tenders. This reform provided the opportunities that they were asking for,
- The management of this new system appeared to be satisfactory from the first year or so. In the context of a totally new organisation, there has been no major wasting of the new inputs and no lost opportunity.

2.3 The individualisation of the separate levels within science policy

Last, but not least, the new national scientific policy identifies different "levels" of it's action. During the preceding period, research was conceived, managed, and evaluated by the specialised bodies such as the CNRS. These organisations received a lump sum for a general mission that was discussed globally. This process was implemented within the national budget process. These institutions acted at the level of the whole country with specialisation on one specific field (agriculture, health, oceans…). They had to develop a global vision for their mission and conceptualise general objectives and targets; they might build their programmes and allocate the money between various laboratories according to their own processes (competition, negotiation…). Their laboratories managed their own activity of research that became for most of them "mixed units" composed of university academics and full time researchers from INSERM, INRA, CNRS… This concept of a mixed unit provided a real autonomy to the laboratories that succeeded in the build up of such cooperative organisations. But these institutions have maintained the responsibility to evaluate their own labs and their own researchers.

This integrated process has resulted in very strong expertise in certain fields such as the evaluation of individual researchers and of teams of research.

However, these organisations turned into self-justified bodies. The efficiency of the unique level of conception-application-evaluation of research process was very much dependant on the multi-ability of each organisation. Moreover, it needed to create institutional routines that made it difficult to evolve in case of instability of the environment and of the scientific objectives.

The reform has been passed under the objective to structure science policy through four specialised levels of institutions. These levels split into 1/ the global vision of policy priorities and the political decision of global funding (this level is directly coordinated by the government); 2/ the settlement of global scientific priorities, including the design of research programs, the management of call for tenders and their evaluation (creation of two new bodies ANR and AII); 3/ the management of these programs within which research labs can evolve (the existing institutions and some additional ones); 4/ the evaluation process through an independent body. For each level new institutions have been created. Each new institution manages the additional funding that goes with the reform. But it must borrow some of the responsibilities that were formerly managed by the existing research bodies, namely the scientific institutions and the Universities.

Four levels of science policy and their relevant bodies (new and old) in France, with comparisons between regional and European existing institutions

Level	National (New institutions are in italics)	Regions	Europe[1]
1-Global priorities (policy level)	High Council for Science and Technology (HCST) CSRT [2] DGRI (military)	Vice presidency « research » Regional plan for Eco. Dev. and Education	ERA[3] and FP7[4] ERC[5]
2- Scientific priorities (programs level)	2 key institutions for funding research: ANR and AII (no more the universities and the specialised institutions)	Reg. Scientific Council CPER [6]	FP7 ERA-NET ERC
3- Management level **Laboratories and their researchers**	PRES Pôles RTRA Carnot “Réform” of Universities Universities + Scient. Institutions + Great Schools OSEO, Space Agency, Military research (DGA)	PRES Pôles RTRA Carnot	NoE Eureka
4- Evaluation level	Specific new Evaluation Agency (AERES)		

1 For European Research Policy, see : http://ec.europa.eu/research/

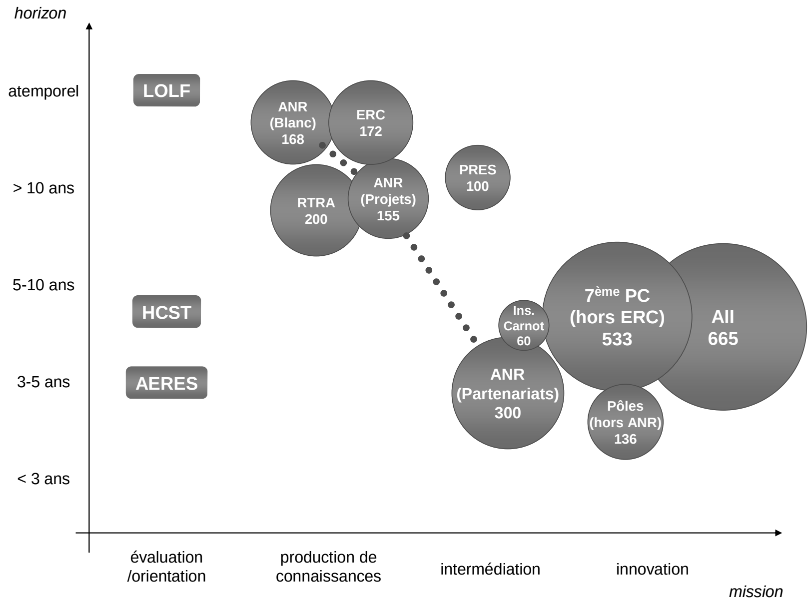
2 Conseil Supérieur de la Recherche et de la Technologie. Advisory council at the Ministry of Research. It is composed of representative of the different social partners categories : Business, workers unions, Universities, CNRS and others institutions of research, Régions and Cities… (http://www.enseignementsup-recherche.gouv.fr/conseil/csrt/index.htm)

3 European research Area: http://ec.europa.eu/research/leaflets/enlargement/index_en.html

4 7th Framework Programme: http://ec.europa.eu/research/fp7/

5 European Research Council and its Scientific Council: http://ec.europa.eu/research/future/basic_research/erc_sci_council_en.htm

6 Contrats de Plan Etat-Region



New bodies (competitive funding) (M€ expected yearly)

We include the European funding that is provided under a competitive process:

(the 2 figures come from Lesourne and Randet ed. 2007)

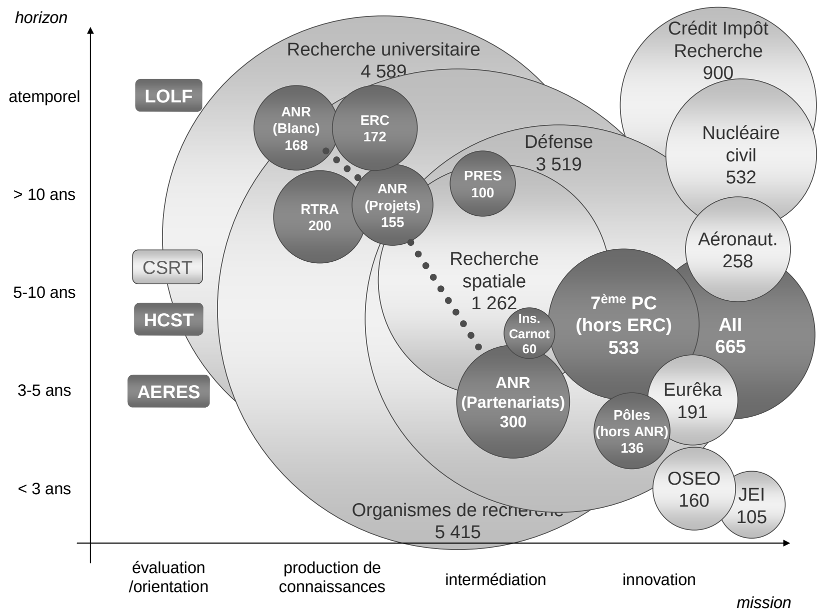
The two bodies that manage the biggest part of new funding are the ANR and the AII.

The National Agency for Research (ANR)

It is the main Agency that is responsible for the “flexible” share of the public policy toward research. ANR is responsible for the design of new research programmes, for call for tenders, for the selection of beneficiaries and partly for the evaluation of their output. The funding of annual programmes is under competition rules. ANR is also in charge of the financing of other programmes such as the “Instituts Carnot” we will see later. The ANR competitive process is complementary to the one of existing institutions that is more stable and based on large domains and long term programmes.

The Agency for Industrial Innovation (AII)

The goals of this Agency are to support ambitious industrial programmes based on the highest development of science and technology, that may meet a profitable market on a medium term basis. Such policies have been developed by most developed countries, including the US, Japan, Great-Britain and Germany. They are still in progress for industrial programmes related to environmental issues, health, energy and the communications industry. The AII acts less as incentive to businesses that fulfil public programmes, than as support for major industrial initiatives under private leadership. It focuses on a very limited number of big projects. With a comparable budget, this Agency selected 11 projects in 2006, while the ANR selected 1630. Consequently, budgets are big and can help for risky and ambitious projects. But this procedure is considered at the edge of the European policy and their "euro-compatibility" needs to be established.



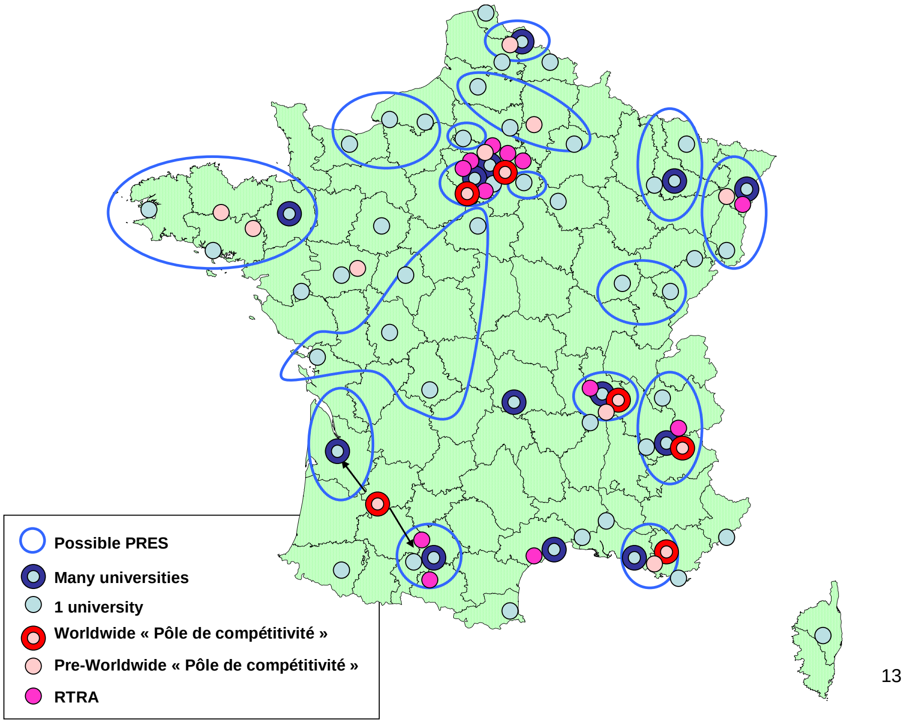
Relationship between old and new funding (M€ yearly)

A portion of the new institutions (represented through rectangles on the left side of the figure) do not require specific funding; they are mainly related to the design of the policy and the evaluation of it. Additional funding remains obviously a small portion of the recurrent funding. But this amount brings a considerable leverage effect upon the complete public process, if not on private funding.

2.4 The new "National" policy has strong Regional and European implications:

Resulting from national centralised decision, these measures induce a new way of governing research within the country. The split between various levels or functions induces necessarily more autonomy for each level and particularly for actors in the field of research, mainly the universities. But the reform manages a degree of coherence with the European policy (ANR and AII projects are open to other European partners and follow European rules).

Furthermore, because it tends to reinforce the most efficient institutions, it also links scientific excellence to territory location. These new institutions provide national recognition to the best local and regional initiatives in research policy. And when the best project is selected in a specific region, its neighbours are obliged to consider different objectives where they may have a chance to succeed.



Territorial impact of the universities in the country and their evolution

(As it was perceived in June 2007)

Among the new institutions, four of them require a strong local or regional embedding. They are the following :

PRES (Pole for Research and Higher Education):

The university landscape is very fragmented and as occurs in many cities (Lyon, Strasbourg, Lille, Bordeaux, Toulouse, Marseille… not to mention Paris), two or tree universities may exist, with duplications in higher education and in research. This new institution intends to fuel cooperation between universities within the same area. It intends to improve the specialisation of university policies, and to increase their size, up to the international standards. This incentive for cooperation was initially limited to universities. But rapidly, they have included the *Grandes écoles*, as well as research labs related to organisations such as CNRS.

Nine PRES have been established in 2007 among those “possible” marked on the above map. Cooperation and merging is limited to the activities that will benefit directly from such economies of scale.

The main issue at stake is to experience how people, coming from independent bodies and specific cultures, will be able to work together. The quality of common projects that will be chosen in each case will be determinant. Up to now, a few mergers of universities have been planned; and the other cases limit their projects to common doctoral schools, international student programmes and platforms of scientific equipment.

RTRA (Networks for world-class research : Réseaux Thématiques de Recherche Avancée) :

These networks are based on cooperative fundamental research projects between leading research groups in the country. Such projects are intended to but together people from different research institutions. Their characteristics are, besides the evidence of excellence in the given field, a large size (+500 researchers) and a high degree of internationalisation. Partnership programme can include local agencies and businesses, as well as international partners.

The objective is to create foundations (institutional settings that remain rare in this country) and a public financial support to participate in the initial funding. In 2006, 13 projects have been selected nationwide (from 37 proposals), and the public funds go up from 12 to 20 M€ for each of them. At this point, funding coming from private donors and from the members themselves remains limited.

Competitive Industrial Clusters (Pôles de Compétitivité):

In this case, the model is one of the industrial cluster based on high tech, or, at least, on a high originality of the activity through Private-Public Partnership.

These poles are conceived as tools for targeting regional specialisation. The objective is to design one industrial ambition and to combine, from this ambition, a set of industrial firms with private and public research centres, training organisations, etc. Such clusters are built from partnership projects with a high level of innovation and a common strategy of development. Today, 71 Poles exist; 7 of which are considered as world-class clusters (aerospace, electronic, health, transportation…). The Regions provide a large part of the finance for these projects, while the Ministry of Finance keeps control on the process and on its evolution.

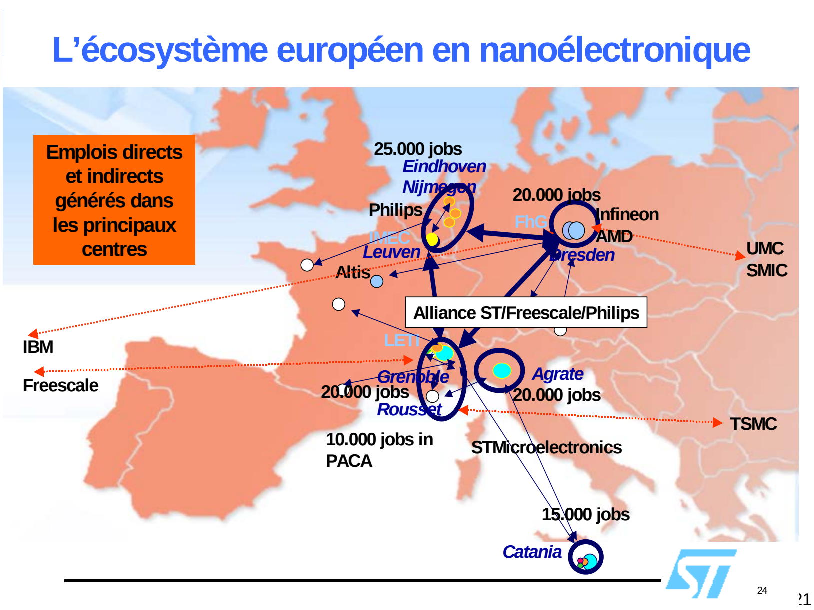
These clusters are key elements of the dynamics of the national system of innovation. They are jointly based on local partnership and on international competitive ability. They bring some flexibility to the system.

Carnot Institutes:

The Carnot organisation (Carnot was a famous physicist from the early nineteen century) tends to promote transfers of knowledge and science-technology partnerships between public laboratories and industrial agents. The institutes have been selected according to their past ability to collaborate efficiently with socio-economic partners. They are designed under the model of the German 57 **Fraunhofer Gesellschaft** and intend to use similar standards for their partnership research activity. 20 institutes were approved in 2006 for 4 years (out of 60 applications).

The state incentive related to those institutes represents a portion of private money gathered for research (total of 60 M€ in 2007). The concept of public "foundation"[1], as an entity which exists to support a non-for-profit institution, and which is funded by an endowment or donations, has to be clarified. In the case of the Instituts Carnot, the initial public endowment has been declared as "consumptible"(edible). If a foundation spends its equity, the concept of foundation disappears. The tradition of the foundation is rare in France where most of the funding dimensions are related to general expenditure.

Regional clusterisation of research and of it applications is well recognised. But the territorial dimension of "regions" must be considered as a mix between territorial dynamics and network dynamics. At this point, territory is very often designed as networks at a European scale more than as isolated islands within an ocean of unconcerned participants. An illustration of the issues of clusterisation of research and of innovation is provided below:



[1] The foundation finds its origins into Medieval Ages, when a patron created a foundation in order to endow a monastery or other religious institution in perpetuity.

Part III Ongoing initiatives, and forthcoming challenges

Up to now, science policy innovations answered primarily to the necessity to provide new means for the researchers who wanted to innovate within the existing national system of research. These reforms pave the way for the improvement of high standard research and for more specialisation and exceptionalism. Doing so, the upward reforms present 2 characteristics:

1. They add new opportunities thanks to new institutions that stack over the existing ones. The research groups can reap the benefits of the new instruments; but they still have to deal with their old institutions and their heavy institutional procedures. New institutions do not suppress the old ones. At an individual level (the researcher and his laboratory) it results in an increase of the administrative burden.
2. They leave undone the more important side of the reform: that of the rehabilitation of existing institutions. This reform refers to the Universities and the research institutions capabilities on one side, and to the rules of the management of the entire system on the other. Amongst others, this last set of problems deals with the ability of the fragmented institutions (*Grandes écoles*, Universities and Institutes) to work together.

Today, as the reform of Universities is under way; a Law was passed in July 2007. We will present some dimensions of it in the first section. The second section will consider the present challenges for a system that is now in the middle of the ford.

3.1 The reform of universities

We have noted above the important decisions to adapt universities. One of these has been the setting up of new curricula adapted to the European model LMD (Licence - Master – PhD representing 3, 5 and 8 years of higher education). In this case, the initiatives have been left to the universities, with the double result of creating new innovative training and research programmes and maintaining the old ones, under new formal presentation. The immediate effect has been an inflation of studies. But the differentiation process is on it way, and some Darwinian process will clarify, in the near future, the supply of higher education.

The second step has been represented through the networking of existing research activities resulting from the four events described above: PRES, RTRA and Carnot.

The third and most recent step, still at its negotiation level, is “the reform” of the structures of management of the universities. A law has just been passed and its application remains to be implemented. In that respect, the reform of Universities is still under hard political debate. It cannot be among the ambitions of this paper to enter into the details of this ongoing process. However, we take into account that a consensus is largely shared on the contradictory situation of the university in France. This situation is threefold:

1. Universities are the major source of scientific research and of scientific knowledge in the country. They fulfil this mission through their laboratories which are mostly "mixed laboratories" in cooperation with one or more Institutions. Universities are also the major producer of higher education through research in the country. Teaching and learning do not limit themselves to knowledge that is currently well known and recognised, but include how you learn to address what is not already known. These universities benefit mostly from international recognition for research.
2. Simultaneously, Universities are accessible to every single student who succeeds at the baccalaureat. This right is mandatory and at almost no cost for the relevant student.
3. In addition, Universities are required to follow national regulations in many ways: for their education curricula; for the hiring of professors and administrative staff; for the spending of money, including that which comes from private and non state sources; for the management of their real estate, etc.

The autonomy and the governance of universities:

The major dimension of the present reform of universities is related to their degree of autonomy and their capability of governance. The existing structures were targeted toward the build up of a national common capital in knowledge that is shared by a wider section of the people. The national goal considered excellence as a collective issue, with limited space for islands of excellence in very sharp domains. Times changed and, in the context of worldwide specialisation of research and of higher education, the objective moved toward new strategies that target specific goals and that, consequently, concentrate the existing means.

Autonomy is the first consequence of this new context. Strategies in scientific choice include targeted initiatives and, consequently, an obligation to differentiate between research programmes that have to compete on a worldwide scale and those competing nationally. But the universities remain constrained by common rules, designed at the national level. These administrative rules have been built and accumulated during more than a century. Today, they require the biggest part of their management energy, and are not directly related to what is needed. As has been said, the new strategic objectives imply that universities obtain strong degrees of autonomy. They need the possibility to hire their staff, to fix their wages, to select their students, to create incentives for innovations and for their results, to manage their assets and real property. The pending reform provides some answers to these questions. The adjustment of national rules (including the recent finance rules called the LOLF[1] remains to be done and will be addressed in the near future.

Governance:

Autonomy has no effect so long as its beneficiaries do not have the capacity to use the opportunity at strategic and management levels. The present reform increases the powers of the presidents of universities and opens various measures in order to provide a more coherent, responsive and strategic mode of management. This new mode of management requires the capabilities of evaluation, decision, implementation and monitoring, that are, very often, unfamiliar to the present university managers. Management abilities now include risk taking, responsibility of the decision makers and related rewards and benefits. At this point relations between administrative staff and academic staff require managerial capabilities that are comparable to the management of enterprises[2]. Unlike the preceding reforms (1969) this “new model of management” supposes that initiatives come from the universities and not from the government. The later acts through incentives, more than rules and decisions.

The universities management requires fulfilment of these new responsibilities; to increase their flexibility and to simplify the rules of their management. Today, limited capabilities exist at this level. Universities are managed by heavy administrative councils with limited possibilities for initiatives; external partners exist but they have a very limited possibility to influence the decision making process; the elected managers (presidents and vice-presidents) are more often professors with no specific management training. A change in human resources will have to be made along with this institutional restructuring.

3.2 Conclusion: The ongoing dilemma of the French National Research System

The above reform of the university addresses a central issue that requires strong commitment from both sides: the ministry and the universities themselves. What is at stake is, jointly, more money, more freedom, more management and more competition.

But still, this unavoidable aggiornamento opens a new set of major issues that remain of equal importance to the ones that have already been addressed. These questions concern mainly money issues and

[1] Loi Organique relative aux Lois de Finance passed in 2001 and applied since January 2006 that intends to rely public budget to rules of performance and to light the heavy procedures of accountability.

[2] We can notice that there are many degrees of liberty that already exist and that are not used by the executives (they feel often trapped into a statufied situation).

management of human resources. The open questions may be presented as following:

- The recent increase in funding for research has had a major effect. But it leaves a gap between the country and its partners. Looking at the figures related to R/D as well as those related to higher education and research shows a need for more money into research and higher education; benchmarking other countries underlines real differences in the amounts and in the structure of expenditures (OST, 2006). Global expenditures in R/D are in Germany double those of France, while the share of public money remains higher in France. That is to say that the increase of means in research primarily requires a real improvement from private money. The main partner is business. Private funding of research, as a share of GDP is lower in France than the US, Japan, Germany and Great Britain.
- The second issue related to funding is the cost of education that is considered here, primarily for public gain and as a democratic objective. Higher education remains almost free of charge for the beneficiary. In a context where public deficit is considered as bad public conduct (that remains a questionable issue), the question becomes to know in what respect, and at what level, the students will have to pay fees for their education? An important, related question is the position of foreigners (that is, non EU citizens) who come to European universities and receive free education that is paid for by those on the tax roll. This question cannot be addressed by one country and is a European issue. International comparisons and collective decisions must be considered. Whatever position is taken, any increase in tuition fees will have to come with a new system of grants for low income students.
- The management of human resources within universities is another major and complex issue. It concerns students, administrative staff and academics. The student population is the key element that determines the attractive capacity of any university (and is determined by it). Good students working together benefit from cumulative effects and improve more rapidly. Where and when must the selection of students be made? The system is currently contradictory: Selection can occur before entry, or within the first years of university. Selective universities (primarily the *Grandes écoles* in France) are extremely strict when they register their students and very flexible when the elected students get their diploma. The only selection, at the exit level is the rank achieved by each student. On the reverse, non-selective universities are required to register every student who

succeeded at their baccalaureat, (diploma at the end of the secondary school) or at any preceding educational level. But a selection occurs at the end of the academic year. An example is that more than half of the students that enter the French university fail the exams at the end of their first year. Selection is becoming a key issue, but it is not alone: other important issues are, for example, job opportunities that are opened to students who have been trained for research (PhD) outside of public research…

- The second dimension of management of human resources concerns administrative and academic staff. In most of the cases, researchers, professors, technical staff and administrative staff are civil servants. Their status is efficient when they are performing day to day functions within public services. However, they are much less adequate for jobs that include risk, change, experiment and competition. At this point, the new open context of universities changes the duties of each of its members. Consequently, it changes the rules of management for current jobs as well as the carriers of academics. The issues related to financial compensations and incentives, as well as to stability of employment and promotions will soon be at the centre of the debate.

These changes and new issues underline the fact that the restructuring of higher education and research is a long way from its goal with many uncertainties on each separate issue as well as globally. Public policy toward world class research and world class universities faces a set of dilemmas that underline the double necessity of concentration of means on precise targets and the systemic dynamics that pursue excellence in complex societies. The main dilemmas that have to be taken into account by policy makers and by academic executives may be summarised as the following:

1. Looking at world-class universities, is it better to gather a limited number of excellent Universities or a larger network of very good universities with wider social impact? The Jao Tong University ranking highlighted the opposition between the US and European university systems at this point.
2. When relations between research and higher education are considered; do we get better results when we target the activity to research, or on higher education, or on both? This debate is still open and answers are not automatic when we consider what happens in different university systems. The case of Grandes Ecoles in France, which are world-class in education but not in research, must be considered and discussed.
3. In what respect does world class ambition need to have strong territorial impact on universities in

education and research? What weight must be attributed to the activity developed under the "third mission" (SPRU, 2002) that focuses on the quality of regional output of science on the territory. Third mission is, equally, one of the recognised missions of strong universities. Under the same set of concerns, the question is raised about the choice between targeted finance on high scientific specialisation and territory sprinkling. Every world-class ambition needs a world sized network. But intellectual districts and clusterisation exist also for research. Financing of research requires local and contextual equipment.

4. Other dilemmas will exist between strong coordination of strategies in research against laisser-faire. Strategy needs not only a vision of the future, but also the capacity to implement projects and to make innovation accepted by naturally reluctant bodies and individuals. Coordination is mandatory; but the level of it is variable. The concept of subsidiarity must be developed at this point.

The answer to these questions, and to others such as those that deal with "targeted scientific fields / open researches"; "recurrent money / project dependent incentives"; "long term strategic RD / fast answer to market demand … will never be simple. We all know that there is no unique answer to these dilemmas. There is no optimum.

Strategic attitude has to evaluate the opposing issues and make a decision that will take into account the 2 opposite figures. This decision will have to be reviewed and modified regularly. Moreover, the effects of any strategic decisions regarding research and higher education will not be visible before many years (five, ten or more) after they have been made.

France has an old, strong and extremely structured national system of research and innovation. Its capacity to evolve within the changing world context is at stake. As science is more open and competitive than ever, the future of this system is not only linked to the excellence of its results but of its entire coherence. In this context, cooperation and strong incentives for competition between participants of the system becomes a key element. In that respect, the key word becomes *coopetition*. Present policies try to help this aggiornamento. After these few years, it has become obvious that people know where they stand within the worldwide landscape. They also know what not to do. But they have to learn what and how to experiment.

References

Chesnais, F. (1993): *The French National system of innovation* in R. Nelson (ed) op cit

Cohen, W.M. & Levinthal D. A. (1990):" Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, 35 (1): 128-52.

Lesourne J. & Randet D. (2007) *La Recherche et l'Innovation en France*. Futuris, Odile Jacob, Paris

Lundvall, B.A. (1992) : *National systems of innovation,* London, Pinter

OST (2006): *Indicateurs de sciences et de technologies,* Economica, Paris

Nelson, R. R. (1993) *National Innovation Systems: A Comparative Analysis*, Oxford University Press, Inc.

SPRU (2002): *Measuring third mission activity* Final Report to the Russell Group of Universities

Zahra S. A. & George G. (2002). "Absorptive Capacity: A Review, Reconceptualization, and Extension". *Academy of Management Review,* vol. 27(2): 185-203.

Swedish Strategies for World-Class Status in the Context of University Rankings - Metrics for Academic Science

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Abstract

Ten years ago we were looked on in wonder at the ranking system that had made its entrance into the American university world. We were amazed how universities were to be ranked as if they were football teams and over the enormous importance that universities assigned to their position in this ranking system, both as concerns the status of their own brand and the value that their ranking was perceived to have as far as recruiting students was concerned. At that time we were part of a system in which we were all more or less equal. We all enjoyed the right to confer degrees and there were plenty of students for all of us.

Today ranking is a reality also for us in China and in Europe. A considerable amount of time is spent understanding and adapting reports in order to fulfil the criteria for an eminent seat of learning. This was discussed at a meeting in Leiden in Holland recently and it became clear that what the Presidents of European universities had been suspected for some time was true. However, many of the ranking lists are not meant to guide university management and faculties, neither are they meant as consumer information for students, they exist to be attractive to media and serve special interests. These include the glorification of English language universities and of medical and biological sciences. It also became clear that neither was the management of reports from the various universities good enough. There was no independent scrutiny of the universities' claims at all. In spite of this the media continue to report these ranking lists as the truth. The result is a one-dimensional competition in populism something akin to the Eurovision Song Contest, which leads to the call for "one ranking for all".

The complex role of the modern university includes, in addition to education and research, innovation, entrepreneurship and liaison with society. Consequently it is essential to be able to follow and evaluate, applying different indicators, the operations of our own and other universities for example through bibliometric studies. Being able to share good examples and to then utilise them in our own operations is very valuable. For our stakeholders and presumptive students this means serious scrutiny of reports and that they are able to rely on the fact that the information provided actually is correct. Bibliometric studies and rankings are here to stay. Frivolous ranking, fuelled by special interests and provided by ignorant journalists applying bottom line thinking would be a good thing to avoid.

Swedish Strategies for World-Class Status in the Context of University Rankings - Metrics for Academic Science

Introduction

Ten years ago we looked on in wonder at the ranking system that had made its entrance into the American university world. We were amazed how universities were to be ranked as if they were football teams and we gasped over the enormous importance that universities assigned to their position in this ranking system, both as concerns the status of their own brand and the value that their ranking was perceived to have as far as recruiting students was concerned. At that time we were part of a system in which we were all more or less equal. We all enjoyed the right to confer degrees and there were plenty of students for all of us.

Today ranking is also a reality for China and Europe. A considerable amount of time is spent understanding and adapting reports in order to fulfil the ranking criteria for an eminent seat of learning. Ranking is a way of comparing universities; their productivity, quality of research and higher education. The criteria for this vary depending on the specific objective of the university. Quality in higher education is different for an American community college than for an American Ivy League university. This can be easily recognized by comparing the ranking lists from Washington Monthly and the U.S. News. The Washington Monthly uses information from student surveys about their educational experience and also on employability, while the U.S. News uses more traditional measures available from university statistics such as faculty/student ratios. Of course the research intensity of these categories differs considerably. All international ranking lists have their specific purpose and promote different ideologies concerning the role of the university in the global knowledge society.

However, many of the ranking lists are not meant to guide university management and faculties, neither are they meant as consumer information for students, they exist to be attractive to media and serve special interests. It also became clear that neither was the management of reports from the various universities good enough. There was no independent scrutiny of these universities' claims! In spite of this the media continue to report these ranking lists as the truth. (The result is a one-dimensional competition in populism something akin to the Eurovision Song Contest, which leads to the call for "one ranking for all".)

Using these ranking lists for student consumer information, or for identifying role models for universities in a development phase, demands a good levels of knowledge about the criteria used by the rankings. It also demands knowledgeable journalists to comment on them. Unfortunately the criteria used and transparency as to how data have been collected are not always optimal. We can foresee an increasing number of ranking lists in the future for promoting and providing information about different parts of the global knowledge community.

In order to bring some order and transparency into the field, a ranking list of these ranking lists should be created. Then the information, or lack of it, on how they are created would become public. The organizations publishing these ranking lists should learn from each other. To stay influential they will need to comply with certain elementary rules of statistics and analysis.

Many countries though, among them Norway, Australia and UK, have introduced another type of ranking lists or comparative study - the Norwegian and the Australian models will be presented and discussed below. The purpose of theses universities introducing another type of ranking lists is in order to distribute economic resources for research and higher education to universities according to their quality and productivity. The problem is similar to the public ranking lists. Which criteria should be used? It is even worse because a national and global picture of what an excellent university is (including research, higher education and interaction with industry and society) must be formulated. This picture will of course also change over time according to new policies concerning the role of universities. Here the problem cannot be avoided simply by saying that a certain aspect of a university activity is being ranked. Here multi-parameter optimization is necessary. Most probably, “peer review” groups will be an important component in making decisions on the comparisons needed for resource allocation.

In research we believe that a firm basis for comparison can be obtained by using new, bibliometric methods of comparing quality and production. We have tested this in a number of cases; Australian universities, Nordic universities, Swedish universities and university colleges. Not surprisingly we find for the Swedish universities and university colleges a close correlation between actual economic resources and research productivity and quality. However the differences are significant and we believe that a resource allocation based on our data would be a more effective method of promoting and creating incentives for better research, higher productivity and improved quality.

The Norwegian Model

In 2005, a quite comprehensive metric model was implemented in Norway. The Norwegian Model uses a weighting of publications in two dimensions: firstly according to different publication channels (articles in ISSN journals, articles in ISBN books and ISBN books), and second according to level of quality of the publication (normal and high). Approximately 80 per cent of all university publications are covered by the documentation system built up for the purpose of formula funding. By covering almost all publication channels (including books) the counting procedures has probably become more legitimate from the researchers' point of view.

There are basically two drawbacks to the Norwegian model. Firstly, the heterogeneity of disciplines when it comes to productivity makes it difficult to compare areas of science. Accordingly, universities can hardly be compared as they will have different mixes of disciplines. Secondly, the lack of a quality dimension based on actual citations.

The New Australian Model

Australia is now in the process of developing a research quality framework (RQF). The intention of this framework is to establish the best quality and impact of research. Consequently the proposed system is a complicated matrix of assessments. It includes self-assessment, international and/or national peer review (as qualitative assessment), external endorsement (stakeholder impact) and quantitative metrics (DEST 2007). The last point, research output metrics, includes full reporting of books, book chapters and journal articles or the equivalent (in all 21 different types of output). According to available documents, the metrics will be using measurement of ranked channels of publications (called outlets), i.e. channels will be classified into tiers according to pre-determined distribution (A* - top 5%, A - next 15%, B - next 30% and C - next 50%). Standard bibliometric methods will be applied to a number of disciplines, but not to all. In some disciplines "non-standard bibliometrics" will be applied which would include citations from books and articles in books. The proposed bibliometric analyses include citations per publication using world and Australian benchmarks.

Although the Australian RQF system may be regarded as superior compared to the Norwegian and UK systems, there is still room for criticism of the "Aussie Model". Granted that the citation analysis will be performed using standard bibliometric methods à la Budapest, Leuven or Leiden, there are two problems that concern us: firstly the productivity aspect and secondly the distribution of funding across areas of science. The problem is that there are no reference values for comparison.

The productivity aspect

Finding a field-adjusted production figure for universities requires a strategy. The preferred option is the use of ISI/Web of Science data with first author (AU) and reprint (RP) author addresses. In most cases the RP author is the author responsible, and probably a representative of the university that should be credited for the article. When information about the distribution of publication frequencies per author is available, it is possible to estimate the number of researchers per area. With information from the tip of the iceberg (first and reprint author) we can actually get more or less full information about the size of the entire iceberg (the research system).

Next step is to check the names so that all homonyms and similar problems have been taken into account. This was carried out for Nordic universities and the operation yielded 51,000 unique authors for the period 2001–2004. Addresses were harmonized. By using a hierarchical clustering technique, 23 macro classes were identified. Each author belongs to one main macro class according to this methodology.

Bibliometric data are Waring distributions; from this follows that it is possible to establish a reference value by using statistical techniques. This is carried out for each of the 23 macro classes. Agriculture and Humanities are two of the largest areas of research in Australia according to this analysis. By using the number of articles per university divided by the reference value we obtain the Waring value for each university and each macro class. This is the relative **quantity of production** performed by the university in each macro class. Then, simply by multiplying the Waring value per macro class and university by the well-known field normalized citation score (CPP/FCSm) a combined value incorporating production and quality of production can be established.

Application to Australian Institutions

The Waring model has been applied to Australian universities.[1] Australia has had a system of formula-based funding for many years; moreover right now it is moving into a new and complex system. Consequently, Australia is used to counting publications and Australian researchers can be expected to be more prudent with their addresses than many other university researchers. In order to account for the mobility of researchers between universities and different structural phenomena related to the number of researchers per area, we have decided to perform the analysis split into two periods: 2001–2002 and 2003–2004.[2]

1 See Sandström & Sandström (2007) A Metric for Academic Performance.

2 Cf. Schubert & Telcs 1989.

Procedure

The number of articles per university and macro class is divided by the reference value – the Waring reference value – for each macro class.[1] This gives us a figure for how many researchers the actual number of articles represents (ten highly productive researchers might publish as much as a normal group of twenty researchers). We then add these values together to obtain a sum of “producers”, i.e. the number of researchers that corresponds to the number of articles.

Field normalized citation scores per macro class and university have been calculated. All articles incorporating an Australian university address have been used for this procedure, not only articles with a reprint author address connected to the university.

Finally, these values are joined together. Through a simple multiplication of Waring values and CPP/FCSm per macro class and university, we obtain the combined value of production and quality.

Table 1 Results for Australian universities (Go8 on top)

	A	B	C	D	F
UNIV	**No frac articles**	**Waring**	**CPP/FCSm**	**B* C**	**Column D %**
SYDNEY UNIV	5 769	5 021	1.11	5 575	11.95
MELBOURNE UNIV	5 260	4 673	1.10	5 160	11.06
QUEENSLAND UNIV	5 068	4 441	1.06	4 709	10.10
AUSTRALIAN NATL UNIV	3 876	3 549	1.20	4 256	9.12
NEW S WALES UNIV	4 304	3 716	1.08	4 011	8.60
MONASH UNIV	3 857	3 349	1.02	3 426	7.34
WE AUSTRALIA UNIV	3 141	2 687	1.08	2 891	6.20
ADELAIDE UNIV	2 651	2 196	1.00	2 201	4.72
NEWCASTLE UNIV	1 449	1 334	1.08	1 437	3.08
MACQUARIE UNIV	1 132	1 140	1.12	1 281	2.75
TASMANIA UNIV	1 352	1 290	0.90	1 164	2.50
LA TROBE UNIV	1 107	1 233	0.89	1 104	2.37
GRIFFITH UNIV	1 179	1 125	0.89	1 000	2.14
QUEENSLAND UNIV TECH	1 107	945	1.04	981	2.10
WOLLONGONG UNIV	1 110	890	1.05	931	1.99
CURTIN UNIV TECHNOL	853	884	1.02	900	1.93
FLINDERS UNIV	1 026	940	0.93	874	1.87
UNIV N QUEENSLAND	922	832	0.99	820	1.76
DEAKIN UNIV	929	912	0.87	795	1.70
MURDOCH UNIV	773	754	0.92	690	1.48
TECHNOL SYDNEY UNIV	652	651	0.88	573	1.23
S AUSTRALIA UNIV	633	570	0.98	558	1.20
RMIT UNIV	786	632	0.82	517	1.11
SWINBURNE UNIV TECH	520	432	0.92	396	0.85
WE SYDNEY UNIV	471	468	0.84	395	0.85
	49 919	**44 664**		**46 646**	**100%**

[1] Note that the reference values in Table 2 are for a 2-year period and should be doubled in order to represent the full 4-year period.

Discussion

We have described a simple model for metrics of academic science. Compared to the time-consuming efforts that will have to be utilized for the Australian model, our model is more time-efficient. In short, it would save much effort that could be used for research rather than assessments.

The Waring model yields interesting results. Research production from very different areas of science is made comparable. The productivity of researchers differs considerably between universities and this is a working component of the methodology. With this methodology a university will be paid for its activities according to its production and the quality of this production. Governing bodies of universities will try to find ways to support researchers who produce fair numbers of publications, given that these papers are cited. The more papers a university produces, the more citations it will receive assuming that the peer community find the papers interesting and worthy of referencing.

The role of a modern university today is complex. Consequently it is essential to be able to follow and evaluate, applying different indicators, the operations of our own and other universities. Being able to share good examples and to then utilise them in our own operations is extremely valuable. For our stakeholders and presumptive students, this means serious scrutiny of reports and that they are able to rely on the fact that the information provided is actually correct. Bibliometric studies and rankings are here to stay.

References

Braun T; Glänzel W & Schubert A (1990) Publication productivity: from frequency distributions to scientometric indicators. *Journal of Information Science* 16:37-4.

Braun T; Glänzel W (1990), United Germany: The New Scientific Superpower? *Scientometrics* 19 (5-6):513 - 521.

Butler L (2003) Explaining Australia's increased share of ISI publications – the effects of funding formula based on publication counts. *Research Policy* 32(1):143-156.

DEST (2007) Research quality Framework: assessing the quality and impact of research in Australia. July 2007 [www.dest.gov.au]

Glänzel W (1996) The need for standards in bibliometric research and technology. *Scientometrics* 35:167–176.

Glänzel W; Schubert A & Telcs A (1984) Characterization by Truncated Moments and its Application to Pearson-Type Distributions. Zeitschrift für Warscheinlichtkeitstheorie und verwandted Gebiete, 66:173-183. (Correction: Ibid. 74:317 (1987).

Irwin JO (1963) The place of mathematics in medical and biological sciences. J R Statistic Soc. A. 126, 1-4.

Moed, H.F. (2005) Citation Analysis in Research Evaluation. Dordrecht: Springer Verlag.

Sandström, U. & Sandström, E. A Metric for Academic Performance Applied to Australian Universities. Submitted.

Schubert A; Braun T (1996) Cross-field normalization of scientometric indicators. *Scientometrics* 36:311-24.

Schubert A; Glänzel W (1984) A dynamic look at a class of skew distributions: a model with scientometric applications. *Scientometrics* 3:149-67.

Seglen P (1992) The skewness of science. JASIS 43(9):628-638.

Seglen P (1997) Why the impact factor should not be used for evaluating research. *British Medical Journa*l Feb 15, pp 498-502.

Telcs A; Glänzel W & Shubert A (1985) Characterization and statistical test using truncated expectations for a class of skew distributions. *Mathematical Social Sciences* 10:169-78.

Van Raan A.F.J. (2004) Measuring Science. Capita Selecta of Current Main Issues. In: H.F. Moed, W, Glänzel and U.Schmoch, editors: Handbook of Quantitative Science and Technology Research, Dordrecht: Kluwer Academic Publishers, 2004, p.19-50

Van Raan A.F.J. (2006), Statistical Properties of Bibliometric Indicators: Research Group Indicator Distributions and Correlations, *JASIST*, 57 (3): 408-430

Improving Quality of Universities by World-University-Ranking in Slovenia and the Danube Region

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Abstract

This paper presents the results of a case study at the University of Maribor. We emphasize that ranking of heterogeneous young universities without established reputations must be conducted very carefully. Usually, such universities do not appear in lists of the top universities in the world. This should not be understood as a problem, but as an opportunity for development: global university rankings can strongly contribute to university development. Our results show that more successful institutions can have a stimulating effect on the less successful ones. A healthy competition between institutions emerges, representing an important driving force in assuring further development and achieving higher status. The results present an example of good practice and deserve to be further disseminated. This year the University of Maribor is presiding over the Danube Rectors' Conference (DRC), and our active role in the DRC promises good collaboration in the region and further dissemination of the results, which should make an important contribution to the international process of university rankings.

Improving Quality of Universities by World-University-Ranking in Slovenia and the Danube Region

Introduction

Universities have always been ranked. Historically, the criteria were different from those used today, and the evaluation could usually be done on the basis of transparent data that were more easily recognized because of the smaller number of universities. Ranking was also most often limited to smaller regions, as in Slovenia and the Danube region. In Slovenia, there are three such regions: the Eastern (Styria and Prekmurje), Central (Carinthia, Upper Carniola, Lower Carniola) and Western Slovenian (Littoral) regions; altogether, this is a part of the wider Danube region. In recent decades, however, the number of students at universities in Slovenia has greatly increased. In this region universities are young (the oldest university dates back to 1918) and progressing quickly, having excellent results in research and teaching, and producing many successful, employable students. Because of the increasing number of universities and the speed of information transfer based on the world-wide web, globalization has reached the field of higher education, resulting in the world-university-ranking systems (Sadlak, 2006). The world-wide academic ranking systems also contribute to an institutional visibility that extends beyond the boundaries of the local communities where they carry out their activities (Agachi, Nica & Moraru, 2007).

Today we have several ranking systems (for review see Sadlak & Cai, 2007). There are at least 30 different types of national and international rankings, with substantial differences regarding objectives, purpose criteria, selection of data, weighting systems, and other methodological aspects of this complex undertaking. Despite strongly argued resistance towards any overall institutional and/or program rankings, the number of ranking initiatives is increasing. Recently, several countries, including Italy, Hungary, Russia, Romania, the Slovak Republic, and the Ukraine, have initiated their own university rankings (Sadlak, 2007).

Rankings and league tables of universities serve many purposes. In the first place, when correctly understood and interpreted, they are intended to describe the quality of the universities by measuring how well they satisfy the selected criteria that are considered important for achieving their main goals, as determined by the mission statements of these institutions. The league tables are useful to consumers, for fund allocations, and for many other purposes (Wheeler, 2005). The question arises, however, to what extent this data is to be taken absolutely and how it is to be interpreted, which is also one of the most important points included in the Berlin Principles (IREG, 2006).

One of the main problems is to what regional extent the league tables can be fairly established while maintaining their credibility. We are fully aware of linguistic barriers and different cultural, economic, and historical contexts influencing the ranking of the institutions. Therefore, there should be an awareness of possible biases and precision about the objectives of ranking. In a well-defined context apples won't be compared with oranges. This can be achieved in individual countries and smaller regions, and that is why university rankings have become part of the framework of national accountability and quality assurance processes, and why more nations are likely to see the development of their own ranking systems in the future. Given this trend, it is important that these local rankings and league tables be held accountable for the quality of their data collection, methodology, and dissemination practice. This is one of the most prominent conclusions of the Berlin Meeting in 2006, and it has been incorporated into the Berlin Principles. Here, the importance of these principles, particularly for small countries like those in the Danube region (Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Hungary, and Bulgaria), where the limited geographical extent of the spoken languages, which are incapable of becoming lingua franca, and of rapid internationalization and success, becomes apparent. In our context, the Danube region mainly referees the countries and universities which are part of the Danube Rectors' Conference (DRC).

Universities, in particular those in small and developing countries, can benefit from the currently active processes of world university rankings, even if a university does not appear at the top of a league table. University rankings are not necessarily meant to impose competition, but to improve the university system and advise university leaders how to develop in the region. In this sense, higher education can benefit from the rankings and league tables when used with a clear perspective of what ranking actually reflects (Sadlak, 2007). When promising results are obtained in smaller regions, good practices can then be transferred throughout a wider region, which contributes to the dissemination of the worldwide ranking systems in these regions.

The present study is based on university ranking in Slovenia. The problems with a language that is non-lingua-franca and other previously mentioned issues are particularly apparent in small countries. Slovenia has only two million inhabitants. With its three public universities and a few private higher education institutions, it is hard to reach a critical mass of teaching and research staff that can be competitive with those already established in larger countries. This study shows how our universities can avoid taking a passive role and how the universities in Slovenia and the Danube region can actively participate in the world ranking process, taking it as a challenge and as a stimulating, driving force for their own development. Focusing on technical sciences in international cooperation and communicating in English as the easiest way of attaining international publication should not be the guiding principle. Awareness of regional tradition and the development of less widely spoken languages are questions of consciousness of the role of language for upcoming generations and their identity in the global community. Historic, cultural, political, socio-linguistic, and other causes influencing the position and use of language must be taken into account. The universities of the Danube region should focus on emphasizing qualitative regional research and teaching staff for the creation of regional centers of excellence with competitive research and teaching programs.

As a starting point, a case study was conducted at the University of Maribor. The University of Maribor is a new university that has developed very quickly. Its original interest was to create as many different faculties as possible in order to establish a complete university to meet the needs of the broader region, and to organize several different fields of study. Consequently, today the university is heterogeneous, consisting of sixteen faculties in fields including electrical, mechanical and civil engineering, humanities, agriculture, medicine, educational studies, law, economy, and natural sciences. Heterogeneity is a general characteristic of the universities in Slovenia, the former Yugoslavia, and in most cases, of the broader Danube region, and this must be taken into account when trying to apply unified ranking criteria to these universities. Therefore, the ranking methodology must be developed very carefully, and it is presented separately in the next paragraph. In Section 3 the results are presented, indicating that the faculty ranking has contributed to the improvement of all aspects of work at the university. A healthy competition between faculties has emerged, creating an important driving force in assuring further development and achieving higher status. This is important for the whole university, and has significant consequences in different fields. Following these new criteria, a much improved selection of research and other projects has been achieved, and in the future there will be positive consequences for allocation of funds. The results are discussed in a wider context at the end of the paper.

Methods

The methodology of this study is based on well-established international university-ranking systems.

Departing from the Shanghai criteria, the study begins with the set-up of customized criteria for national ranking based on the main features of the Shanghai system and with evaluation of research work of professors and research staff called "Co-operative Online Bibliographic System & Services" (COBISS - http://cobiss.izum.si), where all publications, professional, research and scientific works of academics in Slovenia are catalogued. COBISS is an organisational model of joining libraries into a uniform library information system with shared cataloguing. In the COBISS system, uniform methodology is used for the preparation of bibliographies of Slovenian researchers, registered with the Slovenian Research Agency (comprising more than 10,000 researchers). This ensures rational bibliographic processing, accurate registration, better transparency of research activity results, and the possibility to apply uniform criteria for research activity evaluation standards. Regarding personal bibliographies, the information on the type of a document/work specifies in detail monographs and other completed works (23 categories), articles and component parts (21 categories), and performed works - events (7 categories), generally according to the content of the work (scientific, professional, or other).

An upgrade of COBISS used for evaluating the quality of research work of individuals, research groups, and organizations is called "Slovenian Current Research Information system" (SICRIS - http://sicris.izum.si). The SICRIS information system is developed and maintained by the Institute of Information Science (IZUM) in Maribor and by the Slovenian Research Agency (SRA). The following entities are currently represented in SICRIS: 702 research organisations, 1118 research groups, 11,914 researchers, 4181 research projects, and 599 research programs. SICRIS also allows viewing of presentation pages of more than 500 European projects of the EU Framework Programmes directly from the Projects database within the CORDIS system (http://cordis.europa.eu).

In addition to research oriented evaluation criteria, the Mission Statement of our university requires that teaching activities, research work, and the quality of students' work and lives are also taken into account. In particular, as an important part of the evaluation, international cooperation of the faculties, student and teaching staff mobility, and the ratio between incoming and outgoing students and teachers were considered. The role of international relations offices and outgoing teachers in international student recruitment is very important to us, as is the involvement of teachers from abroad in study programs, international research and other projects, and the organization of international events, such as summer schools and other activities. This international orientation is of particular importance for Slovenia and the Danube region countries.

As a further important element of the ranking criteria, transfer of knowledge into the industry and to the market in general was also included. The effectiveness of this transfer of knowledge in the form of establishing new patents and suggesting improvements proposed by the faculties was assessed. Finally, the overall reputation of the faculties, including international and national prizes, as well as memberships on editorial boards and professional bodies, was taken into account. Considering the international and national prizes, we only focus on achievements in recent years, which is the only reasonable course for a young university, and which is also in agreement with other studies emphasizing that we should attempt to give a picture of current strengths rather than the backwards look inherent in tallies of prizes and accolades from previous decades (O'Leary, 2006; Chubb, 2007).

The complete list of all criteria taken into account is given in Table 1.

Table 1 List of Criteria Taken Into Account in the Evaluation of Faculties at the University of Maribor

Main Criteria	Criteria Specification
Quality of scientific research	• Articles published in SCI, SSCI; A&HCI (group 1.01 according to COBISS; evaluated separately for each quarter according to SICRIS) • Citations on “Web of Science” (WoS) • Patents conferred in USA, Canada, South Korea, Japan, Switzerland, Norway and the EU
Quality of education	• Selection of students evaluated by the ratio interested/accepted • Ratio between graduate and postgraduate students • Ratio between graduates/incoming students • Duration of study • Teaching staff evaluation performed by students • Numbers of graduates/year • Number of master theses/year • Number of doctor theses/year • International prizes (students) • National prizes (students) • University prizes (students)
Quality of international cooperation	• Tempus projects (number, financial funds) • Erasmus projects (number, financial funds) • Leonardo da Vinci projects (number, financial funds) • Grundtvig projects (number, financial funds) • 6th Framework Programme (number, financial funds) • Other international projects (number, financial funds) • Incoming and outgoing students (total number, ratio between incoming/outgoing) • Teaching Stuff (TS)-mobility (total number, ratio between incoming/outgoing)
Efficiency of institutional organisation	• Research projects (number, financial funds) • Basic projects (number, financial funds) • Applicative projects (number, financial funds) • Target research programmes (number, financial funds) • Centres of excellences • Other project financed from state budget (number, financial funds) • Other project not financed from state budget (number, financial funds) • Number of students per full-time teaching staff • Percentage of projects’ funds within total budget
Academic reputation of the institution	• International prizes • National prizes • University prizes • Membership on international editorial boards • Memberships in international associations • Membership on domestic editorial boards • Memberships in domestic associations

Results

Faculties at the University of Maribor have been evaluated according to the criteria listed in Table 1. The evaluation has been performed each year for the last five years. Using five years increases the dynamism and rate of change of this measure, but still provides a statistically valid number (Ince, 2006). The results of our analysis show considerable differences between faculties, which enables us to extract examples of good practice, or to think about possible improvements, if the results are worse. These analyses are of particular importance because they contribute to rising awareness of our being part of global trends and orientations. They give a comparative reflection of the situation and encourage healthy competition between faculties, demonstrating an important driving force in assuring further development and achieving higher status.

According to the main five groups of ranking criteria (see Table 1), we present some of the most representative results of ranking the faculties. The quality of scientific research has been evaluated by the number and importance of published works, the number of citations of such publications, and the number of patents awarded. Because of the heterogeneous structure of the university, and the claims that, in general, it is easier to achieve a high ranking for an institution that is science oriented than for one specializing in humanities and social sciences (Williams, 2007), the league tables have been constructed separately for natural and technical sciences (SCI), social sciences (SSCI), and arts and humanities (A&HCI). Figure 1 shows the results for the SCI group (Fig. 1a), SSCI group (Fig. 1b), and the A&HCI group (Fig. 1c). Obviously, in Fig. 1a the technical sciences are the leading branches. The best results were achieved by the Faculty of Mechanical Engineering (FME), the Faculty of Electrical Engineering and Computer Science (FEECS), and the Faculty of Education (FE), which at that time still included natural sciences and mathematics (today incorporated in the Faculty of Natural Sciences and Mathematics (FNSM)). At the top of the SSCI group (Fig. 1b) was the Faculty of Economics and Business (FEB). The FE was also ranked very highly. At the time of this evaluation the FE incorporated all of the study programmes that today belong to the Faculty of Arts (FA). In the A&HCI group (Fig. 1c) the FE (with all of the study programmes that today belong to the FA and FNSM) played the leading role. It was not possible to conduct evaluations during the period of the last five years for the FA and FNSM, and for other faculties which were established very recently (the Faculty of Medicine (FM) and the Faculty of Logistics (FL)). It should also be noted that the results in Fig. 1 are not averaged according to the number of researchers at the faculties. However, the averaged results do not differ considerably from those presented in Fig. 1.

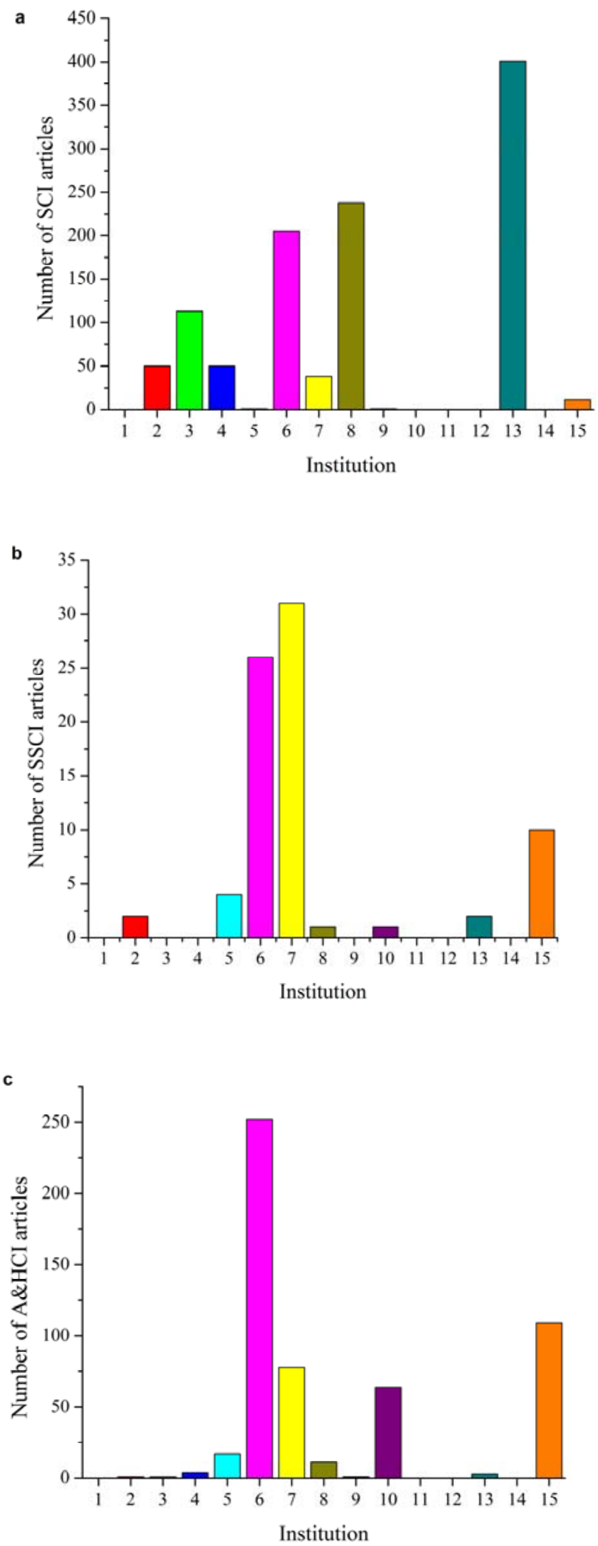


Figure 1 Number of original scientific papers (group 1.01 according to COBISS) in the period 2002-2006. Abbreviations: 1-FA – Faculty of Arts, 2-FAG – Faculty of Agriculture, 3-FCCE – Faculty of Chemistry and Chemical Engineering, 4-FCE – Faculty of Civil Engineering, 5-FCJS – Faculty of Criminal Justice and Security, 6-FE – Faculty of Education, 7-FEB – Faculty of Economics and Business, 8-FEECS – Faculty of Electrical Engineering and Computer Science, 9-FHS – Faculty of Health Sciences, 10-FL – Faculty of Law, 11-FLO – Faculty of Logistics, 12-FM – Faculty of Medicine, 13-FME – Faculty of Mechanical Engineering, 14-FNSM – Faculty of Natural Sciences and Mathematics, 15-FOS – Faculty of Organization Science.

Concerning the faculty ranking in Fig. 1a, the leading faculty, FME, also has the greatest number of citations; however, in the number of patents awarded the FEECS has the leading role. These results show that some faculties are better at publishing scientific papers, and others in transfer of knowledge to industry by developing new patents. Both aspects are of particular importance for further development of the university and the outcomes of this analysis should encourage and facilitate an exchange of successful practices.

The results of a student evaluation of the quality of education at the University of Maribor are presented in Fig. 2. They show no significant differences between the faculties. Similar results, without any significant differences, were also obtained for the duration of studies. The average length of study is around six years, which is a rather long time. On the other hand, there are other indicators that indicate differences between faculties. So, for example, the Faculty of Medicine and the Faculty of Health Sciences have the highest ratio of interested/accepted students, which is in accordance with high interest for promising vocations in medicine and health sciences. It should be noted that results for the most recently established faculties (FA and FNSM) were not yet available at the time of writing.

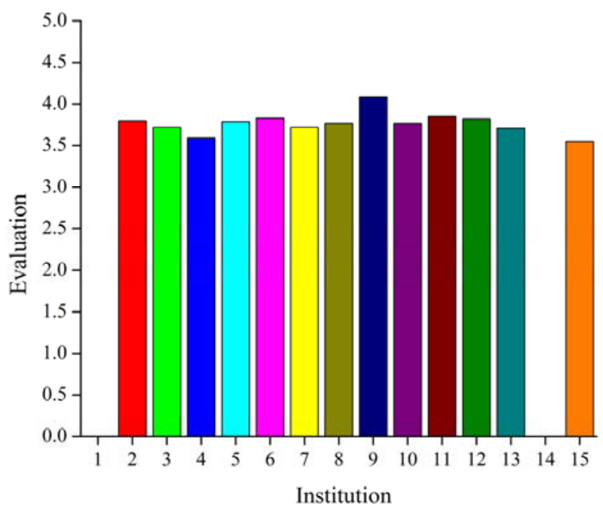


Figure 2 Student evaluations of teaching staff in the academic year 2005/06, 1st semester (evaluation scale 1-5). For the abbreviations see caption of Fig. 1.

In our study, international cooperation was evaluated according to two main criteria: the involvement of faculties in international projects, and the level of organization of students and TS mobility. Figure 3 shows the involvement of faculties in Tempus, Erasmus, Leonardo de Vinci, Grundtvig, 6^{th} Framework Programme and other international projects. It is evident that it is not only the number of projects per faculty that is important (Fig. 3a), but that the value of projects must also be taken into account (Fig. 3b). Some faculties have only a small number of projects, but their value can be quite high. In principle, two main strategies have been detected. There are faculties which tend to have a more decentralized approach with several small projects, and faculties with more centralised operations and a smaller number of big projects. It should be noted that in Fig. 3b the value of projects is presented on a normalised relative scale, i.e., in relation to the average value of projects per faculty normalised to 100%. For example, if a given faculty attains a figure of 50%, this means that its value of projects reaches only 50% of the average value of projects among the faculties.

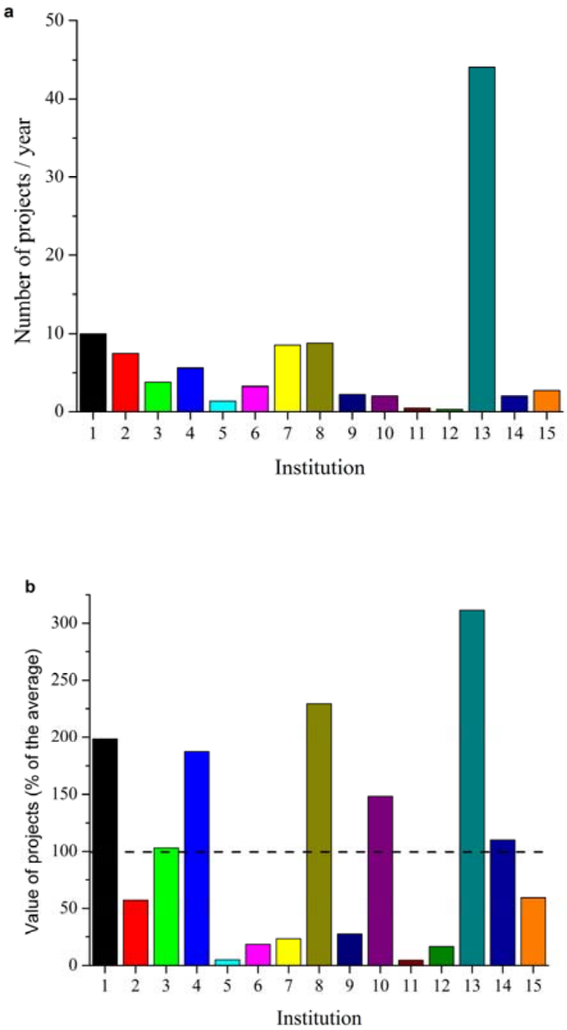
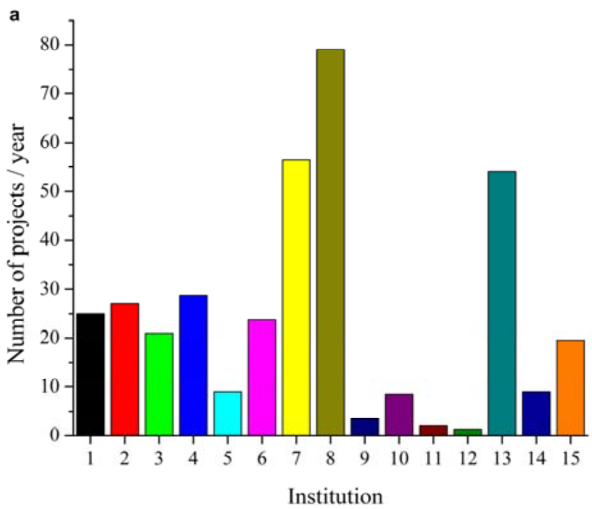


Figure 3 Tempus, Erasmus, Leonardo de Vinci, Grundtvig, 6th Framework Programme and other international projects/year (averaged for the period 2003 – 2006): (a) number of projects, (b) value of projects normalised to the average value of projects per faculty (the average value is taken as 100% - dashed line). For the abbreviations see caption of Fig. 1.

Besides international projects, other types of additional funding are important for the faculties. It will become even more important in the next few years that institutions do not depend only on a fixed pre-determined (lump-sum) state budget with a decreasing formula, but that they replace this funding model with market-oriented project financing (applicative projects). Therefore, for successful development of the institutions it is unavoidable that the faculties become actively involved in earning additional income though public and private projects. Figure 4 shows that the situation at the moment is still very different at the various faculties. Some faculties, like the FEECS, FEB, and FME, have many more projects than the others. Also, a comparison of Figs. 4a and 4b shows that both the number of projects as well as their value must be taken into account. The successful faculties are examples of good practice and they should stimulate activities at other less active faculties. As in Fig. 3b, in Fig. 4b the value of projects is again presented on a normalised relative scale, i.e., in relation to the average value of projects per faculty normalised to 100%.

It should be noted that an absolute comparison of earned project incomes at the faculties is an important indicator for the university as a whole. However, for measuring the effectiveness of particular faculties, additionally earned incomes should be normalised with respect to their total budgets. Furthermore, the total budgets must be linked to the size of faculties with respect to the number of the students and employees.



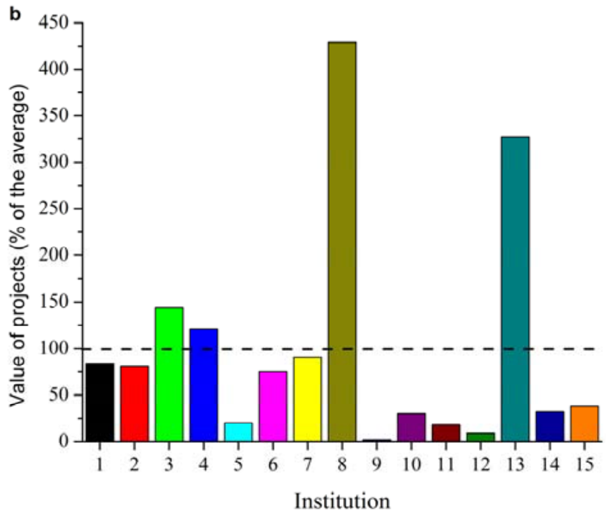


Figure 4 Research projects, basic projects, applied projects, target research programmes, centres of excellences and other projects/year (averaged for the period 2003 – 2006): (a) number of projects, (b) value of projects normalised to the average value of projects per faculty (the average value is taken as 100% - dashed line). For abbreviations see caption of Fig. 1.

In addition to the financial part of our evaluation, the academic reputation of faculties is of particular importance. We measured several indicators, including winning international and national prizes, and memberships in professional bodies and editorial boards. The differences between faculties are remarkable. Figure 5 shows an example of how many researchers at the faculties are members of international editorial boards. The leading faculties are the FEECS, FME, and the FEB.

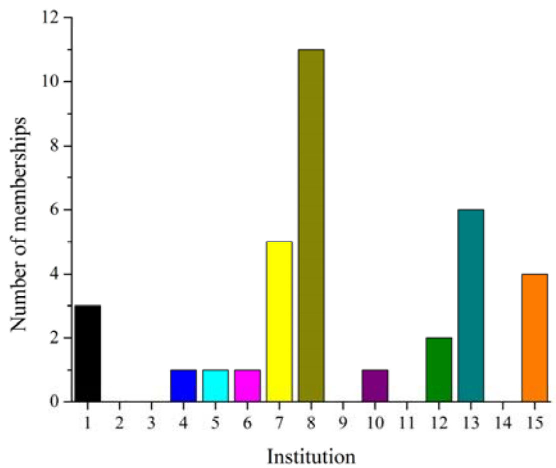


Figure 5 Membership on international editorial boards. For abbreviations see caption of Fig. 1.

It should be noted once again that all results presented in Figs. 1-5 are on an absolute scale. The results are not normalised to the size of faculties. In general, the size of faculty should be taken into account;

however, in this case the normalised results do not considerably differ from those presented here, and therefore we preferred to use the absolute scale.

Discussion

In this paper, we present the results of a case study at the University of Maribor, which is a rather new and heterogeneous university, consisting of sixteen faculties in different fields. Some of them were established very recently, for example, the Faculty of Energy Technology, or are still being constituted (the Faculty of Tourism) and thus could not be included in this analysis. For new universities without an established reputation, ranking must be conducted very carefully. We show in this paper how global university rankings can positively contribute to university development.

The results of our study are promising and clearly indicate that faculty ranking can contribute to a development of all aspects of work at the university. First of all, according to our experience, awareness of being part of global trends, interests, and orientations has improved. A healthy competition between faculties has emerged, and has become an important driving force in assuring further development and achieving higher status. This is an advantage for the whole university, and has important consequences in different fields, including the process of habilitation of professors. By comparing the processes of hiring and tenure at other universities with our own, the criteria are more clearly defined and internationally oriented. The university is developing in accordance with international trends among universities worldwide. Following these criteria, a much better selection of research and other projects has been achieved, and in the future there will be obvious, positive consequences for allocation of funds. We also hope that this ranking will help students to make informed decisions regarding their studies, a benefit which is particularly emphasized in some ranking systems (Müller-Böling & Federkeil, 2007).

Our experience is an example of good practice in the wider region. In the first stage, a new project that will further expand the existing cooperation between the republics of the former Yugoslavia is currently being developed. This is particularly promising because the universities in these countries have an organizational structure similar to that of the University of Maribor, since there is a common history among organizations of higher education, and these results in similar problems and requires similar treatments for solving them.

Moreover, the dissemination of the results will have even broader benefits. The University of Maribor has always played an active role in the Danube region; this year it is presiding over the Danube Rectors' Conference (DRC). Our active role in the DRC promises good collaboration in the region, and in the future, we believe that sharing experience with new partners in the region will be successful and will bring new perspectives to all of us. Hence, we believe that further dissemination of the results will make an important contribution to the international process of university rankings.

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References

Agachi, P. S., Nica, P., & Moraru, C. (2007). University ranking as stimulus for quality enhancement: a case study of Romania. In Sadlak, J., & Cai, L. N. (Eds.) *The World-Class University and Ranking: Aiming Beyond Status*, UNESCO-CEPES, Bucharest, 2007, pp. 223 – 241.

Chubb, I. (2007). Distinguishing (between) universities. In Sadlak, J., & Cai, L. N. (Eds.) *The World-Class University and Ranking: Aiming Beyond Status*, UNESCO-CEPES, Bucharest, 2007, pp. 245 –256.

IREG. *Berlin Principles on Ranking of Higher Education Institutions*, 2006. Retrieved August 17, 2007, from http://www.ihep.com/Organization/Press/Berlin_Principles_Release.pdf.

Ince, M. (2006). Insiders and outsiders lend a balanced view. *The Times Higher Education Supplement*, Vol. 6.

Müller-Böling, D., & Federkeil, G. (2007). The CHE-ranking of German, Swiss and Austrian universities. In Sadlak, J., & Cai, L. N. (Eds.) *The World-Class University and Ranking: Aiming Beyond Status,* UNESCO-CEPES, Bucharest, 2007, pp. 189–203.

O'Leary, J. (2006). Global vision ensures healthy competition. *The Times Higher Education Supplement*, Vol. 6.

Sadlak, J. (2006). Validity of university ranking and its ascending impact on higher education in Europe. *Bridges*, Vol. 12, No. 12. Retrieved August 17, 2007, from http://www.ostina.org/content/view/1701/626/

Sadlak, J. (2007). Developments in higher education and how they stimulate the university rankings' phenomenon. In Sadlak, J., & Cai, L. N. (Eds.) *The World-Class University and Ranking: Aiming Beyond Status*, UNESCO-CEPES, Bucharest, 2007, pp. 75 – 85.

Sadlak, J., & Cai, L.N. (Eds.). (2007). *The World-Class University And Ranking: Aiming Beyond Status,* Bucharest: UNESCO-CEPES.

Wheeler, J. (2005). Making sense of university world league tables. *King's College London International News E-zine*, No. 2. (www.kcl.ac.uk/college/policyzone)

Williams, R. (2007). Broadening the criteria: lessons from Australian rankings. In Sadlak, J., & Cai, L. N. (Eds.) *The World-Class University and Ranking: Aiming Beyond Status*, UNESCO-CEPES, Bucharest, 2007, pp. 205-221.

The New Direction of Japanese Higher Education Policy: Conflicts Between Global and Domestic Logic

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Abstract

In this paper, the internationalization of Japanese higher education is first situated in light of current global trends and challenges. Second, current Japanese higher education policy is outlined, focusing on the struggle to achieve World-Class Universities' (WCUs). Third, the author analyses the reaction of top Japanese universities to policy trends and changes in the market of international students. Lastly, the author discusses the framework of the 'internationalization' dispute in Japanese higher education, focusing on the dilemma between global and domestic logic.

The New Direction of Japanese Higher Education Policy: Conflicts Between Global and Domestic Logic

Introduction

Over the past three decades, the prevailing tone of policy and economic dialogue related to Japan's international status has been characterized by the expressions 'Japan-bashing', 'Japan-passing' (or 'surpassing') and more recently, 'Japan-nothing'. In the 1980s, Japan faced a combination of both derision and admiration from abroad, mainly in light of the extraordinary success of its automobile and electronics manufacturing sectors. In Detroit, Japanese cars were publicly destroyed in symbolic displays of defiance to the economic threat being posed to the American flagship industry, while many American universities simultaneously hastened to establish branch campuses and research institutes within the then-booming 'small-island nation' (Chambers and Cummings 1990).

These days, however, we are witness to increasing international interest in the economic and political prowess of Asia-Pacific countries other than Japan; the attention of North American and European business and academia seems focused above all on China and India. For many, Tokyo is now merely a stopover on the way to Beijing, Singapore, Delhi or some other similarly expanding capital city.

In this paper, the internationalization of Japanese higher education is first situated in light of current global trends and challenges. Second, current Japanese higher education policy is outlined, focusing on the struggle to achieve World-Class Universities' (WCUs). Third, the author analyses the reaction of top Japanese universities to policy trends and changes in the market of international students. Lastly, the author discusses the framework of the 'internationalization' dispute in Japanese higher education, focusing on the dilemma between global and domestic logic.

Background: Perceptions of Japan and its Universities

In August 2007, the non-profit Genron of Japan, the *China Daily* newspaper and Peking Universi ty published the results of the 'Third Japan-China Joint Opinion Poll'(http://www.genron-npo.net/en/bei jing-tokyo2007/002798.html). This annual poll is aimed at gauging prevailing society-wide sentiment i n both countries regarding the dynamics of Japan-China relations and the counterpart's recent internati onal conduct. Results have shown that Chinese respondents are gradually taking a more positive view of Japan (from 11.6% in 2005 to 24.4% in 2007). However, Chinese student perceptions regarding the importance of Japan on the world stage ('important', 10.1%; 'relatively important', 57.1%) remain considerably lower than their Japanese counterparts' view as to the importance of China ('important', 40.3%, 'relatively important', 33.5%). When asked "What comes to mind regarding of Japan?", the top five answers among Chinese students who participated in the survey were: cherry blossoms (51%), the Nanking Massacre (41.9%), the Yasukuni Shrine (36.6%), the Imperial Japanese Army's invasion of China (31.6%) and electronic products (27.7%). As for the general public's response to the same question, electronic products (51.8%), the Nanking Massacre (45.3%), cherry blossoms (44.1%), Mount Fuji (26.4%), and the Imperial Japanese Army's invasion of China (20.4%) were identified. It is clear that the Chinese, and especially Chinese students, do not recognize Japan primarily as a country of high-level science and technology.

Following global trends and the examples of China, South Korea and the United Kingdom in particular, the Japanese government has strengthened its WCU policies since the new millennium (Yonezawa, 2003; 2007). However, in addition to the unclear definition of 'World Class University' among Japanese higher education stakeholders such as the Chinese (Liu, 2007), most top Japanese universities are struggling to improve their international status in the face of the gradual decline in international presence of Japanese universities in growing Asia-Pacific region (Umakoshi, 2007).

It is essential for WCUs to attract international recognition from global peers. However, the slow progress towards internationalization of Japanese higher education as well as Japanese society itself has been a key impediment to achieving this goal. Since the first world university rankings were conducted and published, the world-class status of top Japanese universities has been questioned because of their lack of internationalized character (THES, 2004). In an interview conducted by the *Nikkei Shinbun* newspaper, Altbach mentions three obstacles to the internationalization of Japanese higher education: low English language proficiency, a closed or exclusive national culture, and diplomatic tensions with Korea and China which interfere with regional collaboration such as is typically seen in Europe (Nikkei, August 6, 2007).

Despite these challenges, Japanese top universities are increasing their commitment to world university rankings as well as they are boosting efforts to improve their image abroad through more aggressive marketing strategies. The Japanese government is also in the process of forming a national strategy for the internationalization of Japanese higher education, focusing especially on the improvement of its international competitiveness. Prime Minister Shinzo Abe, who resigned in mid-September, 2007, had organized the 'Council for Asian Gateway Initiatives', placing the issue of the internationalization of higher education at the forefront in attracting high-level intellectuals and professionals from other Asian countries (Council for the Asian Gateway Initiative, 2007).

Japanese Higher Education Policies for Internationalization

Teichler (1999) provides a typology for the internationalization of higher education focusing on Europe, and argues that Japan, just like France, would be categorized as an example of 'internationalization in two arenas'. Specifically, Japan is always faced with the parallel struggles of amplifying its domestic context to other countries and introducing outer contexts to the home country. Although China has a much larger higher education system, it could also be understood as a member of this category. Policies concerning the internationalization of Japanese higher education should always be considered with this balance in mind.

The first efforts towards the internationalization of Japanese higher education started with a drastic increase in the number of overseas students studying in Japan. In 1983, then-Prime Minister Nakasone introduced a plan to increase the number of overseas students to 100,000 by the end of 20th Century, which was realized in 2003 (Horie, 2003; Umakoshi, 1997; Yonezawa, 2005). However, such a quantitative increase in overseas student numbers should not be equated with high academic caliber of these students, or as being conducive to improved educational support services. In fact, around 90% of overseas students have been financially self-supporting, and most have been enrolled in the less prestigious commercial-oriented private institutions. At the same time, around 90% of foreign students come from neighboring East Asian countries, especially from those which regularly use, or are highly familiar with, Chinese characters (e.g., China and Korea). After achieving the numerical target of 100,000, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) altered its policy direction to focus more on the *quality* of the overseas students rather than the *quantity* (Central Council for Education, 2003). However, what 'quality' means remains unclear, at least in official policy documents.

Second, existing Japanese universities initiated programs taught in English, mainly for attracting overseas students who are not always proficient in the Japanese language. Although most top-level national and private universities now offer some programs taught in English, the size and share of total students in these programs is still quite limited. The increased availability of programs taught in the English language also reflected the establishment of several North American university branches, which were not necessarily supported by MEXT so much as by the industrial sector in efforts to set up a new education service market.

A third form of efforts to internationalize Japanese higher education was to foster WCUs through the concentration of financial investment into top universities. In 2002, MEXT revealed its basic policy target to realize the development of approximately 30 WCUs, and started its '21st Century Centers of Excellence (COE21)' project, offering financial support to competitive research units in 5-year stages. From 2002 to 2007, 272 COE units from 97 universities have received such support. However, rankings among the top universities based on the number of selected COE21 research units served merely to reinforce the existing domestic hierarchy of Japanese higher education institutions (Yonezawa, 2003).

In addition to COE21, other efforts to assess and evaluate the performance of Japanese universities have been almost entirely domestic. The national universities, all of which were incorporated in 2004, will go through a performance assessment review in their research and education activities in 2008 to determining the 2011 financial budget. There are many arguments, especially from the ministries in charge of finance and industry, that financial allocation should be concentrated in the limited number of top research universities that have already achieved some degree of international competitiveness.

Government efforts to foster WCUs are strengthened also through newly established projects. In 2007, the Global COE program replaced the COE21 program. The number of selected COE research units is to be roughly half of those that were supported by COE21, while the amount of grants per research unit will be drastically increased. Accordingly, in September 2007, MEXT selected five 'Global Top-level Research Bases', and pledged to support these five bases for 10 to 15 years with between 500 million to 2 billion JPY per base annually.

Reactions of Universities: Appeals of International Competitiveness to the Domestic Government?

As for the reactions of universities to recent higher education policies and their financial outcomes, one can observe the complex interaction of *domestic logic* and *global logic*. Most top national universities appeal that they aim to be globally competitive; some actually declare having successfully reached their numerical targets on world university rankings for any given year. However, the targeted audience for these claims sometimes appears to be the national government that controls the budget, rather than international peers.

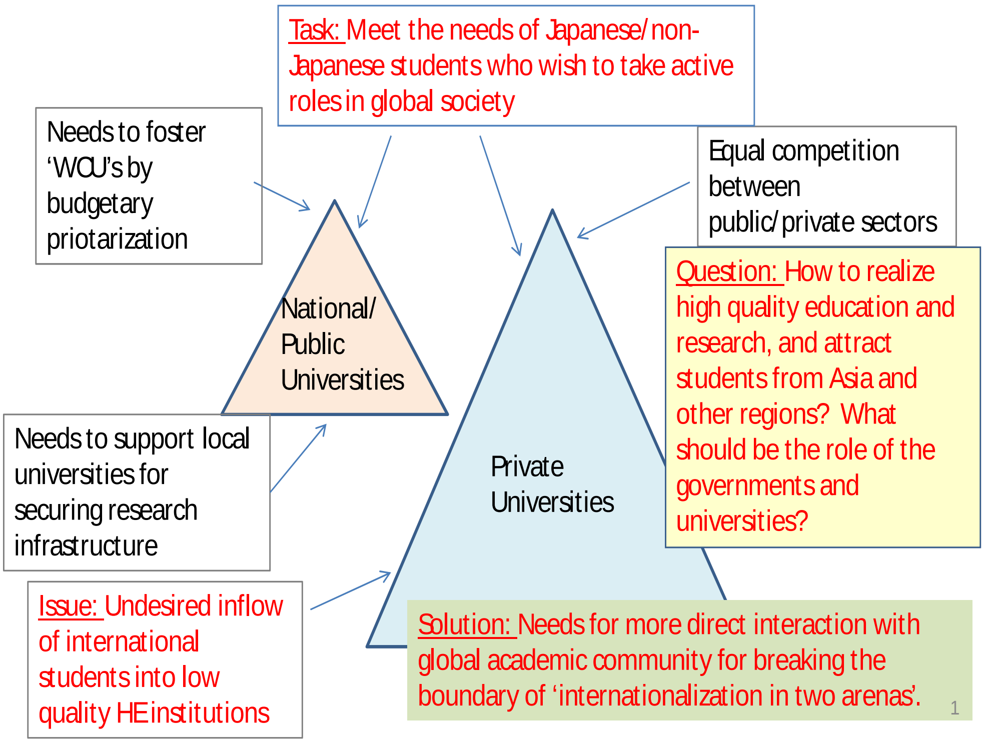
Japanese higher education tends to be bound by the domestic context rather than the global context. Moreover, it puts importance on the value of the academic community, or "supply side", rather than the value of learners, or 'user side'. As a result, a persistent problem has been that assessment processes had been done through documentation written in the Japanese language, requiring high levels of literacy in this medium of any potential reviewers. When the order structure based on a long-standing hierarchy is considered, strong dependence on this domestic context becomes a formidable limit to the improvement of international competitiveness of Japanese higher education. Each university is faced with the challenge improving their reputation within this domestic logic, especially in light of the fact that the results of reviews and assessments tend to reproduce and to strengthen existing positions within the order structure of higher education.

Whether desirable or not, globalization pressures every higher education system to reduce the effects domestic politics between different stakeholders. Merginson and Rhoades (2002) argue that Clark's (1983) 'triangle model' representing the interaction among government, universities, and the market can no longer fully describe current global realities. They argue that these three actors now function as 'glonacal' agencies, across local, national and global levels. Given the aforementioned conditions of 'internationalization in two arenas', however, Japanese universities may continue to be involved in the politics of adjustment shown in Clark's triangle of the university, the government and the market. Universities and the academic community insist on high level scholarly professionalism and contextual sensitivity, and emphasize evaluation by (mainly domestic) peers. The government gropes to establish a link between accountability and financial allocation by clarifying quantitative indicators. The market requests ranking information for personnel recruitment or myopic profit-making considerations. The three actors continue to coordinate with one another on decisions related to existing power dynamics, as well as those necessary to successfully adjust to the effects of globalization.

Under increased pressures stemming from globalization, the diversity of standpoints and views on evaluation and financial allocation among different types of universities becomes clearer. The faculty and administrations of top national universities, especially in engineering and the natural sciences, argue that their institutions should establish a powerful financial base to enable equal competition with top universities in other countries. On the other hand, the leaders of other national universities, usually located in smaller cities, oppose the excess concentration of budgetary resources to the top universities, arguing that this policy will threaten their research infrastructures.

Moreover, from the viewpoint of fair competition, leaders of high-ranking private universities argue that it is necessary to equalize disparities in the present distribution of public funds between national and private universities. Because of their management flexibility and strong graduate representation in neighboring Asian countries, the top private universities counter that they have strong potential to become WCUs and thus deserving of a large proportion of public funding.

At the same time, internationalization of Japanese higher education is ongoing among less prestigious higher education institutions. Rather than being the result of intentional efforts to internationalize in the interests of improving academic quality, these smaller institutions are admitting increasing numbers of overseas students primarily as a means to compensate for the decline in domestic applications. Given the shrinking domestic student market under the demographic decline of the student-age Japanese population, and excess demand for higher education in neighboring countries such as China, this trend will likely continue for some years into the foreseeable future.



Conclusion

At the time of writing, it is unrealistic to assume that the Japanese higher education system will be integrated completely into a single global higher education system. In Japan, WCUs and national policies for their realization should be understood in the context of the necessity to train researchers mainly within the domestic academic market, and the need for sufficient numbers of international students to adapt to Japanese academic customs. The internationalization of Japanese higher education involves different dynamics than those seen in countries such as the United Kingdom and the United States, where internationalization advances relatively passively as ‘centers’ of English-based globalization.

However, it is clear that the Japanese higher education system should adapt itself into the global logic using its own approach. Japanese higher education must be able to provide their students, whether Japanese or non-Japanese, with sufficient training to be able to take an active role in global society. The role that government and universities should play in order to set up a platform where highly qualified academics can gather from all over the world remains in question. In assessment practices concerning higher education, the three actors should ideally work together under a global logic, above the domestic politics of the power balance being struck between government, universities, and the market.

Methods of soliciting the opinions and input of stakeholders outside of Japan would prove effective for converting domestic logic to global logic. The Abe cabinet very recently promoted an Asian gateway strategy from the viewpoint of becoming both an attractive nation and a regional leader. Japan aims to become a hub of Asian higher education through attracting Asian students with quality academic programs. The Japanese government continues to gather information necessary in achieving quality service and information provision, in part by considering the input of international students themselves.

The newly started Global COE project introduced an international review process in English as a part of the university evaluation process. The Global Top-level Research Bases program also invited international committee members; of 15 total members, six are non-Japanese, and one Japanese member is a Nobel Prize winner. However, these trials are yet in their infancy, with most ongoing evaluation processes still highly focused on the domestic academic context.

Japanese university policy appears to be uncertain and slow compared with the policies of China and South Korea. Part of the reason for this is the structural factor that the higher education system of a medium-scale non-English speaking country is facing internationalization in two arenas. Adding to this, the cabinet of newly-appointed prime minister Fukuda at the end of September 2007 may change the policy direction more towards Asian regional harmonization rather than the strong appeal of global competitiveness.

The pressure on Japan to place greater importance on the global arena rather than the expansion of its own context towards other countries is becoming stronger. At a certain stage - and hopefully before Japan truly becomes “nothing” in international comparisons - Japanese higher education system must open itself drastically, and soon.

References

Clark, B. R. (1983). The higher education system: academic organization in cross-national perspective, University of California Press.

Central Council for Ecucation. (2003). *Arata na Ryugakusei Seisaku no Tenkai ni Tsuite (On the Development of New Policy for Overseas Students)*, MEXT.

Council for the Asian Gateway Initiative. (2007). *Asian Gateway Initiative,* Tokyo: Prime Minister of Japan and his Cabinet.

Chambers, G. S. and Cummings, W. K. (1990). *Profiting from education: Japan-United States international education adventures in the 1980s.* New York: Institute of International Education.

Horie, M. (2002). "The internationalization of higher education in Japan in the 1990s: A reconsideration", *Higher Education 43:* pp.65-84.

Liu, Nian Cai. (2007). Research universities in China: Differentiation, classification, and future world-class status, in Philip G. Altbach & Jorge Balán eds, *World Class Worldwide*, Baltimore, the Johns Hopkins University Press, pp. 54-69.

Merginson, S and Rhoades, G. (2002). 'Beyond national states, markets, and systems of higher education: A glonacal agency heuristic', *Higher Education*, 43-10: 281-309.

Nikkei. (2007). *Daigaku kokusaika kisou bei oh chu* (US, Europe and China competing for the internationalization of universities), Nikkei (a newspaper article in Japanese), August 6.

Teichler, U. (1999). Internationalisation as a challenge for higher education in Europe: Tertiary education and management 5:5-23.

THES. (2004). *World University Rankings,* The Times Higher Education Supplement.

Umakoshi T. (1997). Internationalization of Japanese higher education in the 1980's and 1990's', *Higher Education* 34: 259-273.

Umakoshi, T. (2007). *'Asia no daigaku ga yakushin* (Rapid Upgrading of Asian Universities)', *Arcadia Gakuho* 270. Kyoiku Gakujutsu Shinbun (A newspaper article in Japanese.)

Yonezawa, A. (2003). Making "world-class universities": Japan's experiment, *Higher Education Management and Policy*, Volume 15, No. 2, OECD, pp. 9-23.

Yonezawa, A. (2005). The impact of globalization in higher education governance in Japan, in Ka-ho Mok & Richard James, Eds. *Globalization and Higher Education in East Asia*, Singapore: Marshall Cavendish Academic, pp. 157-169.

Yonezawa, A. (2007). 'Japanese flagship universities at a crossroads', *Higher Education* 54:4, pp.483-628 Springer.

Strategies Towards the World-Class Universities of Thai Higher Education Institutions

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Abstract

The purposes of this research are to study the success factors of world class universities and identify strategies towards developing Thai higher education institutions into world class universities. The study also aims to do a situational analysis of Thai higher education institutions. Subsequently the developed strategies are evaluated by a group of experts, so as to establish a framework for the development of strategies in Thai higher education institutions. Relevant documents are content analyses and e-survey of resource persons overseas are conducted. The findings reveal the universal mission of higher education, teaching, research, academic service and cultural dimensions. The internationalizing components of world class universities are found to include the following: 1) managing quality and infrastructure 2) curriculum and innovation 3) research 4) area studies, international students and scholars 5) technical cooperation and international development 6) public service and cultural intelligence. Corporate level strategies towards development of world class universities also include: 1) strategies of value creations as intelligent organizations 2) quality of research, teaching and learning 3) human capital strategies 4) enterprising strategies of higher education institutions 5) strategies of international cooperation and development. The study also proposes the success stories of Chulalongkorn University, a world class public and research university in Thailand. Since its founding in 1917 the university has been committed to excellence in teaching and learning, research, academic services, outstanding in cultural dimensions, and enhancing strategic initiatives for sustainable development.

Strategies Towards the World-Class Universities of Thai Higher Education Institutions

Introduction

Current and trends of higher education are changing drastically. The roles of higher education institutions (HEIs), as the socializing agents are a must to diversify meeting the needs. The core functions of higher education as the community scholars, the places of attraction and pool wisdom as so teaching and learning, research, community service, and preservation of cultural dimensions.

The world is now truly global village. Countries both of the North and South have become inter-connected and interdependent and this is going progress. At this crossroad, we have been facing many challenges which have impacted on humankind and every organization. The main challenges is globalization which impacts on the world both positive and negative changes. The second challenge is the rapid development of information and communication technology (ICT). The world gets much smaller through innovations. We know well of many “es” e-Commerce, e-Banking, e-Education, e-Learning, e-Industries, etc. The world is transforming to knowledge-based society. The third movement which is a big challenge is free trade area (FTA), general agreement on trade in services (GATS) (Knight, 2002, cited in UNESCO, 2002, p.137 – 138, APEC-HRDWG-EDNET, 2005).

Views on World Class Universities-WCUs

Definitions of World Class University

Altbach (2003) defines world class by reference from dictionary as “ranking among the foremost in the world of an international standards of excellence”.

Wichit Srisa-An (2005) states that “World class university” is defined as an institution of academic programs of excellence, a strong tradition of academic research and debate, protection of academic freedom, intellectual autonomy, good governance, and cultural tolerance and diversity.

Wang Yingjie (2001) states that 1) The world-top university must be internationalized 2)The world-top university must be open 3) The world-top university must be critical 4)The world-top university must be inclusive.

Caldwell (2003, p1-2, cited in Clarke, 2003) recognized four freedoms will be required to achieve world class schools: the freedom to innovate, the freedom to work in partnership, freedom from bureaucracy and unnecessary restrictions, and freedom from arbitrary funding pots.

Liverpool (October 19, 2005) suggests the seven elements to the world-class university: 1) Internationalizing the curricula 2) Increasing student exchanges 3) Increasing the number of international students 4) Implementing faculty development and exchanges 5) Utilizing information technology 6) Collaboration with external constituents: and 7) Advancing international development.

Cleaver (2002) suggests to determine how best can do three things: 1) Increase the commitment of organizations of all sizes, in both the private and the public sector, to develop better managers and leaders. 2) Ensure that we have business that is world class and meets the real needs of tomorrow's managers, and 3) Improve the ability of both individuals and organizations to find the right development opportunities to enhance national competitiveness

Buckalew (2002) suggests the responses of the challenges, focusing on teaching and learning, using innovation and information technology in higher education for the following tasks.1) Attracting and retaining the best students 2) Interdisciplinary learning 3) Community outreach 4) Reducing administrative costs and increasing funding 5) Technology roadmaps 6) For profit universities – Virtual and physical teaching and learning 7) Educational technology and the future.

Cheach (September 19, 2005) states that the spirit achieving focus on excellence by the University Autonomy, Governance and Funding (UAGF), the key recommendations respond to the challenges are: 1) University to achieve greater autonomy 2) University governance 3) University accountability 4) University funding 5) Promoting research excellence 6) Access and affordability.

Paitoon Sinlarat (2000), suggests to mega-trends of the global higher education transformations; focusing on 1) Massification of higher education 2) Privatization 3) Technologicalization 4) Internationalization.

Nilland (1998), concluded a public lecture on the challenge of building world class universities (WCUs) in the Asian region . He states that…For universities, world-class standing is built on reputation and perception often seen as subjection and uncertain and it requires outstanding performance in many events; 1) The top of my list is quality of faculty 2) Research reputation is critical 3) Important of a talented undergraduate body 4) International presence 5) Proper resource is an excellence issue 6) The leveraging effect of alliance and networks 7) WCUs embrace many disciplines 8) WCUs will be technology smart 9) WCUs will practice the art of good management.

Carcia (2002) proposed the three pillars of world class public universities: 1) Devotion 2) Accountability, and 3) funding.

Levin,et al.,(2006) note that, in general there is wide agreement that great universities have there major roles 1) Excellence in education of their students 2) Research, development and dissemination of knowledge, and 3) Activities contributing to the cultural, scientific, and civil life of society.

In conclusion, the world class university is higher education institution with the success factors of truly internationalization of the core mission of teaching & learning, research, academic service, tolerance of cultural diversity, and managing quality continuously.

Views on University Rankings

The rankings of universities are popular. Reviewing the rankings and ratings universities from the ranking resources, the rankings and ratings are popular in the North-countries and some in the South, national rankings, regional rankings and international rankings.

Altbach (Winter 2006 p.2) states that rankings and league table have been around for a long time, but there has been dramatic growth in the past several decades. The stakes are now much higher. Rankings serve a variety of purposes, good and bad. Rankings are also inevitable – in the era of massification, those who finance higher and the public want to know which academic institution are the best.

The prominent key themes, as basis for comparisons world class higher education institutions are teaching quality, research quality, graduate employability, and international commitment (Ben Sowter, 2007). These factors are ranked by THES – QS world university rankings.

Shanghai Jiao Tong University (SJTU 2005) initiated academic ranking of world universities by ranking criteria: 1) Quality of education: the indicator of alumni of an institution winning Nobel Prizes and Field Medals 2) Quality of faculty: staff of an institution winning Nobel Prizes and Field Medals; highly cited researchers in 21 broad subject categories 3) Research outputs: the article published in Nature and Science, and articles in Science, Social Sciences, Arts and Humanities 4) Size of institution, academic performance with respect to the size of an institution.

Newsweek International (August 13, 2006) devised a ranking of global universities that takes into account openness and diversity, as well as distinction in research. Newsweek's evaluation the universities in the world by using some of measures used in THES survey. Fifty percent of the score came from equal parts of three measures used by Shanghai Jiao Tong (Academic Rankings of World Class Universities – ARWU); the number of highly cited researchers in various academic fields, the number of articles listed in Nature and Science, and the number of articles listed in the ISI Social Science and Arts & Humanities. Another 40 percent of the score came from equal parts of the four measures used by the THES: the percentage of international faculty, the percentage of international students, citations per faculty member (using ISI data) and the ratio of faculty to students. The final ten percent came from library holdings (number of volumes). The league table has shown the top 100 global universities (Newsweek, Inc. 2007).

There are some specialized of world university rankings. World Education News and Reviews, (WES, 2006) concluded the international rankings by internet presence, 1) Webometrics rankings by internet presence, 2) University metrics "G - Factor"; and 3) 4 international colleges and universities, 4) UNESCO – CEPES and the International Ranking Expert Group (IREG) initiate to improve for better rankings. (http://www.arwu.org)

For the national level of rankings and ratings, there are popular in many countries use the rankings and ratings colleges and universities for informing undergraduate and postgraduate choices, identifying prominent disciplines, identifying top research universities both private and public higher education institutions, identifying the best value of HEIs and the other maintenance functions for quality of life of stakeholders and global communities.

International Rankings: Pros and Cons

International rankings are controversial issues both regional or international rankings.

Arroyo (April 21, 2006) suggests to ranking become a self fulfilling prophecy, since they will help attract top level students and faculty.

Nirwan Idrus (April 23, 2006) states that he do not subscribe the university rankings according to THES, SJTU and so on , because these rankings prioritize certain trait and characteristics in a weighting that the market surveyors determine on their own

Teay Shawyun (April 27, 2006) states that the academic rankings of the world class universities do not represent the real outcomes of whether the graduates are reality competent, effective or knowledgeable and ethical as they are based on proxy quantifiable measures that do not reflect real quality of the graduates nor the instructors. The rankings just concentrate on having the resources rather than the utilization of the resources to achieve real quality.

Van de Water (February 21, 2005) concludes that worldwide rankings do not make meaningful comparisons and comparisons within systems are difficult. There is no acceptable framework for comparison.

Criteria and Factors of University Rankings

The league tables regular show the success factors of excellence, comprise of core missions, or university trilogy: 1) education quality in teaching and learning, 2) research 3) community service. And maintenance functions: staffing, students, academic support systems, good governance of assets management, meeting world competitiveness, etc. The factors should be truly internationalization. (THES, 2005.,SJTU,2005., USNews & World Report 2005 , 2006 , Asiaweek 2000)

Table 1 Academic Ranking of World Class University (SJTU, 2005) Statistics by Region

Region	**Top 20**	**Top 100**	**Top 200**	**Top 300**	**Top 400**	**Top 500**
North and Latin America	17	57	100	140	165	198
Europe	2	35	79	123	168	205
Asia/Pacific	1	8	23	36	65	93
Africa				1	2	4
Total	**20**	**100**	**202**	**300**	**400**	**500**

Source : http://ed.sjtu.edu.cn/rank/2005/ARWU2005Statistics.htm

As shown in Table 1, the distribution of WCUs among regions, most of the WCUs are in the North and Latin America had shown top 200, with 39.6%, and with 41% of WCUs located in Europe, with 18.6% located in Asia/Pacific and in Africa of 4 WCUs, only 0.8%. And the statistics had shown the same situations of ranking WCUSs in the year 2006, and 2007.

The rankings of WCUs are still debating. It's controversial issues among faculty members, academicians and Presidents or Vice Chancellors of the universities. However, the criteria of success factors of the universities are beneficial to the university for self – assessment, and self – improvement continuously for better world universities.

Methodology

The study of strategies towards the world class universities of Thai higher education institutions are three phases:

Phase 1: The study of success factors of the world class universities by content analyses, the 18 relevant documents including e-survey and international ranking resources.

Phase 2: The study of situational analysis of Thai higher education from the following documents:

- Competitiveness scoreboard of IMD world competitiveness, yearbook 2005 (www.imd.ch/wcc), focusing on the sub-factors of Thai university education and some related sub-factors, and compare to highly competitive countries has shown in Figure 1
- Annual report 2005, The Commission on Higher Education
- Assessment report 2005, The Office for National Education Standards and Quality Assessment (Public Organization) (ONESQA), has shown in Table 2
- The other sources, esp., strategic planning, annual reports, self-assessment reports (SAR) and public relations/International offices of the universities, and the reflections of resource persons overseas on Thai higher education institutions.

Phase 3: Propose corporate level of strategies towards the world class universities of Thai Higher education institutions.

The phase is to study corporate level of strategies by reviewing corporate strategies of WCUs overseas and success factors of the world class university in Thailand (THES, 2005), and four samples of the Thai comprehensive public universities in the list of the best university 2000, regional ranking of Asiaweek 2000. Qualitative study by content analysis of Thai National Roadmap in Education (ONEC, 2005) The results of Phase 1 and phase 2 are integrated to establish corporate strategies towards the world class universities of Thai higher education institutions. Assessment of the strategies from resource persons are conducted.

This research expanded to study some cases of Chulalongkorn University Success Stories.

Results

Table 2 Content Analysis of Success Factors of the World Class Universities, sorted by frequency of mention

Factors \ documents	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	f
• Managing quality and infrastructure	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	18
• Curriculum and innovation	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	17
• Research	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	18
• Area studies, international students and scholars	+	+	+	-	+	+	+	-	+	-	+	+	+	-	+	-	-	+	12
• Technical cooperation and international development	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	-	-	+	14
• Public service and cultural intelligence	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	14

Relevant documents

01 Pavich Tongroach, and others (2002)	07 UIUC (2005)	13 Chen Wei-Jao (2005)
02 Wichit Srisa-An (2005)	08 Kit Siang (2005)	14 Lee Don hee (2001)
03 Sippanond Katetut (2004)	09 U. of Oxford (2004)	15 Arroyo (2006)
04 Van de Water (2005)	10 Wang Yingjie (2001)	16 Nirwan Idrus (2006)
05 Bacani (2000)	11 Altbach (2004)	17 Teay Shawyun (2006)
06 Niland (1998)	12 Liverpool (1995)	18 Prasert Chitpong and others (2004 **)**

1. The success factors of the WCUs had shown in Table 2: 1) Managing quality and infrastructure 2)

Curriculum and innovation 3) Research 4) Area studies , international students and scholars 5) Technical cooperation and international development 6) Public service and cultural intelligence.

Data and Information of Thai Higher Education : Exemplary Situation Analysis

Higher education in Thailand has gone through drastic change since the first National Education Act has been enforced in 1999, and the related Amendments in 2002.

The Administration of Ministry of Education Regulatory Act has been promote gated on July 7, 2003, amalgamating education – related agencies, the Ministry of University Affairs, the Ministry of Education, and the Office of the National Education Commission. The former Ministry of University Affair has transformed into Commission on Higher Education (CHE) which an authority to supervise and to promote higher education on academic freedom, autonomy and excellence basis.

The restructuring of the bodies responsible for education has resulted increase number of higher education institutions under supervision of Council on Higher Education (CHE 2005) :

25 comprehensive public universities (2 Mega – universities opened admissions, and 4 autonomous universities.), 59 private universities and colleges, 41 newly elevated Rajabhat universities (RU), 9 clusters of multi-campus Rajamangala universities of Technology (RMUT), 17 Community colleges, 2 Buddhist universities (autonomous), Asian Institute of Technology (AIT) and Pathumwan Institute of Technology (PIT).

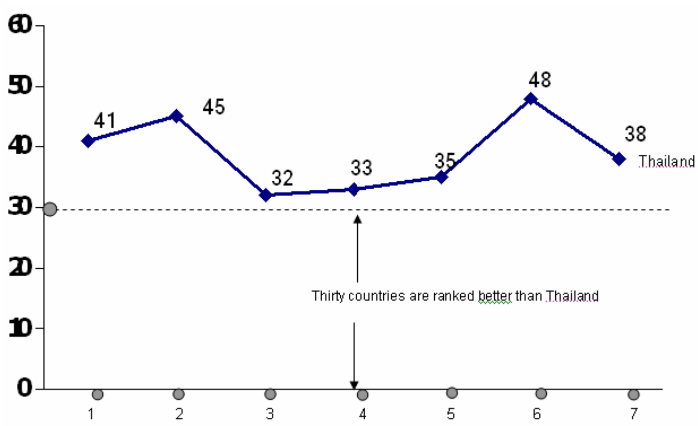
- The Total enrolment in Academic year 2005
- - Grand total 1,907,905, include itn'l students 4,334
- Number of graduates 251,282
- Faculty - academic staff 30,953
- - supportive staff 57,643
- Total budget (Government allocation)
- - MTB 45,249,958,000 ,(MUSD. 1131.25 approx)
- International programs 255
- MOU– international cooperation 1,310
- Initiatives of CHE : 1) Developed admission system 2) Financial reform of HE, 3) Income Contingent Loan (ICL) 4) Cyber university . 5) Brain – based learning (BBL) ,and 6) International affairs, and so forth.

Data and information: Office for National Education Standards and Quality Assessment – ONESQA (2005)

Table 3 The 1st External Assessment and results of HEIs (1999 – 2005)

No.	Standards/kPIS/classifications	Overall %	Public %	Private %	- RU %	RMUT %	Specialty %
1	Grad employment & Further studies	81.29	69.19	68.20	82.91	71.38	98.84
2	PHD – Thesis, Int'l dissemination	23.6	29.45	19.29	0	0	0
3	Research & Development learning/Faculty member	0.09	0.05	0.04	0.08	0.03	0.16
4	FTE students/Faculty	19.96	18.67	18.46	41.08	17.52	9.5
5	Computers/FTE students	1.51	8.11	9.29	14.55	12.97	11.25
6	Doctoral Faculty members	8.97	33.42	9.95	5.72	2.7	6.84
7	Research output/FTE faculty	0.14	0.37	0.11	0.12	0.08	0.14
8	Research output & utilization/Faculty member	0.11	0.23	0.1	0.08	0.07	0.13
9	Research distribution Intl/Faculty member/yr	0.05	0.21	0.01	0	0.01	0.06
10	Academic service project and research/Faculty member/yr	0.31	0.83	0.24	0.29	0.09	0.35
11	Activities/preservation & promotion culture/Faculty member/yr	0.19	0.12	0.14	0.14	0.1	0.33
12	Research funding/Faculty member (USD)	700	3,489.9	339	563.5	213	273

Source: Assessment Report 2005 (ONESQA, 2005) Synthesis by researcher.



1. University education 2. Illiteracy 3. Economic literacy
4. Education finance 5. Language skills 6. Qualified engineers
7. Knowledge transfer

Figure 1 University education and selective some sub-factors (IMD-World competitiveness yearbook 2005 countries (Total 60)

Source IMD – World Competitiveness Yearbook 2005, p.602-605
Synthesis by researcher.

2. The situation of Thai higher education has shown in Table 3, and Figure 1. The situation reveals the strengths of 1) Graduate employment and further studies 2) Student – faculty ratio, and the weaknesses are comprised of the core functions of HEIs: 1) PHD Thesis international dissemination 2) Research and development of learning per faculty member 3) Percent of doctoral faculty members 4) Research output per fulltime faculty 5) Research output and utilization per faculty member 6) international research distribution per faculty member 7) Activities, preservation and promotion culture per faculty member in a year 8) Research funding per faculty member (US Dollars).

The result from Figure 1 has shown the weaknesses in all sub – factors compare with better rankings in thirty countries.

Table 4 Strategies Towards the World Class Universities of Thai Higher Education Institutions.

Core values	mission	Vision	Goals	Strategies	Success factors
Institutions of corporate integrity, continuous quality improvement to be intelligent organization and cultural intelligence	Development Quality of core missions of internationalization in • teaching and learning • research • public service • preserve and promotion of cultural dimensions	Towards the world class universities of Thai higher education institutions	Being five world class universities within ten years (2007 – 2016)	1. Strategies of value creations as intelligent organizations 2. Human capital strategies 3. Enterprising strategies 4. Strategies of international cooperation and development	1. Managing quality and infrastructure 2. Curriculum and innovation 3. Research 4. Area studies, international students and scholars 5. Technical cooperation and international development 6. Public service and cultural intelligence

3.The strategies towards the world class universities of Thai higher education institutions were approved by sixteen resource persons by using open-ended questionnaire, which comprised of core values, mission, vision, goals and four strategies, and the success factors in Table 4.

Chulalongkorn University and Its Success Stories

The basic aims of the study included 1) To explore the positioning of Chulalongkorn University from the resource of rankings and assessment 2) Proposed Chula's success stories as a world class public research university in Thailand.

The above research goals of Chula's success stories were addressed by content analysis of relevant documents, analyzed to active participation, direct observation eavesdropping, and computer search through internet. Descriptive Statistics, analytic induction and conceptual mappings were used in the studies.

Positioning of Chulalongkorn university: Success stories positive images in public arena

In general, higher education in Thailand are under governmental control. The current update of Thai higher education system comprises of 78 public, 62 private, community colleges 17 institutions, which are under the supervision of Commission on Higher Education (CHE), Ministry of education (MOE). (CHE, 2006). Amongst the public universities in Thailand, there are the limit number of highly research universities. The top ranks research universities of Thai higher education institutions are : Chulalongkorn University, Suranaree University of Technology, King Mongkut's University of Technology Thonburi, Mahidol University, Chiang Mai University and the top ranks of teaching: Chulalongkorn University, Khon Kaen University, Chiang Mai University, Mahidol University (CHE ranking of teaching and research universities, 2005)

The Second round of university external assessment of Thai higher education system (2006-2010), released by the Director of ONESQA. (Somwung Pithiyanuwat, cited in Bangkok Post May 22, 2007). The second round utilizes the following standards: 1) Quality of graduates 2) Research and innovations 3) Academic services 4) Arts and culture preservation 5) Organization and human resources development 6) Curriculum and instruction, and 7) Quality assurance system.

Table 5 The preliminary results of Thai universities external assessment (2006-2010)

Category	**Level of Quality**					Certified	Percentage Certified	Certified Conditionally	Not Certified
	2.00	3.00	4.00	5.00	Total				
Government Universities	1	5	16	2	24	18	75.00	5	1
Private Universities	7	35	11	1	54	12	22.22	35	7
Rajabhat Universities	1	16	23	1	41	24	58.54	16	1
Rajamangala Universities	8	26	4	-	38	4	10.53	26	8
Specialized Universities	2	26	63	2	93	65	69.89	26	2
Community Colleges	2	7	1		10	1	10.00	7	2
Total	21	115	118	6	260	124	47.69	115	21

Source: Bangkok Post 22 May 2007

Table 6 The results of Chula's external assessment

Standard and Criteria	Mean	Results
Quality of graduates	4.25	good
Research and innovations	4.60	very good
Academic services	5.00	very good
Arts and culture preservation	5.00	very good
Organization and HR Development	5.00	very good
Curriculum and instruction	4.70	very good
Quality assurance system	4.70	very good

Source : Oral reports of ONESQA-External assessors at Chulalongkorn University (November 16, 2006) in Charmchuree Building Hall 4.

Scalar weighting : Weak 1 2 3 4 5 Very good

The results of Chula's second round of external assessment has shown in the table 6

The results of academic groups assessment: Health Sciences (4.68) Engineering (4.71), Education(4.53), Arts (4.51), Physical & Biomedical Sciences (4.53), Interdisciplinary (4.52), its shown the very good academic clusters. Some academic clusters are good: Architecture (4.30), Administration, Accountancy, Tourism, and Economics (4.26) Humanities and Social Sciences (4.26)

Reflections from international rankings

Table 7 Scores of factors from the league table (THES, 2006)

Factors \ WCUS	Harvard	Cambridge	Melbourne	Kyoto	Chula
Peer reviews 40%	93	100	72	61	33
Recruiter reviews 10%	100	79	44	20	18
Int'l Faculty score 5%	15	58	51	15	9
Int'l students score 5%	25	43	36	7	1
Faculty Students score 20%	56	64	25	44	33
Citations/Faculty score 20%	55	17	7	18	0

THES-QS Rankings The World's Top 200 Universities The position of Chula has shown in the Table 7 and Figure 2.

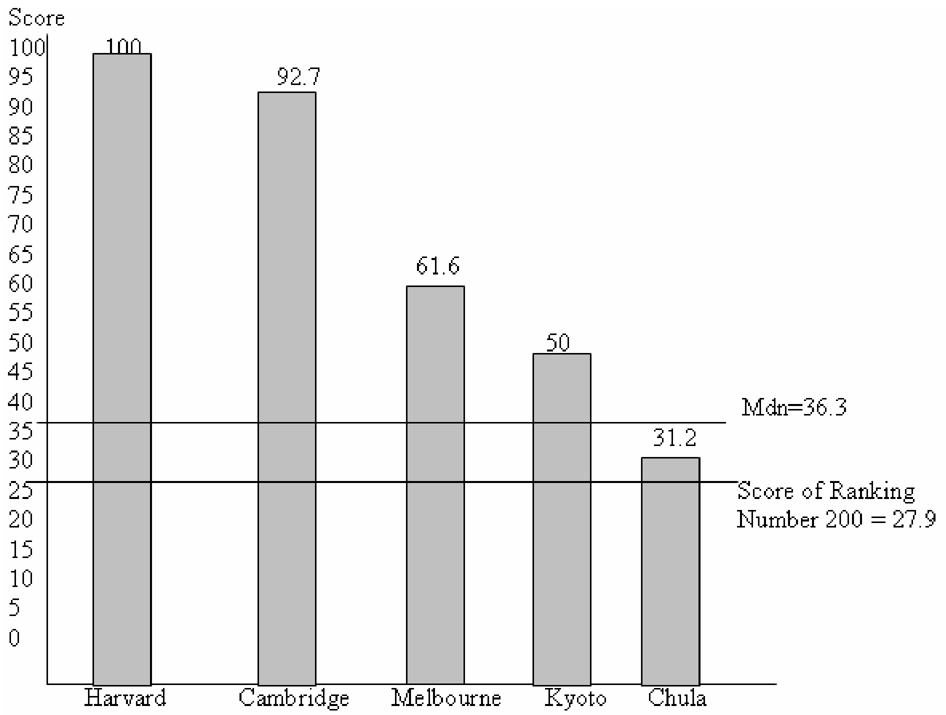


Figure2 Comparisons the samples of WCUs overall weighting scores.

Source: League table (THES, 2006), Analyzed by researcher.

Chula's ranking number in league table is 161 out of 200 universities in the world. The weighting score is 31.2 out of 100, and the median of 200 universities is 36.3. The position of Chula is below the median.(Figure2).

The score of subject area in THES-QS 2006 ranking of Chulalongkorn university: Arts and Humanities

(27.10, ranking number 104), Engineering & IT (31.44, ranking number 100), Life Science and Biomedicine (29.19, ranking number 82), Nature and Science (24.04, ranking number 145), Social Sciences (37.45, ranking number 46) (THES-QS 2006. cited in Ben Sowter, February 12, 2007).

The other rankings, i.e. Webometrics ranking, Chula is ranked the top university in the nations. Chula's SASIN Graduate school is also an outstanding business school in Asia. SASIN Business School is popular for the international students.

Chula's success stories : outlooks, outreach, outright, and self- esteem

Since 2007 marks the auspicious 90th anniversary of Chulalongkorn, strings of celebratory events and activities have been scheduled, i.e. national and international conference, academic outstanding performances, the exhibitive and activating of the faculties, institutes, centers of excellence and many success stories to collect and pool the knowledge and wisdom which align to the mission, vision, core values, and strategies. The Think Tank higher education institution of the nation and international. Growing self-esteem of primary functions, and enhancement of maintenance factors of strong leadership, talent management, green campus, prominent learning facilities.

Selected some data and information of Chulalongkorn university

Chula's Statistics		**Postgraduates Stats**	
- Faculty Stats		- Number of	
Number of Faculty Members	3,190	Postgraduates	12,595
Number of International Faculty Members	183	- Number of International - Postgraduates	227
- Students Stats		**Course Fees (subject to change)**	
Number of Undergraduates	21,457	Average Course Fees	
		- Undergraduate	$8,145
- Number of International Undergraduates	36	- Postgraduates	$9,402

Source: World University Rankings 2006 (QS & The Times Higher Education Supplement), and URL: www.topuniversities.com

Current updated to the academic year 2007 (www.chula.ac.th)

- Number of under-grad students 22,722
- Graduate students 12,869
  - Grad Diploma 245
  - Master 10,373
  - Higher Grad Diploma 383
  - Doctorates 1,868
  - International programs 69 out of 418 regular programs, PhD Int'l programs 18
- MOU : more than 380 contracts with HEIs and inter-organizations more than 40 countries

Specimens of recent success stories

1) An outstanding good governance model of public research university.The Office of Public Sector Development Commission (OPDC), reported the evaluation results of governmental agencies for the fiscal year 2006. As for the assessment on four dimensions of the university's operational plan:The dimension of effectiveness of operational plan (55%) Chula received 4.80, quality service (15%), Chula received 4.80, efficiency of operational plans (10%) Chula received 2.88, and organization development (20%), Chula received 5.0. An overall weighting score 4.65 out of five scales.

2) A team of Chula's engineering students win the second prize in the Robocup Soccer Small Size League, which is part of the World Robocup 2007, held in Atlanta, USA.

3) Chula's Halal Science Center, has been named the recipient of the Halal Journal Award (published in Malaysia) of Best Halal Industry for 2006.

4) A medical research team of Chula found the new treatment of elephantiasis. And conducted research in Avian Flu, HIV/AIDS which are prominent in the ISI standards of citations.

5) On the anniversary day, Chula's organized leading lectures of "Learning from His Majesty the King's Works." A series of lectures focused on the topic "Sufficiency Economy, Learn from Direct Experience." From this set of lectures will follows: 1) Economic Directions 2007: To sustainable success, 2) Educational Management to Achieve National Development, 3) Mass Media and Social Responsibility, 4) Organization Development and Good Governance, 5) Writers work to reflect society or develop society? 6)Thai Public Health System Development, 7) What does Thai

architecture teach Thai society? 8) Logistics-Transportation and Environmental-friendly Power Conservation, 9)Pathway to Rural Areas Development, 10) Chulalongkorn University and Bangkok Development, is a conference that will highlight more than 300 Chula research works with emphasis on the university's involvement in community development, 11) International Conference on "The 8th APRU Distance Learning and Internet Conference."

6) Chula's Continuing Education Center is and outstanding initiatives and shown success stories of life long learning for all.

7) Other special events and activities are performing during Chula's 90th Anniversary.

Results: Chula's Success Stories and Suggestions

8) Chula's identities are to remain a royal university with the core values in the words of king Chulalongkorn, "All of our subjects, from our royal children down to the lowest commoners, will have the same opportunity to study by they royals, nobles or commoners.

9) Chula remains a public research university, Doctoral/Research-Extensive with match to the Carnegie Classification of Institutions of Higher Education for the advancement of teaching (Shulman, 2000 Edition). Chula motivates faculty members for their publications and citations in all fields of academic clusters.

10) Quality assurance system is the success stories tools and maintenance factors. Total quality management is an ongoing process continuously to promote Chula a better world class university.

11) Chula is located in the central and vibrant atmosphere of business center in Bangkok, an outstanding logistic and transportation, the rich of real estates. Its appropriate to re-organize a new model of autonomous and entrepreneurial university with the good governance and integrity.

12) The strategies to attract talents of faculty numbers and students world wide are a must and merit selection by portfolio assessment of output-based performance. Post-doctoral scholarships of the strength international programs should be initiated.

13) A strong partnership with the universities in ASEAN+3, United Nations Universities, promotion of global skills of Chula's communities, partners, and alumni worldwide.enhancement the initiatives of peace and reconciliation, integrity, democratic way of life, civic education, and professional development for K-16 instructors, and life long learning are the core missions and

values for sustainable development of the nation and internationalization.

Conclusions

1. Towards the world class universities of Thai higher education institutions, scenario and long range planning are the challenges of the executives to build human capital, enhancing collaboration and partnership, global team building, internationalizing the campus, university learning, and build the centers of excellence for the enterprising universities and the intelligent organizations**.**

2. Building a number of world class universities in Thailand is challenging for the leaders and human resource in all levels.

3. Guiding performance indicators of the strategies is in progress.

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References

Altbach P.G.(2004).The cost and benefits of world class university. Retrieved January 23, 2006, from http://www.aaup.org/publications/Academe/2004/04jf/04jfaltb.htm

Altbach P.G. The dilemmas of ranking, International higher education. The Boston College. 42 (winter 2006)

Arroyo,E.M.(April 21,2006). Response questionnaires for e-survey.

Asia Pacific Economic Cooperation (2005). "Best practice governance education policy and service delivery" 2005 HRDWG. Conference. Pattaya City, Thailand 20-24 June 2005. (Submitted by AUSTRALIA).

Asiaweek (2000). Asia's best universities 2000 26(25). June 30, 2000, 44-49.

Brodjonegoro, S.S.(2006). Sustainability and higher education in Indonesia. Sub-theme; sufficiency and sustainability. World University Presidents Summit: Reflections on diversity and harmonization. 19-22 July 2006. Bangkok, Thailand..

Buckalew, L.G.(2002). Trends in higher education. A Siemens White Paper, 3-20.

Caldwell,B.J.,(2003) cited in Clarke, (2003), World class education. London, United Kingdom. pp.1-3.

CHE(2005). Annual report 2005. Bangkok, Thailand.

Chen Wei-Jao (2005). "Nurturing talent, creating a first-class university. An interview with NTU Press Retrieved January 19, 2006, from " http://www.sinorama.com.tw/ch/

Chulalongkorn university. Retrieved May 26, 2007, from http://search.it.chula.ac.th/chula_eng/about/admin/org.html and the other web link of www.chula.ac.th

Chulalongkorn university. (March 26, 2007) 90th Anniversary of Chulalongkorn university. Bangkok Chula Printing

Colleges and universities 2006 rankings by web popularity. Retrieved April 14, 2007 from :http//www.4icu.org/th

Commission on Higher Education. Annual report 2006. Bangkok, Thailand.

Commission on Higher Education (2005). Guidelines for international education at Thai colleges and universities. Bureau of International Strategy, September 2005.

Commission on Higher Education Seminar on international dimensions of higher education in Thailand. Bureau of International cooperation strategy. February 21, 2005.

de Water J.V., (February, 2005). Building a world class university: Reality vs. Rhetoric. Seminar in international dimensions of higher education in Thailand. pp.41-42

Earley, P.C.Mosakowski, E (2004). "Cultural Intelligence" Harvard Business Review. October, 2004. pp.139-146.

Hirst. P.(2006) University metrics-global university rankings: G-Factor. Retrieved April 4,2007, from: http://www.universitymetrics.com/g-factor

Idrus, N. (April 23 ,2006). Response questionnaire for e-survey.

IMD, Center of Competitiveness (2005). World competitiveness yearbook. pp 602-605.

Kampechara, P. (July 11, 2007) World class universities: strategies, opportunities and aspirations of Thai higher education institutions. National conference on opportunities and expectations of THEIs development, Faculty of education, Chulalongkorn university. 10-11 July 2007.

Kaplan, R.S., D.P. Norton (2004) Strategy maps. Boston: Harvard Business School Press.

Kit Siang, L.(2005). Meritocracy the only road to world class university Retrieved January 26, 2006, from http://blog.limkitsiang.com/?p=169

Knight, J., (2002) . " GATS – Higher education implications, opinions and questions." First global forum on international quality assurance, accreditation and the recognitions in higher education. UNESCO, Paris, 17 – 18 October 2002. pp. 137 – 138.

Knight, J.(2004). "Internationalization Remodeled: definition, approaches and rationales" Journal of studies in international education vol.8 No.1(abstract). Available from: http://.jsi.sagepub.com/cg:/content/abstract/8/1/54/10/2005

Lee, Don – Hee (October, 2001). Towards a topology of Asean tradition in the world education. Seoul National University, Korea.

Liverpool (updated: 20 April 2005). Building a world-class university positioning Virginia Tech to compete in the international arena. Retrieved January 24, 2006, from http://scholor.lib.vt.edu/vtpubs/spctrum/sp951019/2a.html

N.C. Liu & Y. Cheng (2005). Academic ranking of world universities, methodologies and problems. Retrieved September 17, 2006, from http://ed.sjtu.edu.en/rank/file/ARWU – M&P.pdf

Newsweek International (August 13, 2006). The top 100 Global universities. Retrieved August 16, 2007, from http://www.msnbc.msn.com/id/14321230/site/Newsweek

Niland, J.(1998),The Challenge of building world class universities in Asean region Retrieved March 23,2006, from http://www.onlineopinion.com.au/view.asp?article=997

ONESQA(2005).The 1st External assessment and results of HEIs (1999-2005).Annual report 2005.

Bangkok, Thailand.

ONEC (2003). National Education Act B.E.2542 (1999) Amendments B.E.2545 (2002).Bangkok, Thailand.

Paitoon Sinlarat (2003). Creativity and productivity are the keys for balancing globalization and localization in education. The 8th International conference: Globalization and localization Enmeshed: Searching for a balance in education. November 18-22, 2002. Faculty of Education, Chulalongkorn university.

Paitoon Sinlarat (n.d.) strategies for higher education reform in Thailand : A historical

Retrieved March 13, 2006, from http://www.cshe.nagoya-u.ac.jp/seminar/kokusai/paitoon.pdf

Pavich T., et al., (2002). Autonomous universities and world class universities. Presidential Conference, June 1-2,2002. Pattaya. Cholburi,Thailand.

Prasert Chitpong ,et al., (2004).World class universities**.** Presidential conference, December 9-10, 2004.Maejo University, Chiang Mai, Thailand.

Sippanond, K.(2004)" Building the world class universities, Presidential conference.December 9 -10, 2004.Maejo University, Chiang Mai, Thailand.

SJTU (2005). Academic ranking of world universities, Retrieved January 24, 2006, from http://sjtu.edu.cn/rank/2005/ARWU2005statisics.htm

SJTU (2006) Academic ranking of world universities 2006, Retrieved October 15, 2006 from http://ed.sjtu.edu.cn/ranking.htm

SJTU (2007) Academic ranking of world universities by broad subject fields-2007

(ARWU – Field – 2007). Retrieved August 25, 2007, from http://ed.sjtu.edu.cn/ARWU-FIELD2007/Sta-Institution.thm

Somwung, P.cited in Bangkok Post. (May 22, 2007). ONESQA quality leads to success: University assessment released.

Sowter, Ben (2007) THES-QS World university ranking. Retrieved March 23, 2007, from http://www.griffith.edu.au/conference/university_rankings/

Suchada, K.Khunying (n.d.). Autonomy from the State vs Autonomy from the market. Chulalongkorn university.

Suchart T.(2002). Strategy for change in higher education. 2nd Semester HGDP Program, Faculty of education, Chulalongkorn University(Mimeograph)

Teay, S. (April 27.2006).Response questionnaire for e-servey.

The Carnegie classification of institutions of higher education, 2000 Edition, with a forword by Lee, S.

Shulman. Retrieved July 28, 2007, from http://www.carnegiefoundation.org/dynamics/downloads/file_1_341.pdf

UIUC (2005). A world class university. Retrieved September 1, 2006, from http://www.publications.uiuc.edu/info/world.html.

UNESCO (October 9, 1998). World declaration on higher education for the twenty-first century: vision and action. (adopted by world conference on higher education, Paris)

University of Oxford (2004).Annual review 2003/2004 Retrieved January 24, 2006, from http://www.ox.ac.uk.

USNEWS and World Report (2006). America best graduate school 2006. Retrieved December 5, 2006, fromhttp://www.usnews.com/usnews/edu/grad/ranking/edu/brief/edusp08_brief.php

Varaporn Borvornsiri (2006). cited in UNESCO-Bangkok (2006). Higher education in South-East Asia. UNESCO-APEID. Printed in Thailand.

Webometrics ranking of world universities, January 2007. Retrieved July 25, 2007, from http://www.webometrics:info

WES (2006). World university rankings. Retrieved July 25, 2007 from http://www.wes.org/eWENR/PF/06aug/pffeature.htm

Wichit S.(2005). Thai higher education and world class university. Association of research and higher education development. Chulaporn Center of Research Institute , Bangkok, Thailand.

Williams, R. Dyke N.V. (November 2006). Rating major disciplines in Australian Universities: perceptions and realities. Melbourne Institute of Applied

Economics and Social Research. Retrieved March 6, 2007 from http://melbourneinstitute.com/publications/reports/dr_aus_uni/Executive%20Summary.pdf

Yingjie, W.(October 25, 2001).Building the world top university in a developing country, universals, uniqueness, and cooperation. Beijing Normal University, PR China. Retrieved January 24, 2006, from http://aped.snu.ac.kr/icer/2001/data/1stday.htm.

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Part Four

Institutional Practices for Building World-Class Universities

Combining the Vision, Mission and Actions: Tsinghua's Experience in Building World-Class University

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Abstract

The paper puts the issue of higher education development in a global context with a special focus on China. The efforts from both the government and the top higher learning institutions in building the world class university through the 211 Project and 985 Project since the 90s of the 20^{th} century is specially focused. Tsinghua University works as a case to show the endeavors that an individual institution has taken in developing itself on the bases of environmental changes.

Combining the Vision, Mission and Actions:Tsinghua's Experience in Building the World-Class University

I. Changing Contexts of Higher Education in China

Currently we are getting into the society which knowledge supplanting physical capital works as the first source of wealth and economic growth. The knowledge-driven growth model globally makes higher education, the knowledge-intensive sector, more crucial for the development of regions and nations. "Without more and better higher education, developing countries will find it increasingly difficult to benefit from the global knowledge-based economy." Higher education "is no longer a luxury, it is essential to future national social and economic development."(The Task Force on Higher Education and Society, 2002.)

Over these years of opening up to the world, Chinese government has become more and more aware of the importance of higher education to ensuring the quality of the country's workforce and to carrying out cutting-edge research. The development of higher education was reaching its peak in 1998 marked with two big events which had profound impacts. One was the government push to increase the enrollment of higher education, the other was an official claim of building up few world-class universities in China, which was named as "985 Project" [1].

1.1 Quantitative expansions

As the largest developing country in the world, China has undergone a rapid economic growth of the GDP increasing 9% and up for over 25 years. (see Table 1) Paralleling with the economic development, higher education has got into a new stage. Before the mid 90s, only around 7 percent of the age cohort between 18 and 22 year-old benefited from higher education. The Action Plan for Invigorating Education in the 21st Century (1998-2002) issued by the Ministry of Education and the State Council in 1998 declared that the rate should be reached to 11 percent by the year of 2000. A remarkable leap took place then. In 2002 the internationally acknowledged threshold of mass higher education, 15% of the age cohort, was reached and the total enrollment increased four times within ten years from 1998 to 2006 (see Table 2).Now China not

[1] Chairman Jiang Zemin said in his remark at the 100 years' anniversary of Peking University in 1998 that "China needs to build up several world-class universities in order to realize the modernization". In his speech at Tsinghua University in 2001, he repeated again that we should accelerate the development of higher education and build up few world-class universities in China.

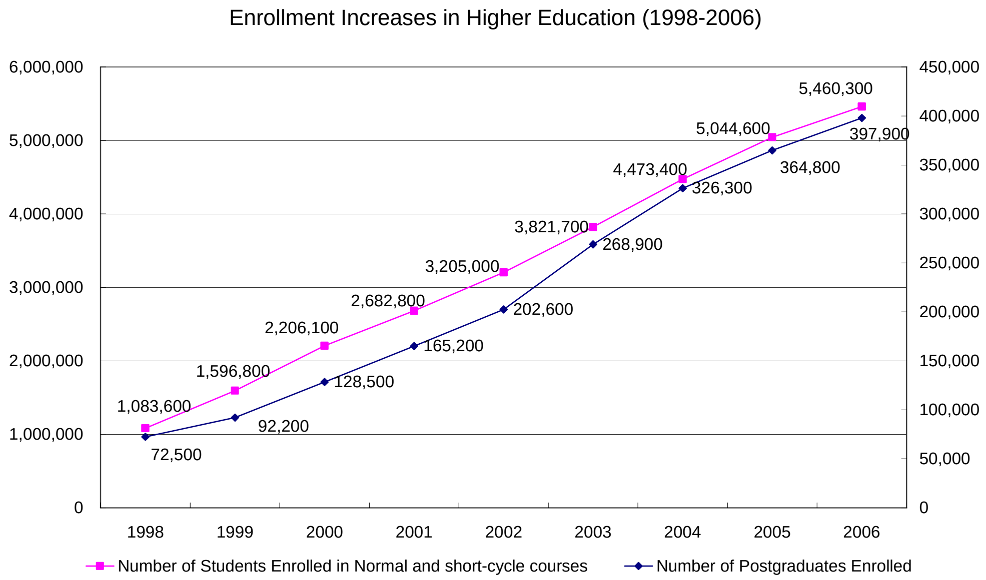
only has the largest population, but also the largest higher education system in the world. A total number of 23 million students were studying in various higher educational institutions in 2006.

Table 1 The GDP and GDP per capita of China between 1978 and 2005.

Year	GDP （Billion RMB）	GDP Per Capita (RBM)	GDP Per Capita (USD by exchange rate)	R&D Expenditure （Billion RMB）
1978	362	379	47	
1982	529	525	66	
1987	1196	1104	138	
1992	2666	2287	286	19
1997	7446	6054	757	40
2002	10517	8214	1027	81
2004	13687	10561	1320	116
2005	18308	14040	1755	245

Source: China statistics Book (1979-2006)

Table 2 The Increase of the Enrollment of Higher Education Institutions in Mainland China from 1998 to 2006.



1.2 Quality concerns

With the rapid expansion of higher education, there grows an increased concern in maintaining and raising quality. In the new century, China started a nation wide endeavor in "capacity building" [1] and the New Action Plan for Invigorating Education (2003-2007) issued by the Ministry of Education (MOE) and the State Council in 2004 put the quality improvement in the top agenda. The most recent important action taken by the central government was launching the "quality-increasing project" in higher education in 2005 based on the document No. 1 issued by the MOE.

II "211" and "985": the Key Construction Projects in Higher Education

Generally speaking, there have been two major pathways in China increasing the quality of higher education. One is the overall concerns and efforts for the whole system as mentioned above, the other is the "key construction project" which usually focusing on a number of higher learning institutions which have better conditions and academic reputations.

2.1 The key construction projects in higher education from the early 50s.

Because of the limited resources and the high demand of quality higher learning institutions, Chinese government has had the policy since the mid 1950s in building up key universities with more government resources and policy support. Table 3 displays the changes of key higher education institutions (HEIs) since 1954.

[1] The Ministry of Education in China organized a group of scholars from different fields in the late 20th century to prepare an overall analysis and a strategic plan for China's education development in the next 50 years. The team worked out an important report "Education and Human Resources in China" published in 2002. It proposed a nationwide "capacity-building" movement. The Action Plan for Invigorating Education 2003-2007 issued by the MOE stared the project of "Quality Education in the New Century" and the focus is on strengthening student's innovation and raises their practice competence.

Table 3 Change of the numbers of Key Higher Education Institutions Since 1954.

Year	Key HEIs	Key construction HEIs 1985-1995	211 Project HEIs	985 Project HEIs
1954	6			
1959	16			
1960	64			
1963	67			
1978	88			
1979	96			
1985		5		
1990		11		
1996			2	
1997			32	
1998			61	2
1999			92	9
2000			99	12
2001				29
2002				33
2003				34
2005			107	
2006				38

2.2 "211"and "985"Projects: national efforts in building the World-Class University

"211 Project " was started in 1993. 100 key universities and key disciplines were selected and receiving special funds from government. It was the largest key construction project supported by the central government in the field of education since the 1950s with the total financial input of 10.894 billion Chinese Yuan from 1995-2000, among which 2.755 billion were from central government, 3.172 billion from affiliated government agencies, 2.489 billion from local governments, 2.363 billion from institutional self collection and 115 million from miscellaneous channels. Another 7.472 billions came from affiliated and local governments specially for improving infrastructures.

The 211 Project institutions have made obvious progress during these years in aspects of student expansion which undergraduate students enrolled in the 211 institutions increased 61 percent, master degree students and doctorial candidates increased 108 and 101 percent respectively, faculty improvement shown by doctor degree holders increased 109 percent and publications in SCI, EI and ISTP increased 94 percent in 2000 compared with the year of 1995. (MOE, 2001)

The 985 Project was commenced in 1998 when Jiang Zemin, the former Chairman of PRC made his speech in the ceremony of the 100th anniversary of Peking University, declaring that China will build up few world class universities through the national efforts. Central government put more resources in the 985 Project institutions which increased from 2 in 1998 to 38 in 2006. Among the total number of 1867 regular HEIs in China, 985 Project schools take less than 3 percent, but more than 50 percent of the total doctorial candidates, the national key discipline programs and key laboratories, more than half of the academicians in Chinese Academy of Sciences and Chinese Academy of Engineering are also from the 38 institutions.

The efforts represented by the 211 and 985 Projects in quality improvement should not just be seen as a government initiated, up-down actions based on the skepticism of centralized system, but rather as a joint attempt from both central government and top higher education institutions in establishing a new rules embedded in traditional reputation-myth combined with recent accepted market-oriented resource flowing. The rationale behind it is the aim to use scarce resources most efficiently by giving them to the best universities which are well established and widely recognized as the institutions more responsible and accountable in doing their jobs. This assumption implies that non-quality related conditions may help to increase overall quality of the institutions and since there has so far been no genuine instrument for quality assurance, public reputation and self-control, plus outside monitoring system which currently in China is still within the educational circle, may work together stimulating the quality movement first in the best universities of the country and then disseminate to the other HEIs.

2.3 The World-Class University in the context of China at the turn of the century

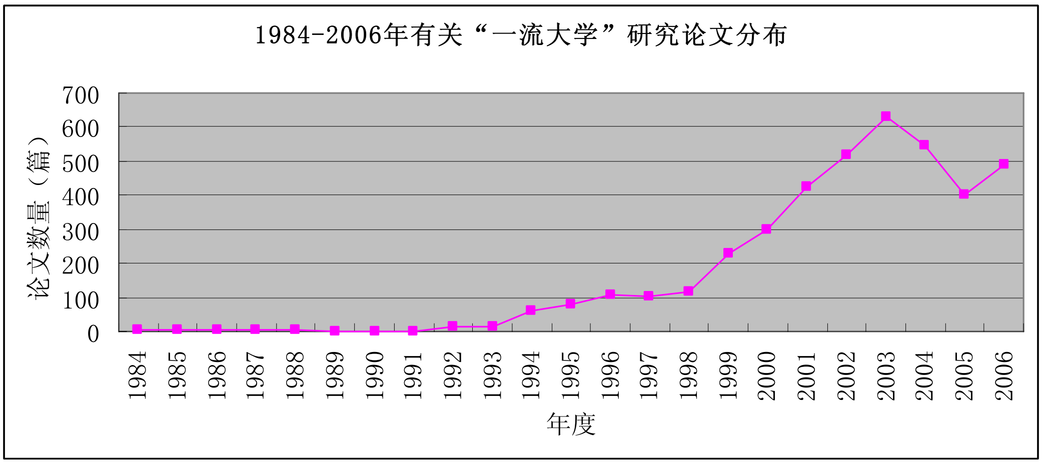
"World Class University" (WCU) as a concept is in general a product of China's concern of the national capacity and competitiveness in knowledge innovation and high-quality-manpower production, particular in the turn of the century. Based on the bibliographic search of the key word "World Class University" from the Data Base of Chinese Journals and Magazines, all together 4203 papers have been searched out during the period of 1984 to 2006 which can be divided into three stages according to the density of the publication: The first stage was before 1992, only less than 6 papers annually been published on the topic which was mainly from liberians and information agencies introducing the high prestigious universities in developed countries.

The second stage was from 1992 to 1997, the annual publications focusing on the topic increased from 13 to over a hundred. Writers not only analysis in more detail and depth the top universities in developed countries, but also discuss the related issues in China. The third stage started in 1998 marked by Jiang Zeming's speech in Peking University, the annual publication increased greatly and got to the peak in 2003 by 632. (see Table 4 and 5)

Table 4　Publication on the Topic of WCU, 1984-2006.

Year	Paper	Year	Paper
1984	3	1996	109
1985	3	1997	102
1986	3	1998	117
1987	3	1999	231
1988	6	2000	300
1989	1	2001	426
1990	0	2002	517
1991	1	2003	632
1992	13	2004	545
1993	15	2005	403
1994	59	2006	490
1995	81	2007	143
		Total	4203

Table 5　The Increase of Publications on the Topic of WCU.



WCU in the context of China at the turn of the century by nature is not a pure academic issue which only attracts scholar's interests. It is a serious policy issue for the government to make decisions, a hot social issue for the public to discuss and a real practice for selected higher learning institutions to work on. This can be depicted by the further analysis of publications mentioned above. For example, among the total number of over 4000 publications, 666 papers have been cited and their authors include 370 scholars mainly in the field of education, 97 university presidents or major managers, 131 administrators of higher learning institutions and 27 government officials. Among the top 10 highly cited papers，5 are from scholars, 4 are from university presidents and 1 from the minister of education. (See table 6)

Table 6　Top 10 highly cited paper

有关"一流大学"研究被引频次前 10 名的文章列表.

Number 序号	**Paper** 文章	**Citation** 被引频次
1	Ding Xueliang, What is the World Class University, Higher education study/ 2001/03 什么是世界一流大学 丁学良 高等教育研究/2001/03	72
2	Zhou Ji, Plan for the New Breakthrough and Have a Leap forward Development—Some Thoughts in Construction the WCU, Higher Education in China/2004/17 谋划改革的新突破 实现发展的新跨越——关于加快建设世界一流大学和高水平大学的几点思考 周济 中国高等教育/2004/17	44
3	The Rule and Enlightens—Some Thoughts on the WCU, Comparative Education Study/2001/07 规律与启示—关于建设世界一流大学的若干思考 王英杰 比较教育研究/2001/07	38
4	Zhang Chuting, the New Century and Human Beings, Higher Education Study/2001/01 新世纪:教育与人 张楚廷 高等教育研究/2001/01	34
5	Liu Daoyu, How China Build up the WCU, Higher Education Study/2003/02 中国怎样建成世界一流水平的大学 刘道玉 高等教育研究/2003/02	32
6	Zhao Junfang, The Original Invigorations of Western Top Universities, Higher Education Study/2001/03 西方名校活力探源 赵俊芳 高等教育研究/2001/03	31
7	Liu Niancai, Cheng Ying, Liu li, Zhao Wenhua, How far are the top Chinese universities with the WCU? Higher Education Study/2002/02 我国名牌大学离世界一流有多远 刘念才,程莹,刘莉,赵文华 高等教育研究/2002/02	29
8	Wang Dazhong, Some Issues in Constructing WCU in China, University Teaching in China/2000/01 关于在中国建设世界一流大学的若干问题 王大中 中国大学教学/2000/01	29
9	Ye Ying, Report on the Liberies of the WCU in America, Journal of University Libery2002/03 美国一流大学及其图书馆调研报告 叶鹰 大学图书馆学报/2002/03	29
10	Some Issues in Constructing WCU in China, Tsinghua Educational Research/2000/01 关于在中国建设世界一流大学的若干问题 王大中 清华大学教育研究/2000/01	26

It seems that most of the authors, no matter scholars, university administrators or government officers, see the value of WCU and support that if China wants to be a strong and influential country in the 21 century, we must have a number of WCU. (Ding, 2001) The gap between top Chinese universities and WCU is quite large, particularly in terms of Nobel prizes, papers published in important scientific journals such as Nature and Science, research expenditures, percentage of faculty members with PhD degrees, proportion of international graduate students etc. (Liu, Cheng, Liu and Zhao, 2002) But we should start the process of construction as the national development strategy and through the unconventional policy to reach the goal. (Wang Dazhong, Tsinghua University Education Study/2000, 2003)

Generally speaking, there exists an increasing aspiration in the society for building the WCU in China at the turn of the century. The 211 and 985 Projects started by the central government, together with the social aspirations, have affected strongly the initiatives of individual university in development. As some scholars has pointed out that the 985 Project has reduced the gap between the top universities in China and the WCU in other countries.(Liu, liu, Cheng, Wan, 2003)

III Tsinghua's Experience in Building the WCU

3.1 Historical base of Tsinghua University (THU)

The evolution of Tsinghua University can be seen as a microcosm of the development of China's modern higher education with a history of nearly 100 years. Tsinghua School (清华学堂) was established in 1911 as a preparatory school for the students who were selected by the government and going to study at American higher education institutions. It became a college in 1925 and then got the official name as the National Tsinghua University in 1928. The Research Institute was set up in 1929. Although Western culture was pervasive in the early history of Tsinghua University, the faculty greatly valued the interaction between the Chinese and Westerners, the sciences and humanities, the ancient and modern. It was one of the best national comprehensive universities in China before 1949 with 5 colleges (Art, Law, Sciences, Engineering, and Agriculture) and 26 departments.

After the founding of People's Republic of China, nationwide restructuring of higher educational institutions made Tsinghua a polytechnic institute which was designated as "the cradle of engineers" in China's industrialization. Since the early 80s, Tsinghua has made a great effort to develop academic strengths other than engineering and now becomes a comprehensive research-intensive university. Currently it has 13 colleges, 54 departments with around 3000 faculties, 13,000 undergraduates and 18,000 postgraduate students. Tsinghua University is among the first group of higher educational institutions in China to establish graduate schools, to receive special funds from the central government by “211 Project” and “985 Project”.

During its nearly 100 years of development, Tsinghua has formed up its university motto as “Self-discipline and Social Commitment”, its major objectives are fostering leading figures for various sectors, pursuing academic excellence while creating new knowledge and providing all-dimensional public services. The University has been frequently ranked number 1 or 2 in a variety of national university assessment or ranking. Currently four out of the nine standing members of China’s Polibureau, including China’s president Hu Jintao are Tsinghua’s alumni. By the year of 2006, 23 percent of members in Chinese Academy of Sciences and Chinese Academy of Engineering are graduates of Tsinghua. Both the Chief Engineer of the Three Gorges Project and the Chief Designer of China’s first Manned Spaceship are Tsinghua alumni as well.

3.2 Building the WCU: the new vision and a roadmap at the turn of the century

Universities, especially research universities, are well-organized institutions in modern society. The big resources and high expectation it received make it an “axial structure” of the society. “Now more than ever, universities have become the principal source of the three most important ingredients of progress in a modern, industrial society: expert knowledge, highly educated people, and scientific discoveries.”(Bok 2003)

Tsinghua University understands clearly that its own future relies on the nation’s development and it has always tried its best to contribute the nation’s goal with its full capacity. In the early 80s, when China was accelerating its economic development, Tsinghua began its transition from a polytechnic institute into a comprehensive research university. Planning for the new stage of development, the university started to discuss the new vision of building the WCU. Ten years later, when the National Program of Educational Reform and Development issued by the Central government put education as the national strategic priority, Tsinghua University set up the strategic development plan for building the WCU with three phases and leading to the year of 2020 and later: The first phase is from 1994 to 2002: the major task is to reform the structure and lay foundation for a comprehensive, research-intensive university; the second stage is from 2003 to 2011: the major work is to make a breakthrough in some strong subjects and take a leap forward in the key fields; the third phase will be from the year 2012 to 2020 and after: the major efforts will be focused on overall improvement and by coordinative efforts, reach the world class standard gradually.

As a late comer in the road of constructing the WCU, Tsinghua University, from its early stage of the process, has taken the issue not only as a practice, but also as a research topic for the whole university to study from different perspectives. Since the early 50s, Tsinghua has had an institutionalized arrangement for organizing discussions on one or two urgent issues for the university's development on the university scale. The arrangement has been officially formatted as the Symposium of Education held every 4 to 5 years. The university-wide discussion helps stimulating different opinions and the formation of consensus on which colleges and sub-sections try their own ways in designing the model fitted for both the disciplinary requirement and the general goals of the university. Both working plans and the deep theoretical thinking come out from the discussion. How to construct the WCU in Tsinghua has been the major concern for the last three symposiums held in 1995, 2000 and 2004 respectively. The hot discussions and deep thinking turn out to be papers published in various journals and magazines. Based on the documentary search of the key word "World Class University" from the Data Base of Chinese Journals and Magazines, 89 papers were written by the writers affiliated to Tsinghua University in the past 20 years, which ranks the number 1 in all higher learning institutions and among the top 10 highly cited paper, the one written by Wang Dazhong (Tsinghua Educational Research, 2000), the former president of Tsinghua University, was the earliest published paper on the topic. In order to discuss the issue in more depth and collect more ideas from different scholars, Tsinghua University organized a national symposium on the "Theory and practice of building the WCU" in March 2003. President Wang Dazhong, in his opening speech, not only clearly explained the three-stage plan for Tsinghua, but also raised an international standard which was AAU（Association of American University）to make a comparison. President Wang pointed out in his speech that AAU represented a cluster of top research universities in the US which their similarities were partly shown by the key indicators as the leading figures in various research fields, total amount of competitive federal research grants, the high-quality faculty members and students, the original research findings shown by publications in the top academic journals and authorized patients. According to Wang Dazhong's idea, we need to have an international standard to start with, although it was not the all about the WCU. (Wang, 2003)

In sum, the goal of constructing the WCU provides a new vision for Tsinghua at its crucial period to target on and the three-stage plan works as a roadmap for the university in practice. Tsignhua people are well-known in China by their working style of "doing is more important than talking" (行胜于言)，the real meaning of the roadmap is not the rigid time-bound plan, but the urgent needs for taking actions in practice.

3.3 Tsinghua University is in the action: from the visible standard to the invisible essence

During the first period, Tsinghua University reorganized its structures and academic disciplines based on the following rules: taking the national modernization strategy as a guideline, strengthening fundamental disciplines, developing medical science, improving humanities, social sciences, management and arts with unique features, breakthroughs in the fields of IT, energy, nano-technology, and life science, keeping track of international research frontiers. 8 new colleges and professional schools in law, mechanical engineering, art, public management, information technologies and computer sciences, medical and mass media have come into being then, plus the 4 colleges previously existed and 1 more being established later, Tsinghua has formed up its shape as a comprehensive university which covers the fields of humanities, natural science, engineering, medicine, finance, law, economy and management etc.

The second stage starting in 2003 is still undergoing now: the major work is to make a breakthrough in its strong fields and take a leap forward in the key subjects. As a formal polytechnic university, Tsinghua has accumulated strength in engineering and some other subjects in natural science and technology. For reaching the goal in the second stage, the university has made great efforts in improving the quality of the strong fields and try to be competitive not only in China, but also world wide. Based on the ESI Data Base survey in 2006, the publication of Tsinghua scholars in physics, chemistry, material sciences, engineering and computer sciences have reached the top 1 percent institutions worldwide within the past decade. According to the "Academic Ranking of World Universities 2007 "(ARWU) made by Shanghai Jiao Tong University, Tsinghua University is in the range of 151-200, but by the ranking of subject fields, its engineering is reaching to the 51-75. (Liu, Cheng and Liu, 2007)

For reaching the goal, the university also puts quality at the top agenda and pursues excellence in both teaching and research. As many top universities in the world, Tsinghua is attractive to the top graduates from senior high schools, particular those who are interested in natural science and technologies. Every year more than 70 percent of the top ten students in the national college entrance exams in natural sciences and technologies from different provinces choose to study in Tsinghua and only the top 1 per thousand high school graduates with the highest scores in the entrance exam are enrolled. Comparable with the highly selected students, Tsinghua has formed up a highly qualified faculty team. The total number of faculties in Tsinghua has decreased from 3807 in 1995 to 2857 in 2006, but the number of doctor-degree holders increased from 572 to 1792 and the percentage increased from 15 to 62.7, much higher than the national average (9.16 percent) and the quotas required by MOE for the research-oriented universities (30 percent). Currently Tsinghua has 49 national key disciplinary subjects and in the national evaluation in 2002 and 2004, 21 out of 37 disciplinary subjects in the university were ranking in the top three, among which 13 were in number 1 nationwide. In the national competition of excellent teaching, Tsinghua won 20 rewards in 2001 and 26 in 2005.

In the knowledge-based society, research capacity and outcomes are crucial indicators for the top universities. Table 7 show the annual increase of research money in Tsinghua, measuring both the research capacity and competitiveness. Table 8 and 9 show the annual increase of publications in *EI, ESPT and SCI, and the* authorized patients which Tsinghua people have made within the recent 10 years. Another indicator to measure the quality and outcomes of research is the national award. By the end of year 2006, Tsinghua University had been granted 336 national awards for science and technology advancement, plus around 2000 awards at province or ministry level.

Table 7 The annual increase of Tsinghua's research expenditures, 1996-2006. (100 million RMB)

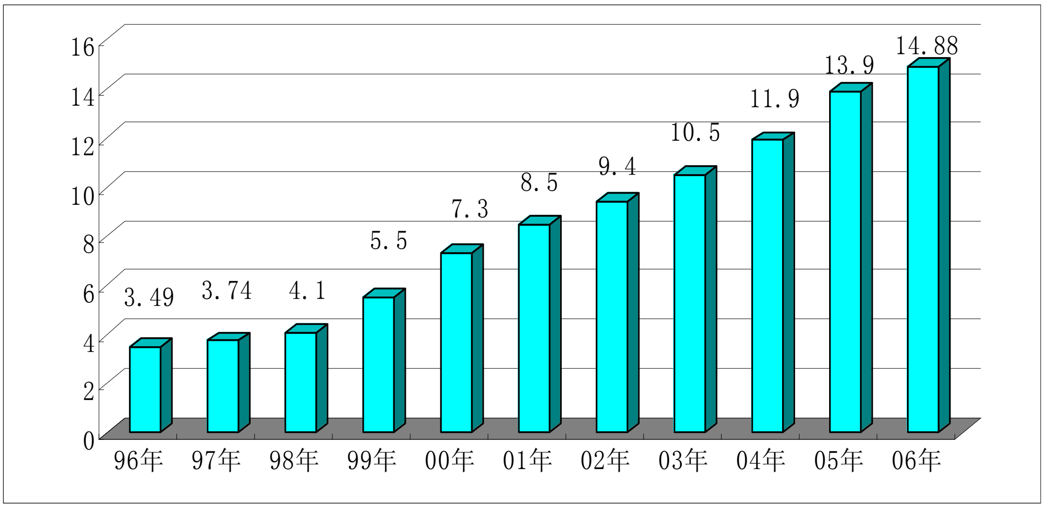


Table 8　Tsinghua's publications in EI, ESPT and SCI, 1996-2006.

Year	1996	1997	1998	1999	2001	2002	2003	2004	2005	2006
EI	511	829	576	1324		2094	2584	2299	3242	3242
ISTP	238	393	263	372	802	1144	1303	1288	1768	1768
SCI	273	407	424	598	1427	1899	2212	2321	2874	2915

Table 9　Tsinghua's patients, 1996-2006

Year	1996	1998	2000	2002	2005	2006
Applied patients	96	149	344	583	872	875
Authorized patients	58	64	135	164	537	568

For showing the progress that Tsinghua has made during the past 10 years, we compare Tsinghua University (THU) with MIT by some selected indicators. (See Table 10)

Table 10　The Comparison of Tsinghua University with MIT in Some Indicators 1996-2006

Year to compare	1996 MIT	1996 THU	2006 MIT	2006 THU
Total expenditure	$ 1.3 billion	￥0.53 billion	$ 2.18 billion	￥3.7 billion
Research expenditure	$0.37 billion	￥0.35 billion	$ 0.58 billion	￥ 1.48 billion
Total number of full-time faculty	896	2488	998	2857
Faculties with doctor degrees (%)	100％	15 %	100%	62.7%
Number of academicians		33	266	64
Total student number	9960	16565	10253	31786
Ratio of graduate students	1.2 ： 1	0.4 ： 1	1.48 ： 1	1.3 ： 1
Doctor degrees granted	554	202	594 (in 2005)	821
SCI papers	3172	273	3554 (in 2005)	2915
Number of Citations	4840	467	13231	4250 (in 2005)

Table 11 provides us a two-angle comparison of Tsinghua and MIT. From one side it shows, after a dozen year of construction, Tsinghua has made a big progress that by pure indicators. the total number of Tsinghua's publication in chemistry and materials science surpass MIT. But from the other angle it also exposes the serious weakness which from the surface is lack of highly-cited paper, but deep in the root is the shortage of original research which represents the core competitiveness of a country.

Table 11 Comparison of the publication of MIT and THU in 6 fields 1997-2007

	MIT			THU		
Fields	Paper	Citation	Citation per paper	Paper	Citation	Citation per paper
PHYSICS	7,651	151,336	19.78	4,876	19,425	3.98
CHEMISTRY	3,423	87,560	25.58	4,238	19,173	4.52
MATERIALS SCIENCE	1,586	23,108	14.57	4,211	15,451	3.67
ENGINEERING	4,267	33,031	7.74	4,184	9,994	2.39
COMPUTER SCIENCE	2,066	13,874	6.72	1,539	1,760	1.14
MATHEMATICS	1,187	5,896	4.97	714	1,559	2.18
Total of the 6 fields	20,180	314,805	13.23	22,109	76,961	3.48

Source: Essential Science Indicators.

Further more, what the indicator-based comparison can not tell is the atmosphere, the spirits, the value and belief of a university. They can not be accountable by numbers-based indicators, but can be felt, depicted and make the university distinguished. With the constructing process goes, Tsinghua people has been more and more aware the importance of qualitative factors of the WCU which usually are invisible and unaccountable, but work as the core of the university. Gu Binlin, the current president of Tsinghua University is the leading figure to advocate the crucial roles of university culture. His most recent speech in the Fifth Forum of the Presidents of 2+7 Universities[1] is entitled "Constructing the Culture of Innovation, Cultivating the Innovative Talents".

Generally speaking, building the WCU represents a new vision for Tsinghua in its 100 years of

[1] In order to have a platform to discuss the specific issues related to the construction of the WCU, presidents of Tsinghua University and Peking University initiated an annual meeting for the presidents of the first groups of the 985 project universities (2+7) in the symposium organized by Tsinghua University in 2003. The Fifth annual meeting was held in 2007 at Harbin Institute of Technology.

development and the 211 and 985 projects started by the central government give the University a big incentive to make greater efforts in pursuing its goal which fits well with the national development. Building the WCU then is not just for the university's sake, but for the well-being of the country.

Conclusion: the Endless Journey to the Future

In knowledge-based society, university is no longer in ivory tower and some scholars even use the word "entrepreneurial university" (Clark, 1998), "post-modern university" (Rip, 2004), "the global university " (Levin, R. C., 2003) to depict the new traits, such as boundary expanded, missions and functions diversified, overall competition intensified. As universities become more and more the "engine of economic growth", the challenge then is to elevate them, at least some of them, to the highest world standard.

Tsinghua's case is notable, for it represents both a convergent model, which universities in China have been transformed into agencies that are adaptable to changing situation, and a unique experience of institutional transferring from a polytechnic institute to a comprehensive research university with the goal of reaching the world standard.

Although it is too early to give an overall evaluation of the university's efforts in building up the WCU, and there is much longer way to go to really form up the common views of WCU in a global view with a national context, what we may summarize from Tsinghua's case is that in a rapid changing society, a university needs to integrate the institutional intrinsic energy with the outside stimulations, to create an atmosphere in the campus which is facilitate the new trials and actions, to take a good use of the embedded patterns of organizational belief and based on it building up institutional consensus which will lead the development going further.

Constructing the WCU, in any country, is a time, resource and wisdom- consumed endeavors and for any institution, is a long, difficult and even painful journey. Although Tsinghua University has formed up the time-bound working plan, it has been widely understood in the university that we are working for an endless future.

References

Report

The Task Force on Higher Education and Society (2002) Higher Education in Developing Countries: Peril and Promise, the World Bank.

Book

Clark, B. R. (1998) Creating Entrepreneurial Universities: Organizational Pathways of Transformation, Oxford: Pergamon. National Planning Commission,

Levin, Richard C. (2003). The work of the university. Yale University Press.

A web site

MOE and Finance Department (2001), Summary of the achievement of the 211 Project in the ninth 5-year plan. From http:www.moe.edu.cn/edoas/website18/level12.jsp?tablename=724infoid=5608

Journal article, more than one author, paginated by volume

Ding, Xueliang (2001). What is the World Class University, Higher education study, 03

Liu, Niancai. Cheng, Ying. Liu, li. Zhao, Wenhua (2002). How far are the top Chinese universities with the WCU? Higher Education Study 02.

Liu, Niancai, Cheng, Ying, Liu, Shaoque (2007). Studies on the international status of selected subjects of the top universities in China and Japan. Proceeding of the Third Sino-Japanese Forum on Higher Education, August 2001, ulumuqi, p. 96.

Liu, Niancai, Liu, Li, Cheng, Ying, Wan, Tengteng (2003). 985 Project has reduced the gap between the top universities in China and the WCU in other countries. China’s Higher Education, 17, 22.

Wang, Dazhong (2000). Some issues in constructing WCU in China, Tsinghua University Education Study 01,

Wang, Dazhong (2003). Strategic thinking and practice of constructing the world class university 03.

Bok, Derek (2003). Academic values and the lure of profit”, The Chronicle of Higher Education, 4/4/.

Rip, Arie (2004) “Strategic Research, Post-modern Universities and Research Training”, Higher education Policy. 17: 159.

Strategies for Developing a World-Class University in a Complex Context: The Case of the Valencia University of Technology

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Abstract

Becoming a *world-class university* is a challenge for many universities around the world and more and more universities setup their goals in such context. Nevertheless, historical and cultural contexts, legal frameworks, economic circumstances are so different that there are different ways of transforming an institution in a *world-class university*. Depending of the context, the internal strategies adopted for each institution could and should be different. The Valencia University of Technology is a university which started a process for becoming a first level university by taking advantage of the possibilities of the general modernization of Spain in the last decades but also striving for overcoming the difficulties coming from a traditional context. The objective of this paper is twofold. First, it will analyse the complex context of the VUT. Second, this paper will present how the VUT has been able to dodge the contextual difficulties and to take advantage of the positive aspects in order to define internal strategies to become a *world-class university*.

Strategies for Developing a World-Class University in a Complex Context: The Case of the Valencia University of Technology

> Everyone wants a world-class university. No country feels it can do without one. The problem is that no one knows what a world-class university is, and no one has figured out how to get one (Altbach, 2003, p 3).

Introduction

The concept of world-class university is elusive. In spite of the lack of a clear definition, some characteristics are necessary for reaching a world-class status. Altbach (2003) pointed out the following:

- Excellence in research underpins the idea of world class--research that is recognized by peers and that pushes back the frontiers of knowledge.
- To attract and retain the best academic staff, favourable working conditions must be available.
- Academic freedom and an atmosphere of intellectual excitement is central to a world-class university.
- World-class universities have a significant measure of internal self-governance, ensuring that the academic community has control over the central elements of academic life
- Adequate funding and facilities must be available to support the research and teaching as well as the other functions of the university.

In spite the fuzziness of the concept, becoming a world-class university is a challenge for many universities around the world and more and more universities setup their goals in such context. Nevertheless, historical and cultural contexts, legal frameworks, economic circumstances are so different that there are different ways of transforming an institution in a world-class university. Depending of the context, the internal strategies adopted for each institution could and should be different. The right combination of internal strategies, adapted to the context, makes the difference in the process of transforming a university in a world-class university.

The Spanish university context, still rather bureaucratic in spite of recent reforms is not the best for flourishing world-class universities. On the other hand, the Spanish economic context, not specially focused on the new economy does not facilitate high level research and innovation. Nevertheless, some universities are trying to overcome the impediments in order to become internationally visible. This is the case of the Valencia University of Technology (VUT), which started a process for becoming a first level university taking advantage of the modernization of Spain in the last decades, but also striving for overcoming the difficulties coming from a traditional context. Vision and leadership are placing this institution in the track of becoming a world-class university. The objective of this paper is twofold. First, it will analyse the complex context of the VUT: a context defined by a mix of traditions, regulations, economic and social factors, all of them with positive and negative effects on university life. Second, this paper will show how the VUT has been able to dodge the contextual difficulties and to take advantage of the positive aspects in order to define internal strategies for becoming a world-class university.

The National Spanish Context

Historical and legal aspects

Higher education in Spain consists almost exclusively of universities. Currently, there are 70 universities, 50 public and 20 private. There are 1.6 million students enrolled, only 8% in private institutions. Formally, all universities have a similar structure and scope as a consequence of the traditional strict state regulation. In principle, all may deliver programs of any level and are engaged in research activities, though in practice there are relevant differences among institutions.

Spanish universities, among the oldest in the world, changed dramatically at the beginning of the nineteenth century adopting the Napoleonic model of higher education. Universities were organized as state agencies totally regulated by laws and norms issued by the state at the national level. Study programmes were identical in all institutions: they had the same curricula and there were no differences even in the syllabi. Universities had no specific budgets and expenditure was regulated by the state down to the smallest detail. This strictly regulated higher education system was also an elitist system whose main goal was to prepare the ruling group of the modern state, especially the civil servants. Consequently, Spanish universities had (and to some extent, still have) a strong professional orientation. The teaching process was focused on the transmission of skills essential to the development of professions, many of which were part of the state structure. Up to recently, this was the Spanish tradition. It is obvious that this system could not allow differentiation, competition or the necessary distinctiveness for some institutions to become *world-class universities*.

Over the last decades, Spain has experienced a period of profound change affecting its social and economic systems. The situation described above began to change during the 1970s, when the system started to shift from elite to mass higher education. Legal changes helped trigger a renovation of the higher education system. In 1983, the University Reform Act was passed, resulting in a profound transformation in the Spanish higher education system. The new Act formed the basis for emancipating higher education from the control of the state, as occurred in other European countries during this decade (Neave & Van Vught, 1991). Universities became autonomous entities and responsibility for universities was transferred to regional governments, institutions began to receive public appropriations as a lump sum, and private universities were allowed (Mora, 2006).

Consequently, 17 regional governments now have responsibility for universities financial and organizational matters. Nevertheless, the Napoleonic tradition of “national diplomas” and civil servant staff has remained, and the central government still has the capacity to establish general rules for curricula[1] and staff salaries or duties (across all public universities), and bears the responsibility of accrediting the study programs.

Another remarkable consequence of the LRU was the strong democratization of the internal structure of universities. The power over crucial decisions was transferred to collegiate bodies, where non-academic staff and students were present in a considerable number (roughly, one-third of the members). The University Senate had considerable power, including the election of the rector (president). Boards with large numbers of members made the decisions on faculties and departments and elected deans and heads of departments. On the other hand, the real influence of external stakeholders is minimal. In spite the changing reality, the idea of university as an ivory tower is still formally and legally present in the Spanish universities.

In the dawn of the new millennium, Spanish universities face a new operating environment, involving: a) a new legal framework, which was drawn up by the central government towards the end of 2001 and reformed in 2007; b) the agreement among all European governments for transforming the structure of higher education in European countries (the Bologna Declaration); and c) the decreasing number of students as a consequence of the dramatic decline in the nation’s birth rate. The new Act is not too innovative and do not change anything crucial but gives universities and autonomous regions more independence to organize themselves as they wish. This will facilitate some differentiation and improvement of those universities which fulfil two conditions: their heads must be interested in promoting change, and they must be located in an region whose leaders are also concerned about the competitiveness of their universities. While it is still too soon to comment on initial results, it can already be seen that some regions are doing more than others on this front.

Four unsolved conflicts in Spanish higher education

These relatively recent changes allowed universities to develop strategies for differentiation and for increasing quality and international visibility. Nevertheless, there are still difficulties to overcome. On the one hand, the legal framework, though it has improved the former situation, still has some links with the old bureaucratic model which do not facilitate a full transformation. On the other hand, traditions are still strong,

[1] A project of Royal decree, still not approved, will allow universities to define their own currícula with flexibility.

especially at faculty level, and implementing reforms breaking the traditional bureaucratic model is not always easy. We are going to point out four key aspects for understanding the difficulties that Spanish universities are facing.

Growth and low efficiency

The real growth of Spain's higher education system began in the early 1960s. Throughout that decade, the number of students doubled; it doubled again within the next 12 years and once again before 1995. During the mid-1990s, enrolment increases stopped abruptly, and in the last decade the number of students has stabilized at around 1.6 million. This stability is largely the consequence of the dramatic and continuous decrease in Spain's birth rate. While the number of students enrolled has stabilized, the participation rate in the higher education system has increased considerably. It can be estimated that roughly 60% of the nation's secondary education graduates are now entering higher education. The proportion of women among all higher education students is now holding steady at around 54%.

It is important to note that students spend considerably more time finishing their degree programs than formally required. This low percentage is explained by the high number of dropouts and students who falls behind in their studies. Several reasons can explain this situation. First, the lack of attractiveness of many study programmes with syllabus rather obsolete. Second, the scarce institutional incentives to attract and retain students (fees are small and public funding relatively stable). Third, the scarce incentives of students to finish because the low cost of their studies and the poor career perspectives[1].

Funding: scarce and unbalanced

In 1985, the total funding for higher education was only 0.54% of GDP, and in 2000 reached 1.2% of GDP, a figure relatively stable until now (OECD, 2006). However, while this represents an important increase in resources made available to the universities, there are special features that should be clarified to understand how this amount of money is distributed.

First, there is a relative importance placed on resources set aside to fund new infrastructure. During the 1990s, greater efforts were made to invest in the higher education system in order to solve one of its key problems: the shortage of buildings and equipment. As an example, in 2000, Spain assigned 20.6% of total spending to capital investment (compared to the OECD average of just 11.6%).

[1] Due to the fast increase in the number of graduates in the labour market, employment conditions of young graduates have worsened in the last years.

Second, most of the current expenditures in Spanish higher education institutions pay for staff. As mentioned previously, this is one aspect of expenditure which universities have little control over, since salaries are set by the central government and, to a lesser extent, by regional governments. This is an important characteristic because it means that only a small percentage of current resources are set aside for expenses other than staff—in particular, funds to purchase goods and services which allow universities to develop quality policies.

Third, the role of private sector funding for higher education increased during the 1990s. In 1991, approximately 20% of university funding came from the private sector; by 1999, this had increased to 25.8%. From a comparative perspective, it is important to mention that during this period of growth in Spain, private funding in other EU countries decreased. Whereas in 1995 the average private sector funding in EU countries was 15.6% of total expenditures, in 1999 this figure had fallen to 13.8%. Finally, an important (and controversial) feature of higher education funding in Spain involves the lack of resources set aside to provide financial aid to students. In 1999, only 0.08% of the GDP was allocated for student grant expenditures.

Academic Staff with an old fashioned status

The current structure of academic staff in Spain was also deeply shaped by the legal changes implemented during the 1980s (Mora, 2001). Their effects amounted to that of an earthquake shaking the traditional structure of Spanish universities. The hierarchical system, based on the individual power of the chair-holder, and the excessive influence of the national guild of chair-holders collapsed. The old academics claim that the profession has lost prestige and social recognition. This is probably true, but it is mostly due to the simple fact that the number of professors has grown enormously as a result of the move towards a mass higher education system.

Nevertheless, the LRU did not change the legal status of the academics. Academics in tenured positions (around 70% of the total) are still civil servants and members of national bodies. There is thus a deep contradiction between the status of academics and the autonomy of universities. Personnel matters are a perfect example of the conflicts that result from this dilemma. On one hand, the central government decides on general personnel policies (basic structure, workload, and salaries), while regional governments are responsible for financing universities and, indirectly, for the payroll in public universities.

Yet academics are mostly civil servants, with salaries and working conditions defined by the central government. In addition, universities can establish their own personnel policies, such as the number of staff in each category or the actual workload of personnel. In fact, decisions are made in universities by the staff through their collegiate boards. Eventually, decisions on staff numbers (made by universities) and decisions on salaries (made by the central government) have direct implications on the costs that regional governments must meet. It is obvious that such a complex, four-level structure of decision making on university personnel issues is inevitably a permanent source of conflict and discord. Fortunately, though these conflicts are permanent, they are less virulent than one may expect of such a potentially conflictive structure. As expected, the recently enacted Higher Education Act has maintained the same civil servant structure, although it allows regional governments to create new positions for professors without civil servant status.

University Governance: the real challenge

As mentioned earlier, a consequence of the 1983 Higher Education Act was the strong democratization of the internal structure of universities. At that moment, after leaving behind nearly a half-century of political dictatorship, those developments were considered a positive and necessary move for everybody. In terms of governance, the main responsibility for managing institutions lies among the academics. Although some institutions hire professional managers for some managerial positions, they are always in dependent positions, while most of the decision-making power lies in the hands of academics who are temporarily occupying a managerial post. Unfortunately, there is no evidence that academics have enough knowledge or training to be effective as university managers.

On the contrary, in general they have no experience in the management of any type of big organization. The results are normally far from being a model of good practice. The move from direct state intervention to institutional autonomy should be accompanied by other mechanisms, such as competitiveness (for students, staff, funds and reputation), diversification of resources, and increasing client power and social responsibility of institutions. These trends have not been sufficiently followed in Spanish universities for several reasons, including: (a) the lack of a tradition of serving the community—coming from a bureaucratic model, universities and staff (mostly civil servants) consider themselves more as belonging to a branch of the public administration than as part of an institution at the service of the community; and (b) the lack of governmental policies on higher education—regional governments, with few exceptions, have not been able to define policies for higher education, establish goals for public institutions, or require universities to achieve some objectives.

By the end of the 1990s, all academic analysts and political parties were aware of the need for changes in the legal structure of higher education, in the sense of introducing a more professional governance style. Nevertheless, the new Higher Education Act made only slight changes in the legal structure of universities, as we mentioned before. Although these were not major changes, they were not at all well received by most university and student leaders, who considered these measures to be an attack on university autonomy and university democracy. However, the act altered such minor aspects of the system, and the reforms had such a lack of ambition, hat it did not attract the support of those parties most interested in change. The act was eventually passed, but all the experts agree that it does not reach far enough. The overall impression is that it will make very little difference to the Spanish higher education system.

The Regional Context

The Valencian Region is one of 17 autonomous regions which make up Spain. The Valencian Region is situated in the east of Spain. The region forms a strip with some 400 km of Mediterranean coastline and extends approximately 60km inland. The region of Valencia has 4.5M inhabitants with a growing tendency due to migration (retired people, mostly from northern European countries, and workers form other countries). Its GDP per capita is close to the national average and to the EU (27) average.

The region has a young population comparatively well educated. The proportion of the population aged between 25 and 34 with higher education qualifications in the Valencian Region is higher than 30%. This is slightly higher than the figure for all OECD countries (29% in 2002). This is a consequence of the positive development in the last years. The figures for the older population are not so positive.

In 1995, internal expenditure on R+D in the region was 0.50% of GDP and in 2003, the figure was 0.87%, which represents an increase of 73% during this period compared to the 36% increase in the national average. Despite this significant increase the figure is low compared with other developed regions in the world. It is worth noting that companies in the Valencian Region invested relatively little. In 1995, their share of the region’s expenditure on R+D was only 30% and in 2003, the figure was 35%. The largest part of expenditure on R+D in the region was still undertaken by universities and in 2003, this represented 53% of total investment in R+D. Nevertheless, the business world displayed a more positive attitude towards innovation in the Valencian Region than in the rest of the country. In fact, the number of innovative companies in the Valencian Region represented 12.3% of the total number in Spain, 1.6 points higher than the proportion of all Valencian businesses in the national total.

Valencian industry is characterised by the concentration of its activities in certain areas and sectors, by the large number of small and medium-sized companies and by the importance of exports. The industrial sector is based on labour-intensive industrial sub-sectors which are mainly involved in the production of intermediate and final consumer goods. Very few companies are involved in knowledge-intensive sectors. High-technology companies only generate 8% of industrial net added value, whereas low-technology companies generate 65%.

The Generalitat Valenciana (Autonomous Government of the Region of Valencia) is responsible for funding the five public universities (by means of direct subsidies and by regulating the price of student tuition fees), endorsing new degree programmes and universities and it is responsible for some issues related to non-civil servant teaching staff. There are also two private universities.

The government of the Region of Valencia, responsible for funding public universities, was the first regional government to introduce a funding model for public universities in the early 90's. The model was a means of clearly stating the objectives of Valencian universities and of linking part of their funding to objectives and performance. The funding model includes 15 objectives measured using 31 indicators. The amount of funding related to these objectives is 10% of total funding. Each university is allowed to select the more convenient specific set of indicators depending on its objectives or its real situation in regard to the indicators.

Reacting to the Context

As it can be appreciated, the Spanish legal framework is not the best for developing distinctiveness. The heavy governance model, the rigid labour status of staff, and the lack of markets mechanisms do not facilitate competition and consequently a continuous attitude of improvement. Nevertheless, legal framework is flexible enough to allow more dynamic institutions, with vision and better leadership to develop strategies for transforming themselves from traditional organisations in high level universities, placing them in the track of becoming *world-class universities*. On the other hand, the social and economic context of the country and the region is not the best for flourishing high level research universities. Neither the Spanish economy nor the regional one are in the cutting edge of the knowledge society. Nevertheless, there is an increasing feeling, especially in universities, that the global needs of the knowledge economy impel universities to play an increasing role at global level.

Universities are increasingly becoming more responsive to social and economic demands. They are transforming their structures in order to be more flexible and faster in responding to these demands. What happens when institutions as a whole cannot be competitive at a global scale because the legal frameworks are too restrictive, the external conditions are not the most favourable or just because the traditions do not encourage entrepreneurialism? When circumstances, legal or economic, do not allow universities a better adaptation to the new demands, the most dynamic institutions are able to find shortcuts. Universities may respond to these situations in at least two, sometimes complementary, ways (Mora and Vieira, in press):

- *Entrepreneurialism through satellites*. Universities with a very traditional core, without a favourable legal framework for entrepreneurialism but with a strong potential (due to its specific approach, its research capacity, and so on) can adopt the solution of not changing the institutional core (because it's legally or culturally difficult, even impossible at the short term) but creating satellites around the university which can adopt an entrepreneurial behaviour.
- *Entrepreneurialism through individuals*. Another alternative that non-entrepreneurial universities adopt when they have the potential in some individuals is developing individual entrepreneurialism. This behaviour (that also can be found mixed with the model of satellite entrepreneurialism) requires individuals who have the capacity to undertake entrepreneurial activities to be granted some level of freedom from the institution.

Some Spanish universities are taking the lead in this deep transformation from a traditional model into a new model. Only few of them are conscious of the relevance of becoming a *world-class university*. These few universities are striving for taking advantage of the possibilities given by the legal framework and the great opportunities given by the socio-economic environment for defining internal strategies in order to transform their role at global level. As we will show in the paper, the VUT in one of the few Spanish universities which is developing a general strategy for taking advantage of the external developments in order to become a *world-class university*.

The VUT Institutional Response

The VUT is a relatively young university founded in 1972 although some schools more than 100 years old. The VUT has 36,000 students (of them, 2,200 doctoral students), 2,700 academic staff and 2,100 non-academic staff. The VUT is constituted by 13 schools covering all fields of Engineering and Architecture.

In addition, it has a Business School and the very old Valencia School of Fine Arts, which incorporated this university few years ago. The main campus is in the city of Valencia and it has two smaller campuses in two towns of the region.

The VUT is a research and technology oriented university with a clear vision about developing external links. It can be summarised as follows:

1. Active co-operation with the social and economic environment.
2. Support for individual and team autonomy to obtain external funds.
3. Support for graduate employment in the shortest period of time.
4. Support for the transfer of research outcomes.

This vision is the seed of a very dynamic institution where members are striving for developing high quality research (in some fields, real world-class research), while also transferring knowledge for the economic development of the region, the country and other areas where the VUT is present.

The VUT has developed several strategies for adapting its vision to the limits imposed by the context (restrictive legal framework, low-technology economic environment, etc). Most of them have been very successful and they are the tools which are putting the VUT in the track of *world-class universities*. It is relevant to present and to analyze these strategies because they could be an interesting example of how universities, in spite of not being in the best or easiest environment, can adopt successful strategies for becoming high level institutions.

Using the working scheme motioned above, we can divide these strategies in two groups: strategies based on "satellites" and strategies based on "individual incentives". This situation was clearly described in a report based on interviews made to key actors in the university (Mora, 2007). One of the interviewed stated: "*It could be said that the VUT is not an entrepreneurial institution (this is, in fact, true of any Spanish university). However, it is full of entrepreneurs who are relatively free to work as they wish within the VUT. They have been helped by the creation of independent satellite centres which have become the driving force behind entrepreneurial activity at the VUT, yet the institution's core, and to a great extent, the university's formal teaching methods, are still highly conventional. This is a clear case of "institutional schizophrenia" i.e. the two live together in harmony as long as there are no clashes between the two cultures. This balance has been maintained up until now thanks to the leadership of the rector".*

At individual level, the university has created a system of incentives to promote research activities. All universities in the region have benefit from the performance related funding described above, but the VUT has designed internal procedures for maximising performance and consequently public funding. These efforts have contributed to an increasing list of scientific publications, a growing number of patents, a proliferation of a variety of university-company relationships including spin-offs, offices for technology transfer and science and technology parks. Such channels of collaboration are acquiring growing importance due to the policy of both university and the government to support such activities.

At institutional level, some examples of the strategies developed for the VUT for becoming a high level university are the following:

Internationalization: The VUT has campuses in Colombia (Corporación COINNOVAR), Argentina (Centro de Capacitación Técnica), México (Centro Universitario de Vinculación con el Entorno), Cuba (Centro de Estudios de Tecnologías Avanzadas) and Uruguay (Fundación para el Desarrollo del Cono Sur). The VUT also carries out postgraduate programmes in Brazil, Chile, Venezuela, Costa Rica, Nicaragua, Jordan and Honduras.

As a consequence of a very active policy for attracting students, especially postgraduate students, the number of international students in the VUT are 2,200, and around 500 are doctoral students.

Research and Innovation: This is probably the most important strategy for becoming VUT a *world-class university*. As we mentioned, the context is not the easiest environment for developing research university with strong links with the region. Nevertheless, the VUT has defined internal strategies in the last years in order to support regional development, developing technology transfer and becoming an engine for regional development.

The research capacities of VUT and the facilities for applying research in technology and innovation are channelled through:

- ***Research Institutes***: They are highly valued centres devoted to artistic, technical or scientific research. Some of them are joint research institutes created in co-operation with other private or public organisations. 35 research institutes are currently operative.
- ***The Scientific Park***: The VUT has recently created its scientific park “City of Innovation” (CPI) whose main objective is the promotion of research and innovation. The CPI has more than 20 institutes and 1,500 researchers working in strong cooperation with enterprises. The work developed by these institutes takes shelter fundamentally in five great areas: industrial and power

technologies; information and communication technologies; civil engineering; agro-alimentary technology; biotechnology; processes and chemical agents. In order to facilitate the applied approach, the CPI is going to lodge the Centre for Development of Innovative Enterprises (CEDIT) that will offer buildings to companies for the development of innovation activities in collaboration with VUT institutes and researchers. The VUT Scientific Park is a powerful instrument for developing the relationships with enterprises and for shifting the traditional regional economy based on low-added-value companies.

- ***INNOVA Foundation***: It was designed to promote university technology. This programme considers the research groups themselves to be the promotional agents and funds specific activities designed to promote the technology they offer and to finance the involvement of technological promoters. INNOVA is a partnership between the VUT, the Business Association of Valencia and the regional government.
- ***Technological Transfer*****:** The VUT has promoted its role as an active player in Valencian innovation, hence fostering cultural change in the university. Two key objectives of this policy have concentrated on encouraging technological research and improving relations with industry. The Centre for Innovation, Research and Technology Transfer provides support to successfully carry out R&D projects. It facilitates and channels the development and transfer of knowledge into industries and businesses.

As a consequence of the strong research activity, the VUT obtained last year 46 M€ (from a total budget of 350M€) from competitive research funds and contracts with enterprises. This amount is the fourth highest among Spanish universities.

Continuing Education Centre (CFP): The VUT created the Continuing Education Centre to support and manage lifelong learning courses. The CFP offers over 1,600 courses (from few days to one year long) from a wide range of areas with high demand by the labour market. The total number of enrolled students reached 45,000 last year. A relevant difference between these courses and the regular ones delivered in the university is the cost: while in regular degrees, students pay only a portion of the real cost of the courses (around 1,000 euro), in the case of courses delivered by the CFP student fees account for the total cost (several thousand euro in some cases). As a consequence this centre provides 8.5 M€ to the university budget. The CFP has a strong international orientation and it is delivering courses in many countries, especially in

Latin America.

Entrepreneurial support: IDEAS (Institute for the Creation and Development of Enterprises) is a free programme designed by VUT to support all the entrepreneurial initiatives that emerge from the University. The IDEAS Initiative supports business opportunities: Information on legal forms, subsidies, business schemes, search for partners, management training, etc.

Employment Service (SIE): The SIE's aim is to contribute towards the integration of VUT graduates into the labour market. To do so, it promotes internships in public and private enterprises; it gives students advice and offers them bonus training, and it manages employment offers and demands for graduates. In addition, the SIE carries out studies on integration of VUT graduates into the workforce.

References

Altbach. P. (2003). The Costs and Benefits of World-Class Universities, *International Higher Education,* Fall 2003

Mora, J. G. (2007). *Report on the UPV. Project EUEREK: European Universities for Entrepreneurship: their Role in the Europe of Knowledge.* www.euerek.info.

Mora, J. G. (2006). Spain. En P. Altbach and J. Forest (eds.), *International Handbook of Higher Education,* Springer. Pp. 995-1003.

Mora, J. G. (2001). The academic profession in Spain: Between the civil service and the market. *Higher Education*, 41(1/2), 131–155.

Mora, J. G. & M. J. Vieira (in press). Governance and entrepreneurialism in European Universities. In M. Shattock (ed.), *The Entrepreneurial Universities in the Knowledge Society*, IIPE-UNESCO.

Neave, G. and van Vught, F. (1991). *Prometheus Bound.* Oxford: Pergamon.

OCDE (2006). *Education at a Glance*. Paris: OECD.

A Step Toward a World-Class Research University: Seoul National University

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Abstract

This article describes background information on definitions of world-class research universities and attempts to provide a general idea of world-class research university. Based on this definition, I take Seoul National University (SNU), Korea as a case study and illustrate its efforts in establishing itself as a world-class research university since 1990. This article also describes the government funding and policy support provided for SNU. Through the support of the government's BK 21 Project, SNU has rapidly increased its global standing.

A Step toward a World-class Research University: Seoul National University

Introduction

Knowledge production and dissemination must spread internationally and all regions of the world need a role in that knowledge network (Altbach 1987). As Korea continuously develops, an emphasis on knowledge is becoming more and more important. By the late 1990s, the Korean economy faced serious difficulties, due mainly to the foreign exchange crisis. As a result, the Korean economic model "Development Dictatorship," broke up. After the economic crisis the government adopted a neo-liberalism policy which had the result of further weakening economic growth and also polarizing classes (Kim Hyung Gi 2006). Consequently, the Korean government proposed as one of its major policy goals a shift to a knowledge-based economy. This shift requires Korea to keep pace with knowledge innovation and development, and one of the most important elements in this endeavour is Korean educational reforms.

Korea instituted a series of educational reform policies to prepare itself to step into a knowledge-based society. Due to large growth in the economy and an increase in student enrollment, Korean higher education could not accommodate all students. As a result, the Korean government faced local, regional, and global competitive pressure on its higher education system. The Korean government has therefore planned to foster world-class research universities through focusing on a few select research universities, while at the same time fostering students in teaching oriented universities and colleges.

Under these circumstances, the government project, Brain Korea 21 (BK 21), which focuses on the building of world-class research universities, has become a core plan in Korean economic development and also a national priority in the face of global competition. The "2007 World University President Forum" held at Seoul National University (SNU) entitled "Seoul Declaration on the Future of the Global Research University" set the direction of 21st century world-class research universities. Following this, SNU is endeavouring to establish itself as a world-class research university. This paper explores the definition of a world-class research university, and takes SNU as a case study to demonstrate the hardships and successes in preparing for the building of a world-class research university through support of the national strategy of South Korea, a small middle income country with a population of 48 million.

What is a world-class research university?

There has been much research and debate on exact standards, rankings, and definitions of world-class universities. However, as of yet, a clear theory or practical standard has not been agreed upon. Generally speaking, when people ask the question what is a world-class research university, answers will invariably include Harvard, Oxford, Berkeley, and Stanford. However, if one were to further question how or why those institutions became world-class universities or were evaluated as such, the responses will not be so clear.

The American Heritage Book of English Usage (1996) describes “World-Class” as being originally used to describe athletes capable of performing at an international level of competition. Since then, the term has been extended to represent an international standard of excellence and has been applied to a wide variety of categories. From the view of the global higher education system, Jan Sadlak and Liu Nian Cai (2007) explain that “World-class” can also be considered “top-tier,” “top-ranked,” “elite,” “leading,” “world-renown,” or “world-acclaimed.” In general, world class is a shorthand way of indicating that a university is among the most prestigious in the world—renowned among academic institutions internationally (Altbach 2003).

Christopher C. Morphew (2007) states that research universities are postsecondary institutions that devote a large portion of their mission, resources, and focus to graduate education and research. Kerr (2001) also explains that a research university educates, usually at all degree levels – an indication the focus extends beyond research. Indeed, this synergy of research and teaching is a hallmark of these institutions, which employ mainly full-time academics who hold doctoral degrees. The Carnegie Foundation placed research universities in one of two categories, research universities I and Research Universities II. Research universities were placed within these two categories depending upon the number of doctorate degrees they awarded and the amount of federal research funding they received. Research universities are defined here as academic institutions committed to the creation and dissemination of knowledge in a range of disciplines and fields, featuring the appropriate laboratories, libraries, and other infrastructure to permit teaching and research at the highest possible level (Research University 2007).

The Economist (2005) argues that the most significant development in higher education is the emergence of a super-league of global universities. We should consider the quality and strategies one might expect to find in a university that is widely recognized as world-class. In an Olympic Games analogy, universities are likened to decathlon athletes competing in many different events over an extended period (Sadlak and Liu 2007). The Olympic Games analogy is an appropriate analogy as it refers back to the original association of the word "world-class" as used to describe athletes performing at an international level and at the same time refers to an international standard of excellence.

Through this understanding of a world-class research university, we now need understand why countries are looking toward establishing world-class universities. First, while there may not be an agreed-upon standard of what a world-class university entails or what it is, the establishment of a world-class research university can at least allow countries to stand within and become part of a particular set of values that identify a world-class university as something valuable throughout the world. The establishment of a world-class university provides the possibility of being associated with a particular level of development in global education and competition. Establishing a world-class research university brings along with it many advantages, namely direct access to quality resources and it can have a strong impact on global society. Second, socially and economically, the establishment of a world-class research university can help foster global leaders and global talent. Policymakers, stakeholders, and academic leaders, whom universities rely upon for investment, leadership, and for enhancing global competitive power, know where they stand and know where to find the best minds, the best working conditions, and the best and most innovative ideas. Third, from the view of culture, world-class research universities can continuously generate knowledge and record achievements and inspire younger generations of students, future teachers, and researchers to aim for higher levels of accomplishment.

How far to go to a world-class research university, SNU

Upon entering the 21st century, scientific and technological advancements, engineering developments and fostering innovative talents have, more so than that of any other period in Korean history, become national pursuits. In this development process, SNU, strongly supported by the government, has played a significant role. In 2006, SNU employed 1,924 faculty members and 416 administrators and 47 foreign faculty members. Of the foreign faculty, 16 are from USA, 7 from Germany, and 5 from Canada and other developed countries. Undergraduate students number 19,812 and graduate students 10,311. Although the institution has a short history of only 60 years, 30 years of full-fledged doctoral programs, SNU's accomplishments are deemed extraordinary in Korea. However, becoming a world-class research university requires a strong global performance, which, of course, means playing the global Olympic ranking game.

The ranking process involves and includes many aspects, namely: data gathering, evaluation, and production of strategic indicators, peer review, benchmarking, and the act of ranking itself (Vlasceanu, Grunberg, and Parlea 2004).

SNU was ranked 45th among the world's top 100 science universities by the Times Higher Education Supplement (THES 2005). In 2007, as is shown in table 1, SNU ranked 1st in South Korea and between 19-24th in regional rankings - Asia Pacific (ARWU 2007). Regionally, SNU is ranked highly, within almost the top 20. This shows that SNU has a high possibility of entering global competition markets.

Table 1 Regional Rank and SNU

Regional Rank	Institution	World Rank	Country	National Rank
1	Tokyo Univ	20	Japan	1
2	Kyoto Univ	22	Japan	2
3	Australian Natl Univ	57	Australia	1
4	Hebrew Univ Jerusalem	64	Israel	1
5	Osaka Univ	67	Japan	3
6	Tohoku Univ	76	Japan	4
7	Univ Melbourne	79	Australia	2
8	Nagoya Univ	94	Japan	5
9	Tokyo Inst Tech	99	Japan	6
10-18	Hokkaido Univ	102-150	Japan	7
10-18	Natl Univ Singapore	102-150	Singapore	1
10-18	Technion Israel Inst Tech	102-150	Israel	2
10-18	Tel Aviv Univ	102-150	Israel	2
10-18	Tsukuba Univ	102-150	Japan	7
10-18	Univ Queensland	102-150	Australia	3
19-24	**Seoul Natl Univ**	**151-202**	**South Korea**	**1**

Generally, world-class research universities are located in developed countries, and also move along lines of strong global power. Cheng Ying and Liu Nian Cai have divided World-class Research Universities into three levels: top 20 universities of the world called "World-Top Universities," the top 21-100 are referred to as "world-class universities," and the top 101-200 as "world-famous universities" (Sadlark & Liu, 2007).

It is very difficult to enter in at the world-top university level; furthermore it may not even be a possibility for SNU yet. At present, SNU is ranked at the world-famous university level, and time will prove if SNU can maintain this ranking. However, at least ranking among the second level of world-class universities (the top 21-100) it has the potential to become a world-class university. While this is not an easy task, it is a possible one.

ARWU is focused on the research dimension of universities and, their rankings are based on 4 factors, namely Quality of Education, Quality of Faculty, Research Output, and Size of Institution (ARWU 2007). Its indicators (Alumni, Award, HiCi, N&S SCI, and Size) have brought about various challenges to most universities as they strive to attain these point indicators. In terms of world-class ranking (See Table 2), SNU ranked between 151st -202nd (ARWU 2007).

Table 2 World Class Rank and SNU

World Rank	Institution	Region	Score on Alumni	Score on Award	Score on HiCi	Score on N&S	Score on SCI	Score on Size	Total Score
1	Harvard Univ	USA	100	100	100	100	100	73	100
2	Stanford Univ	USA	42	78.7	86.1	69.6	70.3	65.7	73.7
50	Univ Southern California	USA	0	26.8	37.1	23.4	52.7	25.9	31.4
51	Univ Florida	USA	21.2	0	37.1	24.8	65.5	26.5	31.1
52	Univ Paris 11	USA	31.3	39.1	14.8	20.4	44.8	30.8	30.9
53	Karolinska Inst Stockholm	USA	28.8	27.3	32.3	16.6	47	24.5	30.8
87	Univ Goettingen	USA	36.3	20	14.8	16.3	39.7	25.2	25.0
90	Indiana Univ - Bloomington	USA	13.2	17.9	27.7	20	39.9	18	24.9
91	Texas A&M Univ - Coll Station	USA	0	0	33.1	23.6	53.7	20.3	24.8
97	Univ Iowa	USA	0	0	34	22.2	49.6	21.1	23.9
99	Tokyo Inst Tech	Asia/Pac	15.6	0	22.2	23.9	46.9	30.4	23.8
99	Univ Bonn	Europe	18.6	20	14.8	16.9	42.6	24.2	23.8
102-150	Univ Ghent	Europe	8.3	15.5	14.8	8.6	49.3	27.4	
151-202	Seoul Natl Univ	Asia/Pac	0	0	7.4	13.5	61.4	18.4	

Table 2 shows that most of the top 100 world-class universities have 6 indicators; however, SNU's current situation shows that there are two 0 point indicators under Alumni of an institution winning Nobel Prizes and Fields Medal and Staff of an institution winning Nobel Prizes and Fields Medal. As SNU has not attained researchers or professors at this level of renown, they need to work to solve these problems. SNU's SCI score is very high at 61, which shows that the current faculty members have published articles in numerous journals. Research output, especially articles published in the Science Citation Index-Expanded and Social Science Citation Index can earn very high points and, as a result, universities can almost approach top world-class ranking level. SCI is a much easier indicator to increase scores in world ranking, but if SNU wants to increase its over all score in the ARWU, they must consider how to raise the levels of the 0 point indicators.

Entering the ranks of the World-Top research universities is very difficult and may even be thought of as impossible. However, through financial and policy support of the Korean government SNU is on its way to becoming a world-class university.

Looking forward to establishing world-class university: SNU

In our 21st century knowledge-based society, university competitive power is an important element of a nation's global agenda. Moreover establishing a world-class research university is multifaceted plan in East Asian countries, such as Korea, China, and Japan. The Japanese government has provided competitive funds to establish "centers of excellence" and has selected 274 research units and provided them with 5 years of special funds (Yonezawa 2003). In China, the "211 Project" and "985 Project" have also supported national key universities and provided funds for the building of research universities internationally and domestically. Likewise, a major strategy of the Korean government is to provide research oriented universities with the resources needed to become comprehensive world-class research universities or single discipline world class research universities. This plan is called 'Brain Korea 21 (BK 21) which has seriously invested funds in the effort to support research universities at a global level, especially in SNU, which is working toward fostering competitive power globally and nationally.

In 1999, the Korean Ministry of Education (MoE) introduced its "5 year Education Development Plan for Establishing an Innovative Knowledge Based Nation" with the aim of structural reform, fostering research universities, and characterising universities in terms of strengths of disciplines. BK 21 is the largest scale project in this plan promised to support science and technology, social science, and supporting facilities for graduate schools As a research oriented university, SNU, selected by the government, was given the strongest support through this plan.. However, as a result of conflict between academism and capitalism among SNU's social science faculty, the social science faculty did not take part in the BK 21 project. The main reason was evaluation by numbers of articles and infringement of university autonomy. In other words, it was an opposition between government (market economic applications) and academics (traditional academism). Despite the conflict during that period, SNU focused on creating stronger graduate schools. SNU subsequently developed a comprehensive studies plan in 2000 and has since endeavoured to establish itself as a world-class research university.

As is shown in Table 3, SNU's academic research funding is supported by MoE & HRD (Ministry of Education & Human Resources Development), KRF (Korea Research Foundation), KS&TF (Korea Science & Technology Foundation), MoST (Ministry of Science and Technology) and other government departments. On average, about 95% of all academic research funding in SNU has come from the government.

Table 3 Main funding support situation (1999-2005)

YEAR	MoE & HRD, KRF	KS&TF MoST	Other government departments	Others Foundations (University itself)	Total
1990	2,980	3,786	6,892	920	14,578
1995	10,170	13,654	12,050	7,007	42,880
2000	48,026	34,238	35,269	9,094	126,627
2005	67,701	82,101	100,891	8,160	258,853

Resource: Ministry of Education & Human Resources Development pp.665 (Amounts in 1 Million Won)

BK 21 Project adapted "Selection and Concentration" in Korean higher education reform and produced good achievements in increasing research power of graduate schools and creating a competitive research environment. The vision of BK 21 is developing high quality human resources through establishing world-class research universities. Therefore, from 1999 to 2005, the government invested a total 1.34 trillion (Won) through the BK 21 Project. This project has mostly contributed to support graduate student researchers, post doctorates, and contract faculties etc. Through this project the publishing of articles was promoted, and, as a result, Korean national ranking placed 18th in SCI in 1999, and increased to

13th place in 2004. SNU also jumped to 31st place from 93rd place. In 2006, SNU faculty members published on average 13.20 articles. Table 4 shows government supported funding through the BK 21 Project.

Table 4   BK 21 funding support (1999-2004) (Amounts in 1 million Won)

	1999	2000	2001	2002	2003	2004	Total
Science & Technology	21,081	34,978	35,677	29,067	31,428	31,428	183,659
Social Science	759	2,387	2,377	1,908	886	886	9,203
Facilities	50,000	50,000	20,000	5,000	10,000	20,000	155,000
Total	71,840	87,365	58,054	35,975	42,314	52,314	347,862

Resource: Li, T.Z. (2006) *Seoul National University Since 1949.* Korea: Korean University Press, pp.666

Through these efforts and support over the last decade SNU has rapidly improved its international ranking score. In 1996, SNU was placed in 800th place, but in 2007 was ranked between 151st -202nd as a world-famous university by ARWU.

Recently, along with SNU's increase in global standing, international academic communication has also increased. First, between 1987 and 2002, SNU entered into cooperative relationships with 55 universities in 19 foreign countries; however, in 2006, the number of its cooperative relationships increased to 102 universities in 32 countries. As we can see, viewed by outside indicators SNU has already reached the level of a world-famous university; however, there are still challenges to be faced on its way to becoming a world-class university. Among the most important elements are the need to strengthen academic autonomy, independent research authority, and international communication and cooperation.

Conclusion

Altbach (2003) points out several important conditions that a world-class university requires—including excellence in research by top-quality scholars, institutional autonomy, academic freedom, adequate facilities for academic work, and long-term public funding. The main strategy to enhance SNU to the level of world-class is to empathetically pursue excellence in research, the first of five conditions identified by Altbach (Sadlark & Liu, 2006).

Participation in the global community of world-class universities as a competitive partner requires an enormous determination, tremendous effort, and plethora of resources (Li, 2006). Establishing a world-class university is an aim of Korea, and it needs a strong national strategy of university development. Presently SNU is ranked as a world-famous university and SNU cannot at this time leave government investment and support. In establishing itself as a research oriented world-class university, SNU is trying hard to establish quality academic achievement. SNU has recognized that the development of a world-class university cannot be realized without continuous international communication and global competition.

This article illustrated Seoul National University as a case study and showed how important government support is in the journey to becoming a world-class research university. SNU it is a good potential reference for other middle income and developing countries on the way to establishing world-class universities.

References

Altbach P. G. (1987). The knowledge context: Comparative perspectives on the distribution of knowledge. Albany: State University of New York Press.

Altbach P. G. (2003). The costs and benefits of world-class universities. International Higher Education, no. 33: 5-9.

The American Heritage Book of English Usage (1996). A Practical and Authoritative.Guide to Contemporary English.1996. Retrieved 1 October 2007 from http://www.bartleby.com/64/C003/0306.html

ARWU (2005). Academic Ranking of World University 2007, Shanghai Institute of Higher. Education, Shanghai Jiao Tong University, Retrieved 1 October 2007. http://ed.sjtu.edu.cn/ranking.htm

ARWU (2007). Academic Ranking of World University 2007, Shanghai Institute of Higher. Education, Shanghai Jiao Tong University, Retrieved 1 October 2007 http://www.arwu.org/field/2007FIELD_Full_List.xls

Christopher C. Morphew (2007). Concept of Research University. WikiAnswers Q&A community. Retrieved at 1 October 2007 from. http://www.answers.com/topic/research-universities

Faust, D. (2007). Harvard Presidential Announcement, Remarks by President-Elect Drew G. Faust, February 11, 2007. Retrieved 1 August 2007 from http://www.news.harvard.edu/gazette/2007/02.15/99-statement.html

Herald Media (2007). Educational competitive power just catch up National competitive power (교육 경쟁력, 이제야 국가 경쟁력 따라잡았다) Retrieved 1 October 2007 from http://www.heraldbiz.com/site/data/html_dir/2007/05/10/200705100175.asp

Kerr, C. (2001). The uses of the university, Cambridge, MA: Harvard University Press

Kim, H. G. (2006). Korean Economy: The 3rd Path (한국 경제: 제 3의 길), Hanul Academy

Lee, K. S. (2005). National Briping (applied date: 2005. 20 April). (국정브리핑 취재 : 이건순 등록일: 2005.04.20)

Li, T.Z. (2006) *Seoul National University Since 1949.* Korea: Korean University Press.

Marginson, S. and van der Wende, M. (2006). To rank or to be ranked: the impact of global rankings in higher education, University of Twente, Netherlands, 1-16. Retrieved 26 June 2007 from http://www.griffith.edu.au/conference/university-rankings/content-papers.html

Marginson, S. (2007). Global university comparisons: the second stage. Presented to the Conference on International Trends in University Rankings and Classifications, Griffith University, 12 February 2007.

Proulx, R. (2007) ‘Criteria for Ranking Universities with Affiliated Components’ (pp. 168). From Jan Sadlak and Liu Nian Cai. (Eds.) (2007) The World-Class University and Ranking: Aiming beyond Status. UNESCO-CEPS (English version),

Research University (n.d.) Retrieved August 25, 2007, from http://en.wikipedia.org/wiki/Research_I_university

Sadlak, J. and Liu, N. C. (Eds.) (2007) The World-Class University and Ranking: Aiming beyond Status. UNESCO-CEPS (English version), pp.17

Seizing the Opportunities (2007). A Group of Eight Discussion Paper, 6 June 2007, 1-69. Retrieved 7 June 2007 from http://www.go8.edu.au/policy/current.htm

The economist (2005). The Brains Business: A Survey of Higher Education, The Economist, 10 September.

UNESCO (2000). Higher Education in Developing Countries: Peril and Promise, World Task Force on Higher Education and Society, World Education Report 2000

University of Adelaide (2006). University of Adelaide Future Directions Strategic Plan 2007-2011. Available at http://www.adelaide.edu.au/policies/34/

Vlasceanu, L., Grunberg, L., and Parlea D.. (Eds) (2004). Quality Assurance and Accreditation: A Glossary of Basic Terms and Definitions, Higher Education. Bucharest: UNESCO-CEPES. Retrieved 15 October 2006. http://www.cepes.ro/publications/default.htm

Yonezawa, A. (2003). Making “World-class Universities” Japan’s Experiment, Higher Education Policy and Management, pp. 9-23

Implications of World University Rankings for National and Institutional Research Strategy of Small Developed Nations

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> *"Small economies such as Singapore, Australia and Switzerland can't compete with giant economies. In the global economy, small means you have to be focused and nimble, find a niche and work with partners."*
>
> Professor Shih Choon Fong (2007)
>
> **President, National University of Singapore**

Abstract

This paper builds upon recent work by Marginson (2007) on the implications university rankings for Australia and that of Salmi and Saroyan (2007) on the use and misuse of league tables as policy instruments. It focuses attention on the implications of world university rankings for research policy and strategy of small nations and their universities. The paper highlights the potential for rankings to be used constructively by governments to "stimulate a culture of quality" and by institutions "for strategic planning and quality improvement purposes". (Salmi and Saroyan, 2007) It discusses the strategic policy options available for small nations and concludes that, unlike large nations, they have limited ability to improve the position of their universities at the 'elite' level but are well positioned to develop research strength deep within their university sectors. Appropriate policy options for small nations include those designed to concentrate research in identified areas of excellence, maximise their collaboration with major players, and enhance their capacity for innovation which often provides first mover advantage. The paper provides a number of strategic 'rules' for small nations and several recommendations for rankings agencies to improve their systems to become more responsive, not only to the characteristics of small nations but potentially institutions in the non-English speaking world, Muslim nations, and developing nations.

Introduction

This paper examines the implications of world university research rankings on national and institutional research strategy of small developed nations[1]. Small nations and their universities have a reputation for performing focused and innovative research, playing an important role in global knowledge production. When adjusted for size, their research performance often exceeds that of larger nations and institutions within.

The emergence of world university rankings however poses special challenges for institutions from small nations. They are rarely able to develop elite status – which for the purpose of this paper is defined as world top 20.[2] Leading institutions from small nations are prominently placed in the world top 100, but lack the size and budget necessary to propel them into the top 20.

The inability of smaller nations and their universities to develop elite institutions is not necessarily viewed within this paper as a shortcoming of the rankings or even an issue of serious concern. The purpose of this paper is to create a better understanding of the role of small nations and their universities within the global knowledge economy and to examine strategic alternatives for decision-makers from small nations to adapt to the reality of rankings.

Given its predominant focus on research indicators and availability of statistical details, the Shanghai Jiao Tong University (SJTU) Academic Ranking of World Universities (ARWU) 2007 has been chosen as the basis for analysis.

Why Focus on Small Developed Nations?

Small developed nations were chosen as the focus for this paper for several reasons:

- Much attention has been paid to the plight of institutions in the non-English speaking world, Muslim nations, and developing nations when aspiring to achieved ranked status;
- Institutions from small developed nations are unrepresented amongst the elite universities (i.e. top 20) and rarely feature in the top 50. The question of whether it is at all possible for these nations to

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1 Small developed nations selected for analysis in this paper are those with populations of <25 million, Gross Domestic Product (GDP) of <2.0% of world GDP and at least one university in the top 400 (SJTU ARWU 2007).

2 References to top 20, top 100 and so on throughout this paper refer to Shanghai Jiao Tong University (SJTU) Academic Ranking of World Universities (ARWU).

develop top 20 institutions requires testing;

- Universities and institutions from small developed nations perform very strongly in the world rankings when adjustments are made for size. They play a crucial role in the global knowledge economy as nimble and specialised research innovators.

This paper explores the effects and implications of world university rankings on national research strategy of small developed nations and their universities. Using the results from the 2007 version of the SJTU Academic Ranking of World Universities the paper examines whether nations such as Australia, Austria, Belgium, Denmark, Finland, Hungary, Ireland, Israel, the Netherlands, New Zealand, Norway, Singapore, Sweden, and Switzerland, have the means to develop at least one top 20 'elite' research university. What are the barriers to top 20 or top 100 aspirations and what are the alternatives when developing national research strategy and policy in response to, or to adapt to, international rankings?

Table 1, below, highlights the excellent performance of small developed nations in the SJTU rankings by ratio of share of top 500 universities to world share of Gross Domestics Product (GDP) – eight of the 14 small nations chosen for this analysis are placed within the top 10 in this revised ranking of nations.

Table 1 Nations ranked according to ratio of: share of universities in SJTU (2007) top 500 over % of world GDP for that nation (small nations highlighted)

Rank	**Nation**	**Universities represented in top 500**	**% of world GDP**	**Ratio top 500/GDP**
1	New Zealand	1.00%	0.20%	5.00
2	Israel	1.40%	0.30%	4.67
3	Sweden	2.20%	0.80%	2.75
4	China-Hong Kong	1.00%	0.40%	2.50
5	Finland	1.00%	0.40%	2.50
6	Australia	3.30%	1.60%	2.06
7	Austria	1.40%	0.70%	2.00
8	Hungary	0.40%	0.20%	2.00
9	Switzerland	1.60%	0.80%	2.00
10	Slovenia	0.20%	0.10%	2.00
11	Belgium	1.40%	0.80%	1.75
12	Netherlands	2.40%	1.40%	1.71
13	China-Taiwan	1.20%	0.70%	1.71
14	UK	8.30%	4.90%	1.69
15	Canada	4.30%	2.60%	1.65
16	South Africa	0.80%	0.50%	1.60
17	Germany	8.10%	6.00%	1.35
18	Denmark	0.80%	0.60%	1.33
19	Norway	0.80%	0.60%	1.33
20	Singapore	0.40%	0.30%	1.33
21	Chile	0.40%	0.30%	1.33
22	Ireland	0.60%	0.50%	1.20
23	USA	32.70%	27.40%	1.19
24	Italy	3.90%	3.80%	1.02
25	Egypt	0.20%	0.20%	1.00

Ninety-seven universities from the 14 selected small nations feature in the SJTU Academic Ranking of World Universities 2007. As a group, small nations are amongst the best performers on the SJTU index represented evenly in all clusters, yet only three of these universities make the top 50:

SJTU cluster	top 100	101-200	201-300	301-400	401-500	Total
No. universities (14 small nations)	18	23	21	17	18	97
% of Total (97)	18.5%	23.8%	21.7%	17.5%	18.5%	100%

While the even distribution suggests some homogeneity amongst small nations and possibly their research policies, research by Cheng and Liu (2006) reveals that while the universities in Australia, Belgium, Norway and Ireland exhibit a 'balanced' disciplinary orientation, those in the Netherlands, Sweden, Denmark, Austria, and Singapore tend to be more 'focused' in their disciplinary orientation. This research indicates that institutions from small nations can thrive equally well in the research rankings by either approach. Singapore's efforts to become a world power in biotechnology, South Korea's work in stem cell research, and Denmark's focus on high-end product design provide excellent examples of the focused approach. (Institute for the Future, 2007) In contrast, the balanced or comprehensive approach is well illustrated by Australia. With 17 universities represented in the top 500, 44% of its 39 universities, Australia has the characteristics of a balanced world-class university system.

The Scientific Wealth and Impact of Small Nations

Groundbreaking work on the topic of scientific wealth of nations was undertaken by Robert May from the UK Office of Science and Technology and published in *Science* in February 1997. May analysed papers and citations from 1981 to 1994 for 15 nations to establish the relative citation impact, RCI (citations divided by publications) which gives some measure of the quality of the average paper. In doing so he found that the smaller developed nations sampled outranked most of the G7 nations. Although the United States headed the RCI rankings, Switzerland followed closely in second position and Sweden in third. When RCI rankings were applied to 20 research fields, small nations led the rankings in 10 of the 20 fields and occupied 59 out of 100 top five positions. May pointed out that consideration of a country's share of the world's total papers or total citations alone tended to focus attention on larger countries. On measures of relative performance such as papers per person or citations per person, the smaller countries including Switzerland, Israel, Sweden, Denmark, Netherlands, Finland, New Zealand, Norway and Australia outranked all of the G7 apart from the UK and US. May also observed that while some larger nations produce outstanding basic research in dedicated national research institutes (e.g. the Max Planck and CNRS institutes) there was sufficient evidence to suggest that better value for money was obtained by performing basic research mostly in universities. He maintained that this had significant implications for the research policies of nations including Sweden and Australia both of which were growing their university sectors at that time.

A study by David King of the UK Office of Science and Technology, which extended the work of May, was published in *Nature* in July 2004. King set out to determine what different countries receive in return for their research spending by comparing the scientific wealth of 31 nations against their respective economic wealth (ratio of citations to all papers to the national GDP, expressed as a function of the national wealth intensity or GDP per person). King, like May seven years earlier, found that the small developed nations all performed strongly by this measure and pointed out the important role that small nations play in the global knowledge economy. He also alluded to the barriers that prevent smaller players from operating at the rarified upper end of the global environment such as the considerably higher salaries offered by leading universities in large economies.

The Competitive Disadvantage of Small Nations

The competitive disadvantage of small nations is illustrated by ranking universities on the main three SJTU indicators of research performance – SCI, N&S and HiCi. *Table 2* shows the five leading universities from the 97 universities sampled from the 14 small developed nations according to these three main indicators.

Table 2 World rank of leading five universities from small developed nations by three major SJTU research performance indicators

Science Citation Index University (world rank)	***Nature/Science* University (world rank)**	**HiCi researchers University (world rank)**
National University of Singapore (38)	Swiss Fed Inst Tech – ETH Zurich (26)	Australian National University (44)
University of Utrecht (41)	Weizmann Inst. Sci. (45)	Swiss Fed Inst Tech – ETH Zurich (46)
University of Sydney (45)	Australian National University (47)	Karolinska Institute (51)
University of Melbourne (46)	University of Utrecht (48)	University of Leiden (65)
University of Helsinki (58)	University of Zurich (53)	University of Utrecht (68)

Table 2 demonstrates that universities in small nations struggle in the bid to attract the leading academic talent (Highly Cited researchers) and are disadvantaged by the use of this indicator. While universities from small nations occupy 18 positions on the SJTU top 100, only 12 of their universities make the top 100 for the HiCi indicator. Institutions from small nations perform better in overall production of research output according to the Thomson ISI indexes and articles in *Nature* and *Science* and draw level with larger nations

for citations per publication. This indicates that small nations are at a competitive disadvantage in attracting the elite academic talent and that strategies and policies aimed at maximizing the production of high quality research outputs are likely to yield a better ‘bang for buck’ than those aimed at attracting elite researchers – which is not to say that there should not be national strategies and programs aimed at the latter.

The Policy Response to World University Rankings

The SJTU and other world and national rankings have proven extremely useful in prompting governments, policy-makers and institutions to evaluate their respective positions in the world of research. Rankings do however reinforce the divide between the elite, world-class, research intensive and teaching orientated universities. According to the World List of Universities and Other Institutions of Higher Education there are 9,760 university level institutions and 8,000 non-university level institutions of higher education. (International Association of Universities, 2006) The SJTU top 500 therefore comprises the top five per cent of world universities and the top three per cent of all higher education institutions. “World university rankings promote worldwide competition for high performing scholars introducing price effects and superimposing an international layer of competition above the national level.” (Marginson, 2007, p.15)

Germany and China are focusing efforts on creating elite universities with the capability to match the outcomes of ‘world-class’ institutions. Germany, for instance, has recently committed €1.9 Billion to develop 10 elite universities – a German version of the Ivy League. (The Chronicle of Higher Education, 2006) The Chinese government has had a policy of giving priority funding to top universities since 1993, when it announced the 211 Higher Education Project, which sought to fund its top 100 institutions to reach world-class standards in the 21st century. At the time of Peking University’s centenary in May 1998, the 985 World-Class University Project was launched; it has continued to concentrate high-level funding but on a smaller number of leading universities. (Hayhoe and Pan, 2005)

Smaller nations are unable to commit the resources necessary to adopt such policies. Instead we are seeing the emergence of policies designed to promote changes in the academic culture in pursuit of higher quality research. An example of such policies is the research assessment exercises, now present in a growing number of small nations including the Netherlands, New Zealand, Australia, and Ireland.

Another recent development is the formation of international alliances such as the International Alliance of Research Universities (IARU) and the League of European Research Universities (LERU) which mainly include the top 100 universities. This phenomenon provides the stimulus for national universities to improve their international collaboration at the highest level. Despite their failure to make the top 25 world rankings, universities from small nations are not being excluded from such groupings. Three of the 10 IARU members come from small nations while nine of the 20 LERU members are drawn from five small European nations. However just two of the 12 member IARU and LERU universities from small nations are represented in the SJTU top 50 (Swiss Federal Institute of Technology Zurich and the University of Utrecht) while nine of the 18 universities from large nations figure in the top 50. This underscores the observations made by May (1997) and King (2004) that focusing attention on share of the world's total papers or citations tends to favour larger countries which generally have the largest institutions. The two international university alliances look beyond size when assessing membership and therefore it is worth asking whether rankings agencies should extend their efforts to include more measures of relative performance such as citations per paper. [1]

World university rankings capture the attention of governments, media, industry and the general public but are prone to focusing attention on size rather than relative quality. No-one is suggesting that Harvard University does not deserve its place at the head of the field, nor that it might not remain at number one on measures of relative quality. Neither is there any denying that small institutions are able to make the top 20 rankings – California Institute of Technology with around 900 undergraduate and 1,100 postgraduate students will rank well by most measures. The point is that observers within the sector understand the dynamics at play while outsiders often do not. The infatuation with rankings is accompanied by an annual media ritual, at least in Australia[2], in which the following questions are posed:

- Why don't we have a university in the top 20 or top 50?
- Should we aim to create at least one 'elite' research institution?
- Are we losing our position in the global knowledge economy?

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1 This observation also applies to public policy. A good example is the MBA provision of the Highly Skilled Migrant Programme in the UK. The 2004 Budget announced a new provision for graduates of 50 top business schools to work in the UK for up to 12 months on completing their MBAs. Refer: htttp://www.workingintheuk.gov.uk/. The UK Government has developed its own method to ascertain the value to the economy and the employability of graduates from leading business schools. Seven of the 50 schools listed are based in smaller nations (Australia, Ireland, Switzerland and the Netherlands) indicating that in this instance the Government has looked beyond external rankings in implementing this major policy direction. By contrast, the equivalent independent MBA school ranking produced by the Financial Times includes only three of these seven schools in its top 50 in 2007.

2 Note also the well publicised newspaper article on January 24, 2004 in Le Monde, "The Great Misery of French Universities"

Even prior to the first edition of the SJTU rankings in 2003, the Australian Minister for Education, Science and Training, the Honourable Dr Brendan Nelson asked whether Australia should "aspire to have one or two universities ranked in the world's top fifty, and if so, how can that be achieved within a policy framework". (Nelson, 2002)[1]

Since then, the emergence of world university rankings has brought this issue further into focus leaving governments and policy makers in small developed nations to ponder over policies which might entail the provision of world class resources to selected elite institutions or fund a world class higher system. But is the 'elite' route even within their capacity?

Can Small Nations Develop Elite (Top 20) Universities?

One obvious barrier to upward mobility is the inability of small nations and their universities to compete on a level playing field in recruiting and providing continuing resources to attract and develop high citation researchers or major prize winners.

Harvard University at #1 on the Shanghai Jiao Tong ranking currently employs 170 highly cited researchers while the University of Tokyo at #20 employs 33. The institution ranked at #5, Massachusetts Institute of Technology states on its website that "63 current or former members of the MIT community have won the Nobel Prize" while John Hopkins (#19) reveals that 32 of its current or former staff and students have received the Prize. Contrast this with *Table 3* showing the number of highly cited researchers and Nobel laureates in the small developed nations and one can see the strategic challenge confronting governments, science and education ministers from small nations and institutions within these nations with top 20 aspirations.

1 Five years on, the current Minister expressed a similar sentiment, "More of our universities should aim to be within the top 100 internationally and I would like some of our universities to aspire to the top 10". (The Honourable Julie Bishop at the opening of the L.H. Martin Institute for Higher Education Management and Leadership, August 30, 2007)

Table 3 Small nations: Highly Cited researchers (August 2007) and Nobel Laureates (1901-2006)

Includes Peace Prize, excludes organisations (e.g. Médecins Sans Frontières, Belgium)

Nation	Highly Cited researchers	Nobel Prize winners
Austria	13	21
Australia	108	10
Belgium	37	9
Denmark	30	14
Finland	16	3
Hungary	5	12
Ireland	7	9
Israel	47	8
The Netherlands	95	18
New Zealand	17	3
Norway	13	10
Singapore	4	0
Sweden	61	28
Switzerland	111	25

Source: Thomson ISI (Highly Cited researchers), Wikipedia (Nobel Laureates)

Table 3 shows that only six of the 14 leading small nations have sufficient numbers of Highly Cited researchers employed in their entire nation (universities and other research institutions) to challenge the University of Tokyo at number 20 on the SJTU list. Only Sweden, Switzerland and Austria have developed enough Nobel laureates to come close to challenging John Hopkins University at #19. Even an amalgamation of leading universities in each of the 14 nations to form one single global contender would only see the 'international' university systems of Sweden, Switzerland, the Netherlands, Australia, Denmark and Austria enter the top 20. Salmi and Saroyan (2007) point out that university mergers seem to be under consideration in Denmark and Finland, as well as in larger countries including France to achieve "poles of excellence". Indeed the most impressive SJTU top 100 improver has been the University of Manchester which moved from 89th position in 2003 to 48th in 2007 – largely as a result of its amalgamation with the former University of Manchester Institute of Science and Technology. Ruling out the improbable notion of widespread amalgamations, can the leading universities in any of the small nations bridge the gap and ever achieve top 20 status? *Table 4* below provides part of the answer to this perennial question by benchmarking the leading university in each of the 14 small nations against the University of Tokyo at #20 on the SJTU rankings. Whether the highest ranked of these, ETH Zurich, can climb seven places into the top 20 is discussed in the accompanying textbox.

Table 4 Leading institutions in 14 small nations benchmarked against University of Tokyo (SJTU world university ranking scores, 2007), n/a = Total Score not available

World Rank	Institution	Country	Score on Alumni	Score on Award	Score on HiCi	Score on N&S	Score on SCI	Score on Size	Total Score
20	University of Tokyo	Japan	33.8	14.1	41.9	52.7	80.9	34	45.9
27	Swiss Fed Inst Tech – ETH Zurich	Switzerland	37.7	36.3	35.5	39.9	38.4	50.5	39.9
42	University of Utrecht	Netherlands	28.8	20.9	27.7	29.9	56.6	26.6	33.5
46	University of Copenhagen	Denmark	28.8	24.2	25.7	25.2	51.4	31.7	32.2
53	Karolinska Institute	Sweden	28.8	27.3	32.3	16.6	47	24.5	30.8
57	Australian National University	Australia	16.6	12.6	36.3	30	44.7	32.2	30.4
64	Hebrew University of Jerusalem	Israel	31.1	20	24.6	23.3	43.6	28.2	29.0
69	University of Oslo	Norway	24.3	33.4	18.2	16.8	42.5	27.9	28.2
73	University of Helsinki	Finland	17.6	17.9	19.6	21.7	52.7	28.9	27.8
102-150	National University of Singapore	Singapore	0	0	14.8	12.9	57.3	27.3	n/a
102-150	University of Ghent	Belgium	8.3	15.5	14.8	8.6	49.3	27.4	n/a
151-202	University of Vienna	Austria	19.5	0	7.4	22.3	36.4	20.5	n/a
203-304	University of Auckland	New Zealand	16.6	0	10.5	14.2	36.1	18.1	n/a
203-304	Trinity College Dublin	Ireland	14.4	14.1	7.4	9.6	27.1	15.5	n/a
305-401	University of Szeged	Hungary	0	15.5	7.4	9.8	23.2	13.7	n/a

Can ETH Zurich make the top 20 SJTU Academic Rankings of World Universities?[1]

Of the 14 national leaders, only the Swiss Federal Institute of Technology Zurich (ETH Zurich), ranked at #27 in the world, has a realistic chance of making the SJTU top 20 within the foreseeable future. ETH Zurich produced 1,805 Thomson ISI indexed outputs in 2006 which equates to 10.6% of total journal outputs of this type for Switzerland. The University of Tokyo at #20 produced 6,944 articles in the same year which places it at number 2 in the world for this measure. However if ETH Zurich were to produce the same number of articles as Tokyo, then an increase of 5,139 articles is required bringing total Swiss output of 17,089 articles in 2006 to 22,228 (a 30% national increase). This would improve the world ranking of ETH Zurich by approximately 10 places and require an additional R&D commitment from the Swiss Government possibly in the order of US$2.0 billion per year.[2] Even if the funding were provided, the nation might have difficulty in attracting the academic talent to undertake the required research and it is likely that many more billions would be needed to provide for supporting infrastructure.

The ETH Zurich example illustrates that creation of an elite top 20 university is within the reach of some small nations but that it would require a massive concentration of national research effort with profound impacts across the university system and the national economy. From a policy perspective there are no apparent examples of governments in small nations systematically setting out to create elite universities as a direct response to the emergence of world university rankings. There is however one outstanding example of a highly successful, large-scale, non-educational program designed to produce 'elite' outcomes – the Australian Institute of Sport (AIS). The following case study asks whether the AIS success story could be replicated in the Australian university system by funding the development of the Australian National University as an elite world top 20 institution. What might be the consequences for the university sector of such a policy, and what are the opportunity costs of deviating from policy measures that have ensured Australia's outstanding performance in the world university rankings to date?

1 Note: ETH Zurich was ranked at 15th for Natural Sciences and Mathematics in the 2007 edition of the SJTU Academic Ranking of World Universities by Broad Subject Field.

2 Based on domestic R&D funding: SFr10 billion (US$8 billion) — 2.7% of GDP in 2005 as reported by Quirin Schiermeier in Nature |Vol 435|26 May 2005

Case Study – Australia – sport, elitism, and research performance

Australia prides itself on its sporting prowess. Robert May (1997) acknowledged this in his landmark article, *The Scientific Wealth of Nations*, where he credited Australia as the lead nation at the 1996 Summer Olympic Games for medals won relative to population size. This result stems from the creation in 1981 of the Australian Institute of Sport (AIS), a bold policy experiment following a failure to win any Gold medals at the Montreal Olympics of 1976, which Australians considered a national humiliation. The AIS is responsible for the development of elite sport and is acknowledged internationally as a world best practice model for elite athlete development. The AIS is no longer a bold experiment in policy – with Australia finishing at fourth position overall on the medal tally at the Athens Olympics in 2004 (behind the USA, China and Russia). With a budget of the equivalent of USD$102.7 million per year it becomes apparent that Olympic glory is an inexpensive pursuit compared to producing Nobel laureates and attracting leading researchers to a nation that is geographically remote, well away from many of the world leaders in academia, government, commerce and industry. Questions are also raised about the paucity of flow-on benefits from an elite sport institute into overall the health and wellbeing of Australian society. This is relevant to the policy issue of funding elite institutions.

Is the elite approach to university research funding appropriate for Australia? Should Australia aspire to develop a world top 20 university? Would there be any flow-on benefits to the university sector?

Lifting the ANU into the top 20

Should the Australian Government aspire to transform its highest ranked university – The Australian National University currently ranked at #57 – into the top 20 world universities? Simple gap analysis indicates that the ANU would need to lift its performance by around 51% on every indicator which would improve its overall SJTU score from 30.4 to 45.9 (University of Tokyo). Given that indicators such as Nobel Prizes and Fields Medals are unable to be influenced in the short to medium-term (due to SJTU's methodology in which these must work at the institution at the time of winning the prize) then all possible gains would need to be made in the three remaining indicators (SCI, N&S and HiCi). Modeling reveals that a 68% improvement is needed across all three indicators to match the performance of Tokyo. This equates to:

Employing an additional 16 Highly Cited researchers (currently 23);

Producing 1,292 additional Thomson ISI indexed articles each year (currently <2,000); and

Producing 48 additional articles in *Nature* or *Science* every five years (currently 70 for 2002-2006).

If research performance improvement were simply a function of additional investment then a 68% increase to the annual ANU budget would require budget supplementation of AUD $600-700 million each year – in addition to the current operating budget of around AUD $900 million. While such a nation-building exercise is within the means of Australia, such expenditure is an improbable political proposition in a nation where amounts in the AUD $600-700 million range exceed the total annual budget of all but six Australian universities. Even the University of Sydney, which recorded total income of AUD $1.21 billion in 2006, received just 38.2% of this income in Commonwealth Government assistance.

Australia has the largest GDP of the small nations included in this analysis and therefore probably has the greatest means to adopt such a strategy. But funding an elite research institution is in the order to 10-20 times more costly than funding an elite sport institution (such as the AIS) and therefore such a strategy appears implausible in Australia.

Funding a world class university system

Since 1988 successive Australian governments have resisted the urge to concentrate excessive amounts of expenditure into creating an elite tier of universities. Endowed with 17 excellent universities in the SJTU top 500 and others on the fringe, the Government has funded a unified national system – or a 'one size fits all' model according to critics. The Government (possibly heeding the advice of Robert May) has outsourced some basic research from the national research institution (CSIRO) to universities, doubled competitive grant funding provided through national research councils over the last five years, while creating schemes such as the Federation Fellowship Program that have attracted leading researchers to Australia or retained those already there. A recently introduced AUD$6.0 billion Higher Education Endowment Fund should in time enhance research infrastructure and place Australian universities in a better position to attract international philanthropic funding. An Australian research assessment exercise, due for introduction in 2008, will further concentrate research funding in universities that produce high quality research outcomes.

These initiatives, by design or otherwise, have assisted the strong rankings performance of Australian universities. The opportunity cost of having 17 universities represented in the top 500 has overruled any imperative to see one in the top 50 or top 20. Despite this, much more can be done to promote international research collaboration, at a country level, project level and between researchers. The current Government is not persuaded to pursue the path of elite university funding – a policy option better left to the research powerhouses such as Germany, China and USA.

Strategic Policy Alternatives for Small Developed Nations

The elite approach to university research development appears better suited to large developed nations (% world GDP >3.0%). Although the research performed in writing this paper is still in a preliminary form, initial findings suggest that there are certain 'rules' that small nations ought to consider when developing international research policy that takes account of the globalisation of research (including rankings).

Rule 1 **Return on research investment is achieved in a greater proportion of universities in small nations than in large nations – the highly concentrated approach to research funding favoured by large nations is not necessary**

Funding an elite group of research universities in small nations is unlikely to yield the same success as in large nations (e.g. China and the US) where the best returns appear to be highly concentrated at the upper end of the sector. The performance of universities from small nations in the world rankings is uniformly strong throughout the top 500 indicating that government research investment is evenly rewarded across the sector.

Rule 2 **World-class university systems can be developed in small nations by taking either a comprehensive or focused approach**

For small developed nations the main strategic alternative to funding an elite university is to systematically develop a world-class system of higher education and research. World-class systems can take two forms, both of which are well accounted for by rankings methods:

- the 'balanced' disciplinary or comprehensive approach; or
- the 'focused' disciplinary approach of developing world-class expertise in targeted areas.

Rule 3 **Developing an elite comprehensive research university is beyond reach**

Governments of small nations should avoid the temptation to try to create a top 20 elite comprehensive research university – the gap is simply too large and the cost too prohibitive for the benefits derived.

Rule 4 **Small nations should aim to enhance partnerships with global research powerhouses**

Policy makers might consider programs to encourage leading national universities to become members of global partnerships of elite, research intensive universities, such as

IARU or LERU, and ensure that national programs exist to enable the other top and middle tier universities to extend their international collaborations. Creation of programs to promote high levels of international research cooperation is an important strategy for small nations given that internationally co-authored papers are cited more than 'single-country' papers. (Nairn and Whitlow, 1990)

Rule 5 **Small nations are disadvantaged in the competition for elite academic talent**

Strategies and policies aimed at maximizing the production of high quality research outputs are likely to yield a better 'bang for buck' than those aimed at attracting a small number of elite researchers. Small nations are not operating at the elite end of the market for leading researchers. This is not to say that there should not be national and institutional strategies and programs aimed at achieving gains in this regard, but these should not be seen as the cornerstone to remaining competitive.

Rule 6 **Outsource basic research from research institutes to universities**

Large government research institutes do not provide the best value for money for undertaking basic research in small nations and more of this should ideally be done in collaboration with universities. Robert May (1997) observed that basic research is better undertaken within the university sector possibly due to the nonhierarchical nature of universities where the "pervasive presence of irreverent young undergraduate and postgraduate students" provides the best environment for productive basic research.

Recommendations for Rankings Agencies

Rankings agencies have proven to be highly responsive in seeking feedback and incorporating suggestions to improve their methods. The most significant recent trend has been the publication of rankings by broad subject field – now performed by both the Times HES-QS World University Rankings and the SJTU Ranking by Broad Subject Field. These improvements have achieved better recognition of the focused nature of some institutions from small nations including (SJTU ranking):

Swiss Fed Inst Tech – ETH Zurich – 15th in Natural Sciences and Mathematics

University of Zurich – 29th in Life and Agricultural Sciences

Karolinska Institute – 9th in Clinical Medicine and Pharmacy, 16th in Life and Agricultural

Sciences

University of Leiden – 35th in Clinical Medicine and Pharmacy

Australian National University – 38th in Natural Sciences and Mathematics, 44th in Life and Agricultural Sciences

This improvement in rankings methodology however has not completely overcome the tyranny of size and therefore several recommendations are made below which might allow for improved acknowledgement of the contributions of small developed nations and also those from the non-English speaking, developing and Muslim nations.

Recommendation One – introduce more relative quality indicators

Throughout this paper, evidence is provided that rankings might not employ enough indicators of relative quality. Consideration of a country's share of the world's total papers or total citations alone tends to focus attention on larger countries and institutions with large budgets. Additional quality indicators, some of which have already been proposed by others, might include:

- average citations per paper for the previous five year period;
- normalisation of total articles by the proportion of journal editors of each country;
- consideration given to ranking universities with different size, history, budget and function etc.;
- papers published in non-native languages might be offered a special weight.

Recommendation Two – Publish rankings for the top 1,000

Following the release of the Berlin Principles on Ranking of Higher Education Institutions (2006) there is an expectation that rankings schemes will provide sufficient clarity about their purpose and goals to promote an informed understanding of results. One noteworthy gap in user awareness is recognition that 95 per cent of the world's 9,760 world universities remain unranked, with mere fractions in performance separating some of these from ranked institutions. This has significant implications for unranked institutions in opportunities for global collaboration and attractiveness to prospective academic staff and international students. One option is to rank down to the top 1,000 and even beyond provided the method is sufficiently robust to differentiate between research performances at these levels.

Recommendation Three – Improve contextual information provided to end users

Irrespective of whether institutions are ranked according to relativities such as size, budget, location and history, there is a case for improving communication about such differences to enable governments, policy makers, university governing bodies, and senior university officials to better define their role in the global context. It will also allow employers, prospective staff and students to make more informed decisions. As pointed out by Salmi and Saroyan (2007) many consumers and stakeholders are unaware of the small magnitude of difference between ranked and unranked institutions and the implicit message they convey can be seriously misleading. To allow for better interpretation of ranking results, it is suggested that information sheets be produced to assist stakeholder groups to better understand the university typologies and national variations and the meaning of the results to their specific needs as policy makers, recruiters, academics, students and the media.

Recommendation Four – Revise the weightings so there is less emphasis on individuals and more on whole of institutional performance

It is proposed that the SJTU weightings for major prize winners and Highly Cited Researchers be adjusted appropriately according to the tiers of institutions. The SJTU indicators for Alumni, Award and HiCi appear to be much more discriminating in separating differences between top 200 universities than those that follow. Several institutions make the top 401-500 rankings due to the presence of a single individual which is hardly a robust indicator of institutional quality. Approximately 77% of institutions in the 203-508 band score ‘0’ for both the ‘Alumni’ and ‘Award’ indicators (which account for 30% of the total score). Therefore the top 200 could be derived using existing SJTU weightings while the remaining institutions under consideration for the 201-500 bands (and beyond) could then be assessed differently. For example:

SJTU Code	Top 200	301 and Beyond
Alumni	10%	5%
Award	20%	10%
HiCi	20%	15%
N&S	20%	20%
SCI	20%	40%
Size	10%	10%
Total	100%	100%

This methodology for institutions ranked 201 and beyond would be to reduce the combined weighting of the ‘Alumni’ and ‘Award’ indicators to from 30% to 15%, reduce the ‘HiCi’ indicator from 20% to 15%, and increase the combined research output indicators (N&S and SCI) from 40% to 60%. The effect of this change would be to provide more meaningful indicators and targets for institutions below top 200, including those not currently ranked. In accordance with Recommendation One it is suggested that the ‘SCI’ indicator should be revised to assess both publication count and average citations per paper and that these be applied in equal proportions when assessing both top 200 and top 201 and beyond.

Conclusion

While small developed nations and their institutions are well represented in the world university research rankings they are not as prominent in the SJTU top 50 as in other clusters and are totally absent from the top 25 (other than in the field rankings). Institutions from small nations confront financial, geographic, and systemic barriers which impede their ability to improve their position in world research rankings. When indicators of relative quality are adopted small nations often outperform larger nations indicating they have a specialised role to play in the global knowledge economy.

Rankings however tend to modify and reinforce performance patterns and behaviour. They contribute to the creation of a norm, often based on the American research university model. Aspirations to conform to this model are not appropriate or realistic for most universities in small nations. Rankings agencies should be kept informed about their impact on various university groupings to allow for continuous improvement and changes to methodology to minimise unintended consequences.

Continued improvement to ranking methodology based on knowledge exchange between the rankings agencies and universities will ensure that the right balance is maintained. This will result in “clean rankings: transparent, free of self-interest and methodologically coherent, that generate an across-the-board dynamic improvement”. (Marginson, 2007) Increasing numbers of observers advocate the style of rankings used by the Centre for Higher Education Development (CHE) in Germany, which dispenses with holistic rankings of institutions. (van der Wende, 2006; Usher & Savino, 2006)

It could however be argued that research-led universities welcome the opportunity to benchmark with world leaders and if rankings were to become too ‘neutral’ then there runs a risk that they might fail to deliver the brutal truth to governments and university planners. In writing this paper, not one piece of evidence was uncovered to suggest that small nations are following the lead of larger ones in devising strategies to create elite or world class universities. Small nations appear to be reacting appropriately with strategies designed to concentrate their research in identified areas of excellence, maximise their collaborations with major players, and enhance their reputation for innovation which often results in first mover advantage. In the words of the President, National University of Singapore, small economies “can’t compete with giant economies. In the global economy, small means you have to be focused and nimble, find a niche and work with partner”.

References

Center for Higher Education Development (CHE), UNESCO-CEPES, Institute for Higher Education Policy, (2006), *Berlin Principles on Ranking of Higher Education Institutions*, Retrieved on 12 April 2007 at http://www.che.de/downloads/Berlin_Principles_IREG_534.pdf

Cheng, Y., & Liu, N.C. (2006). A first approach to the classification of the top 500 world universities by their disciplinary characteristics using scientometrics, *Scientometrics*, 68(1), 135-150.

The Chronicle of Higher Education, *German Universities Learn Which of Them Have a Shot at Elite Status,* 24 January 2006. Retrieved on 20 March 2007 at: http://chronicle.com/daily/2006/01/2006012405n.htm

Hayhoe, R., Pan, J. (2005) China's Universities on the Global Stage: Perspectives of University Leaders, *International Higher Education*, Spring, 20-21.

Institute for the Future (2007), Delta Scan: the future of science and technology, 2005-2055, *Global Diffusion of Science,* Forum conducted on behalf of United Kingdom Office of Science and Innovation, Retrieved on 15 August 2007 at: http://humanitieslab.stanford.edu/2/Home

Institute for Scientific Information, Thomson ISI (2007) Data on highly cited researchers, ISIHighlyCited.com. Accessed on 15 August 2007 at: http://isihighlycited.com/

International Association of Universities (2006), *World List of Universities and Other Institutions of Higher Education*. Retrieved on 20 March 2007, http://www.unesco.org/iau/onlinedatabases/list.html

King, D. A. (2004). The Scientific Impact of Nations, *Nature*, 430, 311-316

May, R M. (1997). The Scientific Wealth of Nations, *Science*, 275, 793-796

Marginson, S. (2007, February 12), *Global university comparisons: the second stage*. Paper presented at Griffith University symposium, International Trends in University Rankings and Classifications (http://www.griffith.edu.au/conference/university-rankings/)

Marginson, S, (2007). Global University Rankings: Implications in general and for Australia, *Journal of Higher Education Policy and Management*, 29:2, 131-142.

Nairn, F. and Whitlow, E.S. (1990), *Measurement of scientific cooperation and co-authorship in EC related areas of science*. Luxemburg: Office for Official Publications of the European Communities, EC report. EUR 12900.

Nelson, B. (2002). *Higher education at the crossroads: an overview paper*. Commonwealth of Australia, AGPS, Canberra.

Salmi, J. and Saroyan, A. (2007). League tables as policy instruments: uses and misuses. Higher Education Management and Policy, 19(2), 24-62

Schiermeier, Q. (2005). Small is beautiful, *Nature* 435, 532-533

Shanghai Jiao Tong University Institute of Higher Education, (2007). *Academic ranking of world universities.* Accessed 1 August 2007 at http://ed.sjtu.edu.cn/ranking.htm

Shih, C.F. (2007, June 6). Focus or die, says Singapore uni chief. *The Australian Higher Education Supplement,* p.29.

Usher, A., and Savino, M. (2006). A World of Difference: *A Global Survey of University League Tables.* Toronto, ON: Educational Policy Institute.

Wende, M.C. van der. (2006). The challenges of university ranking. Presented at Seminar, Leiden University, 16 February, 2006. Retrieved on June 23, 2007 from: http://www.leidenslatest.leidenuniv.nl/content_docs/presentation_prof._van_der_wende.ppt.

The Pursuit of “Scale and Focus” at the University of Adelaide

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Abstract

This paper examines the practical measures that the University of Adelaide, a relatively small, research-intensive Australian university, is taking to improve its performance within the context in which we exist, locally and globally, as well as providing some relevant information on the Australian higher education environment. As a University we face numerous challenges and opportunities, some of which would be common to many higher education institutions, some peculiar to Australia and some unique to our institution. By focusing on the implementation of a strategic research framework aimed at improving the quality and impact of our research performance, and attempting to maximise our limited resources, it is expected our that outcomes will exert a positive change on our international position.

The Pursuit of "Scale and Focus" at the University of Adelaide

Introduction

'Not everything that counts can be counted; not everything that can be counted counts', Albert Einstein.

This paper is focused on the Conference theme of institutional strategies and practices for building world-class universities. It examines the practical measures that the University of Adelaide, a relatively small, research-intensive Australian university, is taking to improve its performance within the context in which we exist, locally and globally, as well as providing some information on the Australian higher education environment. As a University we face numerous challenges and opportunities, some of which would be common to many higher education institutions, some peculiar to Australia and some unique to our institution. We need to work with limited resources, competing in a global system, focusing our efforts on achieving world-class research outcomes in an achievable and sustainable manner.

Context

To give an idea of the size of the University of Adelaide, we have a staff complement of 2,665 people, of whom 1,207 are academics (2006 figures); a student population of 19,646, of whom 1,842 are Higher Degree by Research students (2006 figures); and consolidated income of A$475M, of which approximately A$162M is directly attributable to research income and research block funding (2005 figures). Established in 1874, we have long been amongst Australia's leading universities, with a fine tradition of exemplary scholarship, ground breaking research and influential graduates. We are one of four universities in South Australia, three being established domestic institutions, with the fourth a small branch of a US institution which opened last year. The city of Adelaide has a population of approximately 1.1M people in a State of approximately 1.5M.

Some of our previous graduates have included penicillin pioneer Lord Howard Florey, composer and pianist Miriam Hyde, 2005 Nobel Prize for Medicine winner Dr J Robin Warren, and NASA astronaut Dr Andy Thomas. In 2007, we celebrated our 100th Rhodes Scholar, and have had five Nobel Laureates associated with the University. As a higher education institution we offer a breadth of academic programs, from undergraduate Diplomas to postgraduate PhDs, covering all basic disciplines. Currently, we have international level researchers in fields as diverse as reproductive health and early childhood development, animal and plant functional genomics, evolutionary biology, sustainable resource management, demography, and advanced sensing and control.

Within Australia, the University of Adelaide is a member of the prestigious 'Group of Eight' (Go8) research-intensive universities. There is no doubt that we are advantaged in belonging to this Group, the member institutions of which account for 70% of competitive research income in Australia, produce over 60% of Australian university research publications and two-thirds of patents, generate over 80% of the most highly cited Australian university publications, and account for half of Australia's higher degree by research completions[1]. Being a member of the Go8 has significant branding advantages for us, something which is an important consideration for a small university. This makes us more reliant on our associations, but as an individual institution there are limits as to what we can do. It is primarily against the other Go8 institutions that we seek to benchmark ourselves.

A Global Approach in a National System

It is well known that the rise of global ranking lists has helped to focus many institutions on the idea of whether or not they can legitimately claim to be a world-class university. Of course, not every institution in the world can be a Harvard or a Cambridge. This does not mean that we have low ambitions, rather that we are targeting our ambitions correctly. We will continue to work towards producing the best outcomes possible, as part of a practical approach to achieving realistic goals.

These goals are set out in 'The University of Adelaide Future Directions – Strategic Plan 2007-2011', which also states that our over-arching mission is '"to be an Australian leader in research and teaching of excellence, unequalled in the positive impact our university has on the lives of our students, staff and alumni as well as the local, national and international community" (University of Adelaide, 2006, p.4). As further discussed below, the University is in the process of producing a new Strategic Plan, although the basic theme of striving for excellence and continuing relevance will remain a mainstay.

While acknowledging the influence of international ranking outcomes on perception, prestige and morale, we do not undertake these actions purely in the hope of rising higher in the Jiao Tong Index or the Times Higher Education Supplement Survey, but as part of a planned approach to improvement and in response to a changing Australian and global higher education environment.

[1] http://www.go8.edu.au/about/facts.htm

In the 2007 Shanghai Jiao Tong Academic Ranking of World Universities, Adelaide was placed in the 151-202 band, with only two Australian universities, the Australian National University and University of Melbourne, in the top 100[1]. In the 2006 Times Higher Education Supplement Survey of the World's Top 200 Universities, the University of Adelaide ranked number 105, with 7 Australian universities in the top 100[2]. In both surveys Harvard University was the top ranking institution. Considering the total number of universities around the world, to be in the top 200 should be seen as a relatively good outcome.

Interestingly, a different approach (Abbas & Worthington, 2006) provides another example of how a ranking process may be produced. The study, examining 36 publicly-funded Australian universities[3], has a focus on audited quantitative information on research performance for the period 1998-2002, (i.e. grants, publications and PhD completions). In this instance, the University of Adelaide is placed second in the list of Australian universities, after the University of Melbourne, when considering research performance per academic staff member (p.198). By including the variable of staff numbers, this presents a more accurate picture of productivity and outputs than a more basic focus on the total volume of research output alone. If extrapolated to the international level, such an approach might see a reorganisation of the predominant hierarchical standings.

Our focus as an institution is on self-improvement, not directly on how to improve our ranking. However, we believe that if we can achieve our goals and perform well, then this may well be reflected in the outcomes of future rankings. What most people expect of universities is that ideally they will be excellent at some things and good at other things, not that everything they do is excellent. Such an expectation would be unrealistic from a resource perspective if nothing else, as it is important to see an institution in context. In fact, it is argued that one of the problems with most international ranking systems is that they de-contextualise institutions and foster the illusion of a level playing field (Marginson, 2007, p.13). This is a valid point as, especially in an increasingly global market, it is often the differences that make us strong, not the commonalities.

As an individual institution, we exist within the framework of the Australian government higher education policy, a heavily regulated system that constrains the ability to specialise without a considerable level of risk. It is worth noting the current debate within the Australian higher education sector on the need

[1] http://ed.sjtu.edu.cn/rank/2007/ranking2007.htm

[2] http://www.thes.co.uk/worldrankings/

[3] The study does not include the Australian National University as 'comparable research output data could not be obtained'.

for greater differentiation in the provision of comprehensive research and education, and the re-emergence of the idea of 'elite universities'. This is at least partially a reaction to the increasing globalisation of higher education. As stated in a recently released Go8 Discussion Paper,

> the contemporary research university must be an adaptive institution evolving in the changing society – it cannot live outside the forces of its transformation. Its legitimacy depends not on what it has achieved in the past but on what it is becoming and how it can contribute in the future. (Go8, 2007, p.14)

The paper builds on the argument about focussing the country's limited higher education resources more selectively in order to compete successfully against international competitors and to create acknowledged world-class universities.

This is an important debate for the Australian higher education system. The basic Go8 argument calls for a change from the situation which has existed since the late 1980s, when there was a consolidation of the higher education system to produce the 'Australian Unified National System'. One of the unintended consequences of this process was that of convergence over diversity within Australia when "the aspirational 'norm' quickly became a research-intensive, comprehensive institution" (DEST, 2002, section 3). For example, there has been a proliferation of Medical Schools and MBA programs across the country. This is perhaps not too surprising when you take into account the high level of risk associated with excessive specialisation. Admittedly, there are examples of successful specialisation, for instance Tropical Medicine at James Cook University, and Antarctic and Southern Ocean Studies at the University of Tasmania, but these are more the exception than the rule.

Looking forward, it is argued that three of the main challenges facing the Go8 universities are the need to operate at international standards of excellence, renewing the academic workforce, and maintaining community trust (Go8, 2007, p.22-25). This is closely tied into current debates on research management and organisation; issues with which the University of Adelaide is actively engaged. Certainly, the changing international environment is having an influence on our research priorities as we seek to develop an appropriate scale and focus at the international level, and we need to play to our strengths.

This focus is becoming even more important with the introduction of the Australian Government's

Research Quality Framework (RQF).[1] This is a new system for assessing the quality and impact of research, providing a snapshot of the research strengths of each of Australia's universities. It will potentially re-allocate a significant proportion of the public research funding allocated to universities, although the precise way in which this is to be done is yet to be determined. Following overseas experience of similar programs such as the Research Assessment Exercise in the United Kingdom, the RQF will have, and has already begun to have, a significant effect on Australian universities.

As with all higher education institutions, we must recognise that we exist in an increasingly competitive environment. While we have numerous high-performing individual academics, one of the main challenges being presented by the RQF is to develop high-performing research groups of world-class status, with at least five full-time equivalent academics per group. Each institution will receive a set of ratings in 2008 based on the quality and impact of their selected research groupings, which will remain in effect for the 6 year period 2009 - 2014. As is apparent, the RQF is effectively a retrospective exercise, showing our strengths for the past 5 years, but will affect our future funding for some time to come. The University has committed considerable resources and effort into preparing for the RQF.

One of the stated outcomes of the RQF is to promote increased competition and specialisation within the Australian higher education system. It is interesting to note that one of the consequences of this may be similar to that of the heightened prominence given to global ranking systems. Marginson and van der Wende (2006) argue that the latter "have stimulated global competition for leading researchers and the best young talent" (p.3). This competition is compounded at the national level by the RQF exercise, and brings increased pressure on us to provide attractive incentives to attract and retain high-performing researchers.

Facilitating Change

It seems fair to say that there are two axioms which presumably hold true for most institutions: perception is important and change is difficult. In a recent (2006) internal University of Adelaide staff satisfaction survey, it was found that over three-quarters of the University's staff agreed with the statement that the 'University is successful'. In the same survey only 40% agreed that the amount of change occurring in the University is appropriate.

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[1] Information on the RQF is available at:
http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/research_quality_framework/default.htm

It is essential to acknowledge the importance of internal change processes and the ability to adapt efficiently and effectively. This includes everything from recognising opportunity, working out how to respond to it, gathering sufficient support and effectively implementing the outcomes. Change management within an organisation like a university, a collection of individuals with strong opinions, is rarely an easy matter. It often involves ‘winners and losers’ in the name of the common good. World class institutions such as Harvard and Oxford often appear, at least to the casual observer, to be ‘static’ due to their ‘tradition’. But in reality, while they are solid and relatively steady in approach, they are also affected by the winds of change. The incoming Vice-Chancellor of Oxford, in his 2004 commencement speech, spoke of the need for Oxford to “acknowledge our organisation’s strengths, harness its benefits, and when necessary be ready to revitalise its processes to maintain its standing as a ‘world class’ institution.” (p.6) Similarly, the new President of Harvard University recently spoke of the need for members of that institution to work together by “investing beyond one's own particular interest or bailiwick. … [and] learning to live and to think within the context of the whole university” (Faust, 2007). One of the central aspects to consider here is the allocation or reallocation of resources, along with a willingness of those involved to lead or follow, as required.

So much of the strategic decision-making process in which we engage, and debates about our future directions and investments, come down to a question of ‘balance’. Should we support this discipline rather than that discipline; should we take on more students or spend more time on research; do we employ more staff or ‘better’ but fewer staff with higher salaries; do we focus on basic research or applied research? Getting the balance correct is one of the most difficult but essential tasks in managing a university, particularly as the results will have significant effects. Admittedly, we often fail to get this exactly right, but we must be prepared to make mistakes. Of course we don’t want the mistakes to be too large or occur too often.

One of the more specific challenges facing the University of Adelaide is a demographic one. Within Australia students have traditionally been reluctant to move out of their home state to take up a university position, and South Australia has an ageing demographic profile and relatively constrained local pool of potential students. Therefore, we cannot rely on the local or even the domestic market. We have had relative success in attracting international students, with pleasing growth rates over the last few years, and are planning to expand our overall student numbers over the next few years, particularly in the postgraduate research sphere. This will require considerable financial investment. Part of this promotion will relate to a new scholarship strategy, but fundamentally it is about ensuring and promoting an attractive and stimulating research environment. We want to attract high quality research students and high quality researchers, an intertwined process, and ensure we have high quality infrastructure to support their research. In this situation, marketing and strategic alliances assume even greater weight than would normally be the case. Of course we also want to attract the best undergraduates and utilise our best researchers to provide input into our teaching programs; this is also an important aspect of being a research-intensive university.

Current Actions at the University of Adelaide

The preceding section described some of the challenges which face the University of Adelaide if we are to become a 'world-class university'. We now move on to some of the specific actions which we are undertaking or planning to undertake for sustainability and advancement. The general focus of this paper is on those activities relating to research, with primary examples in which the authors are involved, due to its importance as "the most globalised of all activities in higher education" (Marginson & van der Wende, 2006, p.5), However, the research exercise is not a stand-alone endeavour and the University is looking at strategic changes across the board, in curriculum and student matters, and support services. It should also be noted that this is very much a work in progress, and this paper can realistically only provide a snapshot.

Strategic Planning

One of the main goals of the University of Adelaide's current Strategic Plan is 'Scale and Focus in Research', in which we seek to "ensure that the University of Adelaide will be valued for the excellence and impact of its research" (University of Adelaide, 2006, p.15). With our promotion of this goal, we are intending to put significant resources into a limited number of targeted areas to help them achieve or enhance their international status. In this way, the University will build on those areas of research that are, or have the potential to be, 'world-class', although taking into account the need to maintain an environment that can foster emerging areas. We recognise that we must adopt new strategies that capitalise on our past in a 'plan-driven' manner to build the necessary critical mass for furthering world-class research activities, and which help to create sustainability over time. This is by no means a simple task.

As part of our normal iterative planning process, we are now developing a new Strategic Plan for the period 2008 - 2012 to build on the successful achievement of our goals in the previous 5 year period. These included securing a sound financial base and increasing our student numbers, both domestic and international. As part of our plan-driven approach, we are putting in place practical strategies to encourage improvement and greater collaborative efforts. Efforts are being made to build further linkages with the community, industry and government and we are exploring options on how to deliver significantly enhanced research outcomes on a whole-of-institution basis in order to achieve genuine scale. For example, we are investing significantly (A$150M) in the physical infrastructure of the University.

Of particular relevance to this paper, the new Plan is being developed to have more of an 'aspirational' approach, and may include the stated aim of becoming a 'great research university', raising our profile internationally. Of course, one of the challenges associated with this action is to delineate what we believe to be the characteristics of a great research university, a similar challenge to accurately describing a 'world-class university'. While not without contention, some of the central characteristics of our working model include attracting a high degree of global recognition; an extensive research output in both per capita and absolute terms; ensuring significant shaping of teaching curriculum by research activities; attracting the best students, irrespective of national, cultural or social origins; and having graduates who consistently achieve positions of significance and influence in the community, government, and industry.

Budgets and Funding

As is well know, funding often drives outcomes. One of the main challenges we face is to develop a shared understanding of the desired outcomes and what is required to drive positive behaviour. Within the University, Budget restructuring is allowing for more targeted expenditure of research strategic initiatives funding and review of the purpose of strategic investment funding in the research budget, with an emphasis on a longer-term view of building research capacity in key strategic areas. As mentioned in the section above, we have taken a deliberate decision to place a greater emphasis on larger scale research initiatives in planning and budgeting activities.

We are retaining budget incentives, but developing central co-ordination and application of consistent University-wide selection criteria, (e.g. for seed funding or 'near miss' schemes), to support broad-based research capability and selected 'emerging' research areas. We also need to make the most of our internal resources by ensuring that, as much as possible, funding allocations are used for leverage purposes – funding to attract further external funding. Within our own budgets we must balance the flexibility to respond to *ad hoc* opportunities with the need for longer-term strategic planning.

As a relatively small institution we need to concentrate on getting the maximum potential from our limited funds. The idea of leverage assumes even greater importance, especially as research infrastructure, particularly in the science and engineering disciplines, becomes increasingly costly. We have been assisted to some extent by the recent Commonwealth Government National Collaborative Research Infrastructure Strategy (NCRIS)[1], which is providing significant funding for major research facilities, supporting infrastructure and networks necessary for world-class research. For the University of Adelaide, some of the major projects in which we are involved relate to the construction of a National Plant Phenomics Facility; new equipment as part of a National Imaging Facility to monitor the behaviour and function of cells within animals; the inclusion of a State node in a new National Microscopy and Microanalysis Research Facility; and involvement in microalgae biofuels development. However, while welcome, these developments do require matching funds and supporting infrastructure, and do not cover all the research infrastructure needs of the University.

One of our further challenges is to develop a shared understanding of the desired outcomes and what is required to drive positive behaviour. We also need to gain general acceptance that resources must be moved in response to performance and potential, for the 'greater good'. One of the difficulties we face lies with the way that the funding of major research initiatives often falls to specific organisational units; units which have been designed for other purposes. This can unduly hamper the focus and depth of commitment we require as an institution. Furthermore, we are entering a period of uncertainty in relation to public research funding. As mentioned above, the introduction of the RQF will effect a proportion of that funding, yet how exactly this will be done, will not be known until after the submission of institutional reports at the end of 2007.

Research Structures

The University of Adelaide currently has a considerable number of research centres; some external collaborative initiatives, some University-level organisations, and some based purely within a School or Faculty. We are currently re-examining the way in which we manage these research structures (establishment, funding and performance monitoring, etc) so that there will be a greater recognition that areas of present or potential research excellence and innovation need to be identified, encouraged and promoted. In line with the University's Strategic Plan goal of 'scale and focus' in research, it is important that we promote more strongly the development of critical mass in priority areas, and the alignment of research

[1] Information on NCRIS is available at: http://www.ncris.dest.gov.au/

structures with existing and emerging University research strengths. This is to be achieved by strategic planning, targeted expenditure and regular performance reviews. It is intended that a new, competitive process will be introduced to allocate an amount of performance or 'leverage' funding to the most outstanding University Research Institutes and University Research Centres. This is intended to build upon those of our outstanding research groupings which it can be argued are undertaking world-class research, such as the Centre of Expertise in Photonics, and the Centre for Reproductive Health and the Australian Centre for Ancient DNA.

One important aspect of this targeted approach is to produce an extensive list of uniform performance indicators for use in the application and monitoring processes. We need to be willing and able to use the results of this monitoring to further our strategic aims by promoting change where necessary. High-performing areas can, and should be, rewarded. At any one time, we are dealing with at least three different kinds of research activity – emerging, mature and declining - and this can be a complex process. In dealing with this situation, we need different strategies for the different stages of life of research areas. We need to be in a position where we always have a number of central mature research areas, a number of emerging areas coming to fruition, and possibly a number of areas that are being phased out. Dealing with 'declining areas' is always a difficult activity as it involves real people. While we must make hard decisions for the overall prosperity of the University, they need to be planned carefully and transparently.

Over the last few years we have been experimenting with other strategies to complement our existing research structures. In 2004, approval was given for the establishment of a number of specific University Research 'Clusters'. These were designed to represent a strategy, as opposed to a structure, to achieve relationship building by bringing together University multi-disciplinary research strengths. They are inclusive, thematic, cross-disciplinary groupings of interested researchers, working in areas of state, national and international priority, e.g. water, defence, healthy development. It must be said that the performance of the Clusters has varied and some have proven more successful than others. However, this is to be expected in any experimental strategy. Research Clusters have played a positive part in creating opportunities which may foster new research collaboration and attract additional external funding.

We are now examining options relating to a larger strategy and the potential development of a small series of 'Research Concentrations'. One aspect of this is to identify those of our outstanding, strategic large-scale research activities that have the potential to leverage financial, government and public support; to drive and deliver key national and strategic objectives; and which will ensure the maximum exposure and take-up of our research outcomes. By identifying and supporting key, large-scale areas of strategic research concentration, we are seeking to leverage additional external funding for research and to contribute to future investment funds, etc. This leverage may come from both basic and applied research activities. Certainly, within the University we have numerous diverse activities and considerable expertise which might benefit from a more coordinated approach. One example of a Research Concentration being developed at the moment is called 'Australian Wine 2030', which brings together a coalition of researchers pursuing a linked series of research projects to address key challenges facing the wine industry, including climate change, viticulture and water constraints, supply and demand shifts in the wine market, etc.

Fellowships

Institutional research success is not purely based on the amount of funding available, but also about attracting the right people to create the necessary critical mass, and developing productive and supportive research teams with adequate infrastructure. Such teams are essential for the development of early career researchers and postgraduate students, exposing them to something special. This is about providing the right environment. With this in mind, the University is putting in place a new, prestigious Vice-Chancellor's Postdoctoral Fellowship Scheme to support excellence in research undertaken in any School of the University. The Fellowships will be awarded to researchers of exceptional calibre to undertake collaborative research of national and international significance. This is part of a greater emphasis on the recruitment of independently funded research fellows, an important aspect of the University's research income growth strategy and support of high quality research student supervision.

This strategy is intended to complement existing externally-funded fellowship programs. For example, this year we were successful in attracting significant external funding for an Australian Research Council Federation Fellow and a National Health and Medical Research Council Australian Fellow. These are two of the most prestigious fellowship schemes in Australia.

Higher Degree by Research Students

The University knows that students are a vital part of research culture. We have considered the relative balance between the number of domestic research scholarships and the number of international research scholarships, and are attempting to raise the proportion of international higher degrees by research (HDR) students to meet the Go8 average through a concerted approach, including a specific focus on developing recruitment strategies at the Faculty and School level and increasing the number of international scholarships for high quality students. This will include focussed international scholarships in support of institutional research partnerships. We are also planning to give priority to areas of research strength, as identified through the RQF criteria, for growth in HDR numbers.

The scholarship strategy is to underpin the achievement of our HDR growth targets. We need to increase our numbers to keep pace with our national competitors, and intend to maintain a HDR load of approximately 9% to total student load. The quality and outcomes of our students directly and indirectly relate to other research performance indicators (e.g. publications, graduate outcomes, etc.) There are also qualitative benefits in taking additional international HDR students, such as positive reinforcement of our international reputation and prestige, broadening the research training experience for local students, etc. Admittedly, the provision of additional scholarships and/or fee waivers does come at a significant, initial financial cost, but we cannot afford to do nothing as this would lead to a relative decline in our standing.

We will need to develop a strong marketing plan to attract these additional international students. Part of this relates to a situation where you capitalise on your initial prestige to attract more people, so that you can then choose the best applicants and further increase your prestige. Somewhat of a 'Catch 22' situation.

We are also working on strategies to improve even further the research training environment generally through the provision of adequate support and training for supervisors and postgraduate coordinators, and investing further in student infrastructure and support services.

Internationalisation

The research internationalisation aspects in our current Strategic Plan include exploring the feasibility of developing research collaborations with key institutions in the People's Republic of China and Germany; and by increasing opportunities for students from diverse backgrounds to research and study at universities overseas. While we have over 160 current agreements with overseas institutions, relating to research collaboration, student and/or staff exchanges, teaching and program development, etc., we are attempting to focus on the two countries mentioned in a strategic fashion that can take advantage of our specific strengths and expertise.

The growing research and research training relationship between Australia and China is an important element in this international strategy. For example, research into water resources is a considerable priority and an area of growing research collaboration, building on our environmental and agricultural research expertise; itself developed as a response to our geographic location in the driest state in Australia. The University of Adelaide and the Chinese Academy of Sciences, in conjunction with government agencies, have established the China-Australia Environmental Science and Technology Institute, which aims to tackle some of the biggest environmental issues facing both countries, particularly relating to water and soil quality and use.

We have also recently established a Confucius Institute in conjunction with Shandong University in China. The Institute promotes the learning of Chinese language and culture, and a broader and more informed understanding of China. This is the third such Institute established in Australia, the other two being with the University of Melbourne and the University of Western Australia.

Research collaboration between Australia and Germany is being enhanced through a new researcher exchange scheme between the Go8 universities and the German Academic Service (DAAD). The DAAD is Germany’s national agency for the support of international academic cooperation. Under the Scheme the Go8 and the DAAD have each agreed to provide A$200,000 per annum from 2008 to 2010 to meet the travel and living costs of researchers who spend time at collaborating institutions in Australia or Germany.

Conclusion

Through a planned and well targeted approach that sees the promotion and enhancement of world-class areas of research, the University of Adelaide is putting in place a framework to support an increasingly international orientation. As we attempt to maximise our resources and respond to ever-increasing competitive challenges, local, national and international, we are cognisant that we do this is a global environment where we must continue to perform ‘above our weight’ in as many spheres as possible. By focusing on the implementation of a strategic research framework aimed at improving the quality and impact of our research performance, it is expected our outcomes will exert a positive change on our international position. We do not have a specific date by which we would expect to be recognised as a ‘world-class university’, nor can we guarantee that we will be able to achieve this outcome. However, aspiration, if properly focused and supported, may be the key for a small university to meet the challenge.

References

Abbas, V., and Worthington, A. (2006). Ranking and Clustering Australian University Research Performance, 1998-2002. *Journal of Higher Education Policy and Management*, 28(2), 189-210.

Department of Education, Science and Technology (2002). *Varieties of Excellence: Diversity, Specialisation and Regional Engagement.* Commonwealth of Australia. Retrieved 25 July 2007 from http://www.backingaustraliasfuture.gov.au/publications/varieties_ of_excellence/3.htm

Faust, D. (2007). *Harvard Presidential Announcement, Remarks by President-Elect Drew G. Faust,* February 11, 2007. Retrieved 1 August 2007 from http://www.news.harvard.edu/gazette/2007/02.15/99-statement.html

Hood, J. (2004). *Inaugural Address,* 5 October 2004, Oxford University. Retrieved 25 July 2007 from http://www.admin.ox.ac.uk/po/vc/hood_speech.pdf

Marginson, S. (2007). *Global university comparisons: the second stage. Presented to the Conference on International Trends in University Rankings and Classifications,* Griffith University, 12 February 2007.

Marginson, S. and van der Wende, M. (2006). To rank or to be ranked: the impact of global rankings in higher education, University of Twente, Netherlands, 1-16. Retrieved 26 June 2007 from http://www.griffith.edu.au/conference/university-rankings/content-papers.html

Seizing the Opportunities (2007). *A Group of Eight Discussion Paper,* 6 June 2007, 1-69. Retrieved 7 June 2007 from http://www.go8.edu.au/policy/current.htm

University of Adelaide (2006). *University of Adelaide Future Directions Strategic Plan 2007-2011.* Available at http://www.adelaide.edu.au/policies/34/

Class Universities in Developing Countries: German-Jordanian University Model

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Abstract

This paper outlines the German-Jordanian University model within a framework of two foundational initiatives that are necessary for building class universities in developing countries. The initiatives focus on adopting quality standards in higher education and on fostering high-impact interdisciplinary research, in an effort to excel in academic excellence, accelerate diffusion of research, create private sector partnership, promote multi-cultural communities. The main objective is to enforce the concept of unique, relevant, and internationally-oriented university model on the basis of the German *hochschulen* educational system. Evidences show that such a model enriches both theoretical and practical experiences of students with relevance to industry needs. The University model presents a unique international collaboration and a notion of education with greater diversity, interdisciplinary setup, accelerated diffusion of knowledge and technology, and enhanced societal context.

Class Universities in Developing Countries: German-Jordanian University Model

Recent technological advances have created a new paradigm of higher education, worldwide. New concepts and enhancement theories of education have been introduced to meet expanding technological, sociological and political requirements. These theories have lead over time to a concept of World Class University (WCU). The concept builds on a group of institutions that apply standards of education and build a base for diverse learning, digital education, technological innovation, and knowledge creation.

WCU is usually characterized by the quality of teaching, resources, impact on economic development, and the quality of life of citizens. Ranking a university to be a WCU cannot be uniformly applied worldwide due to the apparent differences between developed and developing countries. The differences are originated by the topology of the educational systems, being decentralist technology driven topology in the developed countries, and centralist politically driven topology in developing countries. Keeping this in mind, developing countries can still leap into a WCU category by restructuring its educational systems to be coherent with the characteristics of WCU originated in industrial countries, (Cai and Ying, 2007; Jan and Cai, 2007; Maureen, 2007). Social fabric and educational barriers, however, are the main concerns that would oppose the diffusion of knowledge and technology transfer in developing countries. The trend in Jordan is to gradually pave these concerns and concurrently move towards a WCU standards.

The impact of technology on every facet of life created a demand for a new educational paradigm in the modern Jordanian society. In 1999, His Majesty King Abdullah II called for immediate economic development, welfare enhancement, fundamental education empowerment, and prosperous industry. In support of his Majesty’s vision, the German-Jordanian University model has emerged with two foundational initiatives, in an effort to build a competent world class university and be able to address newly information driven societal and industrial needs. The initiatives focus on adopting quality standards in internationally-oriented higher education and on fostering high-impact interdisciplinary research that truly addresses market needs and provides a substantive understanding of technology and its role in the society. Many challenges still remain, however.

The paper is intended as a contribution to outline the two initiatives and their implementation challenges in the German-Jordanian University setup. The initiatives more specifically aim at addressing critical needs for a better education, skills, and competencies in developing countries; determining the role of education in fostering innovation within communities and shaping the future economy and society; increasing awareness and acceptance to the technological changes within the social fabric; motivating faculty and staff to get along easily with technology and its usage in providing quality teaching; encouraging university-industry partnership; and fostering creativity and innovation within student and faculty communities.

In the remaining sections of the paper, we present a background on the German-Jordanian University which has been established with a goal to contribute to the global educational thrust for a broader, more inclusive learning society. The foundational initiatives framework and the Standardized higher education and inter-disciplinary research initiatives are then discussed and evaluating measures of success are given.

Background

The German-Jordanian University (GJU) was founded in 2005 by a Royal Decree. Jordan's Ministry of Higher Education and Scientific Research and Germany's Federal Ministry of Education and Research worked together to found the university. It is modeled on the German universities of applied sciences, characterized by their focus on putting knowledge into practice and on promoting knowledge transfer. The university mission has been to educate highly skilled professionals who will be capable of contributing to Jordan's development and economy within a model that:

- Nurtures high-tech research atmosphere to attract highly qualified academics with long industrial experiences
- Provides quality and relevant education to students while emphasizing a necessity for integrating hands-on learning laboratories, soft skills, capstone projects, and field training
- Continuously develops and updates both undergraduate and graduate degree plans to meet ever-changing industrial needs and requirements
- Develops highly technical, multilingual and multicultural professional competencies able to contribute to the global competitive market
- Promotes private sector partnerships at various levels and maintain sustainable industry linkages
- Promotes an alumni network for lifelong learning

By taking advantage of best practices in education in both Jordan and Germany, the university has positioned itself as a leader in its field.

Student enrolment stood at about 900 in Fall 2007. Nearly 8% are non-Jordanian, with some 6 nationalities represented on the campus. This goes a long way towards the enhancement of cross-cultural experience. The university is co-educational, and around 42% of the student body are female.

The University is linked to many other universities, mainly in Germany, and private industries through bilateral agreements for co-operation, collaboration, exchange of faculty members, and student internships. Most students, or nearly 95%, are enrolled in undergraduate programs distributed among 6 schools and 15 programs. Graduate programs at the MSc level are offered in 5 areas of specialisation. The schools comprise of: Technological sciences, natural applied sciences, medical sciences, informatics & computing, architecture & design, and Talal Abu-Ghazaleh college of business.

The Foundational Initiatives Framework

Many concerns have been raised within the traditional higher education systems. These include tendencies for discipline-specific departments, inflexible curricula, emphasis on individual effort rather than team work, little technological and societal context, and lack of communication and leadership skills.

The enthusiastic and thoughtful discussions from varieties of meetings with experts and professionals, government desire of potential improvement, support of German educational systems, along with much continuing work and input from faculty, staff, and students created a demand for an enhanced educational system. This demand has lead to formulating the basis of GJU educational structure. The objectives are: to achieve a national and international class of education, increase diversity in student body, broaden interdisciplinary education, emphasize team work and real world learning experiences, and prepare graduates for success in their careers.

Through cooperative research with the industry, academics better understand industrial needs and can collaboratively create a dynamic research environment that targets industrial projects in multiple dimensions. Within a formal hypothesis, cooperation enhances a broad spectrum of knowledge-technology transfer methods, including personal interactions, research consortia, workshops, student internships, R&D commercialization, and skill alignment to real and immediate industry needs.

Hypothesis 1: The in-campus industrial facility provides a rich collaborative environment that brings together business and technical faculties in the pursuit of projects that cultivate partnership with industrial *and business partners; updates the knowledge base of the University with the latest industry developments; and aligns the skills and knowledge of students to real and immediate industry needs.*

Many of the industries in Jordan are in the range of small-medium size enterprises, and thus are limited in the amount of skills and knowledge developed internally. These skills and knowledge, meanwhile, are continuously undergoing rapid technological changes. This created a strong incentive to industries to create collaborations with universities as a source of new technological skills and knowledge that may be used to complement their internal resources and thus dynamically build their technical capabilities and effectively generate value-added competitive synergies at low costs. Formally;

Hypothesis 2: The industry has a strong partnership tendency for the development of competitive advantage through complementing internal resources, gaining access to university facilities, and building dynamic capabilities at lower costs.

Within the context of the above two hypotheses, the GJU model is built with a focus on two foundational initiatives: Standardized internationally-oriented higher education and high-impact interdisciplinary research.

Standardized Higher Education

The first foundational initiative is set to enforce standards for excellence in all disciplines of internationally-oriented higher education. Worldwide accreditation standards in business, sciences, arts, and engineering are being considered. Standards follow the guidelines of FIPA, AACSB -International accreditation for business administration and accounting, and ASIIN, the German Accreditation Agency Specialized in Accrediting Degree Programs in Engineering, Informatics, the Natural Sciences and Mathematics. The objective is to assure quality and promote excellence and continuous improvement in undergraduate and graduate education.

New educational opportunities have been explored and special attention has been given to emerging fields that show great promise, while retaining commitment to rigidity and depth within the core disciplines. The focus is on specialized engineering programs of critical importance such as Water, Environment, Energy, Maintenance, Embedded systems. These strategic programs will prepare new graduates with skills and capabilities for new inventions and better utilization of resources, thus creating expertise for a better technical standing and a better confrontation of future unprecedented crises in energy and water.

Monitoring and Quality Control

GJU has created a new entity “Center of Educational standards and Quality Control” to monitor progress, conduct regular evaluations, and to keep track of excellence in education. Procedures, processes and methodologies for quality assurance and control are being adapted to assure that the programs offered and faculty members are adhering to local and international standards of higher education. The center regularly analyzes the performance of the programs, faculty, and students for continuous improvement. New and improved teaching methods are being introduced for effective and interactive learning.

Interdisciplinary Education

The curricula of all programs at the German-Jordanian University have been undergoing major renovations to encourage interdisciplinary education, broaden student knowledge, and to foster innovative, creativity and entrepreneurship among student community, and enhance project-oriented and real-world learning experiences.

The university educational structure is rather dynamic and embeds an internationalization component and adops curricula that is continuously and systematically reviewed and developed to ensure that the outcomes continue to meet the demands of a fast growing and evolving technology sector in Jordan and the region.

Diversity and Real World Experience and Impact

The German-Jordanian University has established closer ties with many universities in Germany within a funded consortium of about 70 German Universities. The German Universities host GJU students for one full year (one academic semester and 6 months industry internship). This exposes students to a wide range of scholars, researchers and practitioners from other universities and foreign industries.

The curricula of the programs offered at GJU encourage personal development and facilitate students’ exploring and pursuing entrepreneurial activities while in campus. The University in collaboration with the private sector has created varieties of Internships during the first year, to help students gain more real-world experience; and developed optional short courses and workshops to help students improve leadership, project management, writing skills, and communication skills.

The University has taken a major shift by adopting in-campus industry partnerships with major and world renowned industries, such as Festo, Aramex, Microsoft, IBM, and SUN. Furthermore, the University has a special type of partnership with the world leading business company – Talal Abu Ghazaleh

Organization – in the form of establishing a joint-partnership college of business.

The objective of these partnerships is to bring closer ties with the industry, in an effort to create a direct exposure to technologies and businesses and promote creativity and innovation in the field of applied sciences and engineering, and more importantly, crystallize business, faculty, and student intellectual ideas. In the long-term, students' capabilities and expertise will be enriched to tackle real world problems in such versatile and diverse industries, thus building a sustainable technology workforce and kicking off real economic development.

High-impact Interdisciplinary Research

The second foundational initiative is set to encourage high-impact interdisciplinary research though partnerships that rely on the ground of the above two hypothesis. The partnership model brings together research centers, government, industry, and academic institutions. Figure 1 shows the model as it widens the overlap between collaborations among these sectors by defining a new partnership setup. Each sector has its own potential capabilities and predefined set of roles and responsibilities as indicated in the figure. Research centers have advanced laboratories in technology, environment, energy, biomedicine, and other engineering sciences.

Academic institutions make use of these facilities in teaching and research – in coordination with the industry and in-line with the market needs. The industry cooperates with academic institutions and provides internships to students and professors. Government institutions standardize operating procedures, invest in R&D, and identify nation-wide research priorities and needs.

The practice of science and engineering is changing dramatically. Multidisciplinary collaborations, direct personal interaction, and joint industrial projects will better facilitate creation of knowledge, know-how, and life-long learning. A number of research facilities are being established within the framework of the proposed model. Faculty members with varieties of disciplines collaboratively work with industrial professionals on joint products and services, which draw on a greater variety of perspectives and more fully address societal needs.

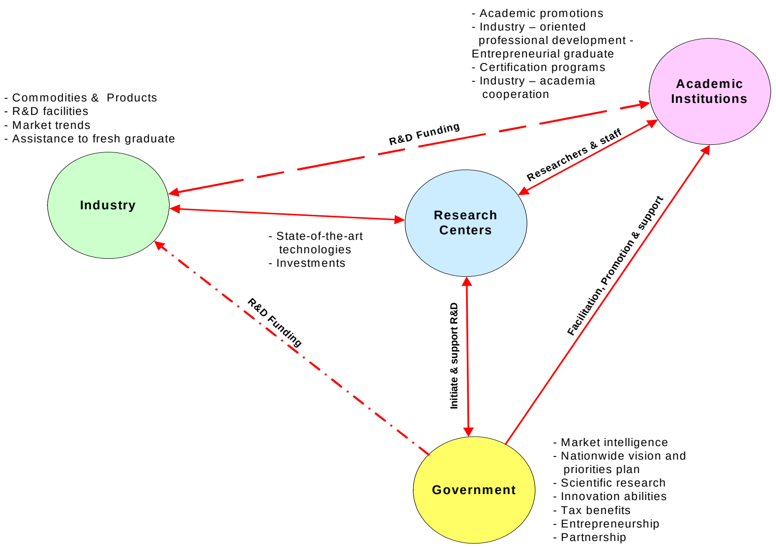

Figure 1 The Partnership Model Bringing Together Research Centers, Government, Industry, and Academic Institutions.

The German-Jordanian University is continuing its effort to create an exceptional research environment that bridges boundaries; promotes interdisciplinary initiatives; facilitates faculty exchange; increases cultural diversity and multi-cultural communities; and promotes multi-institution collaborations and supports closer interactions with private institutions.

Cross-Disciplinary Research

A cross-disciplinary research approach is adopted as an essential component. Researchers from varieties of disciplines are encouraged to create an on-going dialogue with professionals and technologists from the private and public sectors. The successful application of technology arising from these variety of fields will influence students, faculty, private, public and local citizens.

The outstanding capabilities that bring together researchers in a variety of research centers in-campus, resulted in the emergence of new research fields in bioinformatics, market negotiations, robotics, and other engineering disciplines. Building on existing collaborations, a new focus for innovative interdisciplinary work will continue, in an effort to span the domains in design, engineering, biology, science, computing, and art.

Evaluating Success

We give some metrics on the University progress regarding, recruitment, research impact, and external reputation.

Recruitment

There has been a constant improvement in the number, quality and diversity of people GJU attracts at all levels, including undergraduate students, graduate students, administrators, staff, and faculty members. Figure 2 gives the number of students, staff and faculty during the past two years and expected enrolment and hiring until 2011. The University strongly believes in creating diversity among students and staff to promote multi-cultural communities open to dialogue and to comparison between different ethnics, religious and social identities.

Research Impact

The University has worked on promoting private sector partnerships at various levels and sustaining industry linkages within a campus-wide industry oriented technology park. The objective is to facilitate funding for establishments of R&D facilities, student scholarships, and research projects. Examples of these facilities include Aramex center of excellence for logistics, academic initiatives with SUN and Microsoft, FESTO center, and other ongoing establishments of incubators and centers of excellence in all university colleges and schools.

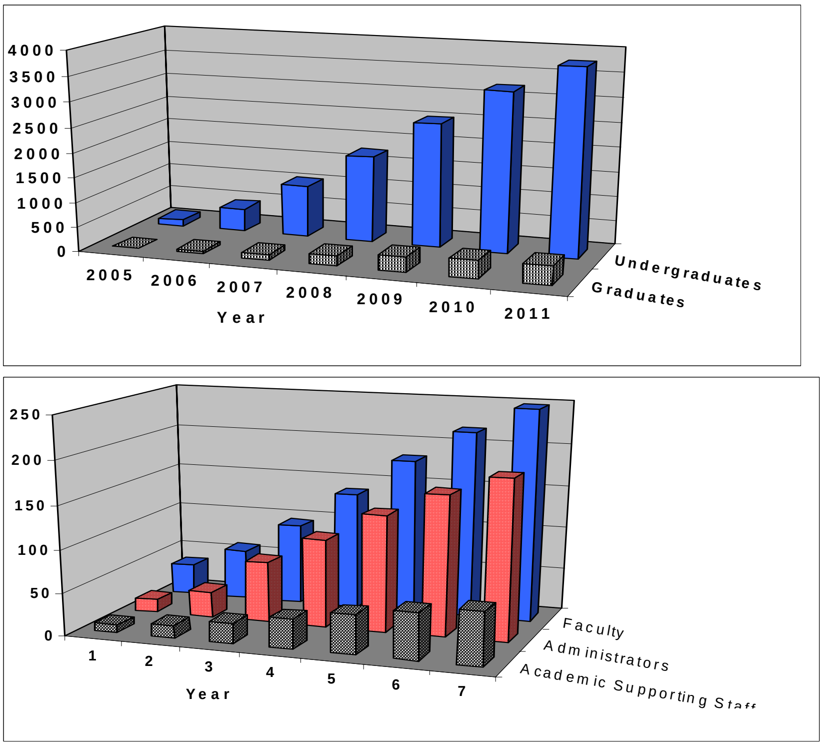

Figure 2 Number Of Students, Staff and Faculty During the Past Two Years and Expected Enrolment and Hiring Until 2011.

Through technology centers, the university has managed to create a culture of entrepreneurship among faculty and student community and has become more in-tuned to the emerging needs of the market economy and the concept of efficient allocation of resources with increased sponsored research funding, patents, publications and industrial collaborations.

External Reputation

Given our objective to become regionally recognized university for higher education excellence in the fields of applied engineering, technology, sciences, and management, it is essential to evaluate ourselves based on our external reputation. While standards, quality of education, professionals, resources, and research are clearly correlated with reputation, it also is useful to measure the University success in terms of ranking at the national and international levels, faculty membership in well-known engineering societies, professional awards, leadership in professional societies, publication volume, and recognition of our contributions and innovations.

Conclusions

Key initiatives within the German-Jordanian University model have been presented with a focus on adopting quality standards in higher education and on fostering high-impact interdisciplinary research that truly addresses market needs and provides a substantive understanding of technology and its role in the society. The initiatives more specifically aim at addressing critical needs for a better education, skills, and competencies in developing countries; determining the role of education in fostering innovation within communities and shaping the future economy and society; increasing awareness and acceptance to the technological changes within the social fabric; motivating faculty and staff to get along easily with technology and its usage in providing quality teaching; encouraging university-industry partnership; and fostering creativity and innovation within student and faculty communities.

The objective of the University setup is to enhance the quality of our academic services, expand R&D to contribute to the advancement of science and technology, and build a modern educational climate that allows better governance, more effective resource allocation and utilization, improved efficiency, optimized operational costs and better educational outcomes. The university model presented in this paper may be taken as an example of a competent university in developing countries. It presents a unique international collaboration and a notion of education with greater diversity, interdisciplinary setup, accelerated diffusion of knowledge and technology, and enhanced societal context. The guidelines presented in this paper constitute an educational framework that can be used to enrich understanding of what is required to enable developing countries to work in concert with the global educational institutes to take advantage of knowldege and technology and do the utmost to achieve academic excellence and boost their industrial and economic standing. The following are a number of recommendations which, if implemented, could lead to a significant improvement in higher education.

- Develop competent academic programs with quality and relevance to meet changing industry requirements and needs.
- Build up international partners to create a continuous dialogue and coordination process to establish a unique educational model driven by dynamic curricula structure.
- Adopt student-centred teaching methodologies through skill-transfer and capacity building, supported by efficient internship programs at international companies and industries.
- Develop partnerships for co-operation that aim at establishing joint projects for internships and work placements and aligning educational outcomes with the market skill requirements.

References

L. Cai, C. Ying (2007). Academic ranking of world universities: methodologies and problems, *The World-class university and ranking: aiming beyond status, 175-188.*

S. Jan, L. Cai (2007). Introduction to the topic: expectations and realities of world-class university status and ranking practices, *International conference on world class universities*, 17 - 23.

Maureen O'Hara (2007). Strangers in a strange land: Knowing, learning and Education for the global knowledge society. *Futures*, 39, 930-941.

Part Five

Cooperation and Competition Among Research Universities

Educational Exchanges: What World-Class Universities Should *Not* Adopt from U.S. Higher Education

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Abstract

American higher education is the envy of the world. In many countries, academic leaders look to the United States for models of good practice. Not every American policy, however, is worthy of emulation. As other nations seek world-class status for their universities, they should avoid four characteristics of American higher education: 1) a uni-dimensional definition of quality, 2) publications as the only legitimate form of scholarship, 3) bigger is better, and 4) financial aid for institutions rather than the public good. This paper outlines the reasons why these policies and practices are ineffective in the United States and discusses alternative approaches for universities seeking global stature.

Educational Exchanges: What World-Class Universities Should *Not* Adopt from U.S. Higher Education

In many countries, university reform efforts are based on the American model of higher education. Since many of the world's most prestigious universities are located in the United States, education authorities in other countries often look to these top insitutions as exemplars of best practice. Not all elements of American higher education are worthy of adoption, however; campus leaders and government authorities should think carefully about appropriateness before implementing U.S. reform efforts.

Evidence of adopting U.S. practice abounds. In China, for example, as in many countries, market principles and private forces are replacing total government control of higher education. English has become the language of research, and increasingly of instruction, in many disciplines. The undergraduate curriculum in many universities resembles the general education requirements of American schools. Hundreds of thousands of students from developing nations have sought higher education in the United States; many of them have returned to assume leadership positions in their home countries, bringing with them the insights gained from their studies abroad. Ideally these insights should include a sense of what not to adopt from the American system.

This article discusses five characteristics of the U.S. system that should be avoided as universities seek world-class status.

1. A uni-dimensional definition of quality
2. Publications as the only legitimate form of scholarship
3. Rankings define excellence
4. Bigger is better
5. Financial aid for institutions rather than the public good

Because the World-Class University conference is taking place in Shanghai, this paper will emphasize China's higher education reforms in the examples given in the text.

A Uni-Dimensional Definition of Quality

American higher education values research. Whether in quality rankings, aspirational statements of university leaders, or promotion and tenure policies, almost all U.S. institutions put scholarly productivity first. Even liberal arts colleges, the category of institutions with the strongest emphasis on teaching, increasingly expect significant research output from their professors. Faculty, too, value research for its intellectual challenge as well as the visibility it provides in the academic community.

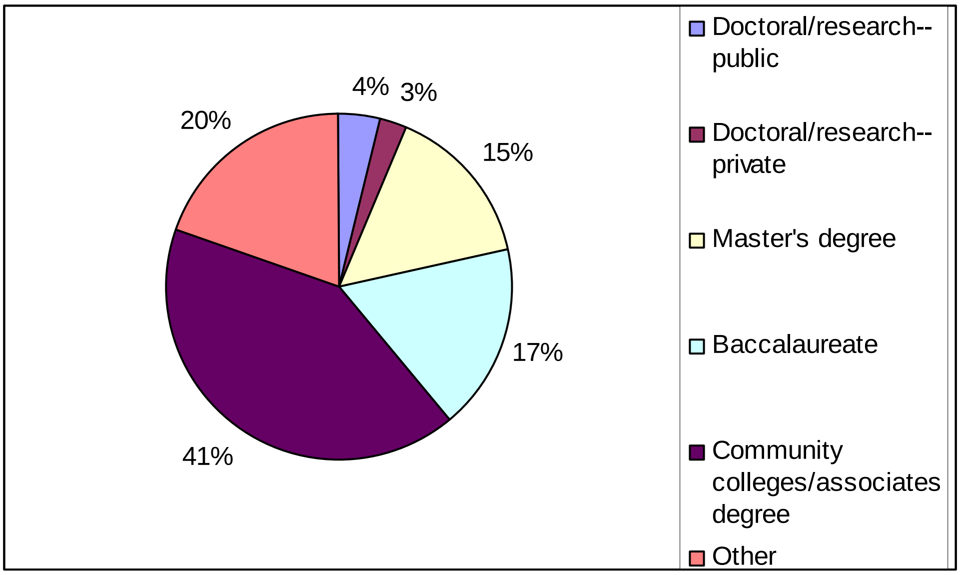

Figure 1 U.S. Institutions of Higher Education by Level of Degree, 2004

Source: Carnegie Classification of Institutions of Higher Education (2005)

Yet the proportion of institutions with research at the heart of their mission is relatively small. As Figure 1 shows, of the nearly 4400 institutions of higher education in the United States, only 282 are classified as research-intensive or research-extensive (i.e., doctoral) universities by the Carnegie Foundation for the Advancement of Teaching (2005). One-quarter of these research institutions are private while the majority receive public funds from the states in which they are located. Both public and private universities gain much of their research funding from different agencies in the federal government, although they do not receive general support at the national level.

The emphasis on research has several roots, beginning with the founding of the University of Berlin in 1809 by Wilhelm von Humboldt as a new conception of higher education. Variations on the German model, such as the University of Chicago and Johns Hopkins University, emerged in the late 19th century but the rise of the American research university occurred in the second half of the 20th century. After 1945, the development of a decentralized, pluralistic academic market forced rapid change, as universities responded to the forces of federal government funding, defense needs, economic growth, the generosity of philanthropic foundations, the baby boom, and the resulting shift from elite to mass higher education. (Geiger, 2004; Graham and Diamond, 1997). While 90% of all American institutions are not formally designated as doctoral or research universities, the prestige of the research enterprise lures many of them to imitate research universities, even though their missions emphasize teaching and applied work for local benefit.

Research is also important to universities in other countries. Government officials and campus leaders value research as vital to economic and social development. Research also plays a significant role in international prestige as noted in Part 3 of this paper. Because of the success of American higher education in developing a strong research base, many universities in other nations feel compelled to follow even when they deplore what is often called American or Western intellectual hegemony. These academics sometimes feel trapped into accepting this single definition of excellence, especially as their institutions seek greater visibility and status worldwide.

China presents a special case. In the desire to become more competitive, top Chinese universities are emphasizing research output at the same time that the country is expanding enrollments dramatically. Both initiatives are investments for the long-term development of China as a knowledge society. The central government is giving additional funding to several dozen research universities with the greatest chance to be internationally competitive. Yet the strength of any society depends upon a broad base of educated citizens, most of whom will attend—not research universities—but other kinds of schools. There needs to be a way to discuss quality in these institutions as well.

Publications as the Only Legitimate Form of Scholarship

With a priority on research comes an emphasis on publications. Books printed by reputable publishers or articles in scholarly journals indicate peer acceptance of the authors' ideas. In addition, publications have the advantage of easy quantification while teaching quality and service to the community are difficult to measure. Many university ranking systems look at publications but the most popular international ratings emphasize high impact journals (mostly in English) and frequent citations by peers as indicators of excellence.

The danger, of course, is that simply producing a large number of publications does not necessarily define excellence. Furthermore, institutions with missions that are not research-intensive all too often mimic research universities in their expectations for publication, yet faculty in such schools teach many more classes and contribute to applied work for the economic and social development of the city or region.

Ernest Boyer, in *Scholarship Reconsidered* (1997), goes beyond the traditional definition of scholarly work to embrace four kinds of scholarship for which professors should be recognized.

1. The scholarship of discovery, the traditional form of research, is the quest for knowledge for its own sake. This traditional research approach must be celebrated and rewarded but it needs to be honored along side three other forms of scholarship.
2. The scholarship of integration focuses on making informed connections across the disciplines. As interdisciplinary research becomes more important in an increasingly interconnected world, integration becomes a vital form of intellectual endeavor.
3. The scholarship of application bridges the gap between the academy and the worlds outside. Especially in rapidly developing nations such as China, applied work is vital for the economic and social development of the nation.
4. The scholarship of teaching emphasizes the transmission, transformation, and extension of knowledge. More than simply good classroom performance, the scholarship of teaching is a reflection upon the process of inspiring the next generation.

Many American institutions, even major research universities, are widening the range of indicators of faculty excellence. Boyer's four categories are being used for assessment of professorial achievement, even in places as distant from the U.S. as Hong Kong. While publications of new knowledge will probably always be most highly regarded, interdisciplinary and applied work is more highly valued than before. Individuals who pursue the scholarship of teaching, especially with indicators of external approval by way of grants and awards, are gaining status as well. Even Harvard University, clearly a research-intensive institution, is giving greater attention to undergraduate requirements and pedagogy (Harvard University, 2007).

Universities desiring to achieve an international reputation tend to pursue the most obvious ways to demonstrate rising achievements. More books and articles published by faculty can certainly serve that purpose, but simply going for quantity, or only valuing certain kinds of publications, shortchanges the faculty and ultimately overlooks other important scholarly contributions. In learning from the American experience, academics in other countries would do well to consider what elements of Boyer's four forms of scholarship might enhance the quality of higher education.

Rankings Define Excellence

University rankings have existed for a long time but until recently they have tended to be domestic comparisons. In the United States, the oldest and most cited are the rankings done by *U.S. News and World Report* magazine. Ostensibly to help high school students and their families make good decisions about college, the annual college ranking also sells lots of magazines.

One of the unintended consequences of the *U.S. News* annual listings is the growing belief that rankings truly measure the quality of American colleges and universities. Schools now publicize their standing, legislators and trustees demand upward mobility in the rankings, and some university presidents even receive financial bonuses when their institutions rise in the listings. More and more, institutional leaders express their goals as “being in the top 25 universities in Europe” or “making the first quartile in *U.S. News*.”

Further evidence of the power of rankings is the effort of some educational leaders to boycott the process. In Canada 26 presidents of leading Canadian universities refused to submit information to *Maclean's* magazine for the 2007 university issue because of concerns about the criteria used, although the magazine collected publicly available data to evaluate these schools anyway (Richard 2006; And now—our biggest ranking issue ever, 2006). Similarly a group of 60 American liberal arts college presidents has called upon peers to refuse to participate in the reputational survey used by *U.S. News*. Instead they are proposing an alternative format in which to present data for the use of college applicants and their families. Unlike their Canadian peers, these U.S. presidents represent smaller, primarily undergraduate institutions and may not have the clout to reform the ranking system. (Annapolis Group 2007; Hoover 2007; Will 2007).

Many nations seek to have globally recognized institutions; an Internet search on the term “world-class universities” yields dozens of results from around the world. China’s focus on world-class universities began in 1998 at Peking University’s centennial celebration, when then-President Jiang Zemin announced the goal of having a small group of world-class universities in China. As a result, the Ministry of Education developed the 985 Project to pump significant new monies into the institutions most likely to become internationally competitive. Starting with Peking and Tsinghua Universities, the 985 Project now provides special support to approximately 40 universities in China. In two rounds of funding, the government has spent more than 30 billion yuan on these leading institutions.

The 985 Project exists in parallel to the 211 Project, designed to prepare the top 100 universities in China for success in the 21st century. In addition, government ministries conduct grant competitions for both basic and applied research. These funds represent a significant commitment by the Chinese government to catapult the best universities into a new international league of higher education.

Table 1. Criteria for International Rankings of Universities, 2006

Shanghai Jiao Tong University Institute for Higher Education

- 10% Quality of education as indicated by numbers of alumni winning Nobel Prizes and Fields Medals
- 40% Quality of faculty
    - 20% professors winning Nobel Prizes and Fields Medals
    - 20% Professors whose research is highly cited by others
- 40% Research output
    - 20% Articles published in Nature and Science
    - 20% Articles included in Science Citation Index and Social Science Citation Index
- 10% Size Academic performance with respect to the size of the institution

Source: Academic Rankings of World Universities 2006. Shanghai Jiaotong University Institute of Higher Education

Times Higher Education Supplement

- 40% Peer review as measured by a survey of university leaders worldwide
- 10% Recruiter review as measured by a survey of corporate recruiters and managers
- 20% Citations of research in high-impact journals
- 20% Faculty-student ratio as a proxy for teaching quality on the assumption that small classes provide a better educational experience for students
- 5% Proportion of international faculty
- 5% Proportion of international students

Source: Times Higher Education Supplement, 6 October 2006

Newsweek International

- 50% Research (from SJTU statistics)
- 40% Faculty characteristics (including the proportion from other countries)
- 10% Library holdings

Source: Newsweek International 13 August 2006

The definition of a world-class university remains unclear, however, although definitions of excellence can be inferred from various ranking systems of universities worldwide. While these rankings do not explicitly say "This is our definition of quality," what they choose to measure can be used as implicit indicators of excellence. The two best-known international ranking systems are conducted by Shanghai Jiao Tong University (SJTU) in China and the *Times Higher Education Supplement* (THES) in the U.K. The dramatic differences in the criteria used by the two systems demonstrate the lack of consensus about what is most important in worldwide university prestige.

The Shanghai Jiao Tong survey is highly focused on published research, especially in science and technology, as Table 1 demonstrates. The *Times Higher Education Supplement*, in contrast, emphasizes institutional reputation as well as faculty and student factors. In the summer of 2006, *Newsweek International* used elements from these two ranking systems to create a list that emphasizes the international dimension of higher education today, especially at research universities.

Table 2　Rankings of Universities Worldwide: Top 20 Universities on Three Ranking Systems

	Shanghai Jiaotong	Times High Ed Supplement	Newsweek Intl Global Universities
Harvard University	1	1	1
University of Cambridge	2	2	6
Stanford University	3	6	2
Univ of California-Berkeley	4	8	5
Massachusetts Inst Tech (MIT)	5	4	7
California Inst Tech (Caltech)	6	7	4
Columbia University	7	12	10
Princeton University	8	10	15
University of Chicago	9	11	20
University of Oxford	10	3	8
Yale University	11	5	3
Cornell University	12	15	19
Univ of California-San Diego	13	44	23
Univ of California-Los Angeles	14	31	12
University of Pennsylvania	15	26	13
Univ of Wisconsin-Madison	16	79 (tie)	28
Univ of Washington-Seattle	17	84	22
Univ of California-San Francisco	18	**	9
Tokyo University	19	19 (tie)	16
Johns Hopkins University	20	23	24
Australian National University	54	16	38
Beijing University	*	14	***
Duke University	31	13	14
Ecole Normale Superieure	99	18	79
Imperial College London	23	9	17
London School of Economics	*	17	34
National University of Singapore	*	19 (tie)	36
University of Michigan	21	29 (tie)	11
University of Toronto	24	27	18

* not in top 100 on Shanghai Jiaotong ranking
** not in top 100 on THES ranking
*** not in top 100 on Newsweek ranking

Academic Ranking of World Universities 2006, Shanghai Jiaotong University Institute of Higher Education
"The Complete List: The Top 100 Global Universities," Newsweek International, 13 August 2006.
"World University Rankings," The Times Higher Education Supplement, 6 October 2006.

The different criteria lead to quite different results, as shown in Table 2. The first few institutions on all three lists are remarkably similar but they spread out quite quickly. Perhaps the most dramatic example is

Peking University, the top-ranked Chinese university on all three lists. THES places Peking University as #15 in the world while SJTU places the campus in an alphabetical section of institutions between 201-300. The Newsweek survey does not include Peking University in the top 100.

Similarly, several large American state universities such as Wisconsin, UCLA, and Washington, appear in the top 20 on the SJTU list because of their strong research programs but fare poorly on THES because they lack instant name recognition. On the other hand, THES has a much more international list, with universities in France, Australia, Singapore, Japan, and Canada joining the U.S. and U.K. universities that lead the SJTU top 20. The differences in the results emphasize caution in using rankings to define excellence.

Levin et al. (2006) provide little hope for agreement on the criteria to be used in higher education comparisons. He and his colleagues applied multivariate analytical techniques to national and international university ranking systems and found little consistency in either methods or results. They conclude that international orientation and research productivity are statistically significant in explaining reputation, but only for universities in English-speaking countries. In general, they say, the issue of world-class standing is a tautology in the sense that there is less agreement on what makes that reputation than the fact that there are a limited number of universities on which widespread agreement of "world-class" is likely.

A more qualitative approach comes from Philip Altbach (2004) who, in analyzing the costs and benefits of world-class status, provides a narrative list of characteristics.

- Excellence in research is the primary criterion, requiring top quality professors. Favorable working conditions are also necessary, including job security and good salary and benefits for academic staff.
- Adequate facilities, appropriate to the discipline, for both teaching and research.
- Adequate funding, consistent and long term.
- Academic freedom allowing professors and students to pursue knowledge wherever it leads, and the ability to publish without fear of sanctions by academic or external authorities.
- An atmosphere of intellectual excitement.
- Institutional self-governance in which the academic community has significant control over the central elements of university life—admission of students, curriculum, criteria for degrees, and selection of new members of the professoriate.

It is interesting to note that, beyond Altbach's first criterion of excellence in research, his standards for world-class status are not duplicated in either the SJTU or THES ranking system, probably because such qualitative factors as academic freedom are so difficult to measure. differences among the various ranking systems allow institutions to pick and choose the standards by which they can "prove" their academic success. The danger, of course, is to believe that a high position on any ranking system truly indicates institutional quality.

Bigger Is Better

The United States is a country that values size—huge hamburgers, ten gallon hats, and big higher education systems. For the last half century, the U.S. has promoted public policies with a commitment to making a college education available to all citizens who can benefit. As other countries also pursue massification, the U.S. is no longer the undisputed leader in terms of the size of the tertiary education sector. For example, China now has millions more students than United States in various forms of higher and adult education, as Figure 2 shows. In addition, China and other countries have thousands more citizens studying abroad.

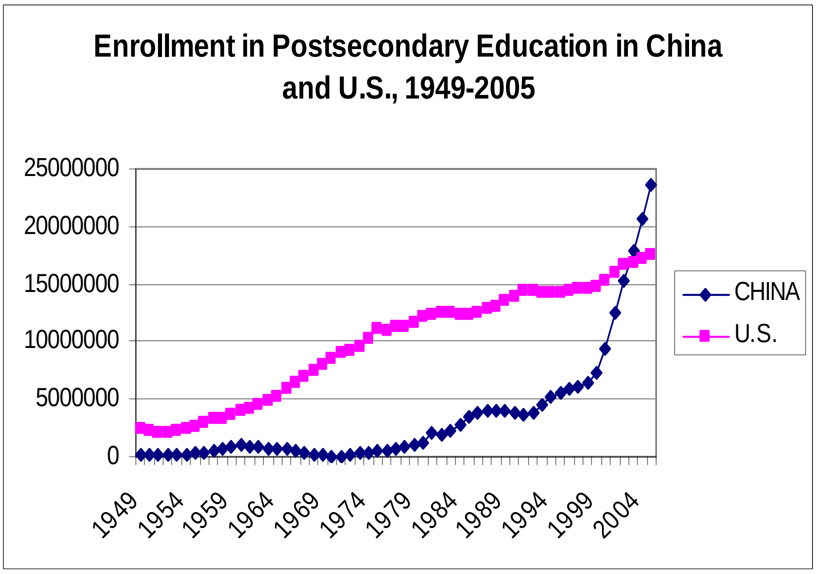

Figure 2

Sources: National Center for Education Statistics, U.S. Department of Education; China Statistical Yearbook, National Bureau of Statistics of China.

Table 3 Gross Enrollment Ratio 2004 (selected countries)

Finland	90%
South Korea	89%
Sweden	84%
United States	82%
Norway	80%
Australia	72%
Macau	69%
Russian Federation	68%
UK	60%
Canada	57%
Cuba	54%
Japan	54%
Germany	49%
Chile	43%
Thailand	41%
Mongolia	39%
Egypt	33%
Hong Kong	32%
Philippines	29%
Turkey	29%
Mexico	23%
CHINA	19%
Indonesia	17%
India	12%
Nigeria	10%

Gross enrollment ratio is the number of students, regardless of age, as a percentage of the college-age population (2004)

Source: Table 8, Global Education Digest 2006,
UNESCO Institute for Statistics

Perhaps a better statistic for comparison is Gross Enrollment Ratio—the number of students in tertiary education, regardless of age, as a percentage of the college-age population, shown in Table 3. Once again, the U.S. has a high Gross Enrollment Ratio but is not at the very top as Scandinavian nations and South Korea have made significant commitments to expansion of higher education.

In some countries, mass education comes about through the creation of new institutions, while in others the strategy is expansion of existing universities. China, for example, is doing both at a dramatic rate. As a result, many Chinese universities face student demand that far outstrips institutional capacity, leading to concerns about diminishing academic quality. In addition, China is encouraging the creation of non-state sponsored universities, although the government is ambivalent about the effectiveness of many private institutions. Most of them are not authorized to grant degrees and are subject to the vagaries of shifting policies (Lin 1999) so the pressure on existing public universities continues.

Table 4 Largest American Colleges and Universities 2005

2005	Enrollment
University of Phoenix on line (Arizona)	117,309
Miami Dade College (Florida)	54,169
Arizona State University	51,612
University of Minnesota--Twin Cities	51,175
Western International University (Arizona)	50,663
Ohio State University—Columbus	50,504
University of Texas—Austin	49,696
University of Florida—Gainesville	49,693
Michigan State University	45,166
Texas A&M University--College Station	44,910
Central Florida University	44,856
City College of San Francisco (California)	43,225
University of South Florida	42,660
University of Illinois--Urbana-Champaign	41,938
University of Wisconsin—Madison	40,793
Pennsylvania State University--University Park	40,709
Purdue University main campus (Indiana)	40,151
New York University	40,004
University of Michigan--Ann Arbor	39,993
North Harris-Montgomery Community College (Texas)	39,516

Source: 2007-8 Almanac of Higher Education, Chronicle of Higher Education, August 2007.

Table 5 Enrollments at Top 20 Universities 2005

	2005 Enrollment
Harvard University	25,017
(Cambridge University, UK)	
Stanford University	19,042
Un.California-Berkeley	33,547
Mass. Institute of Technology	10,206
Cal. Institute of Technology	2,169
Columbia University	21,983
Princeton University	6,773
University of Chicago	14,150
(Oxford University, UK)	
Yale University	11,483
Cornell University	19,642
Un.California-San Diego	25,320
Un.California-Los Angeles	35,625
University of Pennsylvania	23,704
Un.Wisconsin-Madison	40,793
Un.Washington-Seattle	39,251
Un.California-San Francisco	2,863
(University of Tokyo, Japan)	
Johns Hopkins University	19,225

Listing from Academic Ranking of World Universities 2006, Institute of Higher Education, Shanghai Jiaotong University

Enrollments from National Center for Education Statistics, U.S. Department of Education

While American higher education grew rapidly after World War II, the pace was slower than the current expansion rates in China and many other nations. The 20 largest American universities are shown in Table 4. These large institutions, however, are not the most highly regarded ones; none of them appears among the top

20 universities in the SJTU survey. As Table 5 demonstrates, the most prestigious U.S. universities tend to be relatively small. As other nations seek to improve their academic standing around the world, they should not automatically equate size and quality. Bigger is not always better.

Financial Aid for Institutions Rather Than the Public Good

One of the hallmarks of the American higher education scene—and one of its serious problems—is the use of financial aid in student recruitment. Because U.S. higher education is very decentralized and many institutions are private, the American experience is quite different from most other countries. As market-based approaches take hold in different parts of the world, however, some of the problems of the U.S. system may affect other nations as well.

The American experience is fundamentally a market system with a great deal of autonomy residing at the institutional level. Even public colleges and universities supported by their states retain significant control over major features of academic life, including curriculum, faculty hiring, and student selection. The national government plays no role in the admissions process, although it does provide need-based scholarships and loans for students from poor families who would otherwise be unable to participate in higher education.

The U.S. system, in which students apply to whatever institutions they wish and colleges and universities select whichever students they wish, is one of significant competition. While testing plays a role in the process since selective institutions use SAT scores as one measure of student achievement, admission is not based solely on test scores. American admissions offices tend to look at high school grades, teacher recommendations, student extra-curricular activities, and other non-academic factors as well. Students wait and see which institutions will admit them—and often decide which college to attend based on the amount of financial aid that institutions provide.

Financial aid policies are very important for American higher education since most undergraduates need scholarships and/or loans to afford the cost of college. A recent report for the U.S. Department of Education notes that three-quarters of all undergraduate students received some type of financial assistance in the 2004-05 academic year. The percentage is higher at private institutions, both not-for-profit and for-profit institutions (Smith 2007).

Since the 1960s, need-based aid has dominated the U.S. higher education landscape but merit scholarships, awarded without regard to financial need, have grown rapidly in the last decade. In 1994, need-based grants from all sources totaled $18.6 billion nationwide while merit scholarships provided $1.2 billion. By 2004, need-based grants increased 110% to $39.1 billion, while merit scholarships rose to $7.3 billion—a 508% increase (Kahlenberg, 2006). Some of the new merit aid came from funds that had previously been allocated to need-based scholarship programs, hence the current public policy debate about the best way to distribute limited financial aid dollars. Few analysts oppose scholarships for talented students as a matter of principle but many believe that need-based aid is a better policy choice for assisting students with the high cost of college.

Merit-based financial aid allows institutions to attract the students they most want to enroll—often students with strong academic records or special talents such as athletic or musical ability. Students and their parents, for their part, prefer to pay less money for college rather than more, so students often attend the institutions offering the highest amount of financial aid even if the school is not their top choice. The process escalates as students seek larger and larger scholarships and institutions spend more and more for the most desirable applicants. It is the market system working with a vengeance.

Many studies of college-going behavior have demonstrated that students from wealthy families attend college at rates much higher than students from low-income families. According to a 2004 Century Foundation study (Carnevale and Rose, 2004), 74 percent of American undergraduates in 1995 came from the richest socioeconomic quartile of the U.S. population while 3 percent came from the bottom quartile. In other words, access to college is correlated with family income. Multiple explanations abound—affluent families often send their children to the best primary and secondary schools, support enrichment opportunities on weekends and in summers, and thereby provide better academic preparation for college. Wealthy families can easily afford to pay tuition and fees while poor students must take out loans or forego college altogether. Federal and state governments over the last half century have sought to level the playing field by providing need-based financial aid.

Merit scholarships reward students who have been successful in their prior schooling—individuals who are most likely to go to college—a more affluent group than the age cohort in general. Some states have created merit-based scholarships for state residents to attend colleges and universities within the state in order to keep more of their citizens at home. Many individual institutions use merit aid to “shape” the entering class (Lederman 2007). This form of tuition discounting basically lures students to attend campus A rather than campus B; it has little influence at the margin for the most needy students who must decide whether they can afford higher education or not.

The authors of a recent study by the College Board, a non-profit higher education organization, found that 40 percent of institutional grant aid awarded by public four-year colleges and universities is not based on financial need. This high proportion of merit aid "raises serious questions about the extent to which institutional aid funds are being used to enhance access to and choice in higher education. Not only are significant amounts of institutional aid in the public sector being distributed based on criteria other than need, but a high proportion of dollars are allocated to students whose financial circumstances would permit them to enroll without these subsidies." (Lederman 2007).

Thus merit scholarships tend not to increase the total pool of students getting further education, the macro-level goal of government investment in human capital (McPherson and Shapiro, 2006). Scholarship recipients value the financial support they receive, of course, and institutions value these talented students on their campuses, but the nation as a whole does not benefit significantly. Spending millions of dollars on merit scholarships is not a good use of scarce resources.

Economists and policy analysts have criticized merit aid as a misguided approach for increasing higher education attainment. As a result, some institutions are returning to a higher priority on need-based aid. For example, George Washington University announced that it has reallocated roughly $2.5 million from merit to need-based aid for the 2007-08 academic year (Powers 2007). The number of merit awards at GWU dropped from 360 to 300 and the average merit-based scholarship decreased from $18,500 to $12,500. Another example is the small group of wealthy private institutions that promise to admit students without regard for financial circumstances (called "need-blind admissions") and to provide aid for the full amount of the students' needs, although most institutions lack the resources to make such a commitment to applicants (Guess 2007).

As market mechanisms advance in higher education worldwide, individual universities in many countries are slowly gaining more control of the admissions process, so it might not be long before financial aid figures into the process. It would be good for scholars and policymakers to look at the negative implications of merit aid and tuition discounts for recruitment purposes before imitating this aspect of American higher education. Once started, the competition for students through financial aid may be almost impossible to stop.

Conclusion

As universities around the world strive to become world-class, they need to look carefully before adopting practices from other countries. Many policies in American higher education are worthy of emulation but some are not. Certainly all nations want to expand the knowledge base through cutting-edge research, but they also need to define quality in terms of enlarging the pool of well-educated citizens to contribute to overall economic growth and social development. Focusing too heavily on publications is a mistake that some American universities have made in the past—a mistake that leaders in other countries would do well to avoid.

Rankings provide useful comparisons by which institutions can judge their performance relative to peers, but over-reliance on rankings can distract academics from the real priorities of a university—the quality of intellectual achievement and the interactions between faculty and students. Too many Americans have come to believe that a single number in the rankings reflects the true excellence of an institution. It seems that other nations are getting caught in the same trap.

Similarly, institutional size does not automatically equal academic success. Some of the best American universities intentionally control their enrollments in order to assure the excellence of the academic experience for both faculty and students. Here, too, a single number does not equate to quality.

Aspects of the American financial aid system are definitely worthy of emulation; the emphasis on access and equity through need-based grants and loans has provided access to college education for millions of U.S. citizens who contribute significantly to American society. The recent growth in merit-based aid, however, when viewed from the national perspective, has not made as much difference at the margin as the size of the expenditure would suggest. This phenomenon is an example of market forces out of sync with the larger policy goals of human capital development that many countries seek to achieve.

The American higher education system is the envy of the world. Its successes in mass education, in research, and in economic development are impressive. No wonder, then, that academics and policymakers in many countries around the world seek to emulate college and university practices in the United States. As this paper argues, some aspects of the American system are not effective and thus should not be adopted elsewhere. Higher education leaders, at potential world-class universities and other institutions, can learn from the experiences—both good and bad—of the higher system in the United States.

References

Altbach, P.G. (2004). The costs and benefits of world-class universities. Academe 90(1): 20-23.

Altbach, P.G. (2007). Tradition and Transition: The International Imperative in Higher Education. Boston: Center for International Higher Education, Boston College.

And now—our biggest rankings issue ever (2006). Maclean's, 13 November.

Annapolis Group statement on rankings and ratings (2007). Collegenews.org. 19 June. http://www.collegenews.org/x7131.xml

Bowen, W.G. (2006). Extending opportunity: "What is to be done?" In McPherson, M.S. and Shapiro, M.O. (Eds.). College Access: Opportunity or Privilege? (pp.20-33). New York: The College Board.

Boyer, E. (1997). Scholarship Reconsidered: Priorities of the Professoriate. Princeton N.J.: Princeton University Press.

Brody, W.R. (2007). College goes global. Foreign Affairs 86(2): 122-133.

Carnegie Classification of Institutions of Higher Education (2005). Princeton: Carnegie Foundation for the Advancement of Teaching.

Carnevale, A.P. and Rose, S.J. (2004). Socioeconomic status, race/ethnicity, and selective college admissions. In Kahlenberg, R.D. (Ed.), America's Untapped Resource: Low Income Students in Higher Education. New York: Century Foundation Press.

China Statistical Yearbook (2006). Beijing: National Bureau of Statistics of China.

The complete list: the top 100 global universities (2006). Newsweek International, 13 August.

Condition of Education (2007). Washington: National Center for Education Statistics, U.S. Department of Education.

Geiger, R. (2004). Research and Relevant Knowledge: American Research Universities since World War II. New Brunswick: Transaction Publishers.

A glance at the July issue of the American Journal of Sociology: The perversity of law-school rankings (2007). Chronicle of Higher Education. 6 September.

Global Education Digest: Comparing Education Statistics across the World (2006). Montreal: UNESCO Institute of Statistics.

Graham, H.D. and Diamond, N. (1997). The Rise of American Research Universities: Elites and Challengers in the Postwar Era. Baltimore: Johns Hopkins University Press.

Guess, A. (2007). A return to need-blind admissions. Inside Higher Education. 11 June.

Harvard University (2007). Harvard faculty approve new general education curriculum for undergraduate students. Press release from Faculty of Arts and Sciences Office of Communications, 15 May. http://www.fas.harvard.edu/home/news_and_events/releases/gened_05152007.html

Hayhoe, R. (1999). China's Universities, 1895-1995: A Century of Cultural Conflict. Hong Kong: Comparative Education Research Centre, University of Hong Kong.

Hoover, E. (2007). The 'U.S. News' rankings roll on. Chronicle of Higher Education. 7 September.

Kahlenberg, R.D. (2006). Cost remains a key obstacle to college success. Chronicle of Higher Education, 10 March.

Lederman, D. (2006). Documenting the shift to merit. Inside Higher Education. 12 September.

Left Behind: Unequal Opportunity in Higher Education (2004). A Century Foundation Guide to the Issues. www.tcf.org/Publications/Education/leftbehindrc.pdf

Levin, H.M. et al. (2006). What is a world-class university? Presentation at the Comparative and International Education Society, Honolulu, 16 March.

Li, C. (2005). Coming home to teach: status and mobility of returnees in China's higher education. In Li, C. (Ed.), Bridging Minds across the Pacific: U.S.-China Educational Exchanges, 1978-2003. (pp.69-110). Lanham, MD: Lexington Books.

Li, L. (2005). Education for 1.3 Billion. Beijing: Foreign Language and Teaching Research Press.

Lin, J. (1999). Social transformation and private education in China. New York: Praeger.

Marginson, S. (2006). Dynamics of national and global competition in higher education. Higher Education 52(1): 1-39.

McPherson, M.S. and Shapiro, M.O. (1998). The Student Aid Game: Meeting Need and Rewarding Talent in American Higher Education. Princeton, N.J.: Princeton University Press.

McPherson, M.S. and Shapiro, M.O. (2006). Watch what we do (and not what we say): How student aid awards vary with financial need and academic merit. In McPherson and Shapiro (Ed.), College Access: Opportunity or Privilege? (pp.50-73) New York: The College Board.

Mohrman, K., Ma, W. and Baker, D (2007). The emerging global model of the research university. In Altbach, P.G. and Peterson, P.M. (Ed.), Higher Education in the New Century: Global Challenges and Innovative Ideas. Rotterdam: Sense Publications.

Mohrman, K. (2006). Sino-American educational exchanges and the drive to create world-class universities. In C. Li (Ed), Bridging Minds across the Pacific: U.S.-China Educational Exchanges, 1978-2003. (pp.219-235) Lanham, MD: Lexington Books.

Mok, K.H. (2003). Beyond decentralization: changing roles of the state in education. In Mok, K.H. (Ed), Centralization and Decentralization: Educational Reforms and Changing Governance in Chinese Societies, Dortrecht, the Netherlands: Kluwer.

Mok, K.H. (2006). Education Reform and Education Policy in East Asia. New York: Routledge.

Postiglione, G. (2005). Higher education in China. Harvard China Review, 5(2): 139-143.

Powers, E. (2007). Tilting toward need-based aid. Inside Higher Education. 6 March.

Richard, K. (2006). Magazine ranks Canadian universities. Chronicle of Higher Education, 17 November.

Schofer, E. and Meyer, J. (2006). The world-wide expansion of higher education in the twentieth century. American Sociological Review 70(6): 898-920.

Smith, L. (2007). Three-quarters of undergraduates at American colleges receive financial aid, report says. Chronicle of Higher Education. 10 May.

Thacker, P.D. (2007). Merit aid on the defensive (publicly). Inside Higher Education. 13 February.

Vest, C.M. (2005). World-class universities: American lessons. International Higher Education, 38: 6-7.

Will, K.H. (2007). Breaking ranks: a college can't be reduced to a number in a magazine. Washington Post, 9 July.

World university rankings (2006). Times Higher Education Supplement, 6 October.

Zhou, J. (2006). Higher Education in China. Singapore: Thomson Learning.

Global Portfolios and Strategic International Partnerships of a Major Research University

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Abstract

The pressures from the university's internal and external constituencies to enhance academic excellence by attracting the best faculty and students, be more responsive to the needs and opportunities of globalizing labor markets, and provide better support to the national agenda of productivity and competition, have accelerated the pace of a major public research university in reaching out to international markets and becoming aware of a more robust and competitive world emerging within the barrier-free globalizing environment. The university's intent to create a focused and strategic course of action aimed at enhanced international leadership is subject to variances in divisional responses to environmental conditions, the predisposition of their constituent units to work with international markets and, most importantly, the availability at these divisions of resourceful, entrepreneurial faculty members. The characterological development of a large research intensive university unavoidably makes decentralization as a natural organizational response to the internationalization demands.

Global Portfolios and Strategic International Partnerships of a Major Research University

1. Introduction

Globalization has been changing the character of a modern research university, encouraging the development of new structures and incentives in some areas, and constraints and disincentives in others (Slaughter and Leslie, 1997; Currie and Newson, 1998; Deem, 2001; Currie, 2003). Academic capitalism has emerged as a new-fangled revolution, transforming the landscape of higher education all over the world since the 1980s. Despite the world-wide advance of this new revolution, Canadian universities have been comparatively less susceptible to academic capitalism, as Slaughter and Leslie (1997) point out in their ground-breaking work. Being subject to deregulation and decentralization (Jones and Skolnik, 1992; Lang, 2002), as well as a weak foreign policy with regard to promotion of higher education services abroad, Canadian research intensive universities find themselves free surfing in the global markets and relying on creativity of their faculty members to cope with the demands of globalization. With very limited funds available, they, more than their counterparts in the world, are "free to choose their own path and obliged to devise their own goals and strategies in light of their individual circumstances" to be able to "pursue objectives and practices in internationalization" (Bond and Lemasson, 1999, p.243) which is urged by the globalizing environment surrounding them.

Historically, the Canadian academe has witnessed a slow institutional response to international opportunities starting with a sporadic movement of a few individual initiatives abroad between 1950 and 1968, transforming into the accelerated growth of individual projects between 1968 and 1980, followed by intensive governmental support of international programs and partnerships between 1980 and 1990s, and the subsequent growth of institutional structures in universities in the beginning of the 1990s to facilitate, manage and coordinate such partnerships (Clark, 1999). Being comparatively less affected by academic capitalism of the 1980s-1990s, Canadian universities, however, have been extremely ambitious and entrepreneurial in setting international partnerships, especially when opportunities and resources for international development projects were abundant (Bond & Lemasson, 1999). Hence, the research regarding the Canadian institutional engagement with the world primarily focused on international development (Barnard, 1988; Berry, 1995; Knight, 1995; Pan, 1996).

However with a turn of tide in the beginning of 2000s, when the Canadian International Development Agency, a major and almost exclusive resource provider for international work in Canada started to be overtly pessimistic about the value of academic input into results-based management and evaluation frameworks of development projects, a renewed attempt to advocate the ability of the Canadian university to do a meaningful contribution to the world in innovative ways was made by a number of university researchers (Bond & Lemasson, 1999; Stein et al., 2001). Results-based management approach, however, has never been abandoned by the governmental agencies and those universities that wanted to be involved in international development had to comply with the development agencies' objective-oriented, resource-limited, measure-compelling, and milestone-driven approaches, traditionally alien to the academe, or look towards alternative funding (from private donors, foundations, foreign governments and corporations). The agenda of the latter however was becoming increasingly driven by accountability principles as well.

The end of the 1990s and the beginning of the new century has also intensified discussion about internationalization and globalization of higher education, the processes that were equally propelling virtues and vices of new forms of knowledge development, learning, exchange, and impact these were creating on economies, civil societies and academe (Scott, 1998; Currie, 1998; Sadlak, 1998; Subotzky, 1999; Altbach and Teichler, 2001; Salmi, 2001; van der Wende, 2002; Teichler, 2004; Altbach, 2004; Jones et. al., 2005). As major research universities, especially in North America, started to reach out to global markets and develop and deliver revenue generating services and products, the question about the significance and place of international partnerships in higher education received new attention (Goodwin, 1991; de Wit, 1995; Sporn, 2001; Bacow, 2002). The success and collapse of the John Hopkins research enterprise in Singapore (Jaschik, 2006) and impressive growth of genome research consortia in Canada and Europe (LePage, 2003) has also triggered interest among university decision-makers to a closer examination of inter-institutional relations at the time of globalization.

The internationalization literature however has very few in-depth studies of organizational behavior to understand how universities build their international strategies and partnerships. Many researchers continue to view university as a whole rather than a sum of its parts (which is probably of a lesser concern to smaller universities than their large major research-intensive counterparts) (Keller, 1983; Rhoades, 2000). In Canada, largely driven by research of influential associations such as AUCC and CBIE, studies on the universities' engagement in internationalization explain the challenges if universities would be equal parts of a unified system rather than autonomous and diverse institutions (Tillman, 1997). Little attention was given to differentiation and the role of a major research university in these studies. Some studies into differences of disciplinary fields were primarily made with regard to internationalization of disciplines if they were developing outside of organizational structures (Groennings and Wiley, 1991; Gingras et al., 2001). At the same time, the research on internationalization of higher education in Canada provides analysis of challenges at the federal level and inter-governmental relations (Trilokekar, 2006), while giving less attention to interactions between federal and institutional levels, and practically failing to examine the inter-dependence between institutional and program implementation levels and even more importantly to give the whole multilevel (macro-meso-micro) analysis. Hence, inter-connections between policy setting, strategy building and management in the area of internationalization of Canadian higher education still remain inadequately studied and discussed. The research on challenges in regard to strategy building and management of international partnerships in a major research university is practically absent. Given the fact that the concept of strategic development has been entering public universities predominantly from businesses and private universities, the concepts of global portfolios and strategic international partnerships remain broad, ambiguous and practically undefined. Although periodic attention was given to some extra-institutional forms of collaboration such as networking (Stein et. al., 2001; de Wit, 2004), the topic of institutional strategies for internationalization and international partnerships still remains uncovered.

To fill this void, a deeper look into the institutional strategy building with regard to internationalization has been undertaken within the thesis research project entitled *Global Portfolios and Strategic International Partnerships of a Major Research University*. The purpose of this study was to determine the organizational behaviour processes and mechanisms of strategy development in a decentralized academic environment at a time of globalization and enhanced opportunities and demand for international partnerships. This research was focused on investigating how different divisions of a major research university make choices about areas of responsibility and define and implement strategies in the new globalizing context. The thesis looked into how the divisional and institutional authorities determine which connections are strategic and worthwhile to pursue, and which are not. It also investigated decision-making patterns and mechanisms that are applied in governing strategic partnerships.

On the basis of six case studies exploring divisional and university-wide internationalization strategies at the University of Toronto, Canada's largest and most research intensive university, this thesis analyzed three major processes – individuation, institutionalization, and marketization – that determine the development of international strategy at a major research university at the time of globalization. The case study research employed a number of sources of evidence, including participant observation, documentation, archival review, interviews, and a focus group survey to obtain, analyze and synthesize the data from the university's five divisions (Medicine, Engineering, Education, Arts and Science, and Scarborough Campus) and the central administration. The layered use of these sources of evidence was intended to minimize the limitations that each one of them faced in isolation, as well as to provide opportunities for triangulation and, thus, allow for more chances to increase the construct and external validity (Yin, 2003).

Drawing on conceptual frameworks found in business, sociology of science, political science and higher education policy and management literature, the thesis project aimed at expanding and contributing knowledge to these areas in the following ways: by distinguishing the organizational behavior of a major research university from other knowledge institutions and universities described in the literature; by expanding on previous studies of the institutional aspects of internationalization processes in the academe; by identifying differential contextual and structural responses that can motivate and drive decisions at a university at the time of internaionalization; and by identifying and examining the specific character of entrepreneurship that emerges when a major research university is pulled into the process of marketization.

The thesis studied the organizational behavior of a major research university by examining the adequacy of institutional policy instruments (global portfolios, and international partnerships) used by some university decision-makers to create a more harmonious and focused institutional response to globalization. This approach opens a strategic perspective for higher education analysts to understand what motivates and de-motivates institutional response, whether decentralization or centralization can serve as vehicles for the promotion of internationalization, and what costs and benefits can be incurred in the process. This perspective creates an opportunity to evaluate linkages between strategy development and implementation at a major research university.

2. Global Portfolios and Organizational Behaviour

The following three major factors have been determining the development of personal and divisional global portfolios considered in this study:

1) environmental context, which shapes disciplinary development and encourages or discourages responses to international markets, partnerships and networks;

2) disciplinary and professional predisposition to develop products (education and research projects) and services (technical assistance, consulting, technology transfer) for international markets and clients (or education and research target groups in other countries), and to view international extension (exchange and learning) as a valuable contribution to academic growth;

3) availability of entrepreneurial faculty members and administrators, who see the potential value of networking or partnering with their colleagues abroad in pursuit of joint initiatives.

The relative weight of the three formative elements varies in each university division. The following are a couple of examples of how these variations play out across the three factors. With regard to the variance in environmental contexts, the medical faculty, for example, has an inherent connection with the global nature of its environment, given that infectious diseases know no geographical or ideological borders. The teaching programs and services provided to patients abroad are easily defined, as medical science is considered to be intrinsically international. Moreover, the Faculty of Medicine has a large number of researchers who consider field-work in international settings and immediate response to global problems to be a part of their social responsibility mandate. Medical work is organically team-based, communal, interdisciplinary and interactive. These characteristics are translated into international outreach, which is intensified with the increased severity of new pandemics and the ravaging effects that they have on economically disadvantaged parts of the world.

For the engineering faculty, which has organic connections with industry, the international response is usually industry-dependent. Corporations, interested in engaging university R&D for product innovation, motivate engineering entrepreneurs to sign on to industry contracts targeting international markets or coming from multinational corporations. Once engaged, engineers tend to follow the demands and behaviors of the industry with which they are affiliated. The traditional dominance of primary industries in Ontario, for example, offered relatively few incentives for internationalization in the end of 1990s - early 2000s. Likewise, the province's secondary industry tended to be largely derivative, with most of the R&D produced at headquarters elsewhere. The growth of industries related to the knowledge-based economy was just beginning in the same period of time. Consequently, international outreach spearheaded by the provincial industrial sector has been sporadic at best. In general, however, the dependence of industries on innovation and discoveries in techno-science continue to position the engineering faculty in direct correlation with changes in the market. Although enterprise-oriented, the entrepreneurial response of the engineering faculty is primarily "researcher-based". The supremacy of individual entrepreneurship does not encourage a division-wide internationalization strategy in pursuit of coordinated responses to markets and industry stakeholders. Engineering markets are largely fragmented and uncertain; so is the response of the engineering faculty. The engineering faculty members, as one interviewee remarks, constantly "reinvent" themselves as industries change. Such an approach contributes to a fragmented and uncertain international response.

Finally, for researchers in education, social sciences and humanities – branches of learning with an embedded diversity of disciplinary values and ideologies – responses to the globalizing environment are often dependent on these values and ideologies, and often independent of organizational frameworks. Such responses are often linked to disciplinary networks and "invisible colleges", rather than to researchers' home divisions. Any organizational formations and attempts to define an organizational profile are primarily the result of the "forceful" actions of individual champions, rather than outcomes of hierarchies and conformity to traditional norms. The internationalization strategies tend to be fragmented and dependent on individual scholars. Many departments in the area of social sciences and humanities have been historically engaged with international studies and, therefore, have the advantage of already established international networks, which can facilitate their international partnerships and allow them to better understand and reach out to international settings. However, outreach to international markets is not necessarily sought out and acted upon, since markets are viewed as undermining, rather than creating, academic values in the social sciences and humanities.

There are also variances in the structural and operational predispositions of the divisions, which have an impact on how priorities are selected and actions are implemented in the process of strategy development. The Faculty of Medicine and the Faculty of Applied Science and Engineering, for example, have a longer history of strategy planning than the other divisions. Faculty members in the comparatively smaller and less structurally complicated engineering division find the strategy planning process to function as a logical, integrative framework, which allows them to determine priorities and allocate resources in a cohesive manner.

The complicated structure of the medical faculty, with its numerous affiliated teaching hospitals and a growing number of non-medical professionals integrated into the medical structure, makes the process of strategy planning less cohesive and integrated. Although medical and engineering faculty members carry out a formal strategic planning process to define their international leadership positions, their response to the global environment is nominal and interpretive, rather than functional and prescriptive. In other words, they act and later define what they have done, rather than define what they are setting out to do and consequently act. Their operations in the implementation of international strategies are decentralized and researcher-based.

The Faculty of Education (OISE-UT), on the other hand, does not have a formally embedded structure for strategic planning. Having experimented with conducting a formal international strategy planning exercise, the leadership of OISE-UT realized that the diverse views of its researchers contribute to a fragmentation, rather than an amalgamation that would result in a common vision or joint programs. At the Faculty of Arts and Science, where the divergence of views and values requires that "champions" promote their own initiatives with a certain amount of individual force and determination, and where "strategy" and "academic freedom" are opposing, rather than uniting notions, strategic planning, as such, is not used in a broad institutional manner. Instead, the divisional international strategies are defined and implemented within a close circle of key academic and administrative leadership positions. These leadership groups select the target areas where administrative intervention is accepted and tolerated by the research community. These include such activity areas as enhancement of the students' international experience (student exchange, study abroad programs etc.) and international student recruitment. As a result, in terms of administrative deliberation, the academic plan of the Faculty of Arts and Science is ahead of any formal strategic plans that the other divisions used to define their institutional leadership in the globalizing and increasingly competitive world.

The underlying differences in the resource bases of academic divisions also have an impact on whether international strategies are developed in a centralized or decentralized fashion. For example, the Faculty of Medicine, which has the highest comparative proportion of research revenue, has a more decentralized approach to setting international strategies than the Faculty of Arts and Science, which primarily relies on a resource base rooted in tuition fee revenue. The research frameworks, more than the teaching frameworks, require highly decentralized structures for successful operation.

In accordance with Clark's (1997) entrepreneurial framework of organizational transformations in universities, the study took into account three major groups: “academic heartland”, “steering core” and “developmental periphery”, which are important stakeholder groups in regard to differentiation between individuation, institutionalization and marketization of internationalization processes at universities. In this regard, the major distinctions between these three groups are as follows:

1) “Academic heartland” - represented by individual faculty members who perform three traditional functions: research, teaching and service. This group is dispersed on the continuum from traditional to entrepreneurial modes of knowledge production. For traditional academics, strategies are perceived as an infringement on academic freedom; attempts by institutional authorities to reduce their individual autonomy or limit their choice of research projects. For entrepreneurial academics, strategies primarily relate to deliberate personal choices. Strategies consist of objectives identified through a research project or initiative, correlated with the requirements of a funding agency or a potential donor. Consequently, the individual researchers’ global portfolios are dependent on these external resource providers. From the point of individual researchers, the portfolios are descriptive in terms of achievements and prescriptive when it comes to research interests that give form to new projects. In most cases, collaborative decisions are shaped by the need to draw in additional resources from the outside (individuals, research infrastructure, access to subjects of study etc.). In the majority of cases, the collaboration is guided by the principles of academic integrity and peer review, as well as performance evaluation frameworks emphasizing outcomes oriented towards the academic mission. The “academic heartland” representatives primarily focus on, and become engaged in international networks that open up opportunities for receiving and disseminating information which is regarded as important (and in that way, strategic) for the development of their disciplinary fields.

2) “Steering Core” – this group includes key formal leadership and administrative positions. The policy-making, supervisory and coordinating responsibilities are performed by academics and administrators, both of whom usually view strategies in terms of opportunities to achieve performance targets, as defined by their area of responsibility. These strategies do not necessarily correspond with contextual changes or needs. Moreover, administrators understand that the ultimate power over decisions, commitments and performance with regard to international initiatives is located in the “academic heartland”. Practically, this means that nothing will be done until the academics do it. Periodically, representatives of the “steering core” take initiative to advance their portfolios and this can

lead to success in the areas where resources can be secured, and where the faculty members consider that such initiatives should be the ultimate responsibility of the "steering core". In general, however, any "forceful" actions on the part of administrators are often met with reservations and resistance from the "academic heartland". Hence, most of administrative portfolios are just a set of functional responsibilities. This corresponds with the notion of a portfolio in governmental (bureaucratic, hierarchical) terms, rather than business terms. Since most of the decisions with regard to programs, projects and other initiatives are made by the "academic heartland" or "developmental periphery", the overall institutional portfolio is more descriptive than prescriptive. Within the administrative hierarchy, some initiatives can be prescribed by executive officers to constituent departments, but these are tantamount to a minimal portion of the overall institutional portfolio. For the most part, institutional or divisional portfolios make use of priority lists, project pipelines, and institutional capacity statements. The decisions regarding which projects and initiatives are to be selected or prioritized within the portfolios are made by the "steering core" representatives, taking into consideration political situations and political receptiveness. The decisions are primarily aimed at organizational survival achieved through organizational growth. The "steering core's" focus is on inter-institutional international partnerships that enhance the global reputation of the university. Hence, most institutional statements emphasize the importance (i.e., the strategic value) of relations with peer universities.

3) "Developmental Periphery" – consists of entrepreneurial units, such as: continuing education, executive education, professional development programs and departments, grant development units, consulting units and externally funded research centres. Entrepreneurs associated with the developmental periphery usually feel comfortable with strategy planning and strategy implementation. In most cases, their thinking is market-and customer-oriented and they know which international clients can be reached with which products. They monitor markets and respond to market opportunities that may involve risks, through competitive rather than collaborative modes of operation. They exert significant pressure on the "steering core" representatives with regard to better university-wide and divisional coordination, as well as clearer identification of priorities and policies that would facilitate their entrepreneurial outreach. The portfolios formed by the entrepreneurs are selections of products and services, carefully considered within the cost-benefit analysis framework. Generally, the "developmental periphery" portfolios are more prescriptive than descriptive, and are primarily

market-oriented. The decisions regarding international made within the "developmental periphery" are primarily rational and driven by market conditions.

The differences between these three groups are reflected in the metaphors that were used by certain interviewees in the project to describe decision-making processes and coordination of international strategies in their portfolios. When it comes to the "academic heartland", the prevailing allusion is to a Renaissance round-table discussion. As one interviewee explains: "You really need, if you are going to have a dramatic interchange of ideas, people sitting around a desk or a table together, or going out in the evening with a bottle of wine to dinner, talking about their enthusiasms, showing their enthusiasms. It's not just exchange of information, structures. It's actually the chemistry of people who provide the energy, become the motor force for these sorts of things. But strategic connections are important because, to some extent, those are the links, those are the instruments of intellectual mediation". In the academic domain, strategy evolves as the result of very informal discussions among close and trusting colleagues and friends, who get together from time to time. Alternatively, the strategy is devised at more formal meetings, which are organized for the purposes of networking and exchange of research findings and, less often, for the purposes of strategy planning and/or collaboration. According to several interviewees, however, the larger the group becomes, the less coherent it tends to be. Consequently, there is a greater likelihood of having participants who attend such discussions to present and promote their ideas, rather than to listen to the ideas of others or form any joint international initiatives. In such circumstances, the dynamic among the participants tends to turn to competition, rather than collaboration and, thus, international partnerships are a necessity of certain competitive arrangements that are individually, rather than institutionally-driven.

In reference to the administrative domain of the "steering core", an image brought up by one of the interviewees is that of "volcanic eruptions". The respondent in this group described administrative changes in the area of internationalization as "the lava masses rolling down the mountain", making "indentation[s], where [there] was nothing before, and other areas roll[ing] off into the sea". The process is described as "a constant shifting". As the interviewee further explains: "Maybe the image of the volcano is destructive, but I think what is correct is that there is a lot of energy there, a lot of drive to implement change, to think how to make it work." The layers of previous strategic plans and ideas are buried under the streams of molten rock and are unlikely to be ever excavated for any lessons learned, as every new administration gets caught up in the swift current of change and strives to implement their "new ideas" while the magma is still hot. Given that it functions within a fragmented society of scholars, who tend to be provocative and vacillating in their interests and passions, the university administration can appear to be interested in some issues more than others at one point, only to completely change direction in a volcanic eruption that causes the university to pursue new objectives. Often, these objectives are defined in response to new challenges, interests, opportunities and political agendas advanced by influential personalities within the scholarly community. In some politically charged environments, the senior administrators prefer not to reveal their portfolios or selected lists of partnerships and, in some cases, not to have them at all. These administrators have learnt that the burning lava of change can be lethal to the careers of those who make ill-considered or just political decisions.

In describing the entrepreneurial domain of the "developmental periphery", the interviewees conjured up images of technologically savvy vehicles, such as a spacecraft or an ocean-liner. Using this imagery, small and organizationally flexible research centres or NGOs are like nimble, small aircraft that go on periodic missions out of the university-base. One of the interviewees portrayed his unit as a spacecraft, which is bumped by meteorites, but stays in orbit. For large-scale operations units, moored by tradition and links to the entire university's academic body and brand, the imagery is more massive and slower moving. One interviewee described the international strategy as an ocean liner, a large commercial ship that carries passengers on a regular schedule, for a certain price. There are certain limits to this type of travel, however, in terms of capacity, available destinations and passenger satisfaction. In predictable markets, the costs are predictable, and the routes and intermediary ports or stations are too. In emergent or immature markets, they are not. Both the spacecraft and ocean-liners are piloted by captains who take on full responsibility for the safety of the vehicle, the effective operations of the crew, as well as for customer satisfaction and the "bottom-line". As one of the participants in the study remarks: inside the liner, there may be a lot of noise and running around among the working parts; from outside, on the ocean shore, one can only observe a smooth gliding movement across the ocean.

Looking across the range of decision-making patterns, one finds that portfolios are dynamic sets of objectives and outcomes that define products and services, which various university groups select within the range of their mandates. Given the scope of cultural and behavioral differences that prevail at a major research university, there is little predisposition for a harmonious university-wide global portfolio. Instead, there emerge a variety of portfolios related to the three distinctive groups described above. These portfolios are oriented at three different important, but separate dimensions: academic mission, institutional growth or markets. In an environment where higher education is considered to be a public good and higher education services provided to counterparts abroad are regarded as a social responsibility, the major research university remains cautious about merging these three dimensions into one. Interactions between academic mission and institutional growth, academic mission and markets, as well as institutional growth and markets are intermittent but not syncretistic.

3. International Partnerships and Strategic Intentions

International partnerships are often indicators of the productiveness of global portfolios. International partnerships were defined by the respondents in this study as inter-personal or inter-institutional collaborative linkages in pursuit of joint objectives and outcomes, making use of shared internal, as well as external resources secured from various funders.

From the point of view of the "academic heartland", international partnerships can be either an end in itself or a means to an end. Researchers establish formal and informal partnerships with their colleagues abroad to supplement their research projects with necessary expertise and inputs, or to share their findings across a variety of institutional and individual settings. Contacts across individual settings are closely correlated with the concept of networks and invisible colleges, while institutional contacts are associated with the concept of markets and consortia. Since markets are often a taboo term in the "academic heartland", the notion of partnerships tends to be a more relevant means to express the nature of a relationship that outgrows networking and is formed for the express purpose of pulling together very specific intellectual and institutional resources for the purposes of individual research interests. Given the increasing influence of markets, some researchers pursue asymmetric relations with non-academic (business, cultural, governmental and other) organizations in international settings, which may have been less frequent in the past.

From the point of view of the "steering core", international partnerships are usually "institutionally blessed but not institutionally driven" relationships that specific individuals, academic divisions, or departments, form with their counterparts abroad. The "blessing" process usually takes the form of international partnership agreements, with an established procedure of sign-offs performed ceremonially by senior executives. In this context, partnerships can be viewed in terms of hierarchies rather than networking, with some cross-divisional collaboration taking place on campus that is regulated through various institutionally induced policies or clauses (such as IPR or liability) induced by the markets. Most representatives of the "academic heartland" consider the partnership agreements as having little practical value. However, members of the "steering core" often attribute symbolical value to such agreements for the purposes of accountability, profile-building and marketing to various national and international client groups.

With advent of globalization and growing competition for human and capital resources, the "steering core" has been actively advocating the pursuit of equal (symmetric) partnerships. Many "steering core" representatives see equivalence in reputation, size, and scale of programs as the key elements to securing the competitive advantage of the university. Institutional reputation often becomes a leading criterion in the "steering core's" measurement framework. Partner relations with equivalent foreign institutions are also promoted for marketing purposes.

From the point of view of the "developmental periphery", partnerships are very specific inter-institutional formations that pursue market-opportunities. The "developmental periphery" actively selects entrepreneurial faculty in order to develop new products and services (training courses, evaluative research, consultancy etc.) for certain segments of the market. By virtue of being located in an academic environment, the entrepreneurial units face a dilemma: while institutional pressure compels them to partner with equal brand-names, market needs dictate that they respond to demands from smaller and/or less prestigious universities located in new markets. By choosing "second best" universities in foreign countries, some "developmental periphery" units are able to gain control over the process of product development and delivery, as well as over the recruitment and retention of the management and support staff in foreign locations, who ensure successful access to resources from foreign markets. Hence, an asymmetry of partnership relations can be the result of engagement by the "developmental periphery" with partners that are selected on the basis of market logic, rather than as a result of academic interests. These types of partners may include consulting companies, NGOs, business organizations and governmental agencies.

4. Decentralization as Inevitability

The inevitability of decentralization of international strategy and partnership building in the research intensive environment is determined by the following three factors: 1) systemic (devolution of powers to the ground level in the absence of centrally coordinated discretionary funds); 2) structural (size and scale of operations); and 3) characterological (research intensiveness, divisional differences and population differences).

Systemically Induced Devolution of Powers

A major research university, with a dominant part of its intellectual capital invested in national and local needs and with priorities that are primarily steered by federal and provincial governments, has an insignificant ability to move this capital to foreign locations or to create intensive mobility and exchange of its resources. At the time when businesses become increasingly engulfed in issues of globalization and, consequently, national competitiveness and international trade, the pressures that affect the labour force and industrial R&D create a cascade impact on universities. In Canada, where industrial R&D is not strong enough to create significant pressure, the labour force is a major influence on universities, causing them to look for ways to adapt to globalization. As a number of interviews and other studies (for example, Bond and Lemasson, 1999) indicate, this has created a more active and evident growth of internationalization in the area of undergraduate education and, consequently, among the teaching universities of Canada (smaller in scale, more robust in terms of teaching programs that can respond more promptly and adequately to labour markets and that are driven by development-oriented, rather than curiosity-driven research). The Canadian government's emphasis on international development (with training as a key vehicle for human resource development), rather than on global science and technology, has created opportunities for teaching universities, while practically eliminating the major research university from the game. A very slow and indecisive movement in the policy agenda in favour of trade in the beginning of the 2000s, as well as the lack of widely available resources for S&T, created limited opportunities for broad international collaboration by major research universities.

Indeed, university-wide internationalization and international strategy are largely dependent on government policies, programming and leadership in the international arena and markets. Without strong federal programs for international research, Canadian academics can find themselves playing a secondary role by comparison to their peers in more dominant and internationally proactive national settings, such as the US, EU and Australia. Issues of leadership, as well as the culture and history of collaboration between governmental and non-governmental institutions, can define many aspects of how universities are positioned for interaction with foreign settings. By way of example at the provincial level, where education policies are set, the Government of Ontario, has, for years, declined any international education proposals or initiatives spearheaded at the federal level by the Canadian International Bureau for Education [1], a major non-governmental university association advocating international education. Provincial programs in support of international education began only in 2006[2]. Being a middle power with limited ambitions for global leadership, Canada's government seeks and encourages collaborative partnership arrangements and mechanisms through which Canadian universities can join leading international groups at their own expense or at the expense of those international groups. The case studies dealing with the Structural Genomics Consortium and CISEPO are examples of how Canadian leadership exerts itself, despite the tendency promoted by the Canadian government. These responses are largely the result of the direction set by individual leaders, who resisted the general trend and believed that Canada's leadership role should be manifested. The success of the initiatives is largely explained by the ability of the founding researchers to diversify their funding strategies and attract major industrial and/or private donors to their initiatives.

Ultimately, in the absence of government support of the internationalization of research, the major research university is left on its own to decide whether to redistribute internal resources or encourage market-oriented mechanisms. Finding few convincing arguments for major university-wide restructuring of the budget in favour of internationalization, the university is generally only in a position to take a piecemeal approach to it. This means either allocating a very limited amount of internal funds for seed grants, raising some money from private donors, or establishing a coordinating unit that can provide a labour pool able to respond to the growing demand from faculty members seeking external support for their efforts. With globalization increasing the demand among faculty members for more access to international settings, institutional authorities often encounter "demand overload". This overload usually results in a rapid depletion of any available seed grant funds, in overburdened coordinating units failing to balance quality and access to services across the campus, and in frustrated faculty members who either fail to receive support or who receive support of inadequate quality. The institutional authorities generally respond to the "demand overload" by either creating a portfolio (that is, a selected list of initiatives that promise to provide the highest return on investment or which are considered as being politically or institutionally significant), or by devolving the authority over internationalization efforts to lower institutional levels, such as divisions,

1 International Expectations for Higher Education Submission from the Canadian Bureau for International Education (CBIE) to the Ontario Post-Secondary Review http://cbie.ca/download/Publications/RaeSubmission_e.pdf)

2 Ontario Ministry of Training, Colleges and Universities.McGuinty Government Enriching the Learning Experience of Ontario Students. http://ogov.newswire.ca/ontario/GPOE/2007/02/23/c3940.html?lmatch=&lang=_e.html (June 19, 2007)

departments or research units. The creation of portfolios involves the complicated and often politically-charged process of prioritizing and selecting a few initiatives (which generally means singling out a few trusted individuals from a large research community), while seed funds ultimately offer a limited opportunity to create a sustainable initiative. Therefore, institutional authorities often choose to devolve power to lower levels of responsibility. Given the fact that the lower administrative levels essentially follow the same decision-making route (i.e. recognition of "demand overload", selection of a few trusted individuals, evolution of the politically charged environment and search of opportunities to shift responsibility to a lower level), the powers are ultimately devolved to immediate demand generators – that is, to researchers. They are given full responsibility to conduct the fundraising and to seek all appropriate means that are most suitable to implementing their projects.

Since the government is not able to provide support to internationalization, market opportunities are viewed by some faculty members as providing a better, and sometimes the only, access to resources that researchers require for international partnerships. As was earlier proposed by the higher education literature, market-like behaviors emerge and pull researchers into different niches that are most closely affiliated with their competencies and interests and from which competitive strategies can be developed.

Structurally Induced Devolution of Powers

Its sheer structural size and the breadth of its programming make a major research university a unique place of disciplinary and structural diversity. This diversity results in a wide gamut of research interests, priorities and responsibilities, which are practically impossible to harmonize or unify even within a portfolio that comprises of research and education projects selected by a coordinating unit. When it does take place, institutional harmonization of interests across a large campus is more likely to be the result of happenstance (for example, an opportunity to submit a proposal for a large-scale multi-disciplinary project) than a deliberate course of actions. Incidences of coincidental coherence usually hinge on a decision by a number of "champions" in different divisions to work together and commit their time, knowledge and other available resources to some shared goals. The decision can be to raise funds together from donors who support interdisciplinary research or, at the very least, to refrain from competing with each other when applying for funding to the same donors. Such coincidental collaboration does occur and can be successful, if shared leadership is applied consistently to reaching clearly articulated goals. However, when large-scale, multi-disciplinary and multi-partner projects are coordinated from the top, the results are often dismal. This is often due to poor communication, conflicts of interest, vested individual interests that do not match the team objectives, and a failure to apportion responsibilities in a balanced way among team members, resulting in over-responsibility and under-responsibility.

The inability to implement a harmonized response is also caused by the inherent disciplinary disparity that a large research intensive university embodies, as well as by the intrinsic discrepancy in relations with external stakeholders and the wide array of interest groups that a university campus supports. First of all, some disciplines are more inclined to implement outreach than others. For example, the medical faculty is naturally responsive to epidemiological situations that require particular expertise to aggregate in a particular area of the world at the particular time. By way of contrast, the outreach of the engineering faculty is more insulated, industry-related and consultancy-driven. In Arts and Science, outreach comprises a combination of fragmented, value-based, and student-oriented responses. The researchers rely on disciplinary networks that have a tendency to link academics to invisible webs of person-to-person dealings, rather than to academic departments with which they are affiliated. Moreover, the various disciplines that make up these divisions have different histories and predispositions to development and outreach. Some fields of science, including area studies, geography, anthropology, education, public health and environmental engineering, are more predisposed to global outreach than others. Similarly, scholars working in the area of applied science in engineering may be more predisposed to global outreach and problem-solving assignments in international markets than scientists engaged in basic research in the physical and life sciences divisions of Arts and Science.

Secondly, structures of relations with external stakeholders differ from division to division. For example, donors behave differently in relation to medicine versus engineering. Big science projects in medicine require foundations, research councils and governmental programs to work together and collaborate across borders. Consequently, a medical researcher has to be able to work with a variety of donors and to persuade them to collaborate. In engineering, donor contributions are often made to individual engineering consultants, who work on developing or improving products, usually for the purposes of advancing a company's or an industry's competitive advantage. Communications between the donor and the few individuals involved in this type of project can be easily accommodated, either through the engineering laboratory or through the engineer's own company. In the Faculty of Arts and Science, where many subjects are value-laden, community-oriented and ideology-bound, the support of international outreach by private donors can be similarly fragmented along parallel lines of values and ideologies. In this way, support can come from and be directed at projects related to certain cultures, countries or specific communities. In Education, where major donors, such as UNESCO, the World Bank and other international development agencies, have established a pattern of support for educational institutions in developing countries and have encouraged western experts to provide technical assistance, the response and involvement of the faculty can differ from that of Arts and Science. Personal response to donors can matter more in Arts and Science than in Education, while institutional response matters more in Education than in Arts and Science. The environmental conditions shape the behaviour of resource providers, which in turn shapes the behaviour of faculty members and their home organizations.

Thirdly, the large research intensive environment includes a wide spectrum of interest groups. This creates a barrier to harmonization, given that what may be important to a particular individual or interest group may not necessarily be important to another individual or an interest group. Some participants in this study noted that, a central office administrator, who takes the risk of supporting the preferences of a particular interest group, would immediately face objections regarding an infringement on the rights and freedoms of another interest group. Promoting a single direction with focus and single-mindedness at the university-wide level is guaranteed to raise the ire of many people. Some participants in this study suggest that even conducting a review and/or analysis of priorities is impossible on a large campus. According to a sarcastic comment made during one of the interviews, the only way to figure out what is really important is to ban international activity at the university as a whole – this would be sure to produce an immediate response that would demonstrate how important international activities are, what exactly is important, and for whom it is important.

At the major research university no single division has an over-arching monopoly on defining, guiding and/or implementing international partnerships on behalf of the entire university or even on behalf of the division. Procedurally, financial and administrative responsibilities and accountability related to partnership projects are considered to be best left at the project-to-project level, where individual researchers have ultimate decision-making powers. By accommodating the diversity of decision-making styles, the university produces a number of vehicles that are most suitable for a particular environment or a segment of the international market. An attempt to put institutional coordination into place, in order for researchers to follow the same logic of development and abide by the same standards and regulations guiding international strategy, goes against the grain of the major research university's nature and can be a disastrous measure for a university administration that undertakes it.

Characterologically Induced Devolution of Powers

From the point of view of the characterological development of a major research university, the devolution of decision-making powers to the ground level is also inevitably driven by two major factors: research intensiveness and cultural differences between the key three decision-making groups that are unavoidably involved in the process of internationalization: "academic heartland", "steering core", and "developmental periphery".

Despite the fact that the research projects that are conceptually designed and initiated by individual researchers can be exposed to influences by funding agencies or institutional authorities, which might want to steer the researchers in certain directions or toward certain production modes of knowledge development, the research project implementation remains largely in the individual academic leaders' sphere of responsibilities. They determine whether they want to do the project, they define and control the process of project implementation and ensure the quality of inputs, throughputs and outputs. Objectives determined by these leaders tend to reflect on their core competencies, geographic expertise and focus and, thus, take them in a variety of directions and structural arrangements. The academic leaders take full responsibility for relations with their clients and resource providers, since the quality of these relations and the quality of the products and services that they provide to the external stakeholders cannot be compromised. Any deviations in these relations are usually costly and can have adversarial effects on a researcher's personal reputation.

Under such circumstances, the "steering core's" guidelines on strategic partnerships can be nothing more than ambitious messaging, calling for an enhanced international profile of the university, in order to attract more resources and talented, proactive intellectuals. In actuality, representatives of the "academic heartland" perceive this type of messaging as a go-ahead to continue the work that they had been doing and not to re-orient their efforts towards new geographic and disciplinary areas. The researchers tend to remain dedicated to the areas where they have established their personal associations and where they have personal strengths and advantages. In cases where institutional messaging is built on a thorough analysis of internal capacities, divisional interests and knowledge of the academic "champions'" work, the international strategy can result in new advancements and structural creativity, especially if the academic "champions" have full discretion over their innovative endeavors (e.g. Structural Genomics Consortium, Munk Centre for

International Studies, CISEPO and others). However, whatever the institutional message is, it can not create a unified vision and system of control over individual initiatives. Efforts at coordination or harmonization of these activities from the top are viewed by researchers as a wishful thinking or a politically-charged bureaucratic game.

It can be relatively easy to establish the strategy planning boards and committees that would be necessary to implement a centralized vision of international outreach. It can be harder to produce a specific strategic plan. Even more difficult, if not impossible, is the prospect of building a bridge between planning and implementation – a bridge that would link the big institutional plan to the concrete decisions of a large department or research centre and, furthermore, connect the latter with the decisions of individual researchers. Making things even more difficult is the prevailing research funding environment, which tends to be hectic, irregular and unpredictable. In such an environment, the implementation of international research projects can be hectic, irregular and unpredictable too, despite the best thought-out objectives, plans and timelines. At the level of evaluating results, these linkages can be even more difficult to achieve, since different stakeholders ("academic heartland", "steering core" and "developmental periphery") on campus have different structural predispositions and cultural values that have an impact on the assessment of results. The institutionally conducted assessment is, therefore, often fragmented and incoherent and does not provide a harmonious basis for results-based planning of further strategic directions. To achieve at least some coherence in its planning, implementation and evaluation processes, the major research university needs to decentralize the process of strategy development to the lowest possible level.

5. Conclusion

Systemic, structural and characterological features of the research intensive environment make internationalization processes at a major research university inevitably decentralized. The diverse environmental contexts encountered by various divisions, as well as the inherent disciplinary diversity and cultural differences between major decision-making groups on campus, result in a diversity of organizational responses to the threats and opportunities of globalization and make it practically impossible to put forward a definitive university-wide prescription for strategic international partnerships. The organizational responses that are implemented are primarily ground-up projects based on the interests and capacities of individual scholars.

Although some institutional authorities may be more reluctant than others to recognize that the process of individuation is central to the development of internationalization strategies at a major research university, the following trends drive an evolution of interest among administrators in decentralization: the lack of centralized funding for international initiatives; the growing reliance on raising funds from alternative sources; the increasingly complex measures of accountability to institutional, granting and public authorities; a shift in responsibility for budget and management to those who initiate, implement or account for international initiatives. The interest of faculty members in having a decentralized environment is also clear. They tend to be driven by the need to ensure the quality of responses to their target audiences, the effectiveness of communications with their networks, as well as the need to retain a measure of control over emergent perspectives in their fields of study. Many faculty members feel that all of this can be achieved more effectively in a decentralized fashion, without having to deal with bureaucratic intermediaries. Finally, the interest of the entrepreneurial units in having authority devolved to them is understandable too: fleeting opportunities in the markets require prompt and flexible responses, as well as an assortment of partnership relations, which go beyond the institutionally prescribed standards and benchmarks.

As major research universities become increasingly engulfed in global competition for resources and make efforts to gain intellectual and financial capital in new markets with the aid of a unified, coherent message and a brand-name that enhances their institutional profile, they will have to recognize that it is impossible to create a competitive advantage for their divisions and individual researchers by imposing common standards. Similarly, the major research university will also have to accept that the traditional aspiration to create symmetrical relations with prestigious research intensive universities of equal acclaim is not longer valid – it is increasingly unreasonable to insist on equality of relationships, given the advent of market conditions and further diversification of client groups.

Ultimately, given the fact that international initiatives in a decentralized environment can only be "institutionally blessed but not institutionally driven", the absence of prescriptive institutional strategy is not an immediate disadvantage. The central administration's political and financial support in a non-prescriptive fashion opens the way for divisional variety of processes and forms of response that are in line with their structural complexity and environmental conditions. In fact, it creates opportunities for individual and organizational creativity. By thwarting individual entrepreneurship and imposing rules and regulations, the university undermines, rather than promotes, an innovative response to globalization.

References

Altbach, P. and Teichler, U. (2001). Internationalization and Exchanges in a Globalized University. Journal of Studies in International Education, 5 (1), 5-25.

Altbach, P. (2004, June). The Costs and Benefits of World-Class Universities. Academe, (June),1-5.

Bacow, L. (2002). International strategies for research universities. Presentation at the meeting of the University of Toronto Task Force on Internationalization, March 27, 2002. Unpublished.

Barnard, A.K. (1988). North-South collaboration: a Canadian perspective. In Shine, G.L., Gopinathan, S. and Cummings W.K. (Ed.). North-South Scholarly Exchange. Mansell Publishing Ltd., London, UK, 164-178.

Barrow, C.W. (1996). The Strategy of Selective Excellence: Redesigning higher education for global competition in a post-industrial society. Higher Education 31 (4), 447-469.

Beerkens, E. (2002). International inter-organizational arrangements in higher education: towards a typology. Tertiary Education and Management, 8 (4), 297-314.

Berry, J.W. (1995). Cooperation for capacity-building: improving the effectiveness of university linkage projects. J.W.Berry &Associates, Ottawa, ON, Canada.

Bond, S. and Lemasson, J.P. (Eds.) (1999). A New World of Knowledge. Canadian Universities and Globalization. Ottawa: IDRC.

Caron, F. and Tousignant, J. (1999). New Forms of International Cooperation. In Bond, S. and Lemasson, J.P. (Eds.). A New World of Knowledge. Canadian Universities and Globalization. Ottawa: IDRC, 159-182.

Chan, W.E.Y. (2004), International cooperation in higher education: theory and practice, Journal of Studies in International Education, 8 (1), 32-55.

Clark, B. R. (1998). Creating Entrepreneurial Universities: Organizational Pathways of Transformation. Oxford: Pergamon Press for the International Association of Universities.

Clark, B. R. (2001). The entrepreneurial university: New foundations for collegiality, autonomy and achievement. Higher Education Management, 13(2), 9–24.

Clark, H. C. (1999). The Dilemma of Institutional Structures. In Bond, S. and Lemasson, J.P. (Eds.). A New World of Knowledge. Canadian Universities and Globalization. Ottawa: IDRC, 99-128.

Crane, D. (1972). Invisible Colleges: Diffusion of Knowledge in Scientific Communities. Chicago and London: The University of Chicago Press.

Currie, J. (1998). Globalisation Practices and the Professoriate in Anglo-Pacific and North American Universities. Comparative Education Review 42(1): 15-29.

Currie, J. and Newson, J. (Eds.) (1998). Universities and Globalization: Critical Perspectives. California: Sage Publications.

Currie, J. (2003). Globalizing practices and university responses: European and Anglo-American differences. Westport, Connecticut: Praeger.

Deem, R. (2001). Globalisation, New Managerialism, Academic Capitalism and Entrepreneurialism in Universities: Is the Local Dimension Still Important? Comparative Education, 37 (1), 7-20.

de Wit, H. (1995) (Ed.). Strategies for Internationalization of Higher Education: A Comparative Study of Australia, Canada, Europe and the USA. Amsterdam: EAIE.

de Wit, H. (2004). Academic alliances and networks: a new internationalisation strategy in response to the globalisation of our societies. In Theather, D. (Ed.) Consortia, International Networking, Alliances of Universities. University of Melbourne Press.

Gingras, Y., Godin, B. and Foisy, M. (1999). The Internationalization of University Research in Canada. In Bond, S. and Lemasson, J.-P. (Eds.). A New World of Knowledge. Canadian Universities and Globalization. Ottawa: IDRC; 77-98.

Goodwin, C. (1991). Missing the Boat: The Failure to Internationalize American Higher Education. New York: Cambridge University Press.

Groennings, S. and Wiley, D.S. (1990). Group Portrait: Internationalizing the Disciplines. New York: The American Forum.

Gulati, R. and Singh, H. (1998). 'The architecture of cooperation: Managing coordination uncertainty and interdependence in strategic alliances', Administrative Science Quarterly, 43 (4), 781-814.

Harari, M. (1989). Internationalization of Higher Education: Effecting Institutional Change in the Curriculum and Campus. Long Beach, CA: Center for International Education, California State University.

Hayhoe, R. and Pan, J. (Eds.). (2001). Knowledge Across Culture: A Contribution to Dialogues among Civilizations. Hong Kong: Comparative Education Research Centre, University of Hong Kong.

Hayhoe, R. and Pan, J. (Eds.). (1995). East-West Dialogue in Knowledge and Higher Education. New York: M.E.Sharpe.

Jaschik, S. (2006). A Divorce in Singapore. Inside Higher Ed. July 27. Retrieved July 31, 2006, from http://www.insidehighered.com/layout/set/print/news/2006/07/27/singapore (1 of 3)7/31/2006 4:44:05 PM

Jones, G. and Skolnik, M. (1992). "A Comparative Analysis of Arrangements for State Coordination of Higher Education in Canada and the United States". Journal of Higher Education, 63 (2):121-142;

Jones, G., McCarney, P.L. and Skolnik, M.L., (Eds.). (2005). Creating Knowledge, Strengthening Nations.

Toronto, Buffalo, London: University of Toronto.

Karran, T. (1998). Consolidate, collaborate, compete, or quit? Strategic options in the global higher education market. Journal of International Education, 9 (3), 23-30.

Keller, G. (1983). Academic Strategy: The Management Revolution in American Higher Education. Baltimore and London: The Johns Hopkins University (Published in cooperation with the American Association for Higher Education).

Kerr, C. (1991). "International Learning and National Purposes in Higher Education". American Behavioral Scientist. 35 (1), 17-42.

Killing, J. P. (1988). Understanding alliances: The role of task and organizational complexity. In Contractor, F.L. & Lorange, P. (Eds.). Cooperative strategies in international business. 55-67. Lexington, Mass.: Lexington Books.

Knight, J. (1995a). Internationalization at Canadian Universities: The Changing Landscape. Ottawa: Association of Universities and Colleges of Canada.

Knight, J. (1995b). A national study of internationalisation at Canadian universities, in: de Wit, H. (Ed.) Strategies for Internationalisation of Higher Education. A comparative study of Australia, Canada, Europe and the USA. 99-1 20 (Amsterdam: European Association for International Education).

Lang, D. W. (2002). A lexicon of inter-institutional cooperation. Higher Education 44 (1),153-183.

Lang, D. W. (2002). "Responsibility Center Budgeting and Management at the University of Toronto," in Priest, D. et al. (Eds.). Responsibility-Centered Budgeting Systems in Public Universities, Northampton: Edward Elgar, 109-136.

Lang, D. W. and Zha, Q. (2004). Comparing Universities: A Case Study between Canada and China. Higher Education Policy, 17, 339–354

LePage, M. (2003). Canada/Europe Partnerships –Getting to Critical Mass. Presentation at CERT 3rd Annual CEO Round TableTSX Group's Broadcast & Conference CentreToronto, November 21, 2003.

Marginson, S. and Rhoades, G. (2002). Beyond nation states, markets and systems of higher education: A Glonacal Agency Heuristic. Higher Education, 43 (3), 281-309.

Mintzberg, H. and Rose, J.. (2003). Strategic Management Upside Down: Tracking Strategies at McGill University from 1829 to 1980. Canadian Journal of Administrative Sciences. 20 (4), 270-290.

Narula, R. and Hagedoorn, J. (1999). Innovating through strategic alliances: moving towards international partnerships and contractual agreements. Technovation 19, 283–294

Neave, G. (1992). Managing higher education international cooperation: strategies and solutions. Unpublished reference document, UNESCO, Geneva, 166-169.

Oleksiyenko, A. (2002). The Entrepreneurial Response of Public Universities. CSSHE Professional File (Summer).

Pan, J. N.-R. (1996). The Role of Canadian Universities in International Development: A Case-Study of the Canada-China University Linkage Programs. (Ph.D. Diss., University of Toronto).

Rhoades, G. (2000). Who's Doing It Right? Strategic Activity in Public Research Universities. Review of Higher Education 24 (1), 41-66.

Rudzki, R.E.J. (2000). Implementing internationalization: the practical application of the fractal process Model. Journal of Studies in International Education, 4 (2), 77-90.

Sadlak, J. (1998). Globalization and Concurrent Challenges for Higher Education. In Scott, P. (Ed.) The Globalization of Higher Education. Buckingham, England and Philadelphia, PA: Society for Research into Higher Education and Open University Press, 314-319

Salmi, J. (2001). Tertiary education in the 21st century: Challenges and opportunities. Higher Education Management, 13(2), 105–131.

Scott, P. (1998). The Globalization of Higher Education. Buckingham: The Society for Research into Higher Education and Open University Press.

Skolnikoff, E.B. (1994). 'Knowledge without borders? Internationalization of the research universities', in Cole, J.R., Barber, E.G. and Graubard, S.R. (Eds.), The Research University in a Time of Discontent. Baltimore: Johns Hopkins University Press, 337-343.

Slaughter, S. and Leslie, L. (1997). Academic Capitalism: Politics, Policies, and the Entrepreneurial University. Baltimore and London: The Johns Hopkins University Press.

Sporn, B. (2001). Building adaptive universities: Emerging organizational forms based on experiences of European and US Universities. Tertiary Education and Management, 7 (2), 121-134.

Stein, J., Stren, R., Fitzgibbon, J. and Maclean, M. (2001). Networks of Knowledge: Collaborative Innovation in International Learning. Toronto: University of Toronto Press.

Subotzky, George. (1999). Alternatives to the Entrepreneurial University: New Models of Knowledge Production in Community Service Programs. Higher Education, 38 (4), 401-440.

Teichler, Ulrich. (2004). The Changing Debate on Internationalization of Higher Education. Higher Education, 48 (1), 5-26.

Tillman, G. (1997). Internationalization of advanced learning: toward a planning framework. Association of Canadian Community Colleges; Association of Universities and Colleges of Canada; Canadian Bureau for International Education, Ottawa, ON, Canada.

Trilokekar, R.-D. (2006). Federalism, Foreign Policy and the Internationalization of Higher Education: A Case-Study of the International Academic Relations Division, Department of Foreign Affairs and International Trade, Canada. (Ed.D. Dissertation. Theory and Policy Studies in Education: Higher Education. OISE-UT).

Wende, M.C. van der (2002). Internationalisation policies: About new trends and contrasting paradigms.Higher Education Policy 14, 249–259.

Yin, R. K. (2003). Case Study Research: Design and Methods. Sage Publications: Thousand Oaks, London, New Delhi.

Elite Scientists and the Global Brain Drain

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Abstract

There are signs – one is world university league tables – that people increasingly think globally when choosing the university in which they wish to work and study. This paper is an exploration of data on the international brain drain. We study highly-cited physicists, highly-cited bio-scientists, and assistant professors of economics. First, we demonstrate that talented researchers are being systematically funnelled into a small number of countries. Among young economists in the top American universities, for example, 75% did their undergraduate degree outside the United States. Second, the extent of the elite brain drain is considerable. Among the world's top physicists, nearly half no longer work in the country in which they were born. Third, the USA and Switzerland are per capita the largest net-importers of elite scientists. Fourth, we estimate the migration 'funnelling coefficient' at approximately 0.2 (meaning that 20% of top researchers tend to leave their country at each professional stage). Fifth, and against our prior expectations, the productivity of top scientists, as measured by the Hirsch h-index, is similar between the elite movers and stayers. Thus it is apparently not true that it is disproportionately the very best people who emigrate. Sixth, there is extreme clustering of ISI Highly Cited Researchers into particular fields in different universities. Seventh, we debate the questions: are the brain drain and this kind of funnelling good or bad for the world, and how should universities and governments respond?

Elite Scientists and the Global Brain Drain

1. Introduction

It is evening. There is snow on the ground. Inside, a grey-haired Englishman in a white bow tie steps forward, and Anthony Leggett lifts something small into the air. Photographers strain forward and the gold of the Nobel Prize in Physics flashes back from his hand. A second Englishman, Peter Mansfield, emerges from the wings. This time it is the Nobel Prize in Physiology and Medicine that is held toward the cameras. A third Briton joins them. Amid Swedish and foreign reporters, Clive Granger raises aloft the Nobel Prize in Economics. The date is December 10, 2003. Next morning, the readers of The New York Times learn little of the trio's common birthplace. Instead they discover, correctly, that Americans again scooped the bulk of the Nobel awards in Stockholm, but that an elderly medical scientist from England received one. By then, Professor Anthony Leggett, born a Londoner, is en route back to his laboratory in Illinois. Professor Clive Granger, originally from Swansea, is sitting westbound on an aeroplane and writing the next of his University of California lectures.

This is a study of the brain drain and why it may matter. We examine the migration decisions made by some of the world's most creative scientists. Our paper lays out data on the mobility of three kinds of university researchers. Its focus is senior physicists, senior bio-scientists, and assistant professors in the top American economics departments. In this way, we hope the paper provides a flavour of science and social science, and of old and young.

Our data on senior physicists and bio-scientists are drawn from the ISI Web of Science database known as www.isihighlycited.com. This lists the world's most-cited people across a range of 21 subject fields. The database seems particularly valuable, even though it is still relatively un-exploited, as a source of information on scientists, both because of the talented nature of the group (many of the men and women in our data set are likely to go on to win Nobel Prizes) and because it is possible to link bibliometrically to most of these scientists' published articles. Information on factors such as the citations h-index, as suggested by Hirsch (2005), can thereby be studied directly. Although it has recently become possible to draw upon Google Scholar to construct h-indexes, in this paper we rely on data from ISI.

The paper is interested in a number of questions:

- Among elite scientists, how strong is the world's brain drain?

- Is it disproportionately the very best researchers who migrate?
- Why are certain countries successful at attracting top scientists? Should governments try particularly to retain young stars, and if so how might they do so?
- Is the brain drain beneficial for the world as a whole or merely good for the acquiring country (often, in our data, the United States)? Can we quantify the nature of the loss to a donor nation?
- How can we measure the average quality of movers compared to stayers?
- How much ‘clustering’ of elite scientists is there? In other words, do particular universities attract star researchers if they already have brilliant people in those particular fields?
- Might clustering create too much conformity of thinking?
- If increased publicity given to world rankings of university-quality encourages more international mobility in the future, what are the policy implications of the brain drain, if any, for the welfare of the world as a whole?
- Should individual governments have policies to slow the elite brain drain?
- How ought a university to react strategically to the existence of these kinds of brain drain pressures?

We believe these questions are important. Our paper provides evidence relevant to some, and speculates on others, although we shall not be able definitively to answer all of them.

Part of our aim is to measure the productivity of researchers. There are two main ways to do this. One is to count the number of papers produced by a scholar. The other is to count a scholar’s citations (that is, the number of times that he or she is referenced in others researchers’ bibliographies). We adopt principally the latter. Particular emphasis is given here to a scholar’s h-index. An h-index is a summary statistic that is becoming widely used in bibliometric inquiries. A scholar who has published Z papers each of which has been cited at least Z times is said to have an h-value of Z. It tells us in a quick way how highly cited a person is, and is calculated by rank-ordering a scholar’s journal papers by how many times each paper has been cited, and then solving for the highest integer defined by the equality: *the number of cites = the number of that paper in the rank ordering*. For example, consider someone who had published eight journal articles that have been cited respectively 0 times, 0 times, 0 times, 3 times, 4 times, 5 times, 6 times and 7 times. This scholar’s h-index would be 4. Such a person has published 4 articles cited at least 4 times.

Nevertheless, other approaches are possible. Hence at one or two points in the paper we use, as an alternative, the total number of lifetime citations to an individual’s work.

One potential weakness of our analysis ought be acknowledged from the outset. Because we shall be using data from ISI, this paper will concentrate on scientific work published in English-language research articles. As in so much bibliometric analysis, this leads to an undercounting of research results written only in other languages. At the time of writing, it is not possible to correct in a systematic way for this bias, although in the long run it may be that exactly comparable citations indexes in other languages will be developed.

2. The Brain Drain: Background

Higher education is big business. More than 2 million European Union students graduate each year, and approximately 2 million also do so in the United States. Despite this, the EU employs many fewer researchers per 1,000 workers (5.4%) in the labour force when compared to the US (8.7%): see the data in Woods (2003). The measured trans-Atlantic drain is numerically fairly small and has been estimated to be 0.5%-1% (Saint-Paul, 2004). Nevertheless, the migrants are top performers within their fields. When only considering the United States labour force with doctoral degrees in the Science and Engineering field, 29% of those conducting R&D are foreign-born (Johnson and Regets, 1998).

In 2001, the European Council of Ministers adopted 'The Barcelona Objective', stating that all EU members should spend a minimum of 3% of GDP on research by 2010 (EC, 2002). At that point, the EU was estimated to spend 1.9%, compared to the US's value of 2.8%. This strategy was meant to create 400,000 new jobs for European scientists every year (Woods, 2003). Yet, by 2003, only a few countries had met the criteria. The gap between EU and US research spending continues to widen.

The concept of the "brain drain" – the intellectual seepage from a country caused by the emigration of highly-educated personnel – is now a fairly old one. It appears to have gained currency in the 1960s following the prominence given to the phenomenon by a report published by the Royal Society (Royal Society, 1963). That report tried to measure the exodus of British scientists to the United States. Early research on the subject was principally concerned with the emigration of academics and professionals from developing to developed countries, and the possible negative impacts of this migration on the social and economic development of the countries of origin (Bhagwati and Hamada, 1974; Hamada, 1977; McCullock and Yellen, 1977).

Since then, the focus of study has shifted. It has come to take into account a wider understanding of the international mobility of elites, and the conventional wisdom that the brain drain is always negative for the development of source countries has now been displaced in favour of the related concept that it is necessary to balance also the benefits of 'brain gain' and 'brain circulation'. This new perspective is demonstrated through more recent literature in the field, which posits that – at least in the case of larger developing countries with an intermediate level of income – the emigration of intellectual capital, and the prospect of migration, has the potential to encourage human capital formation through inducing greater educational aspirations and additional investment in education, and additionally that past skilled emigration significantly increases a country's chances of attracting foreign direct investment in the subsequent period through skilled migrants' active participation in facilitating such transfers between their host and home countries (Commander, Kangiasniemi and Winters, 2003; Kugler and Rapoport, 2007; Meyer, 2001; Mountford, 1997; Beine, Docquier and Rapoport 2001, 2007). Beyond diaspora externalities and the effects of the raising of expected returns to education, a number of authors have also discussed the relatively short-term nature of movements in pursuit of career development, the higher incidence of migration among potential rather than established elites, and the increasing characterisation of the movements of the highly-educated as circulation and mobility rather than migration (e.g. Bekhradnia and Sastry, 2005; Gaillard and Gaillard, 1997; Laudel, 2005; Meyer, 2001; UUK, 2007).

In the early literature, quantitative measurements of the magnitude of the brain drain were uncommon. More recently, empirical studies have begun to emerge. Carrington and Detragiache's (1998, 1999) work was pioneering. It provided skilled migration rates for 61 developing countries in 1990 by using US census and OECD migration statistics. Notwithstanding the limitations of the data and methodology, as detailed by Docquier and Rapoport (2007), the report of Carrington and Detragiache demonstrated a substantial brain drain to the United States, particularly from small countries in Africa, Central America and the Caribbean and amounting to a significant share of the educated workforces of these nations. Docquier and Marfouk (2004, 2006) extended and refined Carrington and Detragiache's work. They offered new estimates of skilled migration rates for some 170 countries in 1990 and 190 countries in 2000 in both developing and developed countries. The Docquier-Marfouk dataset covered 92.7% of the OECD immigration stock for the relevant periods, and demonstrated that a substantial increase in the magnitude of the brain drain in Western and Eastern Africa and Central America had been experienced over the decade in question, although significant differences remained between regions and countries, with the highest brain drain rates observed in small countries in the Caribbean, Central America and Africa.

What seems clear from the available literature, including quantitative measurements thereof, is that studies tend to cover migration of the generally highly-educated across a range of employment sectors, or have a focus on specific countries or regions. Our paper aims to examine the brain drain with specific reference to elite academics on a global level. The role of the United States, as a nation that gathers up many of these talented people, is a specific focus of our paper.

Pierson and Cotgreave (2000) examined the mobility of scientists who had obtained their doctorates from the UK in 1988 and who continued to be active in their fields at the time of analysis. Each scientist was checked against the Science Citation Index (SCI) of the ISI for the period 1985-1989. All first-authored papers published during this period, together with the number of citations received by each article up to and including May 2000, were recorded. The continuing activity of researchers was established: SCI data provided a check on publication records and current country of abode. Of the 252 scientists tracked, the majority had most recently published from a UK address (62%), while 17% were now based in the US and 21% elsewhere in the world. No significant statistical difference was found between the number of articles by scientists publishing from UK addresses and those publishing from the US (2.40 $\pm$0.24 publications per person vs. 2.07 $\pm$0.43). However, the mean number of citations per article for scientists who had moved to the US was found to be significantly higher than that for UK "stayers". Although Pierson and Cotgreave emphasise that this does not represent conclusive proof of a significant brain drain, they nevertheless present their findings as cause for concern. They suggest that British scientists with the most potential are emigrating to the US.

Although the methodological detail provided by Pierson and Cotgreave is sketchy, their findings are nevertheless in line with those of more fully explained studies presented by Stephan and Levin (Levin and Stephan, 1999; Stephan and Levin, 2001) and Ioannidis (2004).

Stephan and Levin (Levin and Stephan, 1999; Stephan and Levin, 2001) examined whether the foreign-born and foreign-educated were disproportionately represented among individuals making exceptional contributions to science and engineering in the United States. The following illustrative criteria were used to identify data subjects: individuals elected to the US National Academy of Sciences (NAS) and/or National Academy of Engineering (NAE); authors of citation classics (journal articles identified by the Institute for Scientific Information (ISI) as having a "lasting effect on the whole of science"); authors of hot papers ('journal articles published during the most recent two-year period that in the most recent two-month period have attracted significantly more attention than papers of the same age in the same field' (http://scientific.thomson.com/products/sw-hp/)); the 250 ISI most-cited researchers; authors of highly-cited patents; and scientists who had played a key role in the launch of bio-technology firms making an initial public offering from March 1990 through to November 1992. In the case of citation classics and hot papers, further distinctions were made between first authors and non-first authors. The resultant dataset was populated with biographical data drawn from available sources as well as via questionnaire returns. Subsequent statistical analysis of each indicator of scientific achievement revealed that, setting aside some variation by discipline, and with the sole exception of hot papers in the life sciences, elite scientists in the US were disproportionately represented by the foreign-born as well as by those educated abroad, both at undergraduate and postgraduate levels.

Bibliometric methods were also used by Ioannidis (2004) to evaluate the magnitude of the brain drain. He analysed data on 1523 of the ISI most-cited scientists for 1981-1999, using the data to determine the proportion of scientists born in a different country from where they were currently residing and controlling for the potential impact of the relative representation of different scientific fields in the sample analysed. Ioannidis found that, regardless of the analysis used, about a third of elite scientists globally had emigrated from their countries of birth (approximately three-quarters to the US), though there was considerable variability in the rate of foreign-born scientists across scientific fields and among developed countries. In the case of the latter, foreign-born highly-cited scientists accounted for about a third of scientists resident in the US, Australia, Switzerland, Israel, France and the Netherlands, with significantly lower proportions reflected in the UK (24%) and Germany (19%), a significantly higher proportion in Canada (64%), and no foreign-born highly-cited scientists in any country not belonging to an 'established market economy'[1], apart from Singapore. Notably, only 2% of US-born scientists had emigrated, against emigration rates of 20%-86% for other countries. Ioannidis further noted that "under conditions of equity at a global level, the number of native top scientists in each country should be proportional to the population" (Ioannidis, 2004: 938). Adjusting for population, it was found that the number of native highly-cited scientists was at least 75% in only 8 countries apart from the US. A further observation of concern was that, using the US-born scientists as a reference point, 89% of individuals with the potential to make an impact comparable to that of the highly-cited scientists in Ioannidis' sample had not in fact attained this level of achievement. Another of his

[1] United Nations (1981-1986) *Annual Demographic Reports*. United Nations, Geneva.

findings was that countries without an existing critical mass of native scientists – including developed nations – lost most scientists to migration.

In discussing the implications of these global estimates of elite migration, Ioannidis presents his findings as indicative of an increasing exodus of top scientists, citing the likelihood that the rate of progress of scientific growth has a direct and exponential relationship with the critical mass of scientists in a country. His nod to the advantages associated with the migration of scientists is, however, set aside in favour of a strong emphasis on the draining of scientific potential and the consequent developmental stagnation caused by these global inequalities.

The above studies provide quantitative evidence for the brain drain of highly-cited scientists. Yet methodological difficulties have been pointed out by Laudel (2003) in relation to the approaches taken by (for e.g.) Stephan and Levin and by Pierson and Cotgreave. Laudel argues that an investigation of elite mobility must necessarily solve the three methodological problems of delineating a specialty, identifying a specialty's elite and identifying international mobility and migration. The delineation of specialties is only roughly achieved by Stephan and Levin and not undertaken at all in Pierson and Cotgreave's work. In terms of ascertaining mobility, the sources of biographical data on scientists used to achieve this (e.g. the Internet, questionnaires, encyclopaedias of scientists, grant applications, etc.) are highlighted by Laudel, who cites incomplete access and incomplete data. Finally, with regard to the identification of the elite, Laudel mentions a number of issues that have been raised about the use of bibliometrics to measure scientific excellence (e.g. Van Raan, 2000; Tussen, Visser and Van Leeuwen, 2002). The issues include (given the extent of co-authorship in the sciences) the utility of citation classics and hot papers as reliable measures of the quality of a single scientist, as well as measurement problems with homonyms in the ISI data (notwithstanding some attempts to correct for this by Stephan and Levin). Nevertheless, it is worth pointing out Ioannidis' (2004) argument that "despite the debates concerning the limitations of citation analyses and the inability to find a perfect means for weighting research accomplishments (…) the number of citations is a useful surrogate of scientific impact" (Ioannidis 2004: 936). There are of course also other limitations with the studies in question – Pierson and Cotgreave's article, for example, lacks information on the nationality of the individuals included in their dataset, which arguably weakens the implications of their findings.

Laudel presents a detailed discussion of the tests conducted in her study to address the issues identified with delineation and identification of the elite and their mobility – while a range of potential solutions were covered, a combination of elite conference participation (the Gordon conferences) and an analysis of citations within the sample of active conference participants was found a promising approach (though not applicable to all specialties). A test study was conducted using the "Angiotensin" Gordon Conferences. The results from this showed that, of the 131 Angiotensin scientists investigated, 59 had always been in the US and 34 had moved to the US, out of which 16 had moved back to their countries after a temporary stay (supporting the characterisation of elite mobility as circulation) and 18 (approximately 14% of the sample) were still resident in the US, the majority of whom appeared to have migrated permanently based on their length of stay. A further 3 scientists had emigrated from the US to other countries. The remaining 35 had been resident in, or had moved to countries other than, the US. Laudel interprets her findings as confirming a putative brain drain towards the US.

This kind of research gives some credence to the contention that there is an increasing clustering of elite scientists in established centres of academe. This emphasises the degree of separation with countries in which a paucity of top researchers already exists. A perpetuation of the cycle of concentration of excellence and the corresponding scientific deficit elsewhere in the world is unexceptional. Mahroum (2000), for instance, argues that academics move close to centres of academic power and excellence, an assertion supported by empirical research undertaken by Millard (2005) which demonstrates that the location decisions of scientists are taken in the context of the prestige, visibility and networking potential of centres or clusters. As noted by Laudel (2005: 393), "…it follows that 'elite production' is autocatalytic, and that a country needs elites to generate elites".

What implications does this have for the world? It seems from the literature that documentation of the extent of the brain drain in general – not just from developing nations to established market economies but also between OECD countries – has shown an increase in the magnitude in this phenomenon. Although it is clear that there is an increasing need to factor in the impact of return migration and brain circulation, the net effect still appears to be of the 'drain' variety – particularly towards the US. Yet the implications of this are mixed. As far as return migration is concerned, there is limited evidence that this is significant among the highly skilled, unless sustained growth has preceded return (Docquier and Rapoport, 2007). For example, while less than 20% of Taiwanese and Korean Science and Engineering PhDs graduating from US universities in the 1970s originally returned to their home countries (e.g. Kwok and Leland, 1982), this proportion increased to two-thirds during the course of the 1990s following prolonged periods of significant growth in these countries (e.g. Song, 1997). Such a finding indicates that return skilled migration may be more a consequence of rather than a trigger for the development of sending nations. It also appears to be the case that, as demonstrated by Beine, Docquier and Rapoport (2007), while there is clear empirical support for the potential positives associated with elite emigration, this is limited to larger countries combining low levels of human capital and low skilled migration rates. In a comparison of 'winners' versus 'losers' on a country-by-country basis, there are markedly more of the latter – comprised particularly of small countries in Sub-Saharan Africa and Central America. More importantly, however, the latter group are also shown to experience substantive losses against the former's non-negligible gains.

Looked at from another perspective, however, it is possible to conceive of Pierson and Cotgreave's (2000) finding that the mean number of citations per article for scientists who had moved to the US was found to be significantly higher than that for UK "stayers" as evidence contributing to the view that emigration may be beneficial for one's research. By extrapolation, the brain drain might conceivably be beneficial for the scientific community as a whole. As Millard (2005: 357) notes, researchers' location decisions are influenced by their networks, and, citing Grabher (1993) – "underlin(ing) the importance of being involved in international collaborations and networks which – partly through the mobility of researchers – provide a constant inflow of new ideas, facilitating the maintenance of the competitiveness of research groups, institutes and clusters".

Sample 1: Young Economists

We begin with information on elite young American economists. We obtained our data in a simple way: it was done by collating, and examining the patterns in, the curriculum vitae (CVs) of all assistant professors in the top-10 departments in the US. The departments are listed in Table 1. We treat these individuals as data points. Because of their youth, arguably these people give us a glimpse of the future of academic economics.[1] We find evidence of a strong ex post brain drain – a funnelling of talent into the United States – at the bachelor-degree level. The typical assistant professor has a BSc from outside the US.

Our data set on young economists was compiled in January/February 2007. In total, we obtained biographies (usually by reading CVs on the web) on 112 assistant professors. We gathered primary data on assistant professors from the ten highest-ranked economics departments in the US. The departments were

[1] We do not focus on the US to downplay the vitality and importance of young European scholars. Rather, our gathering of data stemmed from a project designed to measure international flows of scientists into the United States.

chosen using www.econphd.net. Stanford University has the highest number in the sample with 16 and the University of Chicago the fewest with 6 assistant professors. In our data, there are 26 women. We documented both the research areas and research styles of the economists (not reported here but available on request). Information is missing for three assistant professors, one in Harvard, Stanford and New York University respectively, which decreases our effective sample size to 109. People's main areas of research were recorded. Data on gender were also collected.

Our results reveal ex post a striking brain drain. Only 25% of the sample had obtained their first degree in the US (Chart 1a), and 87% got their PhD there (Chart 1b). Assistant-professor positions are not evenly distributed between the genders: 24% are female and 76% male. Charts 1c and 1d give more detail on the exact countries of origin. These findings are broadly consistent with concerns expressed, in for example Machin and Oswald (2000) and Neary et al (2003), about the growing dominance of US economics departments in academic economics research.

What is harder to say, when examining a selection of young researchers like these, is how migration and productivity are linked. For that, data on an older group of scholars is required. Our next two samples offer that.

Sample 2: Senior Physicists

Here our sample of researchers is taken from the ISI's list of highly cited physicists on www.isihighlycited.com. At the time of data collection, this contained a list of the 272 most-cited people in scholarly physics journals between 1981 and 1999. Laudel (2003, p.219) points out that the ISI's subject groupings are not broken down into specialities and therefore true in-depth analysis of "cause and consequences" of migration cannot be analysed. However, data on these factors, such as R&D funding, does not have sufficient coverage over physics, let alone its specialities, for that depth of analysis to be undertaken and therefore the sample used is considered to be appropriate. Laudel (2003, p.223) also argues that, once specialities have been identified, citation counts alone do not uniquely identify the elite. However, Ioannidis (2004) also uses highly cited scientists in his sample and argues that they "represent a reliable sample of largely top researchers with major impact in their field" and this view is also taken in this paper. The physicists in the sample are the most "visible" (Cole and Cole 1968, p.400) between these years. Even if they cannot be defined uniquely as the elite, they are an important group.

We created a data set on physicists. Biographical and bibliometric information for the 272 physicists was researched to determine career movements and overall career productivity. The year and place of birth, first degree and PhD were recorded - so too was country of current affiliation. Data were initially gathered from the ISI website and from the physicists' own webpages. This was followed by a further search of the Internet.

We sent emails to 146 physicists whose email addresses were identified. Of these, 63 scientists replied with further information about themselves. Sufficient data were found for 158 of the physicists, although information on first degrees is only available for 150 of them. Further data for the countries of origin and current affiliation was collected from OECD Statistics. All variables were averaged between 1970 and 2006 to cover the main period during which the physicists were active, the mean year of first degree being 1968 and 1973 for PhD. Data were available for 21 countries[1]. Data for the missing countries[2] were not collected from other sources (in order to maintain consistency in data-gathering).

These physicists are currently affiliated to 16 different countries. This leads to some language difficulties. Websites could only be read perfectly in English and Italian, although some online translators were used. Emails were sent in English, and this may have affected response from those in non-English speaking countries. To examine a possible bias towards English-speaking countries, the proportions of the final 158 physicists are compared to those of the original 272. The USA is the only substantially overrepresented country, with 17 more physicists; and Japan is underrepresented by 9 physicists. The other countries varied from their expected number by one or two, although in some cases this is still a large portion of their representation. There is no way to solve this problem, and the response rate (43%) was similar to those of previous studies (Laudel 2003, p.224). This is considered when interpreting later results.

Chart 2 reveals a remarkable funnelling of scientific talent into the United States. Of our 158 highly-cited scientists, 70% were born outside the USA. At the BSc level of their education, that had fallen to 57% of these people being outside America. By the year they came to do their PhD, the majority of these scientists were in the United States. The 70% had become 45%. Finally, when we observe where they work today, only 34% are working outside the United States.

Charts 3a and 3b classify the data by region of donor country and recipient country. As can be seen, in terms of per-capita the big importers of brain power in the world are Switzerland and the USA. This may be

[1] Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, New Zealand, Poland, Spain, Sweden, Switzerland, Turkey, UK and USA

[2] Israel, Argentine, Chile, China, India, Russia, Brazil, Iran, Taiwan

because of the high professorial salaries paid in these nations, or because of generous scientific funding, or for a mixture of these reasons. Charts 4 and 5 are illustrations for Germany and the UK respectively. Charts 6a and 6b give further detail.

We would like to know whether it is the most talented who tend to leave a country. The next issue in data collection, therefore, was in calculating productivity levels. The ISI Web of Knowledge was used to calculate the h-index (as a reminder, an h-index of 20, say, means that a researcher has written at least 20 papers that are each cited at least 20 times). This required us initially to identify each physicist's publication list, which can be problematic when many physicists have similar names. Laudel (2003, p.232) examines this issue and carried out further analysis of publication lists and co-authors to ensure that only the correct scientist's work was included. In our study, each individual was considered separately. In some cases, initial inspection showed no problems: physicists had identified how many papers they had published. However, in some cases, further examination of the exact names used on published papers and identifying the institutions worked for had to be undertaken in order to obtain the publication list. In two cases, physicists were eventually removed from our sample due to our lack of confidence in the measurements. In bibliometrics, total citation counts often contain errors caused by homonyms. The impact of misspecification is considered less problematic with the h-index: the probability of a second physicist with the same surname and initials appearing within the relatively small selection of papers which affect the h-index score is lower than for an entire list of people and publications.

The sample of 158 physicists contains 1 female, and 8 of our 158 have won Nobel Prizes (see appendix 1, tables 15a and 15b). Of the total number, 61.4% have worked in multiple countries and 97.5% have worked in multiple institutions. Currently, 76% are affiliated to a university, 17% to other types of public institutions and 7% are in private institutions. Regarding the span of their careers, 96% have, at some point, worked in academia since obtaining their PhD; 54% have experienced another type of public institution; and 47% have spent a period in the private sector. The average number of institutions worked in is 6.03, and the average number of countries worked in is 2.41, with maximum values of 25 and 12 respectively. These ISI Highly Cited Researcher physicists were born in 32 different countries. They studied for their first degree in 30 different countries. They did PhDs in 22 countries. They are presently located in only 16 countries. This shows a funnelling, at the country level, of approximately 50% from birth to the present day.

The percentage of physicists present now in each country reveals that the principal funnelling effect is towards the USA. Table 2 demonstrates that at birth, 29.7% of physicists were in the USA, which increases to 43.4% at first degree, 55.1% at PhD and to 67.1% presently. The proportion in the 2nd and 3rd ranked countries falls by approximately 3 percentage points from birth to present day, with the share in the rest of the world falling dramatically from 50% at birth to only 19.6% presently.

Overall, 44% of scientists have moved since birth (see Table 3). These findings are only a little different from those of Ioannidis (2005), who found that 50% of his physicists had moved since birth. The difference is partly attributable to the larger sample size in this paper: 158 scientists compared to 46 scientists in Ioannidis' work.

Summary statistics for these people's citation levels can be seen in Table 4. The average h-index in the sample is approximately 59, with minimum and maximum values of 22 and 115 respectively. In order to examine the effect of co-authorship, the number and countries of the co-authors of ten randomly selected physicists in the sample was examined (results not reported but available upon request). The number of co-authors for each of the ten varies extraordinarily from approximately 3 to 366 and the number of affiliated countries from 1 to 7. Although there is a tendency for those with more co-authors to have higher h-indexes, the evidence is not substantial. This seems to reinforce the previous decision to not adjust h-indexes for co-authorship.

These h-index results were compared with the total number of published papers, total citations, and average citation count. There is no correlation with average citations per paper, a significant correlation of 0.40 with total number of published papers, and of 0.54 with total citations.

Chart 7 shows that those who currently work in the USA have an h-index which is on average 5.71 points higher than those in the non-USA institutions. This difference is statistically significant at the 5% level. Breaking the non-USA sample down further leads to very small sample sizes, unfortunately, which makes statistical tests less effective. There are several possible reasons for this apparent higher productivity, one of which is that people working in the USA in a dense academic market cite each other more often for purely sociological reasons.

Are movers of higher quality as physicists than those who choose to stay in their own country? Separating the sample into those who have migrated and those who have not – since either birth, BSc or PhD – shows no statistically significant difference in productivity levels (see Table 5), although there is no perfect way of measuring the productivity levels in the alternative situation. This result tentatively suggests that the act of migration itself may not increase productivity (see, however, Appendix 2 for some qualitative interview insights from scientists within this sample).

Sample 3: Senior Bio-scientists

Our third group of researchers is drawn from bio-science. This group of researchers numbers 163 people. More precisely, they are all ISI Highly Cited Researchers in the ISI field defined as 'Biology and Biochemistry'. Moreover, this time our sample is taken entirely from scientists currently working in the United States. Hence the sampling is somewhat like that for our economists, but with the additional feature that all had to be HiCi researchers to be included.

Chart 8a documents data on all those in our sample who moved into the USA. The chart summarises, for the individuals on whom we have information, the cross-national distribution of their countries of birth. As with physics, these talented individuals come from a host of different birth nations. It can be seen in Chart 8a that Japan is the major donor country (with 7 bio-scientists moving from this country), followed by the UK and Canada (with 5 each). Chart 8b captures the movement data on those who went to the United States after their PhD.

In Chart 9, we plot the numbers of bio-scientists, at different stages of their professional lives. The general pattern is reminiscent of those for the economists and physicists. Once again, North America soaks up, at each successive stage, a larger and larger number of the elite science researchers. For our sample:

% bio-scientists working now in the USA and born in the USA: 60%

% bio-scientists working now in the USA and BSc in USA: 70%

% bio-scientists working now in the USA and PhD in USA: 72%

% bio-scientists working now in the USA: 100%

Greater detail is set out in Chart 9.

3. Funnelling and H-index Productivity

In Tables 6a and 6b, we take a closer look at migration at different stages of a person's professional career. We capture this with what we call a *funnelling coefficient*. This measures the proportion of researchers lost from the country at that career stage. Hence, in Table 6a, 15% of people who are now highly-cited physicists leave their country of birth to do their undergraduate degree; 17% do the equivalent at the PhD stage; 25% do so in between PhD and where they currently work. Table 6b is not exactly comparable, because it draws only on scientists now in the United States, but it gives the same kind of picture. Table 7, on highly-cited bio-scientists, reveals something broadly similar, but interestingly the extent of the funnelling appears rather less than in physics. Whether this reduced mobility might be because of larger set-up costs of laboratories in biological science, as compared to that in physics, can only be one speculation.

An important intellectual issue in the study of the brain drain is whether it might be good for world science for talented people to move to the rich science-intensive nations such as the USA. The argument here is a natural one (and was put forward in the Financial Times in 2007 by Larry Summers, formerly president of Harvard University – in economics this is termed an 'externalities argument'). If scientists become more creative when working with other top people, perhaps by sparking off each other, then it may be beneficial to the global community, in the long run, to have an elite brain drain. Individual donor countries may lose, goes this argument, but mankind as a whole gains from the new ideas so fostered. Oswald (2007b), by contrast, raises the possibility that if most researchers go to the USA it may lead to too much homogeneity of intellectual approach.

Tables 8, 9 and 10 report the h-index values of our ISI Highly Cited Researchers in both physics and bio-science. The tables break down the numbers into movers and stayers: these are the people represented in the Moved and Remained columns respectively. Intriguingly, we cannot find statistically significant differences across these kinds of movers and stayers. A similar kind of result is captured in Chart 10.

Table 11 takes a different look at this issue for the case of the physicists. Here it can be seen that the h-indexes of scholars do not greatly vary across continents.

Many factors influence the productivity of outstanding scientists, so it is natural to ask whether, once other influences are held constant, we can detect an effect from having migrated to a different country. In this spirit, a more formal test than earlier is set out in Table 12. This table provides two sets of regression equations. In the upper half of the table, the dependent variable is the h-index of the highly cited physicists in our sample. In the lower half of Table 12, the dependent variable is the total citations (summed over a lifetime) of these physicists. The independent variables are listed vertically. It can be seen – as we add extra variables, going from the left-hand columns to the right-hand columns – that the country in which an individual scholar works does not prove to be a statistically significant influence on his or her measured productivity. The only significant predictor of citations, whether in the form of an h-index or as a total amount, is the number of years since a person had completed their PhD. There is a chance here that Type II errors are being made. At

138, the sample size is fairly small, and those working in the USA have, according to the penultimate column of the upper half of Table 12, an h-index that is approximately 14% higher than others; but this number is not statistically significantly different from zero at the 5% level.

What Table 12 seems to show us is that elite brain-drainers are not noticeably better or worse than those elite scientists who choose not to leave their country. Whether larger data sets than ours might in the future alter such a conclusion remains, of course, to be seen.

Chart 11 explores data on another issue, which we call *clustering*. It examines the degree to which top researchers are clustered, in particular subject areas, in the world's universities. We provide evidence that this is common. In other words, universities that have one highly cited mathematician or chemist are disproportionately likely to have another in that same field (and this is not merely because they are large or famous universities). This kind of clustering is actually clear informally when one goes through the web pages of www.isihighlycited.com.

To provide a more systematic check, Chart 11 examines a sample of universities with either 2 or 3 ISI Highly Cited Researchers in them. If people are randomly distributed by subject, a duplication of field within this sample should be a rare finding. The reason is that there are 21 different scientific areas listed in the highly-cited website – therefore, given randomness, the probability of any particular field being found is, per person, only approximately 5%. Two brilliant people in the same area would only occur by fluke. Yet Chart 11 shows that the statistically expected number of researchers is not found in the data. Instead, a strong degree of clustering occurs.

If we examine universities with 2 so-called HiCis, it is the case that for one-third of the time, those two individuals are both in the same scholarly area. Randomness, by contrast, would predict that the probability of this would be 1/21. In universities with 3 HiCis, it is the case that for more than half the time, at least two of those people are in the same field. Under the null hypothesis of randomness, this proportion should be approximately only 1/7. For the figures, see Tables 13 and 14.

The import of all this is that the world's universities are, whether through accident or design, specialising in whom they hire. Some universities have heavy concentrations of elite researchers in subject X and none in subject Y, while others have those rare individuals concentrated within subject Y and nobody in subject X. It is not possible to know exactly why this happens. But a plausible part of the explanation is that brilliant people are attracted by the existence of top scholars in their particular field of intellectual endeavour. The result is a highly uneven spread of talent, by field, across universities.

4. Strategies for Universities and Governments

University strategies

There are a number of reasons that might lead us to assume that it is in the interest of "world-class" leading universities to consider the implications of the mobility, funnelling and clustering of the top researchers. A key, if not *the* key, characteristic of a world-class university is the quality of its academic and research staff. This quality drives reputation and influence with the funders of research, within the global higher education and research community, with national and international governments and agencies; it enhances a university's ability to recruit the best staff and students; it helps attract donors and commercial enterprises to their doors.

Our analysis has used Highly Cited researchers as a proxy for the world's best researchers. This indicator, alongside other citation indices, is used within the major world rankings [1]. As these rankings gain publicity and credibility, universities are turning to analysis of their own citation position. They perceive the potential for such rankings as a major publicity tool to enhance global reputation and to attract and retain the best researchers. Just as national rankings lead to game playing by institutions and manipulation of statistics, there is no reason to think international rankings will be immune.

So how might world-class universities react strategically to the evidence of funnelling and clustering of top researchers? There are three major strategies:

i) Grow your own (identify and retain the best researchers from an early stage)

ii) Attract the best

iii) Collaborate with the best

i) Growing your own

Our analysis has suggested that institutions and countries which attract the best researchers early on in their careers will have a higher chance of retaining them in their country of study[2]. Institutions may decide

[1] Shanghai Jaio Tong uses Highly Cited, Nature and Science; THES-QS uses citations.

[2] There are also a number of other studies which have identified this phenomenon on a broader scale. An OECD report in 1999 indicated that 47% of foreign-born PhD graduates who studied in the US remained in the US. A recent report (2007)

to focus on strategies which will produce competitive demand for PhD or postdoctoral funding opportunities and nurture their best staff within their own research communities. What the analysis does not demonstrate, however, is the sheer scale of investment in the next generation's researchers required to produce one world-class researcher. By definition, Highly Cited researchers are a rare breed. This strategy is risky in terms of identifying the next generation of Highly Cited top researchers. It depends on significant amounts of funding being available to invest in a competitive scheme, and relies on an existing community of excellent researchers to attract the most excellent students and early career research staff.

However, in terms of supply, there is evidence of growing internationalisation of university staff, demonstrating increasing mobility. A recent analysis in the UK identified that 19.1% of university academic staff in post in 2005/06 were non-UK nationals. [1] A recent survey amongst Commonwealth countries provided an average of 12% of foreign nationals in the academic workforce.[2] This is likely to be a consequence of the huge increase in mobility of students, funded from massive investment into higher education from growing economies in South East Asia, India and Africa.

ii) Attracting the best

By targeting the best researchers, universities invest in a known quantity. The risk of identifying potential is reduced. Universities could target Highly Cited researchers, or identify potential through analysis of individuals' citations alongside their other research achievements. This is an expensive strategy and also a highly competitive strategy. Academic salaries need to be globally competitive and investment in research infrastructure will also be necessary. Top researchers know their worth and will also be likely to consider a range of other factors such as the staff in the groups and department in the institution, and quality of life factors may increasingly come in to play with researchers in mid-career.

Universities pursuing this strategy must ensure that academic recruitment processes are truly global and truly competitive. Parochial and paternalistic advertising, appointment and promotion structures need to be addressed to ensure that institutions are able to attract the very best staff.

The analysis on clustering of Highly Cited researchers suggests that institutions may benefit from

from the Chinese Academy of Social Sciences in Beijing claimed that 70% of Chinese-born graduates who studied overseas have not returned to China.

[1] UUK Policy Briefing (2007): *Talent wars: the international market for academic staff*

[2] Association of Commonwealth Universities (2007) *2006-07 Academic Staff salary survey*, London:ACU

targeting individuals from within particular subject areas, building on existing strength. Appointment strategies may seek to attract whole groups of research staff to achieve this.

iii) Collaborating with the best

In recent years, critique of the ‘brain drain’ phenomenon has developed into the notion of “brain circulation”. This suggests that mobility is such that researchers may go back and forth between countries and develop global research networks which are not highly dependent on the location of individual institutions. Given that the first two strategies are likely to be expensive and influenced by current reputation and staffing, a third strategy is to encourage and invest in short-term and visiting fellowships and scholarships, with a view to promoting longer term collaboration with current university staff and development of a continuing relationship and identification with the receiving university.

A report by Evidence Ltd[1] identified that 45% of Highly Cited researchers currently located in the UK have spent time overseas during their careers. This is a higher percentage of mobility than a similar comparison with the US, but is lower than that found in Australia and Canada.

Fractional appointments held by an individual in two or more countries are not unusual and increasingly PhD and post-doctoral opportunities may be held collaboratively. This strategy enables universities to grab a piece of the action and benefit from the interaction with the top researchers, without a significant up-front investment. It requires a longer-term game which may bring some initial “quick-wins”.

Governmental strategies

Strategies of universities cannot, however, be considered in isolation from governmental policies and strategies. These will influence the ability of universities to act strategically and may determine the level of funds available to invest in those strategies.

Higher Education has increasingly been the focus of economic, not just education, policies. Global competitiveness has led to increased targets for expenditure on research and development in key world economies: e.g. the EU target is 3 per cent of GDP by 2010; China’s target is 2.5 per cent by 2020. A highly qualified and skilled workforce is regarded as essential to a globally competitive economy. A globally competitive higher education system is regarded as a way to ensure the supply of such a workforce, as well as being a major contributor to research and development in terms of its staff’s output.

Whilst developing countries have for many years invested in a skilled workforce by sending their best

[1] Bekhradnia B, and Sastry T, (2005) Brain drain:migration of academic staff to and from the UK, HEPI

students abroad, governments have realised that this carried a significant risk that these graduates may remain overseas. Governments therefore have turned to strategies to encourage students to remain at home (e.g. in India where investment has focused on securing 5 Indian universities that are regarded as globally competitive) or to return. Recent policies in China and Singapore have been focused on providing attractive packages for returning graduates and skilled workers, e.g. new regulations were introduced in China in March 2007 to provide exemptions from household registrations for senior scientists, engineers and corporate managers.

Other governmental strategies in evidence include focusing investment on centres of excellence (to promote clustering) e.g. CERN, the world's largest particle physics laboratory, in Geneva, and strategies to exploit mobility e.g. Marie Curie fellowships in the European Union.

Governmental immigration strategies can also influence the ability of institutions to attract world-class researchers. The increase of the cap on the numbers of temporary visas available for highly skilled professionals by 80,000 per annum approved by US Congress in 2000 provided a boost for enabling staff mobility at a time of expansion for US universities (although it failed to achieve its target because of restrictions post 9/11). However, restrictions on dual nationality in a number of African states have been regarded as discouraging the return of highly skilled workers.

Dependency on government funding will also have a significant impact on universities' ability to act competitively. Issues such as national salary frameworks and employment conditions are significant, but governments may also seek to influence behaviour to restrict or boost mobility.

Finally, but significantly, governmental policies on the permitted parameters of research will influence the ability of institutions to attract the best researchers. Restrictions reflecting ethical, religious or political ideology may deter or simply prevent the best researchers from reaching a university, whatever the other attractions on offer. When the US clamped down on stem-cell research, a number of leading stem-cell researchers left for overseas.

Institutions still find they have to work within national contexts in an increasingly globally competitive market.

5. Conclusions

This paper is a study of the elite brain drain. We hope that the paper's findings will be of interest to those concerned with the state of world academic research, with brain drain issues, and with long-range university planning. Our paper is unusual within the literature because we concentrate on the migration choices of particularly distinguished scientists and economists.

Partly by contacting the scientists directly, partly by using the source www.isihighlycited.com, and partly by the acquisition through web searches of CVs on individuals, we have constructed data sets on some of the world's leading thinkers in three fields of inquiry. Our data cover 112 young economists, 158 senior physicists, and 163 senior bio-scientists. These data sets are not huge, but that is inevitable when the focus is on rare and iconoclastic individuals. Many of our data points are people who are likely to win Nobel Prizes in their fields.

The background to this project is the attention now paid to the hierarchy of universities in the world. A growth in league tables, in this case across international universities, seems likely to encourage new and explicit status-ladders (indeed that is perhaps their purpose). Like other human beings, scientists care about status. At one level this is all just one more sign of globalisation. But the phenomenon of world league tables could lead to greater emphasis among researchers on where they work rather than what scientific research they do. Something like this has already been seen elsewhere in academia in the form of growing concern among researchers with the prestige of particular journals per se – what some have called an obsession with labels[1] themselves – rather than about the quality of scientific discovery itself. In an increasingly electronic and globalised world, it might not be a surprise to see eventually an equivalent obsession with the prestige labels attached to university names. If so, that is likely to intensify existing mobility and global brain drain pressures.

The paper's main findings are the following:

- There is evidence of a brain drain in elite thinkers. We document a remarkable funnelling of talent from a large number of donor countries into a small number of receiving countries.
- Among ISI Highly Cited Researchers in the field of physics, for example, nearly 50% of individuals do not work in the country in which they were born. We document similar tendencies among elite bio-scientists and young economists.
- In economics, there exists a striking exodus, after the bachelor-degree stage, towards the

[1] See, for example, Monastersky (2005), Starbuck (2005) and Oswald (2007a) - all of whom point out that prestige journal labels are poor sufficient-statistics for quality and thus can mislead.

United States. We study this by collating scholars' CVs. We show that approximately 75% of the assistant professors currently working in the top-10 US departments are in a sense not Americans. They did their undergraduate degrees in other countries.

- At every educational stage, strong funnelling occurs – particularly but not exclusively towards the United States and Switzerland. These nations are, per capita, the world's greatest net-importers of scientific brains.
- In our sample of physicists, there appears not to be a statistically significant difference in quality – we measure this mainly with the h-index – between those who move and those who stay. This differs from the general claim of Pierson and Cotgreave (2000) who focused, perhaps strangely, on citations per paper (their paper in Nature also noted, without comment, that stayers actually write more papers).
- Funnelling occurs at each stage in scientists' educational and professional careers. The coefficient of funnelling is approximately 0.2 among highly-cited physicists and 0.1 among highly-cited bio-scientists. Until more research on other samples is done, these numbers should be treated cautiously.
- There is striking evidence that elite researchers tend to cluster together. Individual universities, in other words, often have their HiCis in only a few fields. As an example, in universities with only 2 ISI Highly Cited Researchers, we show in the paper that one third of the time both those people are in the same discipline.

When distinguished scientists move, it is likely to be costly for donor countries and a boon to receiving nations. But it seems important to think more broadly. As Larry Summers has argued, allowing science researchers to cluster together may provoke positive externalities: people may spark off each other to the benefit of the whole academic discipline. Perhaps the discovery of DNA would have been slowed if the American James Watson had not been in Cambridge to work with the Englishman Francis Crick.

Is the global brain drain a major problem for the world, a minor problem for the world, or perhaps even a benefit to mankind? Such a question is not easy to answer. Our data, however, fail to find a clear productivity difference (some years later) between the elite movers and the elite stayers. This is consistent with, although does not unambiguously prove, the idea that the brain drain creates no significant beneficial externalities for science. Those who advocate the brain drain as good for humanity as a whole need to show that moving makes a migrating scientist do better science. This may be true, and much more research, especially longitudinally, is needed. But we have not found evidence for such a claim.

References

Beine, M., Docquier, F. and Rapoport, H. (2001), "Brain drain and economic growth: theory and evidence", *Journal of Development Economics*, 64(1), pp.275-289.

Beine, M., Docquier, F. and Rapoport, H. (2007), "Brain drain and human capital formation in developing countries: winners and losers", *Economic Journal*, forthcoming. [Working version of paper accessed online at http://www.ires.ucl.ac.be/CSSSP/home_pa_pers/docquier/articles.htm on 25 June 2007]

Bekhradnia, B. and Sastry, T. (2005), *Brain Drain: Migration of Academic Staff to and from the UK*. Higher Education Policy Institute, UK.

Bhagwati, J.N. and Hamada, K. (1974), "The brain drain, international integration of markets for professionals and unemployment: A theoretical analysis", *Journal of Development Economics*, 1(1), pp.19-42.

Carrington, W.J. and Detragiache, E. (1998), "How big is the brain drain?", IMF Working Paper No. 98/102, Institute for the Study of Labor, Washington, DC.

Carrington, W.J. and Detragiache, E. (1999), "How extensive is the brain drain?", *Finance and Development* 36(2), pp.46-49.

Commander, S., Kangasniemi, M. and Winters, L.A. (2004), "The Brain Drain: Curse or Boon? A survey of the literature", in Baldwin, R.E. and Winters, L.A. (eds.), *Challenges to Globalization: Analyzing the Economics,* University of Chicago Press, pp. 235–278.

Docquier, F. and Marfouk, A. (2004), "Measuring the international mobility of skilled workers (1990-2000)", *Policy-Research Working Paper Series No. WPS3381*, The World Bank: Washington D.C.

Docquier, F. and Marfouk, A. (2006), "International migration by educational attainment (1990-2000)", in Ozden, C. and Schiff, M. (eds), *International migration, remittances and the brain drain*, Palgrave Macmillan.

Docquier, F. and Rapoport, H. (2007), "Skilled migration: The perspective of developing countries", in Bhagwati, J. and Hanson, G. (eds), *Skilled migration: prospects, problems and policies*, The Russell Sage Foundation: New York, forthcoming. [Accessed online at http://www.ires.ucl.ac.be/CSSSP/home_pa_pers/docquier/filePDF/BhagwatiHansonChapter.pdf on 25 June 2007]

European Commission. (2002), "More research for Europe: Towards 3% of GDP." Communication from the Commission, COM(2002) 499 final, p.22.

Gaillard, J. and Gaillard, A.M. (1997), "The international mobility of brains: exodus or circulation?", *Science Technology and Society*, 2(2), pp.195-228.

Grabher, G. (1993), “The weakness of strong ties”, in Grabher, G. (ed), *The Embedded Firm: On the Socio-economics of Industrial Networks*, Routledge: London.

Hirsch, J. E. (2005), “An index to quantify an individual’s scientific research output”,

Proceedings of National Academy Science, 102(46), pp. 16569-72.

Ioannidis, J.P.A. (2004), “Global estimates of high-level brain drain and deficit”, *The Journal of the Federation of American Societies for Experimental Biology*, 18, pp.936-939.

Hamada, K. (1977), ”Taxing the brain drain: A global point of view”, in Bhagwati, J. (ed), *The New International Order*, M.I.T. Press: Cambridge, Massachusetts.

Johnson, J. M. and Regets, M. (1998), “International mobility of scientists and engineers to the United States - Brain drain or brain circulation?” National Science Foundation (June). NSF 98-316.

Kugler, M. and Rapoport, H. (2007). “International labor and capital flows:
complements or substitutes?”, *Economics Letters*, 94(2), pp.155-162.

Kwok, V. and Leland, H.E. (1982), “An economic model of the brain drain”, *American Economic Review*, 72(1), pp.91-100.

Laudel, G. (2003), “Studying the brain drain: Can bibliometric methods help?”, *Scientometrics*, 57(2), pp. 215-237.

Laudel, G. (2005), “Migration currents among the scientific elite”, *Minerva*, 43, pp.377-395.

Levin, S.G. and Stephan, P.E. (1999), “Are the foreign born a source of strength for U.S science?” *Science,* 285, pp.1213-1214.

Machin, S. and Oswald, A. J. (2000), “UK economics and the future supply of academic economists”, *Economic Journal*, 110, pp. F334-F349.

Mahroum, S. (2000), “Scientists and global spaces”, *Technology in Society*, 22, pp.513-522.

McCullock, R. and Yellen, J.T. (1977), “Factor mobility, regional development and the distribution of income”, *Journal of Political Economy*, 85(1), pp.79-96.

Meyer, J.B. (2001), “Network approach versus brain drain: Lessons from the diaspora”, *International Migration*, 39(5), pp. 91-110.

Millard, D. (2005), “The impact of clustering on scientific mobility”, *Innovation: The European Journal of Social Science Research*, 18(3), pp.343-359.

Monastersky, R. (2005), “The number that is devouring science”, *The Chronicle of Higher Education*, Issue: October 14.

Mountford, A. (1997), “Can a brain drain be good for growth in the source economy?”, *Journal of Development Economics*, 52(2), pp.287-303.

Neary, J. P., Mirrlees, J. A. and Tirole, J. (2003), “Evaluating economics research in Europe: An introduction.” *Journal of the European Economics Assocation*. 1, pp. 1239-1249.

Oswald, A.J. (2007a), “An examination of the reliability of prestigious scholarly journals: Evidence and implications for decision-makers”, *Economica*, 74, pp.21-31.

Oswald, A.J. (2007b), “Comment on Summers on Life Sciences”, *Financial Times*, January 29th.

Pierson, A.S. and Cotgreave, P. (2000), “Citation figures suggest that the UK brain drain is a genuine problem”, *Nature*, 407, pp.13.

Royal Society (1963), “Emigration of scientists from the United Kingdom: Report of a committee appointed by the Council of the Royal Society”, Royal Society: London.

Saint-Paul, G. (2004), “The brain drain: Some evidence from European expatriates in the United States”, IZA Discussion Paper series; Institute for the Study of Labour (September).

Song, H-Z. (1997), “From brain drain to reverse brain drain: three decades of Korean experience”, *Science, Technology and Society*, 2(2), pp.317-345.

Starbuck, W.H. (2005), “How much better are the most-prestigious journals? The statistics of academic publication”, *Organization Science*, 16, pp.180-200.

Stephan, P.E. and Levin, S.G. (2001), “Exceptional contributions to US science by the foreign-born and foreign-educated”, *Population Research and Policy Review,* 20, pp.59-79.

Summers, L.H. (2007), “America must not surrender its lead in life sciences”, *Financial Times*, January 29th.

Tussen, R.J.W., Visser, M.S. and Van Leeuwen, T.N. (2002), “Benchmarking international scientific excellence: Are highly cited research papers an appropriate frame of reference?”, *Scientometrics*, 54, pp.381-397.

Universities UK (2007), “Talent wars: the international market for academic staff”, Policy Briefing, July.

Van Raan, A.F.J. (2000), “The Pandora’s box of citation analysis: Measuring scientific excellence – The last evil?”, in Cronin, B. and Atkins, H.B. (eds.), *The Web of Knowledge*, Information Today, Inc.: Medford, New Jersey.

Woods, M. (2003), “Europe slow in stemming ‘brain-drain’ to America”, Post-Gazette National Bureau (October 20th) URL: www.post-gazette.com.

Table 1 The Data Set on Young American Economists

Data on Assistant Professors in Major US Departments of Economics

Sample Size: 112

Ranking of Economics Departments			
Ranking	**Name of University**	**Location of University**	**Number of Assistant Professors in Our Data Set (Total: 112)**
1	Harvard University	Cambridge, Massachusetts	14
2	University of Chicago	Chicago, Illinois	6
3	Massachusetts Institute of Technology (MIT)	Cambridge, Massachusetts	9
4	University of California	Berkeley, California	12
5	Princeton University	Princeton, New Jersey	11
6	Stanford University	Palo Alto, California	16
7	Northwestern University	Chicago, Illinois	12
8	University of Pennsylvania	Philadelphia, Pennsylvania	12
9	Yale University	New Haven, CT	9
10	New York University	New York City, New York	11

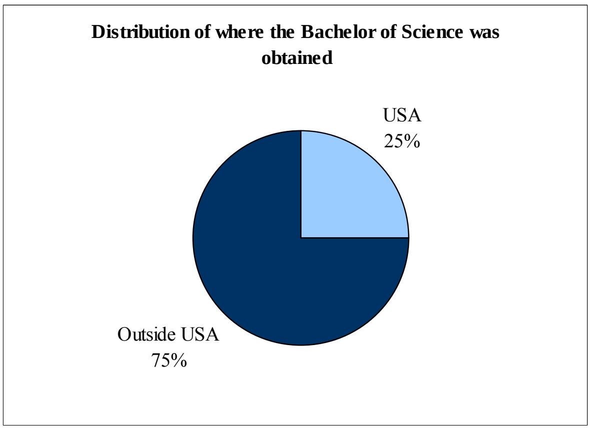

Chart 1a Distribution of USA-based Economists: Country of BSc

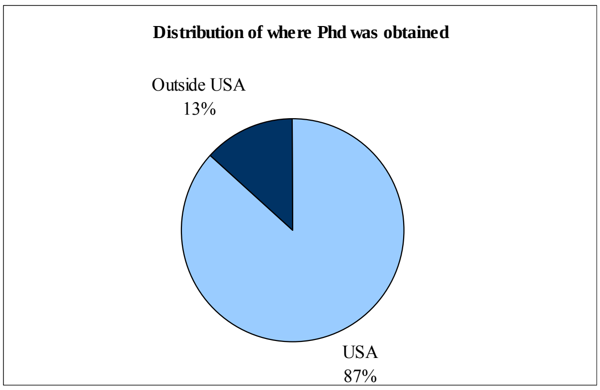

Chart 1b Distribution of USA-based Economists: Country of PhD

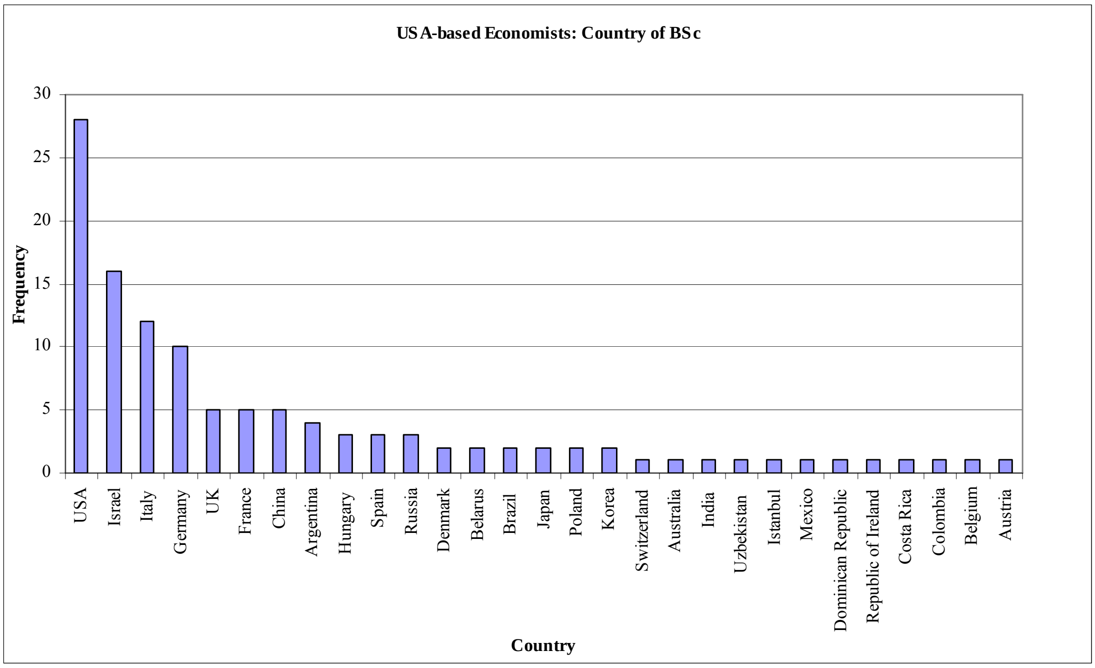

Chart 1c USA-Based Economists: The Country of Their BSc

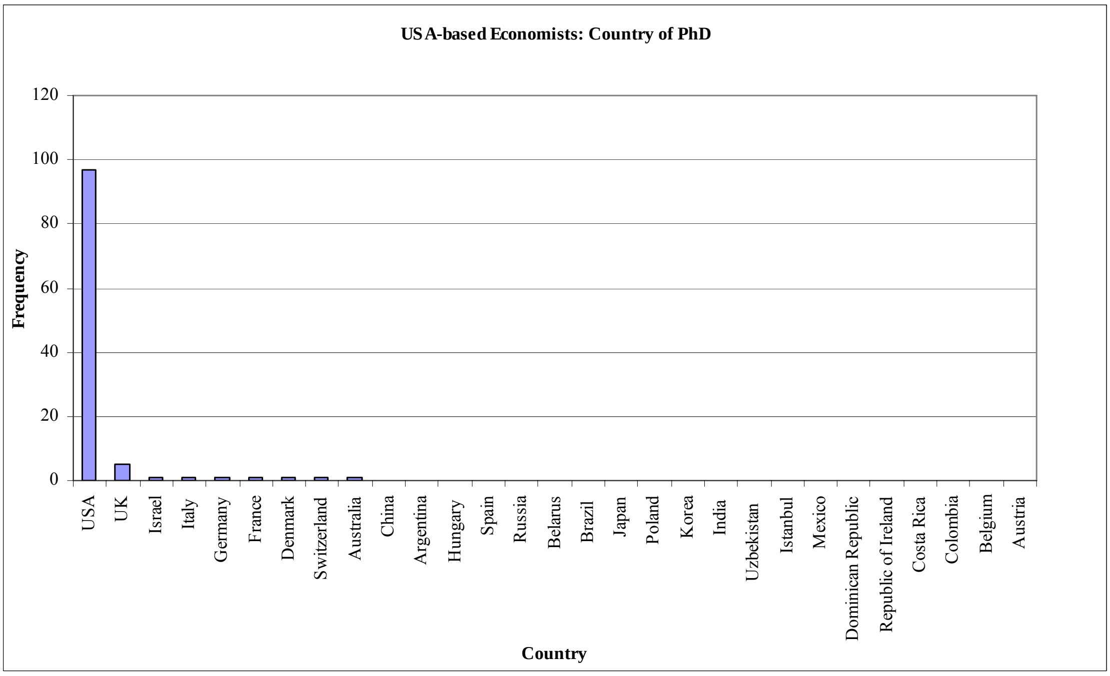

Chart 1d USA-Based Economists: The Country of Their PhD

Note: Economics Assistant Professors currently at Top 10 US Institutions gained their BSc within a wide range of countries. However their PhDs were overwhelmingly obtained in the USA.

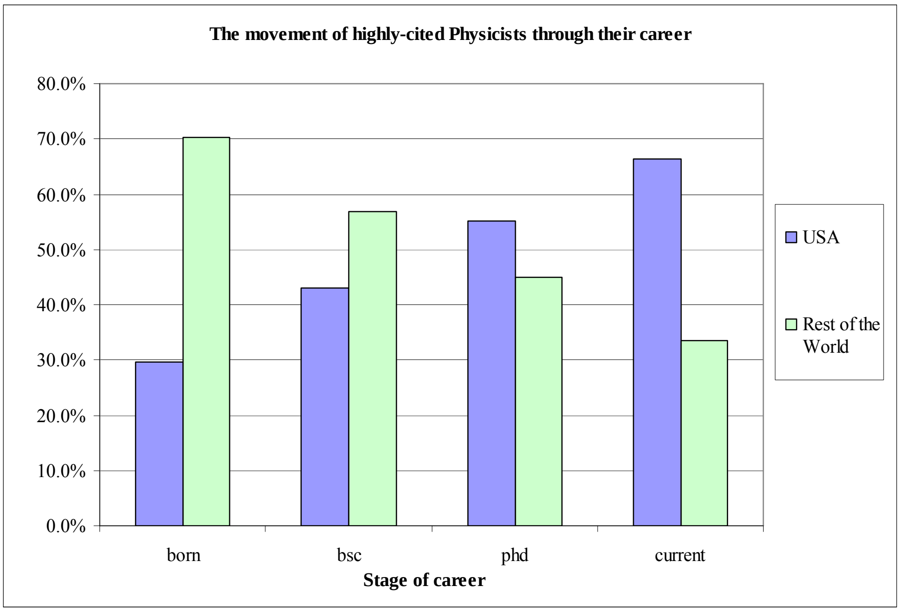

Chart 2 Funnelling into the USA: The Movement of Highly-cited Physicists

Sample Size: 158

Error: Country of birth missing: 20 (12.7%)

BSc country missing: 7 (4.4%)

PhD country missing: 0 (0%)

Current country missing: 0 (0%)

Actual figures for Chart 2 above

Stage	Percent in USA	Percent in Rest of World
Born	29.7	70.3
BSc	43.0	57.0
PhD	55.1	44.9
Current	66.5	33.5

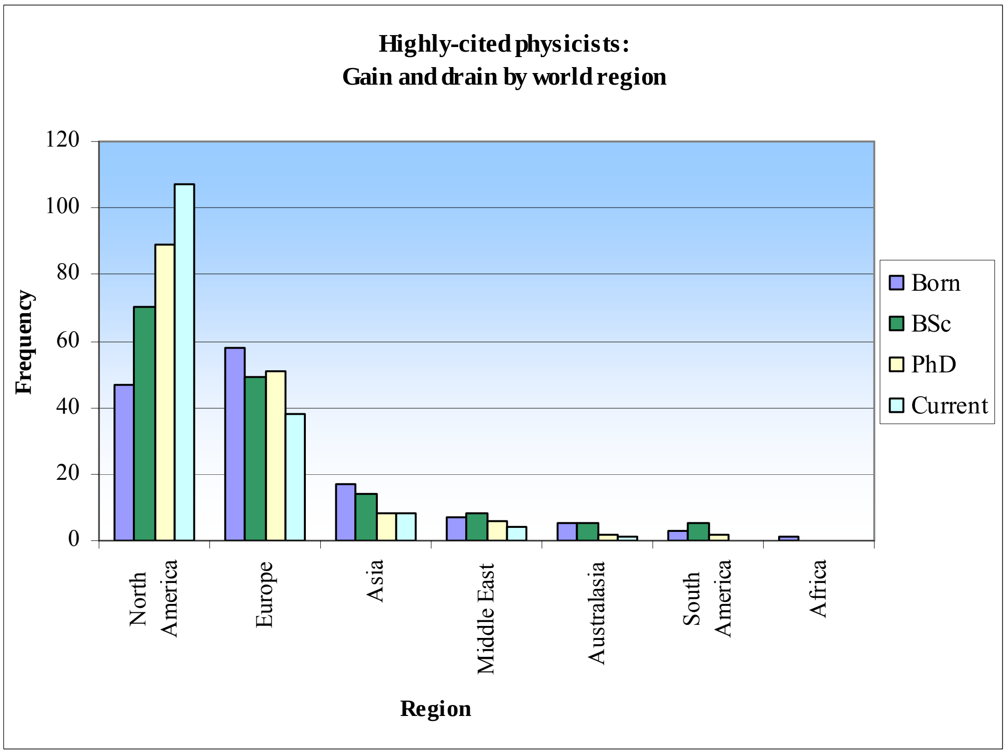

Chart 3a Highly-cited Physicists: Gain and Drain by World Region

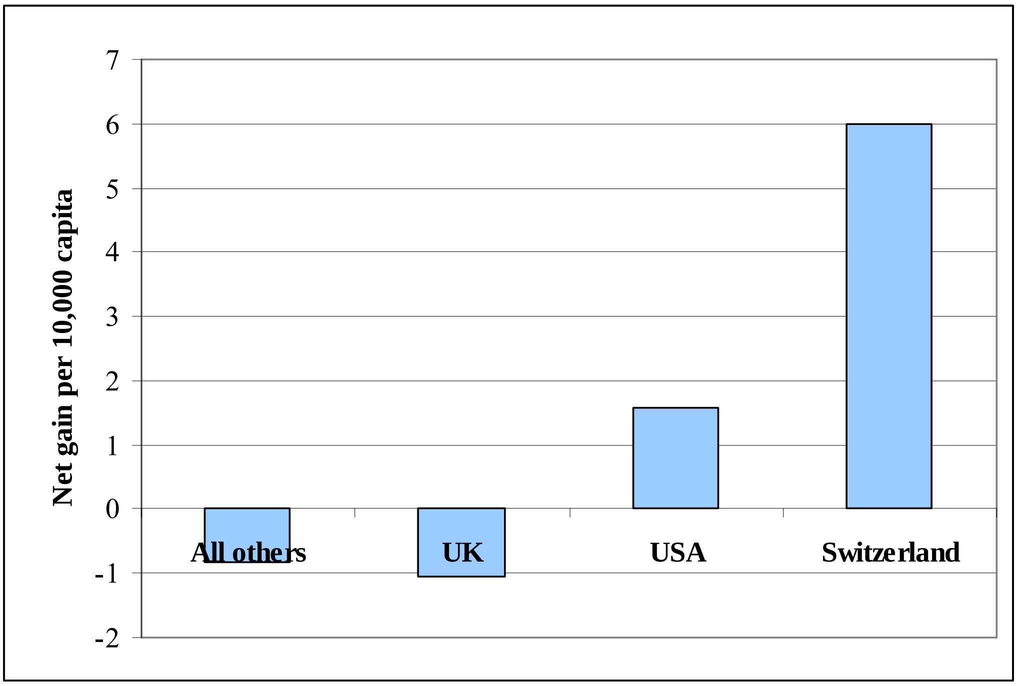

Chart 3b Highly-cited Physicists: Data on Net Gainers

Note: Chart 3b highlights the net gain of physicists within selected countries divided by 10,000 capita.

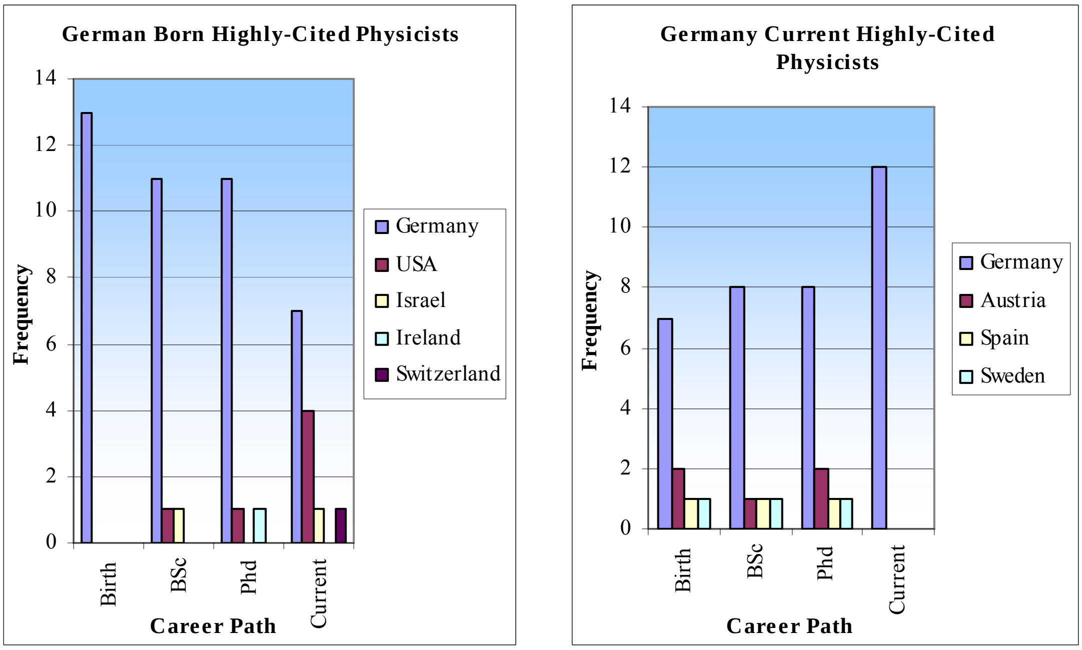

Chart 4 Insights into Specific Country-Retention: Germany

Note: Although German born physicists are drained predominantly to the USA, a larger proportion is retained. Also Germany does gain from other countries and therefore only incurs a slight net drain.

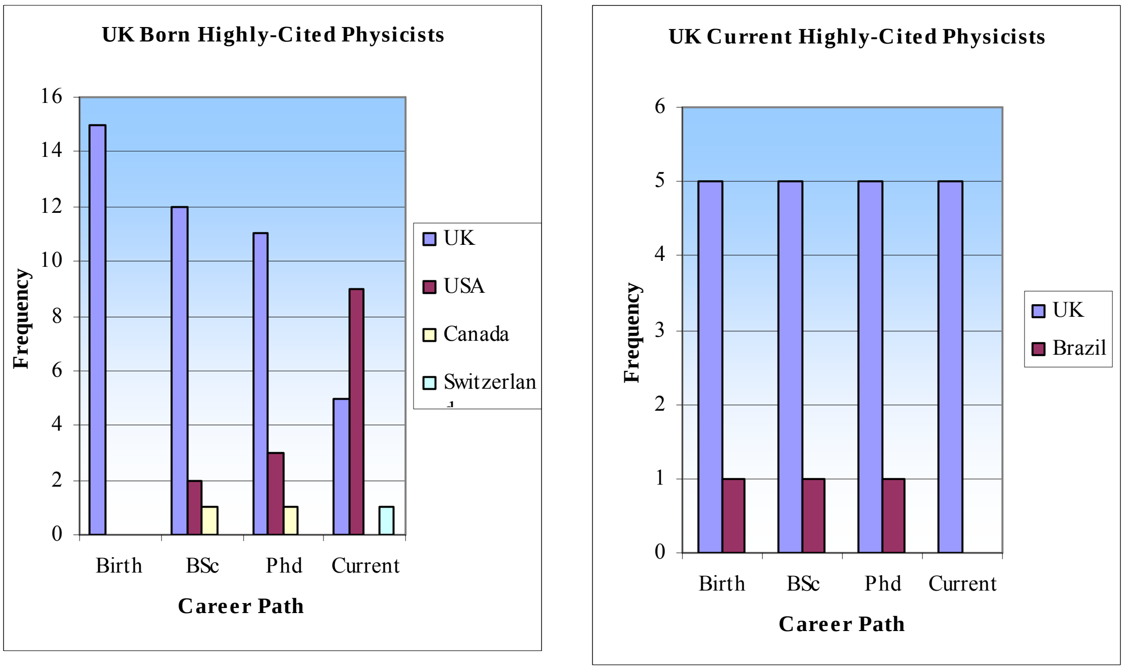

Chart 5 Insights into Specific Country-Retention: UK

Note: UK born physicists are drained predominantly to the USA; a larger proportion is drained than retained. The UK does not significantly gain from other countries.

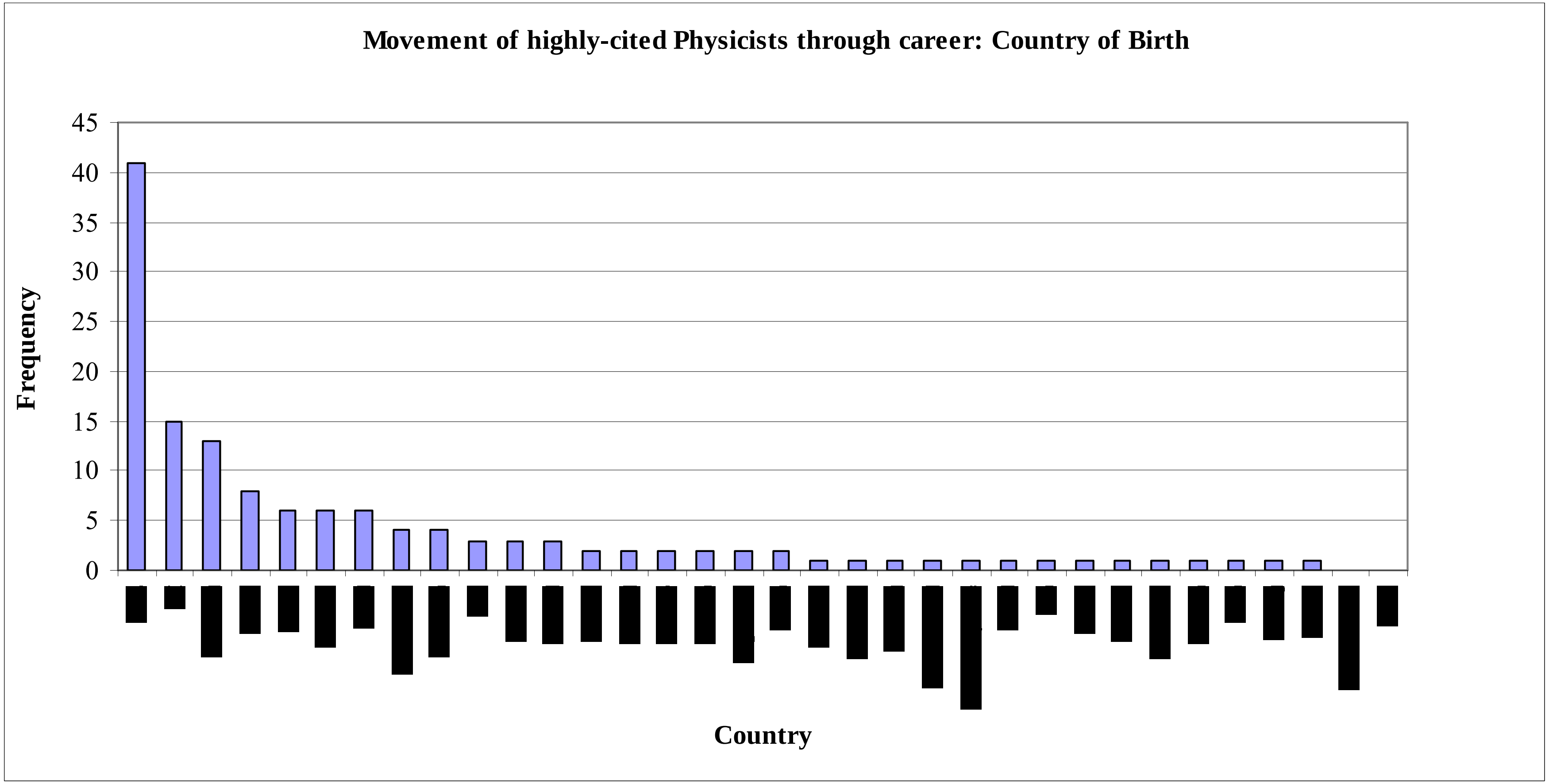

Chart 6a   Movement of Highly-Cited Physicists Through Their Careers: Country of Birth

Charts 6a and 6b highlight the movement of highly-cited physicists throughout their careers. They illustrate the observation that whilst many countries produce physicists they are funnelled to around half the original number of countries. Although only 30% of highly-cited physicists are born in the USA, 67% are currently located there.

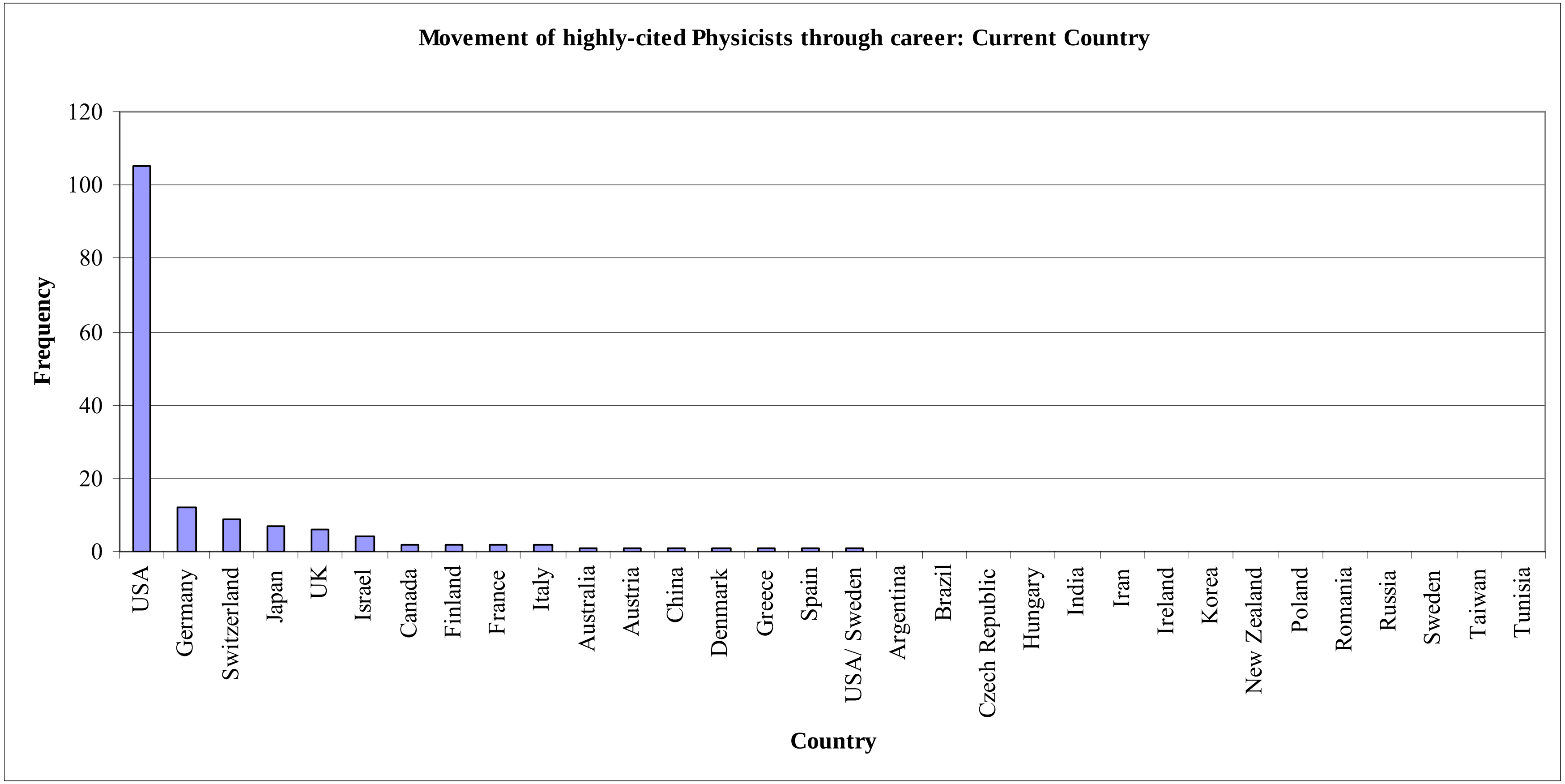

Chart 6b Movement of Highly-Cited Physicists Through Careers: Their Current Country of Employment

Table 2 Data on Physicists

	Birth (32 countries)	BSc. (30 countries)	PhD (22 Countries)	Now (16 countries)
1st	USA (29.7%)	USA (43.3%)	USA (55.1%)	USA (67.1%)
2nd	UK (10.9%)	Germany (8.7%)	UK (8.9%)	Germany (7.6%)
3rd	Germany (9.4%)	UK (8.0%)	Germany (8.2%)	Switzerland (5.7%)
Others	50%	40%	27.8%	19.6%[1]

Table 3 Highly-cited Physicists – Overall Movement

Current location	Frequency	Percent
In country of Birth	77	56.2
Not in country of Birth	60	43.8

Note: This table highlights the overall movement of highly-cited physicists from birth to current location.

Table 4 Summary of the Physicists' h-indexes

No. Observations	158
Mean	58.97
Standard Deviation	13.52
Minimum	22
Maximum	115
Median	57

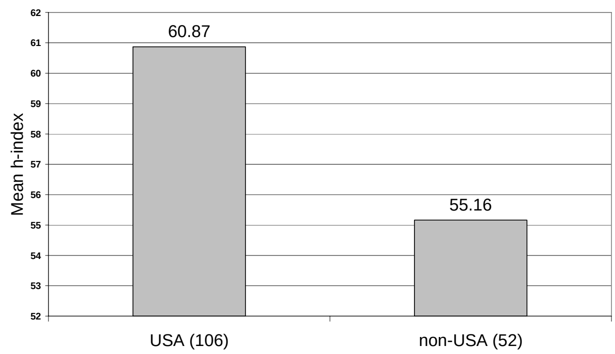

Chart 7 Mean H-Index in Physics by Current Country Affiliation

Table 5 Productivity Differentials Between Those Who Moved and Those Who Did Not

Stage	Average if not moved country since stage	Average if moved country since stage	Statistically different?
Birth	60.69	57.66	No, t = -1.24
BSc.	60.04	59.21	No, t = -0.36
PhD.	59.19	58.38	No, t = 0.33

1 The UK was ranked 5th with 3.8% of the physicists, after Japan which was 4th with 4.4%.

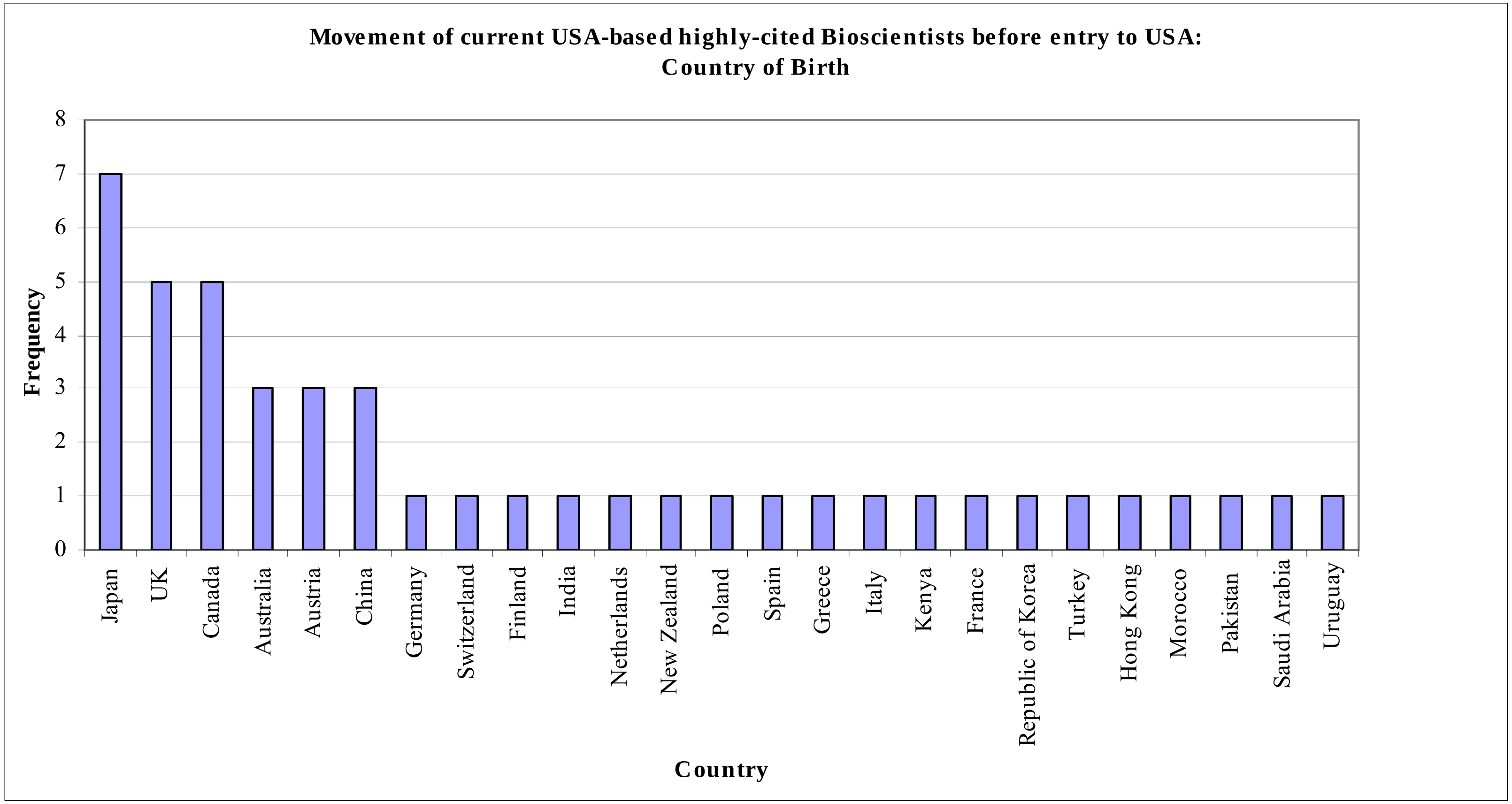

Chart 8a Movement of Current USA-Based Highly-cited Bio-scientists Before Entry to USA: Country of Birth

Sample Size: 163
Error: Country of birth missing: 50 (30.7%), UG institution missing: 21 (12.9%), PG institution missing: 15 (9.2%)

Note: Charts 8a and 8b highlight the movement of highly-cited Bio-scientists before entry to the USA. They show the funnelling effect towards the USA as well as the UK. All the above Bio-scientists are currently employed in the USA therefore the funnelling continues post-Phd.

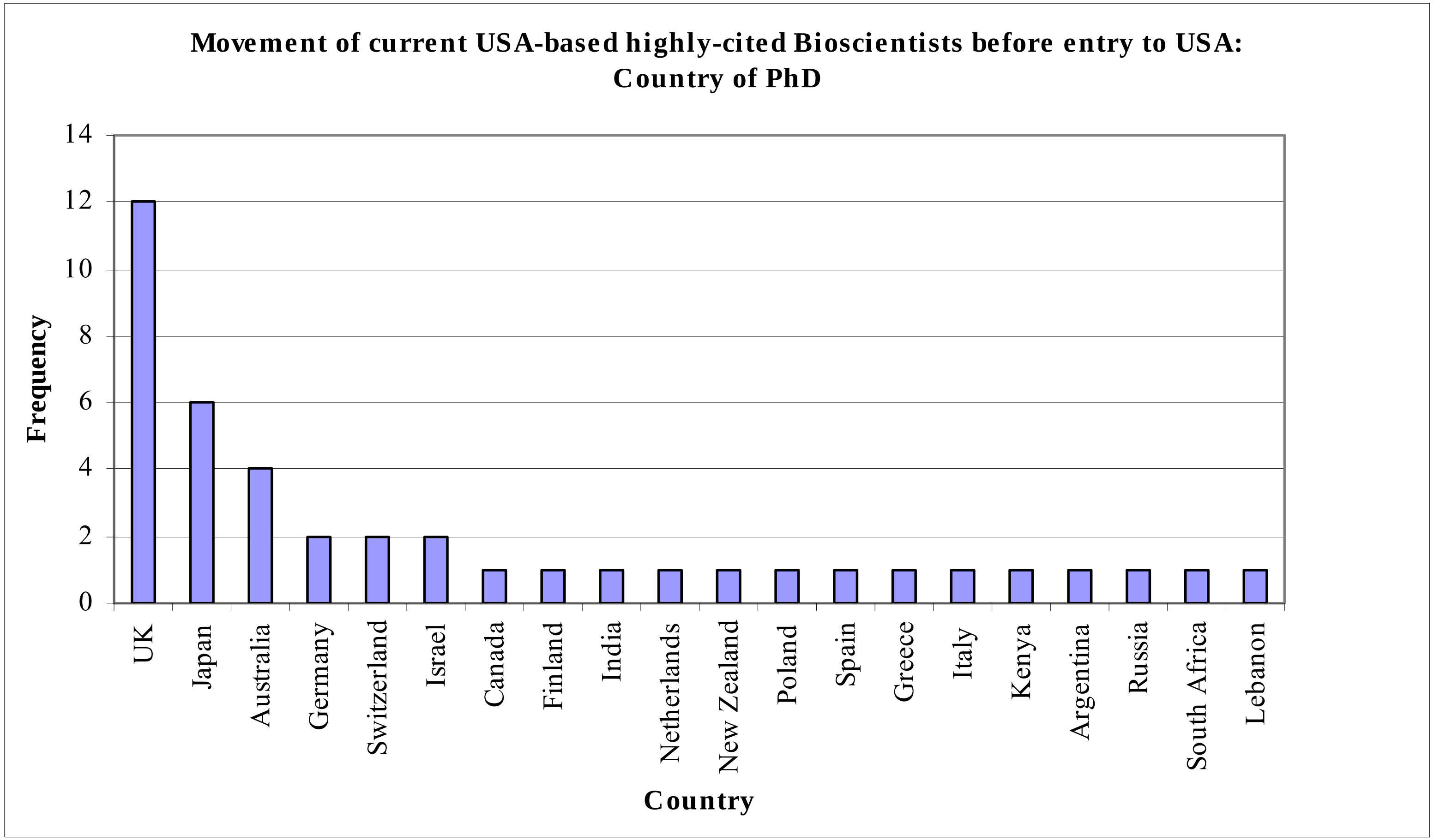

Chart 8b ***Movement of Current USA-based Highly-cited Bio-scientists Before Entry to USA: Country of PhD***

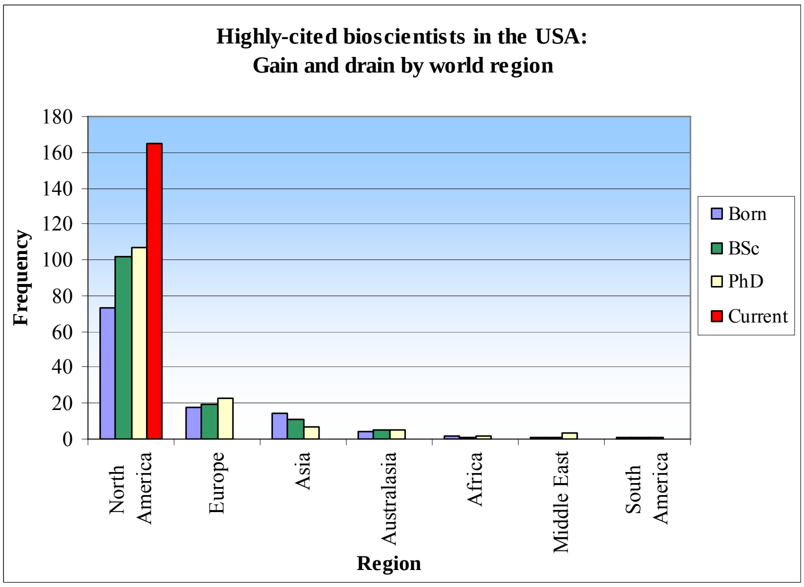

Chart 9 Highly-cited Bio-scientists: Gain and Drain by World Region

Note: All the above Bio-scientists are currently in the USA. This highlights the overall gain of North America and the subsequent drain from all other regions.

Figures for above highly-cited Bio-scientists currently in the USA

Stage	Percent in USA	Percent in Rest of World
Born	60.2	39.8
BSc	69.7	30.3
PhD	71.6	28.4
Current	100	0

Table 6a Funnelling Coefficients for Highly-Cited Physicists Overall

Sample: 158

Stage	% moving	% remaining	Funnelling Co-efficient
Birth to BSc	15.3	84.7	0.15
BSc to PhD	17.3	82.7	0.17
PhD to Current	24.8	75.2	0.25

Note: The extent of funnelling is determined by the percentage moving to a different country at each stage of their career (Birth, BSc, PhD, Current). The greater the co-efficient the greater the migration. Tables 6a, 6b and 7 highlight this funnelling co-efficient.

Table 6b Funnelling Coefficients for Highly-Cited Physicists – Current USA Only

Sample: 105

Stage	% moving	% remaining	Funnelling Co-efficient
Birth to BSc	20	80	0.20
BSc to PhD	17.5	82.5	0.18
PhD to Current	100	0	1

Table 7 Funnelling Coefficients for Highly-cited Bio-scientists in the USA

Sample: 163

Stage	% moving	% remaining	Funnelling Co-efficient
Birth to BSc	9.3	90.7	0.09
BSc to PhD	11.3	88.7	0.11
PhD to Current	100	0	1

Table 8 Funnelling and the H-Index for Highly-Cited Physicists Overall

Sample: 158

Birth to BSc	Mean	Lower bound (95%)	Upper bound (95%)
Moved	61.75	57.08	66.42
Remained	59.17	56.46	61.88
BSc to PhD	**Mean**	**Lower bound (95%)**	**Upper bound (95%)**
Moved	60.08	55.53	64.62
Remained	59.35	56.93	61.77
PhD to Current	**Mean**	**Lower bound (95%)**	**Upper bound (95%)**
Moved	59.08	56.54	61.61
Remained	59.08	55.07	63.08

Note: Tables 8, 9 and 10 show the current h-index for those physicists who remained and those who moved at each stage. To allow some comparison with the USA-only bio-scientist data in table 10, table 9 is constructed using data on physicists currently in the USA. There is no significant difference (at 95% confidence) between movers and stayers within the two data sets.

Table 9 Highly-cited Physicists – Current USA only

Sample: 105

Birth to BSc	Mean	Lower bound (95%)	Upper bound (95%)
Moved	63.82	59.05	68.59
Remained	60.76	57.19	64.34
BSc to PhD	**Mean**	**Lower bound (95%)**	**Upper bound (95%)**
Moved	61.67	55.33	68.00
Remained	60.79	57.94	63.63

Table 10 Highly-cited Bio-scientists in the USA

Sample: 163

Birth to BSc	Mean	Lower bound (95%)	Upper bound (95%)
Moved	88.60	70.51	106.69
Remained	89.67	82.80	96.54
BSc to PhD	**Mean**	**Lower bound (95%)**	**Upper bound (95%)**
Moved	83.38	78.13	88.62
Remained	88.63	82.38	94.87

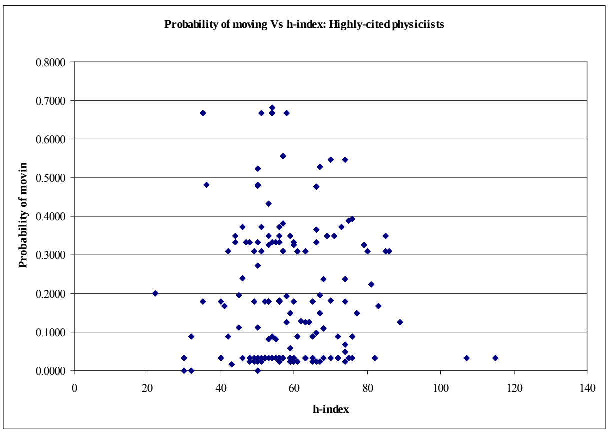

Chart 10 Probability of Moving Plotted Against their h-index: Highly-cited Physicists

Note: Chart 10 shows h-index against probability of moving. This probability of moving is calculated by country at each career stage for each individual. There is little relationship between the two in terms of highly-cited physicists.

Table 11 The Mean h-index Values for Migrating and Non-migrating Physicists

Country BSc	**Country Now**	**Number**	**Average h-index**
Asia	Asia	10	56.1
Asia	Europe	1	59
Asia	North America	6	55.5
Europe	Europe	31	56.1
Europe	North America	8	63.1
North America	North America	91	61.2
Oceania	Europe	1	57
Oceania	Oceania	1	54
South America	Europe	1	55
South America	North America	2	52

Table 12 Productivity Equations for Highly Cited Physicists

(t-statistics in brackets; estimation is by OLS; bold indicates significant at the 5% level)

Dependent Variable: Natural logarithm of the h index

Constant	**3.834 (53.23)**	**3.828 (48.39)**	**3.804 (48.71)**	**3.737 (44.92)**	**3.739 (44.62)**
Years since Phd	**0.006 (3.10)**	**0.006 (2.73)**	**0.006 (2.55)**	**0.007 (2.96)**	**0.007 (2.94)**
USA Born		0.037 (0.83)	-0.049 (-0.88)	-0.063 (-1.14)	-0.071 (-1.10)
USA Phd			**0.131 (2.56)**	0.058 (0.95)	0.051 (0.75)
Now in USA				**0.121 (2.13)**	0.137 (1.59)
BSc outside USA * Now in USA					-0.0186 (-0.25)
R^2	0.0579	0.0605	0.1045	0.1340	0.1344
R^2_{adj}	0.0519	0.0466	0.0844	0.1079	0.1016
Number of observations	158	138	138	138	138

Dependent Variable: Natural logarithm of total citations

Constant	**9.161 (67.83)**	**9.150 (62.40)**	**9.120 (62.17)**	**9.023 (57.33)**	**9.027 (56.95)**
Years since Phd	**0.015 (3.79)**	**0.014 (3.45)**	**0.014 (3.32)**	**0.015 (3.60)**	**0.015 (3.56)**
USA Born		0.073 (0.88)	-0.034 (-0.33)	-0.054 (-0.52)	-0.071 (-0.58)
USA Phd			0.163 (1.70)	0.058 (0.50)	0.044 (0.34)
Now in USA				0.175 (1.63)	0.208 (1.27)
BSc outside USA * Now in USA					-0.038 (-0.27)
R^2	0.0845	0.0906	0.1099	0.1273	0.1278
R^2_{adj}	0.0786	0.0772	0.0900	0.1010	0.0947
Number of observations	158	138	138	138	138

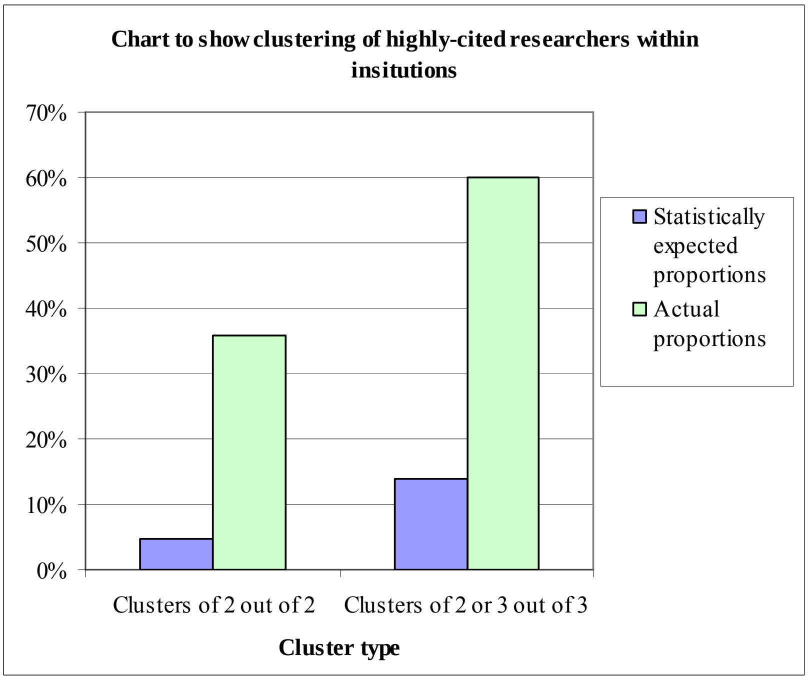

Chart 11 Evidence of High Levels of Clustering Within Subjects

Sample = All institutions beginning with "University" or equivalent on www.isihighlycited.com.
Note: This analysis uses www.isihighlycited.com. The first clustered columns represent universities with only two ISI Highly Cited Researchers in the whole university and the second clustered column is universities with only three ISI Highly Cited Researchers in the whole university. In the first case, the two researchers are in the same field for approximately one-third of the time. In the second case, for more than half the time at least two of the three researchers are in the same field. The statistically expected propositions are given on Chart 11 for comparison. Tables 13 and 14 give further insights into the data used in Chart 11.

Table 13 Clusters of 2 out of 2

Summary of findings	**Total**
Total sample of institutions	430
Institutes with only 2 highly-cited researchers	67
Number of these with 2 highly-cited researchers in same research area	24
Percentage with same areas	35.8%

Table 14 Clusters of 2 or 3 out of 3

Summary of findings	**Total**
Total sample of institutions	430
Institutes with only 3 highly-cited researchers	30
Number of these with 2 or 3 highly-cited researchers in same research area	18
Percentage with same areas	60.0%

Appendix 1: Nobel Prize Laureates

Table 15a Among Current Highly-Cited Physicists, There Are 7 Nobel Laureates in Physics.

name	hindex	results	avcite	totalcite	uniname	born	yborn	bsc	ybsc	phd	yphd	current country	age
Anderson, Philip Warren	75	289	135.45	135831	Princeton University	USA	1923	USA	1943	USA	1949	USA	84
Wilczek, Frank	72	322	66.17	21307	Massachusetts Institute of Technology	USA	1951	USA	1970	USA	1974	USA	56
Tsui, Daniel C.	67	474	31.71	15030	Princeton University	China	1939	USA	1957	USA	1967	USA	68
Gross, David J.	62	127	90.025	20242	University of California, Santa Barbara	USA	1941	Israel	1962	USA	1966	USA	66
Koshiba, Masatoshi	59	579	32.2	18645	University of Tokyo	Japan	1926	Japan	1951	USA	1955	Japan	81
Stormer, Horst L.	56	214	56.23	12034	University of Columbia	Germany	1949	Germany	1972	Germany	1977	USA	58
Binnig, Gerd K.	40	82	159.05	13042	IBM Zurich Research Laboratory	Germany	1947	Germany	1973	Germany	1978	Switzerland	60

Table 15b Among current highly-cited Bio-scientists in the USA there are currently 8 Nobel Laureates in Medicine.

Name	h-index	D.O.B	Country of birth	UG granting institution	PG degree granting institution	Current Institution
Greengard, Paul	131	12/11/1925	USA	Hamilton College, Clinton, NY, USA	Ph.D The Johns Hopkins University, Baltimore, MD, USA	Rockefeller University
Gilman, Alfred G.	110	07/01/1941	USA	Yale University, New Haven, CT, USA	Ph.D Case Western Reserve University, Cleveland, OH, USA	University of Texas Southwestern Medical Center at Dallas
Krebs, Edwin G.	100	06/06/1918	USA	University of Illinois, USA	Washington University School of Medicine, USA	University of Washington
Cohen, Stanley	-	11/17/1922	USA	Brooklyn College, Brooklyn, NY, USA	Ph.D University of Michigan, East Lansing, MI, USA	University of Arizona
Brown, Michael S.	161	04/13/1941	USA	University of Pennsylvania,PA, USA	M.D. University of Pennsylvania, Philadelphia, PA, USA	University of Texas Southwestern Medical Center at Dallas
Goldstein, Joseph L.	159	04/18/1940	USA	Washington and Lee University, VA, USA	M.D. University of Texas Southwestern Medical Center, USA	University of Texas Southwestern Medical Center at Dallas
Guillemin, Roger C.L.	95	01/11/1924	France	University of Dijon, France	Ph.D University of Montreal, Canada	Salk Institute for Biological Studies
Khorana, H. Gobind	76	01/09/1922	Pakistan	M.Sc. Punjab University, Lahore, Pakistan	Ph.D University of Liverpool, United Kingdom	Massachusetts Institute of Technology

Appendix 2 Qualitative insights from highly-cited physicists: UK leavers

Q. We would like to know if British Physicists who emigrate go on to do significantly better research than if they had remained. This is obviously a difficult question to answer. But what is your opinion, in the case of your own work?

*"I left the UK to go to graduate school (at the University of California, Santa Barbara) in 1965. I went with a "green card" (permanent resident visa) with the intention of becoming a US citizen. I had both professional and personal reasons for making this decision. In 1965, the UK was in a downward spiral - the economy was failing because of frequent "wild-cat" strikes by the labor unions, and the rigid class system**. The American research community was larger, more dynamic and much better supported. As a young scientist with a "working-class" background, I believed at the time, and still do, that my opportunities in the United States were much better than in the UK.*** *After completing graduate school, I joined a large American company that had a strong commitment to basic research, and worked there for 23 years. The UK had few, if any, industrial laboratories of the same quality or size.* ***I do believe that I have been able to do significantly better research in the United Sates than I would have been able to do in the United Kingdom.*** *I also believe that I have done better personally**. The level of support (equipment, infrastructure, financial support, etc.) is important, and I believe that this has been a significant factor in my success in the United States. Almost certainly, I would not have received the same level of support had I remained in the UK**."*

"This is a very difficult question to answer but, ***in my own case, I think that I probably did carry out better research in the US that I would have been able to do if I had stayed in the UK.*** *However, in my case, I think that working at IBM Research played a very important role in my research since I was better able to understand what's important in taking a fundamental scientific discovery into a useful technology. The importance of much research today is often judged by its potential commercial impact."*

"In my case I was fortunate to come to JILA soon after it was formed. Our AMO physics group, of roughly ten senior scientists, is now rated #1 worldwide (with Nobel prizes in 2000 and 2005 - and more to come!). ***In no way would it have been possible for me to have had such outstanding colleagues and facilities in the UK. In fact my atrocious Norfolk accent (I was a country scholarship boy) would probably counted against me in the early 60s.****"*

"In my case, I had access to a much greater range of technology in my field of interest by moving to the US when I did (I moved to Bell Labs). There is no doubt that was helpful to my research. The environment in

Bell Labs was also very conducive to doing good research because the work was relatively well supported financially without the continual need for long grant proposals. That particular research model is, however, almost dead. In my current work at a major research university, ***I also benefit from a strong depth of available technology, technology that is available because of the coexistence of top research in both science and engineering at one institution. That combination of the best science and the best engineering is a particular strength of some top institutions in the US, and is much less common in the UK, perhaps because of a lower perceived status of engineering there****.* ***Another benefit in the US compared to the UK is that there is not just one source for research funding with only one set of values defined by one group of people.*** *None of us is smart enough to know the "right" answer as to what work should be funded, and a diversity of sources helps avoid narrowness of criteria for what is "good"."*

Key themes

⇒ Class system in 1960s UK

⇒ Realised more of their potential in USA

⇒ More funding, facilities and emphasis on research area in USA

Q. And in the case of other scientists of whom you know, would you say that their work was improved by leaving Britain?

"I am not in close contact with many British scientists (either those working in Europe or those working in the USA). However, ***my overall impression is that scientists from the UK who are now working in the US have done better work than their colleagues who remained in the UK. I also believe that scientists born in the UK who are now working in the USA have done better work, an average, than their American born colleagues. The United States has also provided scientists born abroad with the opportunity to become leaders in the research community and research institutions.*** *I am not personally familiar with British scientists who have come to the US in mid-career, and for this reason, it is difficulty to judge whether leaving Britain for the USA has improved the work of the scientists who I know personally.* ***I believe that scientists who come to America from abroad are, on average, more ambitious, energetic and competitive than their colleagues who remain behind. For this reason, it is difficult to assess whether they have done better because of the advantages that America offers or because they are not representative of the research community that they have come from****."*

"Looking at my peers from my Cambridge and London, it is clear that those who came overseas had more opportunities and were much more likely to be successful scientists than those that stayed in the system. ***Indeed, many of the "top" scientists in the UK today have spent much of their early careers in the US."***

"There is one other benefit of leaving Britain, which has nothing to do with the US being better than the UK; it is simply that it is more stimulating to move. The best end result here is not to want to stop people leaving Britain, but to have a healthy and balanced continual exchange of people.*"*

Key themes

- ⇒ Others have realised more of their potential in USA
- ⇒ Cause and effect difficult to separate: do better academics go to the USA or do they become better because they go to the USA?
- ⇒ The issue is not brain drain so long as there is brain circulation

Part Six

World-Class Universities – International Perspectives

The Challenge of Establishing World-Class Universities

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The Challenge of Establishing World-Class Universities

"I do believe that it is necessary to stress that for most countries today, human resource development and human capital formation are either extremely important, absolutely vital, or a matter of life and death. In the case of Malaysia…we think it is a matter of life or death."
Abdullah Bin Ahmed Badawi, Prime Minister of Malaysia (Opening Speech of the 2006 Meeting of the Association of Commonwealth Universities)

1. Introduction

In September 2005, the new world ranking published by the *Times Higher Education Supplement* was received like a bomb shell in Malaysia when it showed the country's top two universities slipping by almost 100 places compared to the previous year. Notwithstanding the fact that the big drop was mostly due to a change in the ranking methodology, the news was so traumatic that there were widespread calls for the establishment of a Royal Commission of Inquiry to investigate the matter. This strong reaction was not out of character in a nation whose current Ninth Development Plan aims at shaping the transformation of the country into a knowledge-based economy with emphasis on the important contribution of the university sector.

Preoccupations about university rankings reflect the general recognition that economic growth and global competitiveness are increasingly driven by knowledge, and that universities can play a key role in that context. Indeed, rapid advances in science and technology across a wide range of areas from information and communication technologies (ICTs) to biotechnology to new materials provide great potential for countries to accelerate and strengthen their economic development. The application of knowledge results in more efficient ways of producing goods and services and delivering them more effectively and at lower costs to a greater number of people.

The 1999 World Development Report on the Knowledge Economy (World Bank, 1999) proposed an analytical framework emphasizing the complementary role of four key strategic dimensions to guide countries in the transition to a knowledge-based economy: an appropriate economic and institutional regime, a strong human capital base, a dynamic information infrastructure and an efficient national innovation system.

Tertiary education is central to all four pillars of this framework, but its role is particularly crucial in support of building a strong human capital base and contributing to an efficient national innovation system. Tertiary education helps countries build globally competitive economies by developing a skilled, productive and flexible labor force and by creating, applying and spreading new ideas and technologies. A recent global study of patent generation has shown, for example, that universities and research institutes, rather than firms, drive scientific advances in biotechnology (Cookson, 2007). Tertiary education institutions can also play a vital role in their local and regional economy (Yusuf and Nabeshima, 2007).

Within the tertiary education system, research universities play a critical role in training the professionals, scientists and researchers needed by the economy and generating new knowledge in support of the national innovation system (World Bank, 2002). In this context, an increasingly pressing priority of many governments is to make sure that their top universities are actually operating at the cutting edge of intellectual and scientific development.

The main objective of this paper, therefore, is to explore what are the challenges involved in setting up globally competitive universities, also called "world-class", "elite", or "flagship" universities, that will be expected to compete effectively with the best of the best. The paper starts by attempting to construct an operational definition of a world-class university. It then outlines possible strategies and pathways for establishing such universities.

2. What Does It Mean to Be a World-Class University?

In the past decade, the term "world-class university" has become a catch phrase for not simply improving the quality of learning and research in tertiary education but more importantly for developing the capacity to compete in the global tertiary education marketplace through the acquisition and creation of advanced knowledge. With students looking to attend the best possible institution they can afford, often regardless of national borders, and governments keen on maximizing the returns on their investments on universities, global standing is becoming an increasingly important concern for institutions around the world (Williams and Van Dyke, 2007). The paradox of the world-class university, however, as Altbach has succinctly and accurately observed, is that "everyone wants one, no one knows what it is, and no one knows how to get one" (Altbach, 2004).

To become a member of the exclusive group of world-class university is not something that one achieves by self-declaration. This is an elite status conferred by the outside world on the basis of international recognition. Until recently, the process involved a subjective qualification based mostly on reputation. For example, Ivy League universities in the United States, such as Harvard, Yale or Cornell, Oxford and Cambridge in the United Kingdom, and Tokyo University have traditionally been counted among the exclusive group of elite universities. But no direct and rigorous measure was available to substantiate their superior status in terms of training of graduates, research output, and technology transfer. Even the higher salaries captured by their graduates could be interpreted as a signaling proxy as much as the true value of their education.

With the proliferation of league tables in the past few years, however, more systematic ways of identifying and classifying world-class universities have appeared (IHEP, 2007). While most of the 45 of the best known rankings purport to categorize universities within a given country, there have also been attempts to establish international rankings. The two most comprehensive international rankings, allowing for broad benchmark comparisons of institutions across national borders, are those prepared by the Times Higher Education Supplement (THES) and Shanghai's Jiao Tong University (SJTU).

To compare the international stature of institutions, these league tables are constructed by using objective and/or subjective data obtained from the universities themselves or from the public domain. The THES ranking selects the top 200 universities in the world. First presented in 2004, the methodology for this ranking focuses most heavily on international reputation, combining subjective inputs such as peer reviews and employer recruiting surveys and quantitative data, including the numbers of international students and faculty, and the influence of the faculty, as represented by research citations. Operating since 2003, SJTU uses a methodology that focuses on seemingly more objective indicators, such as the academic and research performance of faculty, alumni, and staff. The measures evaluated include publications, citations, and exclusive international awards, such as Nobel prizes and Fields medals. Shanghai's ranking is also presented slightly differently: the top 100 institutions are listed in ranked ordinal. The remaining 400 institutions are listed by clusters of approximately 50 and 100 (101-152, 153-202, 203-300, etc.), and alphabetically within those clusters. Table 1 shows the results of the 2006 world rankings.

Table 1 Top Twenty Universities in World Rankings (2006)

Rank	THES	Rank	SJTU
1	Harvard University	1	Harvard University
2	University of Cambridge	2	University of Cambridge
3	University of Oxford	3	Stanford University
4	Massachusetts Institute of Technology	4	University of California - Berkeley
4	Yale University	5	Massachusetts Institute of Technology
6	Stanford University	6	California Institute of Technology
7	California Institute of Technology	7	Columbia University
8	University of California, Berkeley	8	Princeton University
9	Imperial College London	9	University of Chicago
10	Princeton University	10	University of Oxford
11	University of Chicago	11	Yale University
12	Columbia University	12	Cornell University
13	Duke University	13	University of California - San Diego
14	Beijing University	14	University of California - Los Angeles
15	Cornell University	15	University of Pennsylvania
16	Australian National University	16	University of Wisconsin - Madison
17	London School of Economics and Political.Science	17	University of Washington - Seattle
18	Ecole Normale Supérieure (Paris)	18	University of California – San Francisco
19	National University of Singapore	19	Johns Hopkins University
19	Tokyo University	20	Tokyo University

Notwithstanding the serious methodological limitations of any ranking exercise (Salmi and Saroyan, 2007), world-class universities are recognized in part for their superior outputs. They produce well-qualified graduates who are in high demand on the labor market, they conduct leading-edge research published in top scientific journals and, in the case of science and technology oriented institutions, they contribute to technical innovations through patents and licenses.

As illustrated by Table 1, most universities recognized as world-class originate from a very small number of countries, mostly Western. In fact, Tokyo University is the only non US and non UK university among the top 20 in the SJTU ranking. If one considers that there are between 30 and 50 world-class universities in total, according to the SJTU ranking they all come from a small group of 8 North American and Western European countries, Japan being again the only exception (see Annex 1). THES has a slightly wider range of countries of origin among the top 50 universities (11 countries), including Singapore, Hong Kong and New Zealand besides the usual North American and Western European nations (see Annex 2).

The few scholars who have attempted to define what world-class universities have that regular universities do not possess have identified a number of basic features such as highly qualified faculty, excellence in research, quality teaching, high levels of government as well as non-government sources of funding, international and highly talented students, academic freedom, well-defined autonomous governance structures, and well-equipped facilities for teaching, research, administration, and, often, student life (Altbach, 2004; Khoon, 2005; Niland, 2000, 2007). Recent collaborative research on this theme between UK and Chinese universities (Alden and Lin, 2004) has resulted in an even longer list of key attributes, ranging from the international reputation of the university to more abstract concepts, such as the university's contribution to society, both very difficult to measure in an objective manner (see Annex 3).

In an attempt to propose a more manageable definition of world-class universities, this policy note makes the case that the superior results of these institutions (highly sought graduates, leading edge research, technology transfer) can essentially be attributed to three complementary sets of factors that can be found at play among most top universities, namely (i) a **high concentration of talent** (faculty and students), (ii) **abundant resources** to offer a rich learning environment and conduct advanced research, and (iii) **favorable governance** features that encourage strategic vision, innovation and flexibility, and enable institutions to make decisions and manage resources without being encumbered by bureaucracy.

2.1 Concentration of Talent.

The first and perhaps foremost determinant of excellence is the presence of a critical mass of top students and outstanding faculty. World-class universities are able to select the best students and attract the most qualified professors and researchers.

> In the sciences, being at the right university—the one where the most state-of-the-art research is being done in the best equipped labs by the most visible scientists—is extremely important. George Stigler describes this as a snowballing process, where an outstanding scientist gets funded to do exciting research, attracts other faculty, then the best students—until a critical mass is formed that has an irresistible appeal to any young person entering the field.

Mihaly Csikszentmihalyi (Flow and the Psychology of Discovery and Invention)

This has always been the hallmark of Ivy League universities in the US or Oxford and Cambridge in the UK. And it is also a feature of the newer world-class universities, such as the National University of Singapore or Tsing Hua University in China.

An important factor in that respect is the ability and the privilege of these universities to select the most academically qualified students. For example, Beijing University, China’s top institution of higher learning, admits the 50 best students of each province every year. Harvard University, the California Institute of Technology, MIT and Yale University are the most selective universities in the United States as measured by the average SAT scores of their incoming undergraduate students.

One corollary of this observation is that tertiary education institutions in countries where there is little internal mobility of students and faculty are at risk of academic in-breeding. Indeed, universities that rely principally on their own undergraduates to continue into graduate programs or that hire many of their own graduates to join the teaching staff are not likely to be at the leading edge of intellectual development.

It is also difficult to maintain high selectivity in institutions with rapidly growing student enrollment and fairly open admission policies. The huge size of the leading universities of Latin American countries such as México or Argentina—the Autonomous University of México (UNAM) has 137,000 students and the University of Buenos Aires (UAB) has 183,000--is certainly a major factor in explaining why these universities have failed to enter the top league, despite having a few excellent departments and research centers which are undoubtedly world-class. At the other extreme, Beijing University maintained its overall enrollment at less than 20,000 until the early 2000s and even today has no more than 30,000 students.

World-class universities also tend to have a high proportion of carefully selected graduate students, as illustrated by Table 2 below, reflecting their strength in research.

Table 2 Weight of Graduate Students in Selected Universities

University	Undergraduate Students	Graduate Students	Share of Graduate Students (%)
Harvard [1]	7,002	10,094	59
Stanford [2]	6,442	11,325	64
MIT [3]	4,066	6,140	60
Oxford [4]	11,106	6,601	37
Cambridge [5]	12,284	6,649	35
LSE [6]	4,254	4,386	51
Beijing [7]	14,662	16,666	53
Tokyo [8]	15,466	12,676	45

[1] 2005-2006 http://vpf-web.harvard.edu/budget/factbook/current_facts/2006OnlineFactBook.pdf
[2] 2006-2007 http://www.stanford.edu/home/statistics/#enrollment
[3] 2005-2006 http://web.mit.edu/ir/cds/2006/b.html
[4] 2005-2006 http://www.ox.ac.uk/aboutoxford/annualreview/app2ii.shtml
[5] 2004-2005 http://www.admin.cam.ac.uk/reporter/2004-05/special/19/studentnumbers2005.pdf
[6] Kahn and Malingre (2007)
[7] 2006-2007 Beijing University Admission Office
[8] 2004 http://www.u-tokyo.ac.jp/stu04/e08_02_e.html

In many cases, world-class universities have students and faculty who are not exclusively from the country where the university operates. This enables them to attract the most talented people, no matter where they come from, and open themselves to new ideas and approaches. As a matter of fact, the international dimension is becoming increasingly important in determining the configuration of these elite institutions. Both the THES world ranking of universities and Newsweek's 2006 ranking of Global Universities weighted their rankings to favor institutions with strong international components. Harvard University, for instance, has a student population that is 19 percent international; Stanford has 21 percent; and Columbia, 23 percent. At Cambridge University, 18 percent of the students are not from the UK or EU countries. The US universities ranked at the top of the global surveys also show sizeable proportions of foreign academic staff. For instance, the proportion of international faculty at Harvard, including medical academic staff, is approximately 30 percent. Similarly, the proportion of foreign academics at Oxford and Cambridge is 36 and 33 percent, respectively. By contrast, in France only 7 percent of all researchers are foreign academics. Unquestionably the world's best universities enroll and employ large numbers of foreign students and faculty in their search for the most talented.

The new patterns of knowledge generation and sharing, documented by Gibbons (1994) in his path breaking work on the shift towards a problem-based mode of production of knowledge, are characterized by the growing importance of international knowledge networks. In this respect, the fact that world-class universities succeed in mobilizing a broadly diverse national and international academic staff is likely to maximize these institutions' knowledge networking capacity.

2.2 Abundant Resources.

Abundance of resources is the second element that characterizes most world-class universities, in response to the huge costs involved in running a complex research–intensive university. These universities have four main sources of financing: government budget funding for operational expenditures and research, contract research from public organizations and private firms, the financial returns generated by endowments and gifts, and tuition fees.

In Western Europe, public funding is by far the principal source of finance for teaching and research, although the top UK universities have some endowment funds and top-up fees have been introduced in recent years. In Asia, the National University of Singapore, which became a private corporation in 2006, has been the most successful institution in terms of endowment funding. It has managed to build up a sizeable portfolio of 774 million dollars through effective fund-raising, making it richer than any British university after Cambridge and Oxford. The US and to a lesser extent Japan have thriving private research universities. The sound financial base of the top US universities is due to two factors. First they have large endowments (Table 3) which provide budget security, comfort, and the ability to focus on institutional priorities over medium and long-term. Unlike many universities in Europe, they are not at the short-term mercy of government funding sources or the whims of changing political priorities.

Table 3 Comparison of US and UK Endowment Levels

US Institutions	**Endowments Assets (2006 million $)**	**UK Institutions**	**Endowment Assets (2002 million $)**
Harvard University	28,916	Cambridge	4,000
Yale University	18,031	Oxford	4,000
Stanford University	14,085	Edinburgh	3200
University of Texas	13,235	Glasgow	240
Princeton University	13,045	King's	200

Source: 2006 NACUBO Endowment Study, 2007 National Association of College and University Business Officers. University Endowments – UK/US Comparison, May 2003, retrieved on 17 March 2007 from http://www.suttontrust.com/reports/endowments_report.pdf

Second they benefit from the success of their faculty in competing for government research funding.

At least two-thirds of the research funding captured by the top US research universities comes from public sources. The top ranking Canadian universities in international league tables are also the top universities in research income (Salmi and Saroyan, 2007).

These abundant resources create a virtuous circle that allows the concerned institutions to attract even more top professors and researchers, as is often the case among elite universities in the US. Among the 20 top ranked universities in the US, only two --Michigan State and Berkeley-- are public. Annual surveys of salaries indicate that private universities in the US pay their professors 30 percent more than public universities on average (CHE, 2007).

2.3 Appropriate Governance.

The third dimension concerns the overall regulatory framework, the competitive environment and the degree of academic and managerial autonomy that universities enjoy. In a recent survey report, The Economist (2005) referred to the tertiary education system in the United States as "the best in the world" and associated this success not only to its wealth but to its relative independence from the state, the competitive spirit that encompasses every aspect of it, and its ability to make academic work and product relevant and useful to society. The article observed that the environment in which universities operate fosters competitiveness, unrestrained scientific inquiry, critical thinking, innovation, and creativity. Moreover, institutions that have complete autonomy are also more flexible because they are not bound by cumbersome bureaucracies and externally imposed standards, notwithstanding the legitimate accountability mechanisms which bind them. As a result, they can manage their resources with agility and quickly respond to the demands of a rapidly changing global market.

The autonomy elements outlined above are necessary though not sufficient to establish and maintain world-class universities. Other crucial governance features are needed such as inspiring and persistent leaders, a strong strategic vision of where the institution is going, a philosophy of success and excellence, and a culture of constant reflection, organizational learning and change.

The cases of Germany and France are interesting to discuss in this context. Even though they are among the top economies in the world, their universities are hardly recognized as elite institutions. In 2006, the best French university was ranked 46th by SJTU and the first German university was ranked 51. Benchmarking them against the three sets of criteria proposed above shows clearly why universities of these two countries do not shine in international rankings. To begin with, there is very little screening of students entering tertiary education. In most programs, having graduated from secondary school is the only prerequisite to admission (with the exception of the highly selective French engineering and professional "Grandes Ecoles").

Another important factor is the absolute lack of competition among universities. All universities are treated equally in terms of budget and assignment of personnel, making it quite difficult if not impossible to mobilize the necessary resources to set up centers of excellence with a large concentration of top researchers. For both Germany and France, per student public expenditures on tertiary education are slightly below the OECD average, and half the level of US universities. When the first SJTU ranking was published at the end of 2003, the daily paper *Le Monde* ran an article on January 24, 2004 entitled "The great misery of French universities." The university presidents and union leaders interviewed for that article argued that the lack of budgetary resources and the rigidities associated with their utilization was one of the main explanations for the demise of the French university system.

Finally, in both countries, universities are government entities constrained by civil service employment rules and rigid management controls. This means, in particular, that it is not possible to pay higher salaries to reward the more productive academics or attract world-class researchers and to invest in leading edge research facilities. For example, the salaries of French business administration professors are 20 percent lower than those of their US counterparts (Egide, 2007).

In the case of France, two additional structural features complicate the situation further. First, according to Orivel (2004), one of the main reasons why French universities are not internationally competitive is the dual structure of the tertiary education system. The top engineering and professional schools ("*Grandes Ecoles*") recruit the best students through very competitive national examinations, while the universities receive the bulk of secondary school graduates who have automatic access. Since the *Grandes Ecoles* are predominantly elite professionally-oriented schools, they conduct very little research; as a result, most doctoral students in the research universities do not come from the most academically qualified student groups. This is quite unlike the practice in more competitive university systems in the US, the UK or Japan. Second, the strict separation between the research institutes affiliated with the National Centre for Scientific Research (CNRS) and the research departments of the universities results in the dispersion of human and financial resources. The strength of world-class universities is that research is integrated at all levels.

Box 1 – Watching the Rankings: the French Experience

Each year, when Shanghai's Jiao Tong University publishes its world ranking of universities, France responds with a mix of indignation and consternation. Indignation, because French educators complain that the system favours "Anglo-Saxon" universities and makes no allowance for France's unusual division into elite grandes écoles and mass universities. Consternation, because not a single French university makes it into the world's top 40. Its best-placed institution—Paris VI—manages only 45th place.

Source: The Economist (28 October 2006). "Lessons from the Campus." Special Survey Section on France.

Alignment of Success Factors. Finally, it is important to stress that it is the combination of these three sets of features, concentration of talent / abundant funding / appropriate governance, that makes the difference. The dynamic interaction among these three groups of factors is the distinguishing characteristic of high-ranking universities (Figure 1).

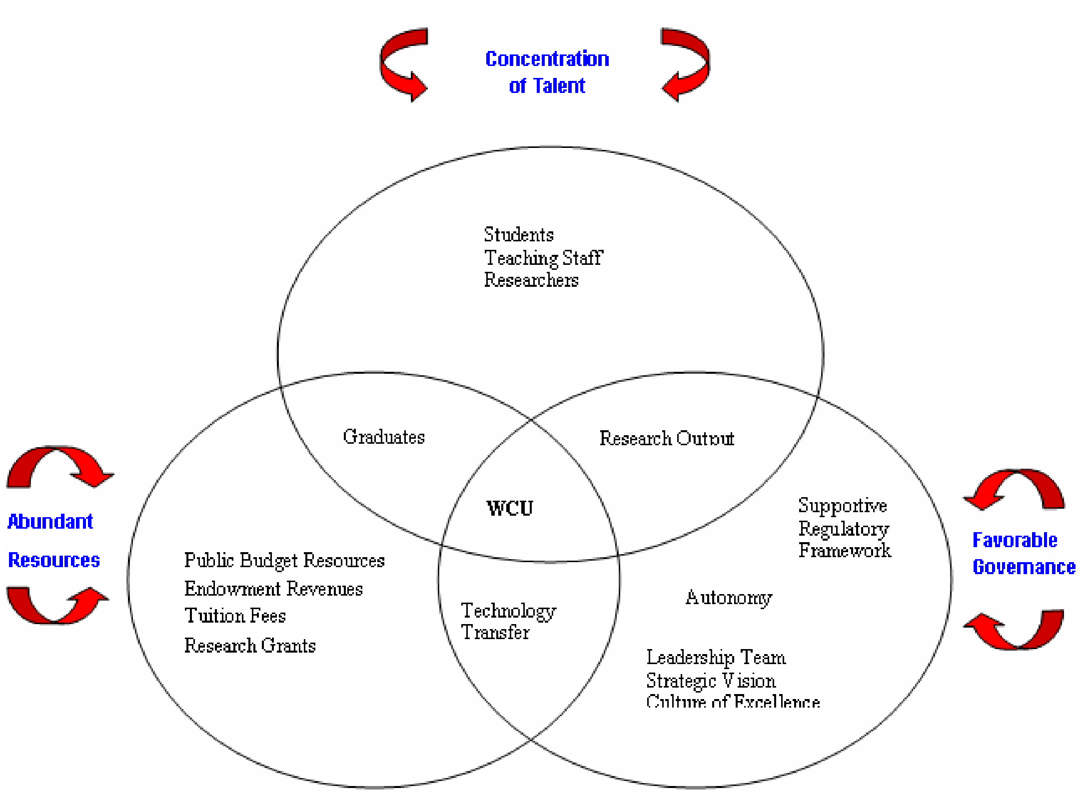

Figure 1 - Characteristics of a World-Class University Alignment of Key Factors

Just investing money in an institution or making it very selective in terms of student admission is not sufficient to build a world-class university, as illustrated by the case of Brazil's top university, the University of São Paulo (USP). Brazil is the 5th most populated nation and the 10th largest economy on the planet, it has world class companies such as Embraer and Aracruz Celulose, but there is no Brazilian university among the 100 top ranked universities in the world.

How is it that USP, the country's foremost university, does not make it into the top group in the international rankings, despite having some of the features of world-class universities? When it was created in 1934, USP leaders made it a point to hire only prominent professors from all over Europe (Schwartzman, 2005). Today it is the most selective institution in Brazil, it has the highest number of top-rated graduate programs and it produces every year more Ph.D. graduates than any US university. At the same time, its ability to manage its resources is constrained by rigid civil service regulations, even though it is the richest university in the country. It has very few linkages with the international research community and only 3 percent of its graduate students are from outside Brazil. The university is very inward-looking: most students come from the State of São Paulo and most professors are USP graduates. Foreign professors cannot be recruited by law and it is forbidden to write a doctoral dissertation in a language other than Portuguese. According to Schwartzman (2005), the key missing element is the absence of a vision of excellence to challenge the status quo and transform the university. This lack of strategic vision can be observed as much at the national and state government level as well as at the helm of the university itself.

3. Paths to Transformation

> Infosys and Wipro are great role models. I cannot say that I will be as great as them, but today India is producing more entrepreneurs than any other country. … As chairman of Jet Airways, I definitely would like to see India able to create a world-class airline. We should not be inferior to Singapore and Cathay Pacific in terms of reliability and standards of service. We will hire the best brains, the best talent. We aim to be second to none.
>
> Jet Airways Founder and Chairman, Naresh Goyal
> Newsweek interview, 16 July 2007

Two complementary perspectives need to be considered in examining how to establish new world-class universities. The first dimension, of an external nature, concerns the role of government at the national /

state / provincial level and the resources that can be made available to enhance the stature of institutions. The second dimension is internal. It has to do with the individual institutions themselves and the necessary evolution and steps they need to take to elevate themselves to world-class institutions.

3.1 Role of Government

In the past, the role of government in nurturing the growth of world-class universities was not a critical factor. The history of the Ivy Leagues universities in the US reveals that, by and large, they grew to prominence as a result of incremental progress rather than deliberate government intervention. Similarly, Oxford and Cambridge evolved over the centuries of their own volition, with public funding, but with considerable autonomy in terms of governance, definition of mission and direction. Today, however, it is unlikely that a world-class university can be rapidly created without a favorable policy environment and direct public initiative and support, if only because of the high costs involved in setting up advanced research facilities and capacities.

Altbach (2004) reports a late nineteenth century conversation between John D. Rockefeller and the then President of Harvard University, Charles W. Eliot, where the former asked the latter what would be the cost of establishing a world-class university. Eliot's answer was "50 million dollars and 200 years." But in fact the University of Chicago was able, at the beginning of the twentieth century, to achieve this goal within twenty years, at a price tag of less than 100 million dollars. Professor Altbach's estimate puts the cost of creating a world-class university today at around 500 million dollars.

In that respect, one of the key questions that national authorities need to ponder is how many world-class universities their country can afford and to make sure that investment for that purpose will not cost at the expense of investing in other priority areas. Adopting the goal of building world-class universities, however, does not imply that all universities in a given country can or should aspire to be of international standing. A more attainable goal could rather be to set up an integrated system of teaching, research, and technology-oriented institutions that feed into and support a few centers of excellence that focus on value-added fields and chosen areas of comparative advantage, and can eventually evolve into world-class institutions. Even in the richest OECD countries, only a handful of institutions achieve the kind of concentration of top researchers, professors, students, facilities, and resources that world class universities enjoy as pre-conditions for excellence in scholarship. In the US, for example, of about 5,000 tertiary education institutions no more than 30 universities are among the best in the world; in the UK less than 10 universities and in Japan no more than 5 belong to this category.

The next relevant set of questions is about the most effective approach to achieve the proposed goal of becoming world-class. International experience shows that three basic strategies can be followed to establish world-class universities. First, the government could consider upgrading a small number of existing universities that have the potential of excelling (picking winners). A second strategy would consist in encouraging a number of existing institutions to merge and transform into a new university that would achieve the type of synergies corresponding to a world-class institution (hybrid formula). A third approach would be to create new universities from scratch (clean slate approach). Each one of these approaches presents advantages and drawbacks.

3.1.1 Upgrading Existing Institutions. One of the main benefits of this first approach is that the costs can be significantly less than building new institutions from scratch. This is the strategy followed by China since the early 1980s.

Box 2 - Tertiary Education Reform in China

The Chinese government has been eager to develop a tertiary education system of international stature and recent reform efforts reflect this goal. In 1993, the Government adopted the *Guidelines of China's Educational Reform and Development*, which called among other things to build up 100 key universities with high quality courses of specialized studies. In 1998, then President Jiang Zemin announced the goal of building world-class universities, with a clear focus on the advancement of science and technology. Since then, state financing for tertiary education has more than doubled, reaching $10.4 billion in 2003 or almost 1% of GDP. Several top universities received grants to improve institutional quality under the 985 Project, which reflects a conscious strategy to concentrate resources on a few institutions with the greatest potential for success at the international level.

Chinese universities are currently spending millions of dollars to recruit internationally renown, foreign-trained Chinese and Chinese-American scholars and build state of the art research laboratories, particularly in science and technology. The strategy is to surround their star faculty with the brightest students, give them academic leeway and provide competitive salary and additional non-salary incentives. With low labor costs, structural upgrades are achievable at a tenth of the cost in industrial countries. All this is happening in the context of a new regime of financial autonomy, significant cost sharing, and intense efforts to develop management expertise at all levels of university leadership.

Source: French (2005); Mohrman (2005).

But this approach is unlikely to succeed in countries where the governance structure and arrangements that prevented the emergence of world-class universities in the first place are not drastically revised. A comparison of the experiences of Malaysia and Singapore can serve to illustrate this point. Since Singapore was initially one of the provinces of the Malaysian Kingdom during the first few years following independence from the British, contrasting the stories of the University of Malaya and of the National University of Singapore (NUS) can be quite instructive given that they departed from common cultural and colonial origins. At independence, the University of Malaya operated as a two-campus university, one in Kuala Lumpur and the other in Singapore. The former evolved into the flagship University of Malaya from the very beginning, and the other became the University of Singapore (before merging with Nanyang University in 1980 to create the National University of Singapore). Today, NUS functions as a true world-class university (ranked 19^{th} by the 2006 THES) while the University of Malaya struggles as a second-tier research university (ranked 192nd).

In examining the different evolutionary paths of these two institutions, several factor appear to be constraining the University of Malaya's capacity to improve and innovate as the NUS has. The first one is the affirmative action policy implemented by the Malaysian government in favor of the children of the Malay majority population (*Bumiputras*), which prevents the university from being selective in its student admissions and targeting only the best and brightest in the country. In addition the Ministry of Higher Education places a 5 percent cap on the number of foreign undergraduate students that public universities can enroll, while the proportion of foreign students at NUS is 20 percent at undergraduate level and 43 percent at graduate level. Second, NUS is able to mobilize almost twice as many financial resources as the University of Malaya ($ 205 million annual budget vs. $ 118 million) through cost-sharing, investment revenue, fund raising and government resources. As a result, the annual per student expenditures were $6,300 and $4,053, respectively. Third, in Malaysia, civil service regulations and a rigid financial framework make it difficult, if not impossible, to provide competitive compensation packages to attract the most competent professors and researchers, including foreign faculty. NUS, on the contrary, is free to bring in top researchers and professors from all over the world, pay a global market rate for them, and provide performance incentives to stimulate competition and to retain the best and the brightest. As a matter of fact, a good number of Malaysia's top researchers have been recruited by NUS.

Box 3 - Do Governments Care about Higher Education?
Lessons from the Soccer Field

For the sake of argument, let us consider the following: how would Barcelona's professional soccer team (FC Barcelona) perform if it were constrained by all the rules that burden our universities? What would happen if all the players were civil servants with salaries determined by a government ministry and if they were allowed to continue playing every day regardless of their performance during official games and behavior during practice sessions? What would happen if the club's income was not linked to its game results, if it could not pay higher salaries to attract the best players in the world or if it could not quickly get rid of the under-performing players? What would happen if team strategy and tactics were decided by the government rather than by the coach? Wouldn't such an approach risk relegating the Barcelona team to the sidelines of mediocrity? If we agree that such an approach is unwise for a sports team, why do we allow our universities to operate under such conditions? This suggests that, deep down, we care more about soccer than about the education of our children.

Adapted by Jamil Salmi and Richard Hopper from Sala I Martín, X. (2006). "A great sense of humor", Vanguardia, 17 November 2006.
Professor Sala I Martín teaches at Colombia University in the US and Universidad Pompeu Fabra in Spain

Governments need therefore to construct a supportive external policy environment and create the financing and regulatory conditions that will enable and encourage their universities to compete at an international level on a host of indicators on which the quality and relevance of university education are commonly assessed (see box 3) including reputation and awards, foreign students and faculty, and research grants. One way to facilitate this is to grant management autonomy to the universities, another is provide performance-based financing, and yet another one is to put in place favorable taxation systems that will allow companies and philanthropists to make tax-free donations to universities. The US and India provide good examples of this practice.

3.1.2 Merging Existing Institutions. The second possible approach consists of promoting mergers among existing institutions. France and Denmark are two countries that have diligently embarked on this path in recent years. In France, individual universities and "*grandes écoles*" are exploring the feasibility of merging on a regional basis. In Denmark, the government has set up an Innovation Fund that would reward, among other things, the combination of similar institutions. In China, too, a number of mergers have taken place to consolidate existing institutions. For example, Beijing Medical University merged with Beijing University in 2000; similarly in Shanghai Fudan University merged with a medical university, and Zhejiang University was created out of the merger of five universities. In 2004, in the UK, the Victoria University of Manchester (VUM) and the University of Manchester Institute of Science and Technology (UMIST) merged, creating the largest university in the UK, with the purposefully stated goal of being "top 25 by 2015" (http://www.manchester.ac.uk/research/about/strategy/). Also in the UK recently, Cardiff University and South Wales School of Medicine have merged as a deliberate step to establish a world-class university in Wales. These mergers to create larger universities are a clear response to the fact that international rankings compare the number of research publications of institutions independently from the size of their student enrollment.

The great advantage of mergers is that they can result in stronger institutions able to capitalize on the new synergies that their combined human and financial resources may generate. But mergers can work both ways, carrying also the risk of aggregating problems instead of resolving them. In the case of France, for example, mergers would augment the critical mass of researchers and bring about a higher place in the SJTU ranking that favors research output. But they would not address the fundamental limitations that French universities suffer from, namely the inability to select incoming students, a weak financial basis, rigid governance arrangements and outdated management practices. The Danish case has greater chances of success since the push for mergers is taking place within the context of an overall governance reform aiming at transforming all universities in the country into more flexible and dynamic institutions (see Annex 4).

The second danger associated with mergers is that the newly consolidated institution could be dysfunctional because of clashing institutional cultures. It has become clear, for example, that the previously mentioned merger between VUM and UMIST has not been as successful as expected. Currently acknowledging a £30 million budget deficit and the likelihood of up to 400 jobs lost on the campus (Qureshi, 2007), the University of Manchester has had immediate experience with the complexities of merging—including duplication of staff and curricular offerings, and the short-term absorption of labor contracts and institutional debt. In addition, the newly formed institution, with its commitment to achieving world-class status, invested heavily in hiring 'superstar' academic staff and supplying them with correspondingly 'superstar' facilities. This exacerbating further the staffing debt that the institution inherited with the merging of the distinct and separate institutional staffs—and their individual cultures, norms, and labor contracts—into the one university. It remains to be seen how Manchester will address these financial, cultural and inter-personal obstacles while simultaneously maintaining is quest for world-class status.

Thus, one of the main challenges when undertaking a merger is to create a shared academic culture and transformation vision among all constituting units (faculties, schools, departments) and bring internal coherence to the newly-established institution. In many cases, the leaders of merged universities are severely constrained by the high level of independence claimed by constituting units. The new university established by merging existing universities may carry the legacy of the old brands which in many cases can be an obstacle in attracting excellent students and staff.

3.1.3 Creating New Institutions. In countries where institutional habits, cumbersome governance structures and bureaucratic management practices prevent traditional universities from being innovative, creating new institutions maybe the best approach, provided that it is possible to staff them with people not influenced by the culture of the traditional universities and provided that financial resources are not a constraint. New institutions can emerge from the private sector or governments can allow new public institutions to operate under a more favorable regulatory framework. Kazakhstan is a country intent on following this path as it seeks to make its economy less dependent on oil and more competitive overall. The Government of Kazakhstan has decided to set up a new International University in Astana. The plan is that this university will follow a highly innovative multidisciplinary curriculum in cooperation with leading international universities.

One of the earlier success stories in that respect was the establishment of the Indian Institutes of Technology which, in the past decades, have gradually risen to world-class status (Box 4).

Box 4 - The Indian Institutes of Technology: a Success Story

Soon after becoming independent, India placed science and technology high on its economic development agenda. The first Indian Institute of Technology (IIT) was established in 1951 at Kharagpur, (West Bengal) with support from UNESCO, based on the MIT model. The Second IIT was established at Bombay (now Mumbai) in 1958 with assistance from the Soviet Union through UNESCO. In 1959, IIT Madras (now Chennai) was established with assistance from Germany; and IIT Kanpur with help from a consortium of US Universities. British industry and the UK Government supported the establishment of IIT Delhi in 1961. In 1994, IIT Guwahati was established totally through indigenous efforts. In 2001, the University of Roorkee was brought under the IIT family as the seventh such institution.

While taking advantage of experience and best practices in industrial countries, India ensured that the "institutions represented India's urges and India's future in making" (Prime Minister Nehru, 1956). The Indian Parliament designated them as "Institutes of National Importance" - publicly funded institutions enjoying maximum academic and managerial freedom- offering programs of high quality and relevance in engineering, technology, applied sciences and management at undergraduate, masters, and doctorate level and offering their own degrees. Student admissions are made strictly according to merit through a highly competitive common entrance test.

Today, the IITs attract the best students interested in a career in engineering and applied sciences. Several IIT alumni occupy the highest positions of responsibility in education, research, business and innovation in several parts of the world. In 2005, The Times Higher Education Supplement ranked the IITs as globally third best engineering school after MIT and the University of California, Berkeley.

The main strength of the IITs has been their sustained ability to attract the best students and turn them into "creative engineers" or "engineer entrepreneurs". Initially IITs were criticized for their contribution to the brain- drain as about 40% of the graduates went abroad. Today, with the opening and fast growth of the Indian economy, this "weakness" is turning into a big strength for international cooperation and investments. Much of the success of Bangalore, for instance, is attributed to the phenomenon of reverse brain drain.

Elaborated by Shashi Shrivastava

A third promising example is the creation of the Paris School of Economics (PSE) in February 2007, modeled after the London School of Economics. This initiative combines elements of mergers with the creation of a brand new type of institution in the French context (Kahn and Malingre, 2007). Co-sponsored by 4 "*grandes écoles*", the Paris I University (Sorbonne) and the National Research Institute (CNRS), PSE will operate as a private foundation regrouping the best economics departments from the participating institutions. Its initial funding comes not only from the State and the Region but also from private companies and a US foundation. Unlike traditional French universities, PSE will be highly selective in terms of incoming students. Many of the core professors will come from the most prestigious universities in the world.

The creation of new institutions may also have the side benefit of stimulating existing ones into becoming more responsive to a more competitive environment. Examples from many parts of the world showing that the emergence of high quality private universities in countries with a predominantly public tertiary education sector has provoked the public universities into becoming more strategically focused. In Uruguay, the venerable University of the Republic—which had exercised a monopoly over tertiary education in the country for 150 years—started a strategic planning process and considered establishing postgraduate programs for the first time only after being confronted in the mid-1990s with competition from newly established private universities. Similarly, in Russia, the creation of the Higher School of Economics and of the Moscow School of Social and Economic Sciences in the 1990s pressured the department of economics at the State University of Moscow to revamp its curriculum and get more actively involved in international exchanges.

To maintain the favorable conditions that were instrumental for the establishment of a new world-class institution requires constant vigilance, as the growing faculty shortage faced by the Indian Institutes of Technology illustrates. India's economic success has translated into a much larger income gap than in the past between the Institutes and industry. As a result, fewer promising graduates seek an academic career (Neelakantan, 2007). Without the autonomy to raise salaries and offer more competitive employment packages, the IITs are at risk of losing their competitive edge. The younger Indian Institutes of Management face the same hurdle in their quest for world-class status (Bradshaw, 2007).

3.1.4 Evaluation of these Approaches. Table 4 attempts to summarize the positive and negative aspects linked to each approach (upgrading, merging or creating new institutions). It should be noted that these generic approaches are not mutually incompatible and that countries may pursue a combination of strategies based on these models.

Table 4 – Costs and Benefits of Strategic Approaches for Establishing World-Class Universities

Approach / Conditions	Upgrading Existing Institutions	Merging Existing Institutions	Creation New Institutions
Ability to Attract Talent	Difficult to renew staff and change the brand to attract top students	Opportunity to change the leadership and to attract new staff. Existing staff may resist	Opportunity to select the best (staff and students). Difficulties in recruiting top students to "unknown" institution. Need to build up research and teaching traditions.
Costs	Less expensive	Neutral	More expensive
Governance	Difficult to change mode of operation within same regulatory framework	More likely to work with different legal status than existing institutions	Opportunity to create appropriate framework
Institutional Culture	Difficult to transform from within	May be difficult to create a new identity out of distinct institutional cultures	Opportunity to create culture of excellence
Change Management	Major consultation and communication campaign with all stakeholders	"Normative" approach to educate all stakeholders about expected norms and institutional culture	"Environmental adaptive" approach to communicate and socially market the new institution

Countries deciding to establish world-class universities by upgrading or merging existing ones must also chose an appropriate methodology to select among existing universities. Governments need to assess the degree to which they want to manage the process in a centralized way, cherry-picking institutions where centers of excellence could be established or boosted, or whether it would be preferable to steer the tertiary education system at a distance, relying on broad strategic orientations and financial incentives to entice the most dynamic universities to transform themselves.

International experience suggests that, in medium to large-size countries, the latter approach could be more effective in the long run. The China '211' project, the Brain 21 program in South Korea, the German "Initiative for Excellence" and the Millenium Institutes recently established in Chile are examples of how countries stimulate the creation or consolidation of research centers of excellence. Annex 5 describes the most recent "excellence" initiatives implemented throughout the world.

Box 5 – The German "Initiative for Excellence"

In January 2004, the federal Ministry of Education and Research launched a national competition to identify about 10 universities with the potential of becoming elite universities. Extra funding will be provided under three windows: to entire institutions aiming to become world-class universities, to centers of excellence with international recognition, and to graduate schools intent of strengthening the quality of their programs.

After initial resistance from the States jealous of their traditional authority in the area of tertiary education funding, a compromise was reached and a joint commission was established, with representatives of the German Research Foundation and the Science Council.

In January 2006, the Commission selected 10 universities among 27 candidates, 41 proposals for centers of excellence among 157 submissions, and 39 graduate schools among 135 proposals. The majority of selected universities (7 out of 10) are located in two states (Baden-Württemberg and Bavaria) and only 10 percent of the winning centers of excellence are in the humanities and social sciences. Most of the selected graduate schools have a strong multi-disciplinary focus. A total of 2.3 billion dollars of additional funding will be made available to support the winning proposals over a period of four years.

Source: Kehm (2006)

Finally, it is important to stress that the national government is not the only major player when it comes to facilitating the establishment of world-class institutions. In large countries and/or federal systems, regional or provincial authorities can play a critical role, as illustrated by the active role played by the Californian authorities in designing and establishing an integrated system of tertiary education in the Sixties, or more recently in establishing special Innovation Funds to strengthen linkages between the research universities and the regional economy. Similarly, the Shanghai municipality has given active support to its leading universities in the past ten years as part of its accelerated development policies and, in the State of Nuevo Léon in Mexico, the business community has also contributed substantially to the success of the Technology Institute of Monterrey.

3.2 Strategic Dimensions at the Institutional Level

3.2.1 Leadership and Strategic Vision. The establishment of a world-class university requires, above all, a strong leadership, a bold vision of the institution's mission and goals, and a clearly articulated strategic plan to translate the vision into concrete programs and targets.

Recent research on university leadership suggests that, in the case of top research universities, the best performing institutions have leaders who combine good managerial skills and a successful research career (Goodall, 2006). To be able to develop an appropriate vision for the future of the university and to implement this vision in an effective manner, the university president / vice-chancellor / rector needs to fully understand the core agenda of the institution and to be able to apply the vision with the necessary operational skills.

A crucial element of the vision is the discovery of a niche market towards which the institution will seek to build and maximize its comparative advantage. In that respect, it is important to underline that a university, even a world-class university, most likely cannot excel in all areas. Harvard University, widely recognized as the number one institution in the world, is not the best ranked university in all disciplines. Its strengths are especially noted in economics, medical sciences, education, political science, law, business studies, English and history.

Part of the vision-setting will therefore consist in delineating the main areas where the institution wishes and has the potential to operate at the forefront. Some world-class institutions, such as the Indian Institutes of Technology, have specialized in a few engineering disciplines. The London School of Economics is best known for outstanding scholarship in economics, sociology, political science and anthropology. Even though Swiss universities do not reach the top 50, the Lausanne Hotel Management School (*Ecole Hôtelière de Lausanne*), the only European School accredited by the New England Association of Schools and Colleges, is considered to be one of the best in the world together with the University of Nevada and Cornell University's Schools of Hotel Administration.

In identifying a distinct area of emphasis, institutions aspiring to become world-class universities do not need to replicate what the current top universities do. They can innovate in many different ways. They can for instance choose a radically different approach to organize the curriculum and pedagogy of the institution, as the newly established Olin College in Massachusetts and LimKokWing University College of Creative Technology in Malaysia have attempted in the field of engineering and technology. Or they may opt for linking their transformation to shifting regional or local development opportunities, as illustrated by the example of Clemson University in South Carolina (see box 6).

Box 6 – Developing a New Vision at Clemson University

Clemson University, a land grant university in South Carolina traditionally focused on agriculture and mechanical engineering, has undertaken a radical transformation process in recent years. Based on an in-depth analysis of the conversion of South Carolina into one of the leading automotive regions in the US, Clemson University formed a strategic partnership with BMW with the aim of recreating itself as the premier automotive and motor sports research and education university. Its new vision statement specifically mentions the target of becoming one of the nation's top-20 public universities (as measured by *US News and World Report*), up from rank 74 four years ago and 34 in 2005.

Source: Presentation by Chris Przirembel, Vice-President for Research and Economic Development, Clemson University, at MIT Conference on Local Innovation Systems, Cambridge, Massachusetts, 13 December 2005.

3.2.2 Sequencing. The time dimension is an important aspect that needs also to be factored into the strategic plan of the aspiring world-class university. Developing a culture of excellence does not happen from one day to the other. Proper sequencing of interventions and careful balance between the quantitative objectives are required in order to avoid experiencing the kinds of growing pains that some of the Chinese universities have encountered (Box 7).

Box 7 – Obstacles to the Transformation of Chinese Universities

There are signs that China's plans to achieve world-class stature are meeting some obstacles. First is the concern that Chinese universities have expanded too quickly at the expense of maintaining quality. Second, the academic culture that demands quick results hampers innovative and long-term research efforts. While the "publish or perish" culture is strong in the United States, such pressures are often balanced with the recognition of the value of creativity and originality. Lack of undergraduate students with a strong foundation in science and technology is the third weakness. Without well-trained students entering the graduate programs, first-class faculty and laboratories will be underutilized. Fourthly, lack of academic freedom is a serious issue in China. Faculty and students are encouraged to question government policies or engage in debates on pressing issues in only a limited way, with some disincentive for creative thinking.

Finally, China's vision of world class universities focuses almost exclusively on factors such as increased publications in international journals, up-to-date laboratories, more buildings, star professors and additional funding (Mohrman 2003). Yet the vision is largely imitative rather than creative. Ruth Simmons (2003), president of Brown University, emphasizes the importance of other factors: "the bedrock of university quality in the United States is peer review, a system in which standards are set by leaders of the field and those leaders are themselves challenged and judged by this process". Simmons goes on to note that "universities promote the capacity of scholars to develop original work that is not immediately applicable or useful. Great universities are not only useful in their own time but in preparing for future times. What allows a great university to do that is as little interference from the state as possible. The role of the state is to provide resources but to give wide latitude to universities' leaders to decide how scholarship is to advance." Their universities might do better to focus on building world-class departments, institutes or schools, rather than trying to excel on all accounts (Altbach 2003).

It is important to stress that vision development and strategic planning are not a one-time exercise. In a highly competitive environment, the more successful organizations in both business and academia are those that are relentless in challenging themselves in the pursuit of better and more effective ways of responding to client needs. With constant replenishment of intellectual capital, performance is never static in the best universities. The most successful institutions are not content with relying on past accomplishments but always aspire to be among the best in the world and, internally, they create an atmosphere of competitiveness that lets them do just that.

Not even the most famous universities are immune from the necessity to evolve and adapt to changing circumstances, as Oxford University's failed attempt at financial reform illustrates. In recent years, the University's central authorities have faced the need for additional resources to be able to continue hiring internationally renowned professors and researchers in an increasingly competitive market for academics. But they have been constrained by traditional governance arrangements whereby the bulk of Oxford University's wealth is controlled by the individual colleges. One aspect of the reform proposals submitted in 2006 by John Hood, the new Vice-Chancellor recruited from New Zealand, was to give more power over these resources to the University's central leadership, while also allowing for increased financial oversight by outsiders. But the reform was rejected by Oxford's academic community (The Times, 2006).

3.2.3 Internationalization Dimension. One way of accelerating the transformation into a world-class university is to use the internationalization card effectively. An influx of top foreign students can be instrumental in upgrading the academic level of the student population and enriching the quality of the learning experience through the multi-cultural dimension. In this regard, the capacity to offer programs in a foreign language, especially English, can be a powerful attraction factor. Among the 100 top universities according to the SJTU ranking, 11 come from non native English speaking countries where some of the graduate programs are offered in English (Denmark, Finland, Israel, the Netherlands, Norway, Sweden, and Switzerland).

As discussed earlier, the ability to attract foreign professors and researchers is also an important determinant of excellence. Universities need to be able to offer incentives including flexible remuneration and employment conditions to bring on board, on a short or medium term basis, top academics from other countries. These individuals can help upgrade existing departments or establish graduate programs and research centers in new areas of competitive advantage. In cases where it is difficult to attract foreign faculty on a full-time basis, the university can start by bringing leading foreign scholars on a temporary basis.

To facilitate the contribution of foreign scholars, a number of aspiring world-class universities have formed fruitful partnerships with top universities in industrial countries. This was the case of the Indian Institutes of Technology in the early years of their establishment (see box 4). More recently, the National University of Singapore, one of the emerging world-class universities, has relied most on strategic alliances, for example with MIT, Harvard, Duke, Johns Hopkins University, Eidhoven University of Technology in the

Netherlands, the Australian National University and Tsinghua University in China, to mention only the better known partner institutions.

Attracting leading scholars from the diaspora is another internationalization strategy that a few universities in India and China have implemented with success. Bejing University, for example, has hired hundreds of academics of Chinese origin. As part of its human resource strategy, the university closely monitors good Chinese scholars abroad and creates favorable conditions for their return.

Box 8 - How Diasporas can contribute to Development in Home Countries

A diaspora is a network of people coming from a same home country and living abroad. A successful diaspora network is characterized by the following three elements: (i) members of the diaspora are talented and show strong intrinsic motivation; (ii) they are involved in project implementation in their home country and serve as connectors, catalysts or vectors for projects development in the home country; (iii) its efficiency, continuity and development over time are based on concrete activities with measurable outcomes.

In most cases, diasporas and expatriate networks emerge spontaneously. However, government interventions can still be relevant to help develop or structure such initiatives. The first condition home countries need to fulfill in order to take advantage of these expatriate talents is to recognize them as an opportunity to develop a knowledge-based economy. Strategies to leverage diasporas vary with the country conditions on one hand, and the diaspora's characteristics on the other hand. Nevertheless, a common and critical element to efficiently use expatriate talent is the existence of solid institutions..

An excellent illustration of efficient search diaspora network is GlobalScot, a network of high powered Scots from all over the world who use their expertise and influence as antennae, bridges, and springboards to generate projects in Scotland. Launched in 2002, this network has proven extremely attractive and efficient with 850 influential businesspeople participating in 2005, and therefore contributing to Scotland's economic development strategy. Chile Global and Mexico Talent Abroad Network took GlobalScot as an inspiring model and are on the way to successfully adapt it to their respective specificities.

Diasporas as search networks can be compared to and learn from alumni networks. Therefore, there is a great opportunity for tertiary institutions to participate in the diaspora network process. Universities have indeed a potent comparative advantage to follow distinctive alumni, identify leaders abroad, and gradually build a search network. This is how successful diasporas begin.

Source: Kuznetsov, 2006

Related to this internationalization dimension is the extent to which national researchers have the linguistic competence to publish in English. One way in which institutions and academics advance their reputation is by their presence in scientific publications. Since citation indices compile data primarily from journals published in English, the facility with which academics can disseminate research results in English becomes a critical factor in enhancing institutional reputation. Needless to say that institutions functioning in English are more likely to engender such success.

In some cases, universities have also found it useful to hire a foreign professional to lead the institution through the proposed transformation process. South Korea, the UK and Australia are examples of countries where this has happened in recent years. Of course, this approach is not always well accepted. Bringing an outsider to lead a flagship university can hurt national sensitivities and not many countries have shown the disposition to undertake international recruitment searches to fill the highest university positions. But this is one of the ways in which institutions can challenge themselves into "thinking outside the box" and embracing a change management mindset.

In the case of science and technology oriented universities, the ability to attract research contracts from foreign firms and multinational corporations is a good measure of how the scientific standing of rising universities is recognized by companies. In recent years, a few Chinese and Indian universities have received important research contracts from North American and European firms, sometimes at the expense of universities in the countries of origin of the companies (Yusuf and Nabeshima, 2007).

3.2.4 Summary Checklist. The following critical questions need to be reviewed to guide the quest towards establishing world-class universities:

At the National Level

- How many world class universities are desirable and affordable?
- What strategy would work best in the country context: upgrading of existing institutions, merger of existing institutions, or creation of new institutions?
- What should be the selection process (in the first or second case)?
- How will the transformation be financed?
- What are the governance and management arrangements that must be put in place to support this transformation?
- What will be government's role in this process?

At the Institutional Level

- Does the institution have a winning leadership team?
- What is the overall vision and what are the specific goals that the university is seeking to achieve?
- In what niche(s) will it pursue excellence in teaching and research?
- How will the internationalization of the university be achieved?
- What is the likely cost of the proposed qualitative leap and how is it going to be funded?
- How will success be measured? What outcome indicators and accountability mechanisms will be used?

4. Conclusion

Good is the enemy of great.
Jim Collins

The highest ranked universities are the ones that make significant contributions to the advancement of knowledge through research, teach with the most innovative curricula and pedagogical methods under most conducive circumstances, make research an integral component of undergraduate teaching, and produce graduates who stand out because of their success in intensely competitive arenas during their education and, more importantly, after graduation. It is these concrete accomplishments and the international reputation associated with these sustained achievements that make these institutions world class.

There is no universal recipe or magic formula for "making" a world-class university. National contexts and institutional set-ups vary widely. Countries must therefore choose, among the various possible pathways, a strategy that plays to its former strengths and present resources. But international experience provides a few lessons regarding the key features of such universities (high concentration of talent, abundance of resources, and flexible governance arrangements) and successful approaches to move in that direction, from upgrading or merging existing institutions to creating new institutions altogether.

Under any scenario, building a world-class university does not happen overnight. No matter how much money can be thrown at the endeavor, it is unrealistic to expect instant results. Creating a culture of excellence and achieving high quality outputs take many years.

Furthermore, the transformation of the university system cannot take place in isolation. The long term vision for creating world class universities, and its implementation, should be closely articulated with (i) the country's overall economic and social development strategy, (ii) ongoing changes and planned reforms at the lower levels of the education system, and (iii) plans for the development of other types of tertiary education institutions in order to build an integrated system of teaching, research, and technology-oriented institutions.

In that respect, it is worth observing that, while world-class institutions are commonly equated with top research universities, there are also world-class tertiary education institutions which are neither research-focused nor operate as universities *strictu sensu*. The UK Open University, for example, is widely recognized as the premier distance education institution in the world, and yet it does not make the international rankings Conestoga College in Ontario is ranked as the best community college in Canada, and in Germany the Fachhochschulen of Mannheim and Bremen have an outstanding reputation. Even among universities, international rankings clearly favor research-intensive universities at the cost of excluding excellent institutions that are primarily undergraduate. As countries embark on the task of establishing world-class universities, they may also want to consider the desirability of creating, besides research universities, excellent alternative institutions to meet the wide range of education and training needs that the tertiary education system is expected to satisfy.

Annex 1 - THES 2006 Country Ranking

Country Ranking	Country	International Rank of Top University in Country
1	USA	1
2	UK	2
3	China	14
4	Australia	16
5	France	18
6	Japan	19
7	Singapore	19
8	Canada	21
9	Switzerland	24
10	Hong Kong	33
11	New Zealand	46
12	Denmark	54
13	India	57
14	Germany	58
15	South Korea	63
16	Netherlands	67
17	Mexico	74
18	Belgium	76
19	Ireland	78
20	Austria	87
21	Russia	93
22	Taiwan	108
23	Finland	116
24	Israel	119
25	Sweden	122
26	Thailand	161
27	Norway	177
28	Malaysia	185
29	Spain	190
30	Italy	197

Annex 2 – Shanghai Jiao Tong University 2007 Country Ranking

Country Ranking	Country	Rank of Top University in Country
1	USA	1
2	UK	4
3	Japan	20
4	Canada	23
5	Switzerland	27
6	France	39
7	Netherlands	42
8	Denmark	46
9	Sweden	53
10	Germany	53
11	Australia	57
12	Israel	64
13	Norway	69
14	Finland	73
15	Russia	76
17	Singapore, Belgium, Italy, Brazil	102 – 150
21	Taiwan, South Korea, China, Spain, Argentina, Mexico	151 – 202
25	Czech Republic, Hong Kong, Ireland, Greece, New Zealand, South Africa	203 – 304
33	Hungary, India, Poland, Egypt	305 – 402
36	Chile, Turkey, Portugal, Slovenia	403 – 510

Source: 2007 Institute of Higher Education, Shanghai Jiao Tong University

Annex 3 Key Characteristics of World Class Universities

A world class university:

- has an international reputation for its research
- has an international reputation for its teaching
- has a number of research stars and world leaders in their fields
- is recognised not only by other world class universities, e.g., US Ivy League, but also outside the world of higher education

- has a number of world class departments (i.e., not necessarily all)
- identifies and builds on its research strengths and has a distinctive reputation and focus, i.e. its ‘lead’ subjects
- generates innovative ideas and produces basic and applied research in abundance
- produces path breaking research output recognised by peers and prizes, e.g., Nobel Prize Winners
- attracts the most able students and produces the best graduates
- can attract and retain the best staff
- can recruit staff and students from an international market
- attracts a high proportion of postgraduate students, both taught and research
- attracts a high proportion of students from overseas
- operates within a global market and is international in many activities, e.g., research links, student and staff exchanges, throughput of visitors of international standing
- has a very sound financial base
- receives large endowment capital and income
- has diversified sources of income, e.g., government, private companies sector, research income, overseas student fees
- provides a high quality and supportive research and educational environment for both its staff and students, e.g., high quality buildings and facilities/high quality campus
- has a first class management team with strategic vision and implementation plans
- produces graduates who end up in positions of influence and/or power, i.e., movers and shakers, e.g., Prime Ministers and Presidents
- often has a long history of superior achievement, e.g., Oxford and Cambridge in the UK and Harvard in the
- USA
- makes a big contribution to society and our times
- continually benchmarks with top universities and departments worldwide
- has the confidence to set its own agenda

Source: Alden and Lin (2004)

Annex 4 - Higher Education Reform in Denmark: The University Act of 2003

Through reforms in four key areas—institutional autonomy, institutional leadership, quality assurance and internationalization--, Denmark is in the process of transforming its university system into an independent sector contributing to broad national success by answering more effectively to the evolving labor market that it serves.

Institutional autonomy: Increased independence for Denmark's universities.

- As of 2003, all universities in Denmark are considered independent subsidiaries of the Ministry of Science, Technology, and Innovation.
- Funds are distributed based on established rates for research and on per student enrollments and completion, to establish more objective criteria for funding. Institutions are allowed to use their complete subsidies as they deem necessary, may also seek outside sources of funding, to complement the state contributions, and may establish profit-making activities.
- Performance Contracts, first introduced in 1999, serve as a kind of contract between the government and individual institutions regarding how that institution will seek to maximize its individual strengths. Institutions work to their strengths, as defined by themselves, and seek successes at points where they are most competitive.

Institutional leadership.

- Leadership at every level is balanced within and outside:
- Governance of the institution is primarily in the purview of an external majority university Board, whose members are elected, not appointed, and include representatives from both within and outside the university, including academic and administrative staff and students.
- Each university's Rector serves at the will of the Board.
- Deans are hired and supervised by the Rector and in turn hire and supervise Department Heads

Source: Universities Act 2003, retrieved on 12/14/05 from http://www.videnskabsministeriet.dk.

Annex 5 - Recent Research "Excellence" Initiatives

Country	Number of Target Institutions and Eligibility Criteria	Resources Allocated	Investment Horizon
Germany Excellence Initiative 2006 [55]	40 graduate schools 30 Clusters of Excellence (universities and private sector) 10 Top-level research universities	$2.3 billion in total	Five year funding Two rounds: 2006, 2007
Brain Korea 21 Program [56]	Science and Technology: 11 Universities Humanities and Social Sciences: 11 Universities Leading Regional Universities: 38 Universities Professional Graduate Schools in 11 Universities	$1.17 billion in total	7 years Two rounds in 1999
Korea Science and Engineering Foundation (KOSEF) [57]	1) Science Research Centers (SRC) /Engineering Research Centers (ERC): up to 65 centers 2) Medical Science and Engineering Research Centers (MRC): 18 Centers 3) National Core Research Centers (NCRC): 6 Centers funded in 2006	1) $64.2M / year= 2) $7M / year 3) $10.8M / year	1) up to 9 years 2) up to 9 years 3) up to 7 years= All 3 programs launched in FY 2002 or FY 2003
Japan Top-30 Program (Centers Of Excellence for 21st Century Plan) [58]	31 Higher Education Institutions	$150 million / year (Program Total: 37.8B Yen)	5 year funding Launched in 2002 3 rounds: 2002, 2003, 2004
Japan Global Centers of Excellence Program [59]	50 – 75 Centers Funded per year (5 new fields of study each year)	50 – 500 Million Yen per center per year (~$400,000 – $4M)	5 years Launched in 2007
European Commission, Framework Programme 7 (FP7) [60]	TBD – determined by structure of Research Proposals (RFPs)	Based on number of RFPs with a "centre of excellence" structure The overall FP7 budget is EUR 50.5 Billion covering 2007-2013 [61]	Launched in 2007 2007-2013
China 211 Project [62]	100 higher education institutions	$18 billion in 7 years ($400M to funding World Class Research Departments)	Launched in 1996

[55] http://www.dfg.de/en/research_funding/coordinated_programmes/excellence_initiative/

[56] http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN015416.pdf; http://www.bk21.or.kr/datas/english_ver.htm

[57] http://www.kosef.re.kr/english_new/programs/programs_01_04.html

[58] http://www.jsps.go.jp/english/e-21coe/index.html

[59] http://www.jsps.go.jp/english/e-globalcoe/index.html; http://www.jsps.go.jp/english/e-globalcoe/data/application_guidelines.pdf; http://www.jsps.go.jp/english/e-globalcoe/data/review_guidelines.pdf

[60] http://ec.europa.eu/research/era/pdf/centres.pdf

[61] http://cordis.europa.eu/fp7/what_en.html#funding

[62] http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN015416.pdf

Country	Number of Target Institutions and Eligibility Criteria	Resources Allocated	Investment Horizon
China 985 Project [63]	34 research universities	28.3B Yuan	1999 – 2001
Chinese Academy of Sciences (CAS) Institutes[64]	Mathematics and physics 15 Chemistry and chemical engineering 12 Biological sciences 20 Earth Sciences 19 Technological sciences 21 Others 2		
Canada Networks of Centers of Excellence [65]	23 currently funded Networks of Centers of Excellence 16 previously funded Networks	C$77.4 million per year since 1999 C$47.3 million a year in 1997-1999 C$437 million in total in 1988-1998	Operating since 1988 Permanent program since 1997
UK Funding for Excellent Units [66]	Universities with the highest marks after the Research Assessment Exercise	$8.63 billion disbursed after 2001 RAE	5 years for Research Council funded Centers [67] Two rounds: 1996 and 2001 2008 RAE Scheduled [68]
Chile Millennium Science Initiative [69]	Groups of Researchers:	3 Science Institutes: $1 million a year for 10 years; 5-12 Science Nuclei: $250 thousand a year $25 million in total in 2000-2004	Every 5 years for nuclei and every 10 years for institutes
Denmark (Globalization Fund)	Funds to be allocated to research universities on a competitive basis	$1.9 billion between 2007 and 2012	Launched in 2006
NEPAD / Blair Commission for Africa (Proposed) [70]	Revitalise Africa's institutions of higher education Develop centres of excellence in science and technology, including African institutes of technology	US$500 million a year, over 10 years up to US$3 billion over 10 years	
Taiwan Development Plan for University Research Excellence [71]	Selection and financial support of internationally leading fields	$400M	4 years

Elaborated by Natalia Agapitova, Michael Ehst and Jamil Salmi (last update 9 March 2007)

[63] http://www.oecd.org/dataoecd/9/45/37800198.pdf

[64] http://www.itps.se/Archive/Documents/Swedish/Publikationer/Rapporter/Arbetsrapporter%20(R)/R2007/R2007_001%20FoU-finansiarer.pdf

[65] http://www.nce.gc.ca/

[66] http://www.hefce.ac.uk/research/funding/

[67] http://www.rcuk.ac.uk/research/resfunding.htm

[68] http://www.rae.ac.uk/

[69] http://www.msi-sig.org/msi/current.html

[70] http://www.eurodad.org/articles/default.aspx?id=595

[71] http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN015416.pdf

References

On World-Class Universities

Alden, J. and G. Lin (2004). "Benchmarking the Characteristics of a World-Class University: Developing an International Strategy at University Level". London: The UK Higher Education Leadership Foundation. May 2004.

Altbach, Philip.G. (Summer 2005). A World-Class Country without World-Class Higher Education: India's 21st Century Dilemma. International Higher Education. Retrieved April 10, 2007, from www.bc.edu/cihe.

Altbach, Philip.G. (January-February 2004). The Costs and Benefits of World-Class Universities. Academe. Retrieved April 10, 2006, from www.aaup.org.

Altbach, Philip G. (2003). "The Costs and Benefits of World-Class Universities." *Academe* An American's Perspective." Hong Kong: Chinese University of Hong Kong-Hong Kong America Center.

Bradshaw, D. (2007). "India's elite schools aim at autonomy", The Financial Times. 14 October 2007.

Economist (The) (2005). *Secrets of success*. _London: September 10, 2005, Vol. 376, Issue 8443, p. 6.

French, Howard W. (2005). "China Luring Foreign Scholars to Make Its Universities Great." in *New York Times*. New York. January-February.

Goodall, A. (2006). The Leaders of the World's Top 100 Universities, *International Higher Education*. The Boston Center for International Higher Education.Number 42, Winter 2006, pages 3-4.

Kahn, A. and V. Malingre (2007). «Les *French economists* font école». Le Monde. 22 February 2007. Page 3.

Kehm, B. (2006). "The German "Initiative for Excellence" and the Issue of Ranking". International Higher Education. The Boston Center for International Higher Education. Number 44 Summer 2006.

Khoon, K.A. (2005). Hallmark of a World-Class University. College Student Journal. Retrieved April 10, 2007, from http://findarticles.com/p/articles/mi_m0FCR/is_4_39/ai_n16123684.

Kuznetsov, Y. (2006). Diaspora Networks and the International Migration of Skills: How Countries Can Draw on their Talent Abroad. Washington, DC: World Bank Institute Development Studies.

Levin, H., Jeong, D.W., and On, D. (2006). What is a World Class University? Paper prepared for the 2006

Conference of the Comparative & International Education Society. Retrieved April 12, 2007, from www.tc.columbia.edu/centers/coce/pdf_files/c12.pdf.

McNeill, D. (2007). "Japan's New Science Adviser Wants to Shake Up Higher Education". The Chronicle of Higher Education. Friday 25 May 2007. Retrieved at http://chronicle.com/daily/2007/05/2007052508n.htm.

Mohrman, Kathryn. (2003). "Higher Education Reform in Mainland Chinese Universities: *Morning Post*.

Neelakantan, S. (2007). "In India, Economic Success Leaves Universities Desperate for Professors". The Chronicle of Higher Education. 12 October 2007. Retrieved at http://chronicle.com/weekly/v54/i07/07a03701.htm.

Niland, J. (3 February 2000). The challenge of building world class universities in the Asian region. Retrieved April 10, 2006, from http://www.onlineopinion.com.au/view.asp?article=997.

Niland, J. (2007). The Challenge of Building World-Class Universities. In Sadlak, J. and Liu, N.C. (eds.), The World Class University and Ranking: Aiming Beyond Status. Bucharest: UNESCO-CEPES.

Orivel, F. (2004). "Pourquoi les universités françaises sont-elles si mal classées dans les palmarès internationaux?". Dijon: Notes de l'IREDU, May 2004.

Qureshi, Yakub. (March 9, 2007). 400 university jobs could go. Manchester Evening News. Retrieved May 20, 2007 from http://www.manchestereveningnews.co.uk/news/education/s/1001/1001469_400_university_jobs_could_go.html.

Schwartzman, J. (2005). Brazil's leading university: between intelligentsia, world standards and social inclusion. Instituto de Estudos do Trabalho e Sociedade.

Simmons, Beth. (2003). "How to Make a World-Class University." in *South China*

The Times (2006). "Dons urged to reject reforms". 14 November 2006.

Yusuf, S. and K. Nabeshima (2007). How Universities Promote Economic Growth. Washington D.C., The World Bank.

On the Knowledge Economy and the Role of Tertiary Education

Cookson, C. (2007). "Universities drive biotech advancement". The Financial Times, 6 May 2007.

Gibbons, M., C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, and M, Trow. 1994. The New Production of Knowledge: Science and Research in Contemporary Societies. London: Sage.

The World Bank. (2002). Constructing Knowledge Societies. Washington, DC: The World Bank.

The World Bank (1999). World Development Report 1999. Washington, DC: The World Bank.

On Rankings

Bougnol, M-L. and Dulá, J.H. (July 2006). Validating DEA as a ranking tool: An application of DEA to assess performance in higher education. Annals of Operations Research. Vol 145 (1), pp. 33-365.

Bowden, R. (2000). Fantasy higher education: University and college league tables. *Quality in Higher Education,* 6(1), pp. 41-60.

Brooks, R. L. (2005). Measuring University Quality. *Review of Higher Education*, 29(1), pp. 1-22.

Clarke, M. (2002). Some guidelines for academic quality rankings. *Higher Education in Europe*. 28(4), pp. 443-459.

Clarke, M. (July 2005). Quality assessment lessons from Australia and New Zealand. *Higher Education in Europe*, 30(2), pp. 183-198.

Diamond, N., & Graham, H. D. (2000, July/August). How should we rate research universities? *Change*, 32, pp. 20-33.

Dill, D. and Soo, M. (2005). Academic quality, league tables, and public policy: A cross-national analysis of university ranking systems. *Higher Education*, 49, pp. 495-533.

Eccles, C. (2002). The use of university rankings in the United Kingdom. *Higher Education in Europe 27*(4), pp. 423–432.

Filinov, N. B. and Ruchkina, S. (2002). The Ranking of Higher Education Institutions in Russia: Some Methodological Problems. Higher Education in Europe, Vol. 27(4), pp. 407-421.

Goddard, A. (February 1999). League tables may end in tiers. *Times Higher Education Supplement*, 1371, p. 1.

Institute for Higher Education Policy – IHEP (2007). College and University Ranking Systems: Global Perspectives and American Challenges. Washington DC.

Jobbins, D. (2005). Moving to a Global Stage: A Media View, *Higher Education in Europe*, 30(2), pp. 137-145.

Liu, N.C. and Liu, L. (July 2005). University rankings in China. *Higher Education in Europe*, 30(2), pp. 217-228.

Liu, N.C., and Cheng, Y. (2005). The Academic Ranking of World Universities, *Higher Education in Europe*, 30(2). pp. 127-136.

Pace, C.R., & Wallace, D.G. (1954). Evaluation of institutional programs. *Review of Educational Research*, 24(4), pp. 341-350.

Print M. & Hattie J. (1997). Measuring quality in university: An approach to weighting research productivity. *Higher Education*. 33, pp. 453-469.

Provan, D. and Abercromby, K. (December 2000). University league tables and rankings: A critical analysis. CHEMS Paper No. 30.

Ramsden, P. (1999). Learning to lead in higher education. London: Routledge.

Rocki, M. (July 2005). Polish rankings: Some mathematical aspects. *Higher Education in Europe,* 30 (2), pp. 173-182.

Salmi, J., and A. Saroyan, (2007). League Tables as Policy Instruments: Uses and Misuses. *Higher Education Management and Policy*. OECD, Paris. Volume 19, No. 2.

Shanghai Jiao Tong University. (2006). Academic Ranking of World Universities 2006. Retrieved April 15, 2006, from http://ed.sjtu.edu.cn/ranking2006.htm

SLATE: Organizational History, page 4. Retrieved on 13 March 2006, from http://www.slatearchives.org/orghist.htm

Stuart, D. (1995). Reputational rankings: Background and development. *New Directions for Institutional Research*, 88.

Stuit, D. (1960). Evaluation of institutions and programs. *Review of Educational Research*, 30(4), pp. 371-384.

THES. (2006). The Times Higher World University Rankings 2006. Retrieved April 15, 2006, from http://www.thes.co.uk/worldrankings/

Turner, D.R. (September 2005). Benchmarking in universities: league tables revisited. *Oxford Review of Education*. 31(3), pp. 353-371.

Usher, A. & Savino, M. (January 2006). A world of difference: A global survey of university league tables. Education Policy Institute: Canadian Education Report Series.

Van Dyke, N. (2005). Twenty years of university report cards, *Higher Education in Europe*, 30(2): Ranking systems and methodology in higher education, pp. 103-126

Williams, R. and Van Dyke, N. (2007). Measuring the international standing of universities with an application to Australian Universities. *Higher Education*. 53, pp. 819-841.

Winston, G.C. and Zimmerman, D.J. (2003). 'Peer effects in higher education', NBER Working Paper 9501. Retrieved May 10, 2006, from http://www.nber.org/papers/w9501.

Statistical Sources

CHE, 2007. Chronicle of Higher Education. http://chronicle.com. Section: The 2006-7 Almanac. Volume 53, Issue 1, Page 26.

Egide, 2007. Special report by the Egide Association. "Les enjeux de la mobilité." Accessed on June 7, 2007, at http://www.egide.asso.fr/fr/services/actualites/lettre/L34/dossier34.jhtml

OECD. (2007). Education at a Glance 2007. Paris: OECD.

UNESCO. (2006). Global Education Digest 2006. Montreal: UNESCO-UIS.

The Impact of "Seeking World-Class Status" from the Point of View of Internationalization/Globalization

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