

CHAPTER 18

The Challenge of Establishing World-Class Research Universities in Developing Countries

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INTRODUCTION

Preoccupations about university rankings reflect the general recognition that economic growth and global competitiveness are increasingly driven by knowledge and that universities 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 developing 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.

Tertiary education plays a critical role in that context. It helps countries build globally competitive economies by developing a skilled, productive and flexible labour 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

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can also play a vital role in their local and regional economies (Yusuf & Nabeshima, 2007).

According to *Constructing Knowledge Societies*, the World Bank's latest policy report on the contribution of tertiary education to sustainable economic development (World Bank, 2002), high-performing tertiary education systems encompass a wide range of institutional models — not only research universities but also polytechnics, liberal arts colleges, short-duration technical institutes, community colleges, open universities and so forth — that together produce the variety of skilled workers and employees sought by the labour market. Each type of institution has an important role to play, and achieving a balanced development among the various components of the system is a major preoccupation of many governments.

Within the tertiary education system, research universities play a critical role in training the professionals, high-level specialists, scientists and researchers needed by the economy and in generating new knowledge in support of the national innovation system (World Bank, 2002). An increasingly pressing priority of many developing countries is therefore to ensure that their top universities are actually operating at the cutting edge of intellectual and scientific development.

The main objective of this chapter is to explore the challenges involved in setting up globally competitive research universities in developing countries that will be expected to compete effectively with the best of the best. Is there a pattern or template that might be followed to allow more rapid advancement to world-class status? To answer this question, the chapter starts by constructing an operational definition of a world-class university. It then outlines and analyses possible strategies and pathways for establishing such universities and identifies the multiple challenges, costs and risks associated with these approaches. It concludes by examining some lessons from recent and ongoing experiences to set up new research universities in developing countries.

WHAT DOES IT MEAN TO BE A WORLD-CLASS UNIVERSITY?

In the past decade, the term “world-class university” has become a catchphrase, not simply for improving the quality of learning and research in tertiary education, but also, more importantly, for developing the capacity to compete in the global tertiary education marketplace through the acquisition, adaptation and creation of advanced knowledge. With governments keen on maximizing the returns on their investments in research universities, global standing is becoming an increasingly important concern for institutions around the world (Williams & Van Dyke, 2007).

Becoming a member of the exclusive group of world-class universities is not achieved by self-declaration; rather, elite status is conferred by the outside

world on the basis of international recognition. Until recently, the process involved a subjective qualification, mostly that of reputation. For example, Ivy League universities in the United States (U.S.), such as Harvard, Yale, or Columbia; the Universities of Oxford and Cambridge in the United Kingdom (U.K.); and the University of Tokyo 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 outstanding results such as training of graduates, research output and technology transfer.

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). Although most of the 45 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 THES and Shanghai Jiao Tong University (SJTU). Table 1 shows the results of the 2008 THES and SJTU world rankings.

Table 1: Top 20 Universities in *THES* and *SJTU* World Rankings, 2008

Rank	THES (2008)	Rank	SJTU (2008)
1	Harvard University	1	Harvard University
2	Yale University	2	Stanford University
3	University of Cambridge	3	University of California, Berkeley
4	University of Oxford	4	University of Cambridge
5	California Institute of Technology	5	Massachusetts Institute of Technology (MIT)
6	Imperial College London	6	California Institute of Technology
7	University College London	7	Columbia University
8	University of Chicago	8	Princeton University
9	Massachusetts Institute of Technology (MIT)	9	University of Chicago
10	Columbia University	10	University of Oxford
11	University of Pennsylvania	11	Yale University
12	Princeton University	12	Cornell University
13	Duke University	13	University of California, Los Angeles
13	Johns Hopkins University	14	University of California, San Diego
15	Cornell University	15	University of Pennsylvania

Table 1 cont'd: Top 20 Universities in *THES* and *SJTU* World Rankings, 2008

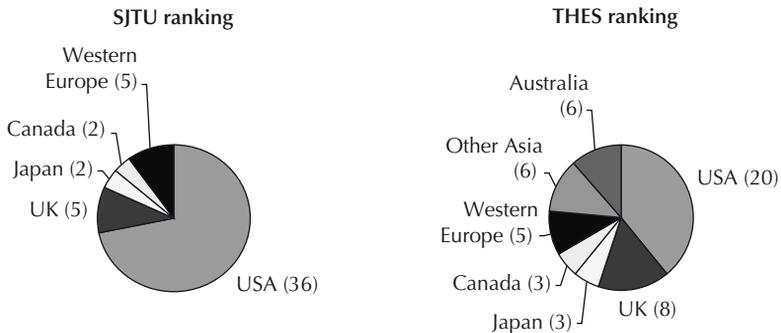
Rank	THES (2008)	Rank	SJTU (2008)
16	Australian National University	16	University of Washington, Seattle
17	Stanford University	17	University of Wisconsin, Madison
18	University of Michigan	18	University of California, San Francisco
19	University of Tokyo	19	University of Tokyo
20	McGill University	20	Johns Hopkins University

Sources: *THES* 2008; *SJTU* 2008.

Notwithstanding the serious methodological limitations of any ranking exercise (Salmi & 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 labour 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 licences.

As illustrated by Table 1, most universities recognized as world-class originate from a very small number of countries, mostly Western. In fact, the University of Tokyo is the only non-U.S., non-U.K. university among the top 20 in the *SJTU* ranking. If one considers that there are only between 30 and 50 world-class universities in total, according to the *SJTU* ranking they all come from a small group of eight North American and Western European countries, Japan being again the only exception. *THES* has a slightly wider range of countries of origin among the top 50 universities (11 countries), including Hong Kong, China; New Zealand; and Singapore, besides the usual North American and Western European nations (Figure 1).

Figure 1: Geographical Distribution of World-Class Universities (Top 50 in 2008)



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 and nongovernment 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 *et al.*, 2005; Niland, 2000, 2007).

In an attempt to propose a more manageable definition of world-class universities, this chapter makes the case that the superior results of these institutions — highly sought graduates, leading-edge research and dynamic technology transfer — can essentially be attributed to three complementary sets of factors: (a) a **high concentration of talent** (faculty and students), (b) **abundant resources** to offer a rich learning environment and to conduct advanced research, and (c) **favourable governance** features that encourage strategic vision, innovation and flexibility and that enable institutions to make decisions and to manage resources without being encumbered by bureaucracy.

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 (1997).

This has always been the hallmark of the Ivy League universities in the United States or the Universities of Oxford and Cambridge in the United Kingdom. And it is also a feature of the newer world-class universities, such as the National University of Singapore (NUS) or Tsinghua University in China.

Beijing's Tsinghua University said last month it would increase the number of awards this year. Students with high scores, such as champions of each province and winners of international student academic competitions, will be entitled to scholarships of up to 40,000 yuan (\$5,700), more than double that of last year.

University World News (UWN) (2008a).

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 inbreeding. Indeed, universities that rely principally on their own undergraduates to continue into graduate programs or that hire principally their own graduates to join the teaching staff are not likely to be at the leading edge of intellectual development. A 2007 survey of European universities found an inverse correlation between endogamy in faculty hiring and research performance: the universities with the highest degree of endogamy had the lowest research results (Aghion *et al.*, 2008).

It is also difficult to maintain high selectivity in institutions with rapidly growing student enrolment and fairly open admission policies. The huge size of the leading universities of Latin American countries such as México or Argentina — the Universidad Nacional Autónoma de México (Autonomous University of México, or UNAM) has 190,418 students, and the University of Buenos Aires (UAB) has 279,306 — 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 that 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, reflecting their strength in research and the fact that graduate students are closely involved in the research activities of these institutions.

The international dimension is becoming increasingly important in determining the configuration of these elite institutions. This enables them to attract the most talented people, no matter where they come from, and open themselves to new ideas and approaches. At the University of Cambridge, 18% of the students are from outside the U.K. or European Union (E.U.) countries. The U.S. universities ranked at the top of the global surveys also show sizable proportions of foreign academic staff. For instance, the proportion of international faculty at Harvard University, including medical academic staff, is approximately 30%. By contrast, only 7% of all researchers in France are foreign academics. Unquestionably, the world's best universities enrol and employ large numbers of foreign students and faculty in their search for the most talented.

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 U.K. 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 substantial endowment funding. It has managed to build up a sizable portfolio of US\$774 million through effective fund-raising, making it richer than any British university after Cambridge and Oxford. The United States and, to a lesser extent, Japan, have thriving private research universities.

A comparative analysis of the SJTU rankings of U.S. and Western European universities confirms that level of expenditures is one of the key determinants of performance. Globally, total spending on tertiary education (public and private) represents 3.3% of gross domestic product (GDP) in the United States versus only 1.3% in the EU25 countries. Per student spending is about US\$54,000 in the United States, compared with US\$13,500 in the European Union (Aghion *et al.*, 2008). Similarly, there are large spending variations among European universities that are correlated with the rankings results of the respective countries. The United Kingdom and Switzerland have relatively well-funded universities and achieve the highest country scores in terms of rankings, while universities from the Southern European countries, including France and Germany, have lower ranking scores associated with low levels of funding (Aghion *et al.*, 2007). The availability of abundant resources creates a virtuous circle that allows the concerned institutions to attract even more top professors and researchers.

Favourable Governance

The third dimension concerns the overall regulatory framework, the competitive environment, and the degree of academic and managerial autonomy that universities enjoy. The *Economist* (2005) referred to the tertiary education system in the United States as “the best in the world” and attributed this success not only to its wealth but also to its relative independence from the state, the competitive spirit that encompasses every aspect of it, and its ability to make academic work and production relevant and useful to society. The report 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, even in light of the legitimate accountability mechanisms that do bind them.

The comparative study of European and U.S. universities mentioned earlier also found that governance was, along with funding, the other main determinant of rankings. “European universities suffer from poor governance, insufficient autonomy and often perverse incentives” (Aghion *et al.*, 2007). A subsequent paper reporting on a survey of European universities found that research performance was positively linked to the degree of autonomy of the universities in the sample, especially with regard to budget management, the ability to hire faculty and staff, and the freedom to set salaries (Aghion *et al.*, 2008). With respect to the composition of university boards, the report concludes that “having significant outside representation on the board may be a necessary condition to ensure that dynamic reforms taking into account long-term institutional interests can be decided upon without undue delay.”

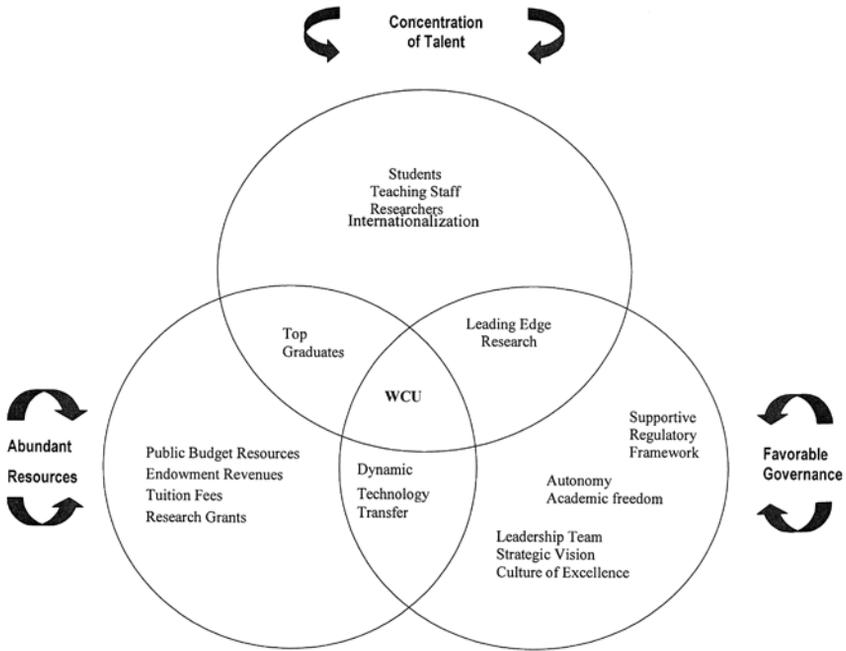
The autonomy elements outlined above are necessary, though not sufficient, to establish and maintain world-class universities. Other crucial governance features are needed, such as inspiring and persistent leaders; a strong strategic vision of where the institution is going; a philosophy of success and excellence; and a culture of constant reflection, organizational learning and change.

Alignment of Factors

Finally, it is important to stress that it is the combination of these three sets of features — concentration of talent, abundant funding and appropriate governance — that makes the difference. The dynamic interaction among these three groups of factors is the distinguishing characteristic of high-ranking universities (as illustrated by Figure 2). The results of the recent survey of European universities mentioned above confirm that funding and governance influence performance together. They indicate clearly that the higher-ranked universities tend to enjoy increased management autonomy, which, in turn, increases the efficiency of spending and results in higher research productivity (Aghion *et al.*, 2008). A study of the influence of governance arrangements on the research output of public universities in the U.S. arrives at the same conclusion. When competitive research funding is available, the more autonomous universities tend to be more successful in producing patents (Aghion *et al.*, 2009).

Having an appropriate governance framework without sufficient resources or the ability to attract top talent does not work either. Similarly, 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 is among the six largest producers of cars in the world, 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.

Figure 2: Characteristics of a World-Class University (WCU): Alignment of Key Factors



Source: Elaborated by Jamil Salmi

PATHS TO TRANSFORMATION

Two complementary perspectives need to be considered in examining how to establish world-class research universities. The first dimension, of an external nature, concerns the role of government 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 that they need to take to transform themselves into world-class research universities.

The 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 League universities in the United States reveals that, by and large, they grew to prominence as a result of incremental progress, rather than by deliberate government intervention. Similarly, the Universities of Oxford and Cambridge evolved over the centuries of their own volition, with variable levels of 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 favourable policy environment and direct public initiative and support, if only because of the high costs involved in setting up advanced research facilities and capacities.

International experience shows that three basic strategies can be followed to establish world-class research universities:

- Governments could consider upgrading a small number of existing universities that have the potential of excelling (picking winners).
- Governments could encourage 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 research institution (hybrid formula).
- Governments could create new world-class universities from scratch (clean-slate approach).

Upgrading Existing Institutions. One of the main benefits of this first approach is that the costs can be significantly less than those of building new institutions from scratch. This is the strategy followed by China since the early 1980s, with a sequence of carefully targeted reforms and investment programs. Indeed, Beijing University and Tsinghua University, China's top two universities, have been granted special privileges by the national authorities, allowing them to select the best students from every province before any other university, much to the consternation of the other leading universities around the country.

But this approach is unlikely to succeed in countries where the governance structure and arrangements that have historically prevented the emergence of world-class universities are not drastically revised. A comparison of the experiences of Malaysia and Singapore can serve to illustrate this point. Because Singapore was initially one of the provinces of the Malaysian Kingdom during the first few years following independence from the British, the contrasting stories of the University of Malaya and of the National University of Singapore (NUS) can be quite instructive, given their 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, which merged with Nanyang University in 1980 to create NUS. By all global ranking measures, NUS today functions as a true world-class university (ranked 19th 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 factors appear to be constraining the University of Malaya's

capacity to improve and innovate as effectively as NUS: affirmative action and restrictive admission policies, lower levels of financial support, and tightly controlled immigration regulations regarding foreign faculty.

The affirmative action policy implemented by the Malaysian government in favour of the children of the Malay majority population (*Bumiputras*) has significantly opened up opportunities for that segment of the population (Tierney & Sirat, 2008).

But the downside of these equity policies was that they prevented the university from being very selective in its student admissions to target the best and brightest in the country. Large numbers of academically qualified Chinese and Indian students, in particular, were unable to attend Malaysia's best universities and had to seek tertiary education abroad, thereby removing important talent from Malaysia. By contrast, the proportion of foreign students at NUS is 20% at the undergraduate level and 43% at the graduate level.

NUS is also able to mobilize nearly twice as many financial resources as the University of Malaya (US\$205 million annual budget versus US\$118 million, respectively) through a combination of cost sharing, investment revenue, fund-raising and government resources. The success of NUS's fund-raising efforts is largely the result of the generous matching-grant program set up by the government in the late 1990s as part of the Thinking Schools, Learning Nation Initiative, which provided a three-to-one matching at the beginning and is now down to one-to-one. As a result, the annual per student expenditures at NUS and the University of Malaya were US\$6,300 and US\$4,053, respectively, in 2006.

Finally, in Malaysia, on one hand, 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, particularly foreign faculty. NUS, on the other hand, is not bound by similar legal constraints. It is therefore able 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. Indeed, a good number of Malaysia's top researchers have been recruited by NUS.

Merging Existing Institutions. The second possible approach to building up a world-class research university consists of promoting mergers among existing institutions. In China, for example, a number of mergers have taken place to consolidate existing institutions. 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 United Kingdom, the Victoria University of Manchester (VUM) and the University of Manchester Institute of Science and Technol-

ogy (UMIST) merged, creating the largest university in the United Kingdom, with the purposefully stated goal of being “top 25 by 2015” (<http://www.manchester.ac.uk/research/about/strategy/>).

The government of the Russian Federation is also relying on amalgamation as a key policy within its overall strategy of developing elite research universities. In 2007, two pilot federal universities were set up by merging existing institutions in Rostov-on-Don in southern Russia and in the Siberian city of Krasnoyarsk. The two new institutions will also receive additional funding to support efforts to allow them to recruit highly qualified researchers and equip state-of-the-art laboratories (Holdsworth, 2008).

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 also be risky, potentially aggravating problems instead of resolving them.

The newly consolidated institution could suffer 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 or originally perceived. Currently acknowledging a £30 million budget deficit and the likelihood of up to 400 jobs lost on the campus, the University of Manchester has had immediate experience with the complexities of merging (Qureshi, 2007). Among the main problems encountered are duplication of staff and curricular offerings, the political challenges of engendering support for the merger by making promises that have proven detrimental to keep, and the short-term absorption of labour contracts and institutional debt.

Creating New Universities. In countries where institutional habits, cumbersome governance structures and bureaucratic management practices prevent traditional universities from being innovative, creating new universities may be the best approach, provided that it is possible to staff them with people not influenced by the culture of 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 favourable regulatory framework. One of the earlier success stories in that respect was the establishment of the Indian Institutes of Technology, which, in past decades, have gradually risen to world-class status.

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 has decided to set up a new international university in Astana. The plan is that this university will follow a highly innovative multidisciplinary curriculum designed in cooperation with leading foreign universities. In the same vein, the government of Saudi Arabia announced in late 2007 its plans for a US\$3 billion graduate research university, King Abdullah University of Science and Technology, which would operate outside the purview of the Min-

istry of Higher Education to allow for greater management autonomy and academic freedom than the regular universities of the kingdom enjoy.

Time is an important dimension that also needs to be factored into the strategic plan of any aspiring world-class university. However, governments are often under pressure to show immediate results, running the risk of taking precipitous decisions and overseeing the fact that the establishment of a strong research university is a long-term process. Building ultra-modern facilities before adequately defining programs, curricula and pedagogical practices that are fully aligned or hiring star researchers from overseas without matching them with a critical mass of national faculty are common mistakes. Developing a culture of excellence in research and teaching does not happen from one day to the next, it requires proper sequencing of interventions, careful balance among the various quantitative and qualitative objectives of the project, and a long-term view.

The creation of new institutions may have the side benefit of stimulating existing ones into becoming more responsive to the global competitive environment. In several countries, the emergence of high-quality private institutions has provoked the existing public universities into becoming more strategically focused. In Russia, for example, 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.

Strategies at the Institutional Level

The establishment of a world-class research university requires, above all, strong leadership, a bold vision of the institution's mission and goals, and a clearly articulated strategic plan to translate the vision into concrete targets and programs. Universities that aspire to better results engage in an objective assessment of their strengths and areas for improvement, set new stretch goals, and design and implement a renewal plan that can lead to improved performance. By contrast, many institutions are complacent in their outlook, lack an ambitious vision of a better future, and continue to operate as they have in the past, ending up with a growing performance gap compared with that of their national or international competitors.

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 leader needs to fully understand the core agenda of the institution and be able to apply the vision with the necessary operational skills.

A crucial element of the vision is the selection of niche domains of research toward which the institution will seek to build and maximize its comparative advantage. In that respect, it is important to underline that a research university — even a world-class university — most likely cannot excel in all areas. Harvard University, widely recognized as the number one institution of higher learning 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.

CONCLUSION

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 the 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 important) after graduation.

There is no universal recipe or magic formula for “making” a world-class research university. National contexts and institutional models vary widely. Therefore, each country must choose, from among the various possible pathways, a strategy that plays to its strengths and resources. International experience provides a few lessons regarding the key features of such universities — high concentrations 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 universities altogether.

Furthermore, the transformation of the university system cannot take place in isolation. A long-term vision for creating world-class universities — and its implementation — should be closely articulated with (a) the country’s overall economic and social development strategy, (b) ongoing changes and planned reforms at the lower levels of the education system, and (c) plans for the development of other types of tertiary education institutions to build an integrated system of teaching, research and technology-oriented institutions.

Finally, the building pressures and momentum behind the push for world-class research universities must be examined within the proper context to avoid over-dramatization of the value and importance of world-class institutions and distortions in resource allocation patterns within national tertiary education systems. Even in a global knowledge economy, where every nation, both industrial and developing, is seeking to increase its share of the economic pie, the hype surrounding world-class institutions far exceeds the need and capacity for many systems to benefit from such advanced education and research opportunities, at least in the short term.

REFERENCES

- Aghion, P., Dewatripont, M., Hoxby, C., Mas-Colell, A. & Sapir, A. (2009). "The Governance and Performance of Research Universities: Evidence from Europe and the U.S." National Bureau of Economic Research. Working Paper No. 14851, April 2009.
- Aghion, P., Dewatripont, M., Hoxby, C., Mas-Colell, A. & Sapir, A. (2008). "Higher aspirations: An agenda for reforming European universities". Bruegel Blueprint Series. Number 5.
- Aghion, P., Dewatripont, M., Hoxby, C., Mas-Colell, A. & Sapir, A. (2007). "Why reform Europe's Universities?" Bruegel Policy Brief. Issue 2007/04. September 2007.
- Altbach, Philip G. (January-February 2004). The Costs and Benefits of World-Class Universities. *Academe*. Retrieved 10 April 2006 from www.aaup.org.
- Cookson, C. (2007). Universities drive biotech advancement. *The Financial Times*, 6 May 2007.
- Csikszentmihalyi, M. (1997). *Creativity: Flow and the Psychology of Discovery and Invention*. New York: Harper Collins.
- Donoghue, S. & Kennerley, M. (2008). "Our Journey Towards World Class Leading Transformational Strategic Change". *Higher Education Management and Policy*. Paris: OECD. Forthcoming.
- Economist, The*. (2005). "Secrets of success". London: 10 September 2005, Vol. 376, Issue 8443, p. 6.
- Goodall, A. (2006). The Leaders of the World's Top 100 Universities, *International Higher Education*. Center for International Higher Education. Number 42, Winter 2006, pp. 3-4.
- Harman, G. & Harman, K. (2008). Strategic mergers of strong institutions to enhance competitive advantage. *Higher Education Policy*, 21, pp. 99-121.
- Holdsworth, N. (2008). "Russia: Super League of 'Federal' Universities". *University World News*. 26 October 2008.
- Institute for Higher Education Policy — IHEP (2007). College and University Ranking Systems: Global Perspectives and American Challenges. Washington D.C.
- Khoon, K. A. (2005). Hallmark of a World-Class University. *College Student Journal*. Retrieved 10 April 2007, from http://findarticles.com/p/articles/mi_m0FCR/is_4_39/ai_n16123684.
- Levin, M. H., Jeong, D. W. & Ou, D. (2006). What is a World Class University? Paper prepared for the 2006 Conference of the Comparative & International Education Society. Retrieved 12 April 2007 from www.tc.columbia.edu/centers/coce/pdf_files/c12.pdf.
- Niland, J. (3 February 2000). The challenge of building world-class universities in the Asian region. Retrieved 10 April 2006 from <http://www.onlineopinion.com.au/view.asp?article=997>.
- Niland, J. (2007). The Challenge of Building World-Class Universities. In J. Sadlak & N. C. Liu (eds.), *The World Class University and Ranking: Aiming Beyond Status*. Bucharest: UNESCO-CEPES.

- Qureshi, Yakub. (9 March 2007). 400 university jobs could go. *Manchester Evening News*. Retrieved 20 May 2007 from http://www.manchestereveningnews.co.uk/news/education/s/1001/1001469_400_university_jobs_could_go.html.
- Salmi, J. & Saroyan, A. (2007). League Tables as Policy Instruments: Uses and Misuses. *Higher Education Management and Policy*. OECD, Paris. 19 (2).
- Salmi, J. (2009). *The Challenge of Establishing World-Class Universities*. Washington D.C.: The World Bank.
- Shanghai Jiao Tong University. (2007). *Academic Ranking of World Universities 2007*. Retrieved 30 March 2008 from <http://ed.sjtu.edu.cn/ranking2006.htm>.
- The World Bank. (2002). *Constructing Knowledge Societies: New Challenges for Tertiary Education*. Washington, D.C.: The World Bank.
- THES. (2007). *The Times Higher Education World University Rankings 2007*. Retrieved 30 March 2008 from <http://www.thes.co.uk/worldrankings/>.
- Tierney, W. & Sirat, M. (2008). "Challenges Facing Malaysian Higher Education". *International Higher Education*. Boston: Number 53, Fall 2008, pp. 23-24.
- University World News (2008). China: Growing competition for top students. Retrieved 14 June 2008 from <http://www.universityworldnews.com>
- Williams, R. & Van Dyke, N. (2007). Measuring the international standing of universities with an application to Australian Universities. *Higher Education*. 53, pp. 819-841.
- Yusuf, S. & Nabeshima, K. (2007). *How Universities Promote Economic Growth*. Washington D.C.: The World Bank.