In the past decade, the term *world-class university* has become a catchphrase to describe research universities at the pinnacle of the tertiary education hierarchy.\(^1\) However, as Philip G. Altbach (2004) has accurately observed, the paradox of the world-class university is that “everyone wants one, no one knows what it is, and no one knows how to get one.”

Becoming a member of the exclusive group of world-class universities is not something that can be achieved by self-declaration. This elite status—exemplified by U.S. Ivy League universities such as Harvard, Yale, or Columbia; the universities of Oxford and Cambridge in the United Kingdom; and the University of Tokyo—is usually conferred by the outside world on the basis of international recognition. Until recently, being deemed world class was based on a subjective qualification, mostly but not exclusively, of perceived reputation. However, no rigorous measures existed to quantify the inputs and processes that lead to the superior achievements and status of world-class universities in terms of training top graduates, producing leading-edge research, and contributing to dynamic knowledge and technology transfer. Even the higher salaries earned by those institutions’ graduates could be interpreted as much as a signaling proxy to employers or the power of social capital in networking as the true value of their education.
The proliferation of international league tables in the past few years—extending the tradition of national rankings in the United States—has created more systematic ways of identifying and classifying world-class universities. The two most comprehensive world rankings, allowing for broad benchmark comparisons of institutions across national borders, are prepared by Shanghai Jiao Tong University (in 2003) and by Times Higher Education (since 2004). A third international ranking by Webometrics in Spain compares 4,000 tertiary education institutions and measures their visibility on the Internet as a proxy of the importance of the concerned institution. Since 2007, the Higher Education Evaluation and Accreditation Council of Taiwan has published a world ranking of universities based on academic performance and research output.

The international rankings have attracted even more attention than their producers originally anticipated, and the impact has been dramatic (Altbach 2006). In a small number of countries, the results are a source of national pride, but more often than not, they are a matter of great concern (Salmi and Saroyan 2007). The results are often dismissed by many critics as irrelevant exercises fraught with data and methodological flaws; boycotted or challenged legally by some universities that are angry about the results; and sometimes used by political opponents as a convenient way to criticize governing parties or, even, entire governments. One thing is sure: they do not leave institutions and stakeholders indifferent.

Governments and institutions worldwide have responded to the university rankings with both words and concrete actions. At the national level, government reactions have ranged from plans to create alternative rankings to proactive policies in support of qualitative transformations in the university sector. At one extreme, RatER, the Russian Federation ranking agency, created an entirely new world ranking, which happened to place Moscow State University in fifth place ahead of Harvard University and the University of Cambridge (Smolentseva 2010). In 2008, during the French presidency of the European Union, the minister of higher education convinced the European Commission to launch a new European ranking that would be “more objective and more favorable to European universities.”

Rather than trying to circumvent the existing international rankings, some governments have provided additional funding to promote national elite universities with explicit or implicit designs to improve the institutions’ position in the rankings. Those efforts are best illustrated by the various “excellence initiatives” taken in recent years in places as varied as China; Denmark; Germany; the Republic of Korea; Nigeria, Russia; Spain;
or Taiwan, China (Salmi 2009). In other cases, governments have encouraged top universities to merge to achieve economies of scale and to reach a better position to compete globally. The Russian government, for example, has promoted the merger of regional tertiary education institutions in Siberia and southern Russia into two federal universities and has provided additional funding to develop innovative programs in existing universities (Smolentseva 2010).

Significant behavioral changes have also been observed at the institutional level (Hazelkorn 2008). In some cases, colleges and universities have become more selective to fare better in rankings that measure the academic scores of incoming students. In many corners of the world, institutions are eagerly participating in the talent war to recruit top-level academics from the best universities internationally. As excellence tends to beget excellence, the effect of the rankings can be seen in the virtuous cycle, where the highest-ranked institutions can attract the best faculty and the best researchers, in turn, want to belong to and be validated by the highest-ranked universities. This cycle then extends to the best students wanting to study with the best faculty, which reinforces the institutional ranking, and so on. Ellen Hazelkorn (2008) also found that donors and philanthropists who offer scholarships for study abroad or funding for research look increasingly to the rankings to provide clues to excellence and to help make decisions about where to direct their resources.

But building a world-class institution requires much more than knee-jerk reactions to the rankings or massive infusions of government money. It is a complex and lengthy process that has only recently begun to receive careful attention (Altbach 2004; Salmi 2009). Not surprisingly, the top 10 universities in the Academic Ranking of World Universities were all founded before 1900, and two are more than eight centuries old (annex 11A).

In this book, the nine case-study chapters—covering 11 universities—illustrate the systematic efforts and multiple challenges faced by institutions trying to pursue the “road to academic excellence.” This synthesis chapter attempts to identify common themes and preliminary lessons gleaned from the stories of these relatively young institutions, which have achieved outstanding results, shown promising signs of success, or faced reversals of fortune. After exploring the extent to which the findings of the case studies confirm or contradict the analytical model proposed in the introduction, this last chapter identifies important additional dimensions that should be taken into consideration to more accurately comprehend the success factors of top research universities. It proposes, in particular,
to take a systematic look at the role of the tertiary education ecosystem, which represents the relevant external forces that directly influence—positively or negatively—the ability of research universities to prosper.

**Testing the Model: Common Themes**

Analyzing the experience of the 11 universities with a common framework allows, for the first time, a real-life testing of the three-sets-of-factors model (talent, funding, and governance) developed by Salmi (2009) in *The Challenge of Establishing World-Class Universities*.

**Talent**

As all the case studies systematically illustrate, a key success factor in building a top research university is the ability to attract, recruit, and retain leading academics. Notably, what truly distinguishes the East Asian universities from the rest of the world is the marked emphasis on internationalization. Both Shanghai Jiao Tong University (China) and Pohang University of Science and Technology (the Republic of Korea) made a strategic decision to rely principally on Chinese or Korean academics trained in the best universities in North America or Europe and, to a large extent, to recruit highly qualified foreign faculty. Significantly increasing the percentage of courses taught in English is an integral part of this strategy, as well. It serves the dual purpose of making it easier to bring in foreign academics and gearing the curriculum toward training students for the global economy. A recent book, *The Great Brain Race* (Wildavsky 2010), provides a well-documented analysis of the rising international talent war. By contrast, because the University of Malaya (Malaysia) teaches courses predominantly in the national language (Bahasa Malaysia), it has a much more limited internationalization of programs, academic staff, and student body.

Hong Kong University of Science and Technology (Hong Kong SAR, China) has pushed this logic to the extreme. The rapid development and rise of the new university can be attributed, in large part, to its systematic policy of giving priority to outstanding Chinese from the diaspora for staffing the initial contingent of academics. This university’s story contains another important lesson, as well; the university recognized that building a strong academic staff is not only about attracting experienced researchers but also about reaching a good balance between academics at the peak of their career and young researchers with promising prospects. Thus, it established recruitment processes in support of that objective.
Pohang University of Science and Technology’s recruitment strategy has shown the same strategic concern of balance between experienced and promising researchers.

In other parts of the world (for example, Eastern Europe, India, and Latin America), staffing approaches have been characterized more by efforts to attract strong academics from the domestic market rather than from the full international arena. Indian Institutes of Technology followed a mixed approach by recruiting academics from the diaspora and local institutions. This strategy worked well for several decades but now that the Indian labor market has become more dynamic, private companies effectively compete for the most qualified professionals, and several Indian Institutes of Technology are facing serious staffing problems.

Similarly, Chilean universities seem to be limited by the fact that full-time professors represent less than half of their teaching staff. In Nigeria, as political troubles mounted under the successive military dictatorships, the University of Ibadan gradually lost its most talented researchers. Many left the country and the continent altogether, and the institution has not been able to replace them with equally qualified and experienced academic staff.

The quality of incoming students represents the second dimension when looking at “concentration of talent” as a key driver of success. In most cases, the institutions analyzed in this book have been very successful in attracting the best students in their country, such as National University of Singapore, Shanghai Jiao Tong University, Indian Institutes of Technology, Monterrey Institute of Technology in Mexico, the University of Chile and Pontifical Catholic University of Chile. In fact, Indian Institutes of Technology may well be the most competitive network of tertiary education institutions in the world, with an acceptance rate of only 1.6 percent (608 applicants for each place), compared, for example, with the all-time-low acceptance rate of 6.9 percent at Harvard for the incoming September 2010 class.

The 2002 admissions reform at the University of Malaya, which replaced the quota system with a meritocratic entrance procedure, reflects a genuine concern about attracting better-qualified students. The move was all the more important because the quality of secondary school graduates has been a preoccupation for the national education authorities. According to the Trends in International Mathematics and Science Study (TIMSS) 2007 results, Malaysian students perform below the average of all 49 participating countries and significantly below Singapore and other East Asian emerging economies.
The case studies of Pohang University of Science and Technology, Higher School of Economics (Russia), and Hong Kong University of Science and Technology illustrate a special challenge faced by new institutions that, by definition, have no comparative track record to boost their appeal and credibility among prospective students. Pohang University of Science and Technology faced the additional challenge of being located far from Seoul, where more than half the country’s tertiary education infrastructure is concentrated. However, using innovative marketing approaches to showcase their operational excellence, the three institutions managed to overcome those obstacles and to establish themselves fairly rapidly as worthwhile options for students choosing from among the top institutions in the respective countries. The Higher School of Economics, for instance, ranks among the top three universities in Russia in terms of average scores of incoming students at the Unified State Examination. The University of Ibadan’s decision to transform itself—for example, to have more graduate students than undergraduates—is an indication of its desire to strengthen its research focus and output, which is a key feature toward attaining world-class status.

At the same time, the high degree of admissions selectivity of emerging research universities raises a general equity issue, especially in the case of private institutions with high tuition fees. Unless they can pursue need-blind admissions policies and offer student aid to a significant proportion of incoming students, these universities risk operating as elitist institutions in terms of socioeconomic composition of the student body.

The balance between undergraduate and graduate students is an important dimension of this discussion on talent concentration. As expected, the more successful research universities tend to have a high proportion of graduate students, as illustrated by table 11.1, which allows the institutions to have a critical mass of research teams.

Institutions with a smaller proportion of graduate students are making deliberate efforts to increase the ratio, such as the Higher School of Economics (planning for 40 percent within 10 years), the National University of Singapore, and the University of Malaya. Even in some institutions with a high proportion of graduate students, the research nature of the institution is also reflected in the participation of undergraduate students in research projects as part of their regular curriculum and the important contribution that top researchers provide to undergraduate teaching.

Finally, it should be noted that the global financial crisis could play out as a positive factor for emerging research universities in many
developing and transition countries. First, institutions have the opportunity to reexamine their academic and financial models in ways that promote innovative thinking, creativity, and efficiency—because of scarcities that may not have been felt in times of abundant resources. Second, the severe budget cuts and resulting lack of employment opportunities in academic institutions in North America and Western Europe may make it easier for institutions in other parts of the world to keep their best academics home and to attract talented young academics away from the best universities in the West.

**Resources**

As expected, the findings of the case studies confirm that emerging research universities need to be well resourced to progress rapidly. This fact emerged appeared clearly from the East Asian cases, as well as from the comparison between the National University of Singapore and the University of Malaya. One reason behind the National University of Singapore’s better performance overall is its ability to spend, year after year, two to three times as much per student as the latter. Similarly, Indian Institutes of Technology were always privileged in comparison with the leading public universities in India.

Abundant funding is indispensable not only for setting up first-rate facilities and an appropriate physical infrastructure but also for attracting and retaining high-level academics. The comparative data shown in annex 11B unequivocally show that the top performers in the rankings among the institutions included in this book have the highest level of annual per

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**Table 11.1 Importance of Graduate Students**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Graduate students (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indian Institute of Technology–Bombay</td>
<td>58</td>
</tr>
<tr>
<td>Pohang University of Science and Technology</td>
<td>55</td>
</tr>
<tr>
<td>Shanghai Jiao Tong University</td>
<td>42</td>
</tr>
<tr>
<td>Ibadan University</td>
<td>37</td>
</tr>
<tr>
<td>Hong Kong University of Science and Technology</td>
<td>36</td>
</tr>
<tr>
<td>University of Malaya</td>
<td>33</td>
</tr>
<tr>
<td>National University of Singapore</td>
<td>23</td>
</tr>
<tr>
<td>Higher School of Economics</td>
<td>15</td>
</tr>
<tr>
<td>University of Chile</td>
<td>15</td>
</tr>
<tr>
<td>Monterrey Institute of Technology</td>
<td>14</td>
</tr>
<tr>
<td>Pontifical Catholic University of Chile</td>
<td>13</td>
</tr>
</tbody>
</table>

*Source: Author based on data from the chapters of this book.*
student funding, ranging from close to US$40,000 in the case of the National University of Singapore to US$70,000 for Pohang University of Science and Technology. At the other end of the spectrum, the financial limitations experienced by the Chilean universities or Higher School of Economics, for instance, are part of the challenge they face in upgrading the qualifications of their academic staff.

Most of the institutions reviewed in this book are public institutions, which reinforces the proposition of the difficulty in today’s environment to consider establishing a new world-class institution using only private resources. Potentially, under special circumstances, this establishment might be achieved, as illustrated by the history of the three private institutions included in the book. But these experiences need to be understood within their specific contexts. The Pontifical Catholic University of Chile, for example, has been in the privileged position of receiving public funding to cover a nonnegligible part of its recurrent expenditures just like any other public university in Chile. As annex 11C shows, it receives the same percentage of its total annual income as the University of Chile (11 percent). Pohang University of Science and Technology has also obtained public subsidies (6 percent of its annual income) to complement the generous contribution from the Pohang Iron and Steel Company, the Korean steel giant (34 percent of annual budget). With an annual spending of about US$70,000 per student, Pohang University of Science and Technology compares favorably with Ivy League universities in the United States, all of which are private, nonprofit institutions receiving high levels of public funding—in many cases, more than some “official” public universities—through research grants and targeted student aid. Monterrey Institute of Technology, in addition to being well supported at the outset by wealthy industrialists, has enjoyed considerable resources through a popular lottery that the federal government allows it to run every year and through government scholarships for some of its graduate students. None of these high-quality private institutions subsists on private sources of funding alone.

Most of the universities showcased in this book have successfully diversified their funding sources by managing to mobilize significant additional resources beyond the direct subsidies they receive from government (see annexes 11C and 11D). The National University of Singapore’s US$1 billion endowment is an impressive achievement. Part of the additional resources generated by successful institutions comes from donations, even though it takes time for new institutions to build up a solid funding base from alumni. The other part is usually
linked to the university’s ability to compete for public research funds. Hong Kong University of Science and Technology, for instance, obtained 72 percent of its research funding on a competitive basis in 2009.

The availability of competitive research funding is indeed an important factor. In their comparative analysis of European and U.S. universities, Philippe Aghion and colleagues observed that regardless of the level of public funding and degree of management autonomy, the weak development of competitive funding mechanisms was one of the major differences identified to explain the much-lower performance of European research universities in international rankings (Aghion et al. 2009). Similarly, a recent report released by the League of European Research Universities attributes the inability of the old continent’s universities to significantly contribute to the production of innovative products and services to inappropriate funding mechanisms. Instead of allocating research money in a competitive way, on the basis of criteria that reward excellence, most European countries display an “obsession with bureaucratic even-handedness” (LERU 2010, 3).

Finally, being well resourced in the early days of an institution is not sufficient for building a top-notch research institution. Funding must be sustained over the long term. The University of Ibadan’s story shows that as the political situation deteriorated in Nigeria, so did economic conditions and the amount of budget resources available to the university. Similarly, in Russia, while the Higher School of Economics received a high level of funding when the new institution was launched, the government was unable to sustain its contribution, especially in terms of capital investment, during the financial crisis after 2007.

**Governance**

The case studies, which analyze a number of positive and less favorable governance situations, show that an appropriate regulatory framework, strong and inspiring leadership, and adequate management significantly influence the ability of research universities to prosper. Indian Institutes of Technology, for example, would not have operated as effectively as they do if they had been constrained by the same financial and administrative regulations that all other public tertiary education institutions must adhere to in India. They have also, by and large, been protected from political interference for the selection of vice chancellors and the recruitment of academics.

The comparison between the University of Malaya and the National University of Singapore illustrates in a striking way the differences in
leadership and management approaches and their direct impact on the respective performance of the two institutions. Similarly, the University of Chile’s status as a public entity prevents it from competing on a level playing field with the Pontifical Catholic University of Chile. Paradoxically, the latter is not subject to the same rules concerning administrative, procurement, and financial control as the former, even though the Pontifical Catholic University of Chile receives budget contributions from the state as other public universities do. The University of Chile is also handicapped by excessive decentralization, which undermines the power of the rector, and by not having a board with outside stakeholders that can help the university to respond better to the needs of society.

As private universities, Pohang University of Science and Technology and Monterrey Institute of Technology have enjoyed much more autonomy and flexibility than public universities in Korea and Mexico, respectively. And as just discussed, the Pontifical Catholic University of Chile has certainly benefited from its status as a private institution by enjoying the best of two worlds—the agility and independence of a nonpublic university, while obtaining public subsidies on a regular basis.

The key dimensions of autonomy brought out by the case studies include the ability to mobilize significant additional funding from a variety of nonpublic sources; to provide attractive remuneration packages for top academics; and to boost the international nature of the institution in terms of program content, language of instruction, and focus of the research.

The Hong Kong University of Science and Technology case study vividly illustrates the importance of leadership for achieving rapid progress. The deliberate decision to hire an experienced university president from the Chinese diaspora by the sponsors of the new university was undoubtedly a major factor contributing to the success of Hong Kong University of Science and Technology. Similarly, Monterrey Institute of Technology benefited from stability in terms of overall direction and management, with its founding entrepreneur remaining as chair of its governing board for 30 years and the same rector at the helm of the institution for the past 20 years.

One of the ways in which purposeful leadership manifests itself is through the talent of articulating an enticing vision for the future of the institution to all its stakeholders. Good salaries are not enough to attract and motivate high-performing academics; faculty members must feel that they are part of a significant project to ensure their full commitment toward the construction or renewal of the institution. In the words of the
first president of Hong Kong University of Science and Technology about the qualities and motivation of his academic staff members, “they had talent, they had ability, but in the end what brought them here was their hearts.” When Pohang University of Science and Technology was established, its leaders had the wisdom to carefully study the difficult experience of a new university established a few years before in Korea.

Finally, the comparisons between the University of Chile and the Pontifical Catholic University of Chile, on the one hand, and the University of Malaya and the National University of Singapore, on the other hand, serve to emphasize the importance of aligning the three sets of factors that, together, determine the performance of research universities: concentration of talent, sufficient funding, and good governance.

**Paths of Development**

The case studies explored in this book include established universities, which have made or are making deliberate efforts to upgrade their quality and effectiveness, and new institutions created from scratch with the ambitious vision of achieving world-class status. The four institutions that seem to have been the most successful, using the criterion of their position in the rankings of the Shanghai Academic Ranking of World Universities and the Times Higher Education rankings—namely, Indian Institutes of Technology, National University of Singapore, Hong Kong University of Science and Technology, and Pohang University of Science and Technology—are all relatively new institutions. Their trajectory would tend to demonstrate that it is easier to reach academic excellence by establishing a new research university than by attempting to upgrade an existing one. It is much less complicated, in particular, to set up a favorable governance framework for a new institution than to try to transform the mode of operation of existing institutions, as the Malaysian case clearly indicates.

Gerard Postiglione prefaced his chapter on Hong Kong University of Science and Technology with the reminder that “Rome was not built in a day.” He stressed the important fact that building a world-class university is a lengthy and complex process that involves several decades of sustained determination and efforts. It has taken, for instance, five decades to bring Indian Institutes of Technology and the National University of Singapore to their present levels. In this respect, the long-term vision adopted by the Pontifical Catholic University of Chile (Horizon 2038) may be much more realistic than Nigeria’s fixation on a 2020 target to have 20 globally ranked institutions.
Among all the case studies reviewed, Hong Kong University of Science and Technology is perhaps the institution that has enjoyed the most rapid ascension, because of a unique combination of favorable factors from the very beginning that may prove quite difficult to replicate. At a critical moment of transformation for the entire territory because of the handover to China, the new university was established with the benefit of a clear vision, strong leadership, an outstanding academic body, an innovative educational model, ample resources, and a supportive governance and management framework. This situation of “perfect star alignment” is not easy to replicate, let alone sustain, over the long term.

The case studies have also brought out a number of “accelerating factors” that can play a positive role in the quest for excellence. The first factor is relying extensively on the diaspora, especially when establishing a new institution. As illustrated by the experiences of Pohang University of Science and Technology and Hong Kong University of Science and Technology, convincing large numbers of overseas scholars to come back to their country of origin is an effective way of rapidly building up the academic strength of an institution. The second factor, using English as the main language of an institution, greatly enhances its ability to attract highly qualified foreign academics, as the National University of Singapore has managed to accomplish. Concentrating on niche areas, such as the science and engineering disciplines, is the third convenient manner of achieving a critical mass more rapidly. The fourth approach uses benchmarking as a guide to orient the institution in its upgrading efforts. Shanghai Jiao Tong University, for instance, anchored its strategic planning work in careful comparisons with leading Chinese universities first and then moved to include peer foreign universities in the benchmarking exercise.

The fifth factor is to introduce significant curriculum and pedagogical innovations. Hong Kong University of Science and Technology, for example, was the first U.S.-style university in Hong Kong, which made it distinct in comparison to the existing institutions operating according to the British model. Higher School of Economics was among the first institutions in Russia to offer a curriculum that integrates teaching and research and to establish a supportive digital library. Those kinds of innovative features—part of the “latecomer advantage”—are of great consequence for new institutions that need to be attractive enough to entice students away from existing universities and to get them to risk enrolling in an “unknown” program. Hong Kong University of Science and Technology’s experience
proves that, through a highly innovative academic model, new institutions can draw first-rate academics and students away from well-established universities.

The last point worth underlining regarding the “road to excellence” is the need for successful institutions to remain vigilant and to maintain a sense of urgency to avoid complacency. This factor implies continuous monitoring and self-assessment to identify tensions or threats and to act quickly to address them. The Indian Institutes of Technology, for example, are now faced with an issue of faculty renewal in an academic labor-force environment that has become increasingly competitive. The Pohang University of Science and Technology case study shows that integrating research and undergraduate education can be a significant challenge when academics are under pressure to publish in the top journals.

Emerging research universities also face a variety of equity challenges. Considerable financial resources are required to enforce a needs-blind admission system. Legally imposed affirmative-action programs may distort the meritocratic process. Highly competitive admissions procedures, including high-stakes admissions exams, may engender high levels of private coaching that favor students from richer families.

**Importance of the Tertiary Education Ecosystem**

Outstanding research universities do not operate in a vacuum. A common thread across all the case studies in this book is that analyzing what happens in the institutions alone is not sufficient to understand and appreciate the full dynamics of their relative success or failure. The analysis cannot be complete unless it also takes into consideration key forces at play at the level of what could be called the *ecosystem*, within which tertiary education institutions evolve. These forces can have a facilitating or constraining effect, depending on the circumstances. In Hong Kong, the creation of the University of Science and Technology fitted nicely with the ambitious plans of the new leadership after the transfer of authority from Great Britain to China. The new university benefited from a favorable governance framework, full academic freedom, and generous public funding. By contrast, in Chile, the absence of a national vision for the development of tertiary education, the limited leadership role played by the Ministry of Education, the lack of a modern governance structure for public universities, and the low level of financial support for the country’s
flagship research institution explain the modest results achieved by the University of Chile.

As illustrated in figure 11.1, the main dimensions of the ecosystem include the following elements:

- **Macro environment**: the overall political and economic situation of a country, together with the rule of law and the enforcement of basic freedoms, which influence, in particular, the governance of tertiary education institutions (appointment of university leaders), their level of funding, academic freedom, and safety in the physical environment.
- **Leadership at the national level**: the existence of a vision and a strategic plan to shape the future of tertiary education and capacity to implement reforms.

**Figure 11.1 Understanding How the Ecosystem Influences the Performance of Top Research Universities**

**Sources**: Jamil Salmi.
• Governance and regulatory framework: the governance structure and processes at the national and institutional levels that determine the degree of autonomy that tertiary education institutions enjoy and the mechanisms of accountability they are subject to (especially important from the viewpoint of the human resources policies and management practices that allow emerging research universities to attract and keep qualified academics)

• Quality assurance framework: the institutional setup and the instruments in place for assessing and enhancing the quality of research, teaching, and learning

• Financial resources and incentives: the absolute volume of resources available to finance tertiary education in a country (mobilization of public and private resources) and the mechanisms through which those resources are allocated to various institutions

• Articulation and information mechanisms: the links and bridges between high schools and tertiary education and the pathways and procedures integrating the various types of institutions that constitute a tertiary education system, all of which affect the academic characteristics of incoming students and their academic results as they move through the tertiary education system

• Location: the quality of economic, social, and cultural characteristics and infrastructures available in the specific geographical setting of a tertiary education institution that determine, in particular, its ability to attract outstanding scholars and talented students; these characteristics include public services, recreational amenities, housing, transportation, and environmental quality (Yusuf forthcoming)

• Digital and telecommunications infrastructure: the availability of broadband connectivity and end-user devices to support the delivery of educational, research, and administrative services of tertiary education institutions in an efficient, reliable, and affordable way

The case studies show several ways in which the tertiary education ecosystem affects the performance of individual institutions. The first general finding is that high-performing systems are characterized by a high level of alignment among the various dimensions, as highlighted by the Hong Kong SAR, China; Korea; and Singapore cases. The absence of some of the elements or the lack of alignment among the various dimensions is likely to compromise the ability of research universities to thrive and endure. In the Nigerian case, for example, the deteriorating governance situation during the dictatorship years had a directly adverse
impact on the financing of the University of Ibadan. Moreover, it is doubtful that Nigeria, with its current digital infrastructure challenges, will achieve much progress toward its national objective of 20 world-class universities by 2020 without effective solutions to the problems of frequent power shortages and limited Internet access across the entire national university system.

Within this general principle, the second crucial finding is that some of the factors are absolute requisites, whereas others are quite relevant but not entirely indispensable. As discussed earlier, the governance framework and the availability of financial resources are definitely essential because they condition the degree of autonomy of research universities. Those factors influence the universities’ ability to mobilize funding for recruiting and keeping top academics and for providing them with the appropriate teaching and research infrastructure, including the digital infrastructure that is becoming increasingly necessary for advanced research.

Other factors such as the rule of law, the level of democracy, the existence of a national vision for the future of tertiary education, articulation mechanisms, and location are certainly significant. Yet the jury is still out regarding the ability to determine, in a conclusive way, whether research institutions can excel without these supporting dimensions or whether these factors represent significant elements of vulnerability over the long term. The China case study is a good illustration of this dilemma.

China has been among the countries with the highest investing to upgrade their top universities through a series of targeted programs (the famous 211 and 985 Projects). The rapid rise of Chinese universities in the Academic Ranking of World Universities attests to the success of these efforts. In 2003, only 14 Chinese universities were included in the first edition of the ranking; by 2009, 24 appeared among the top 500 universities in the world. No other country in the world has made such progress. Increased funding has been coupled with more management autonomy to facilitate the development of Chinese universities. The tight political control in the country as a whole, however, translates into restrictions that could hamper the full development of flagship universities in the medium term.

The first element of tension comes from the dual governance structure that characterizes Chinese universities. Despite being the formal leader of the institution, the university president shares the authority to appoint members of the senior academic and administrative team with a
Communist Party secretary who, in many cases, is also the chair of the university board. This structure is not a problem when the two leaders see eye to eye, but it has the potential to undermine the ability of the university president to lead and manage the institution in a truly autonomous fashion. The success of the National Institute for Biological Sciences, which contributes half of the peer-reviewed publications in China, is attributed in part to the fact that it is the only research institute in China without a Communist Party secretary (Pomfret 2010).

Academic freedom is a second potential source of tension. It is not a significant constraint in the hard sciences—although government control of the Internet affects all scholars—but it certainly hinders the ability of social scientists to conduct scientific inquiries on issues that are politically sensitive. Finally, pressure from the local authorities may undermine the meritocratic admission process whenever a university is subject to a quota of local students. In the case of Shanghai Jiao Tong University, for example, at least 35 percent of incoming undergraduate students must be from the Shanghai region.

Generally speaking, the rule of law, political stability, and the respect of basic freedoms are important dimensions of the political context into which high-quality universities operate. Infringing on these basic tenets of democratic life is not conducive to a thriving intellectual environment. In Nigeria, for instance, substantial additional funding has been offered to a select group of federal universities. But the resurgence of sectarian and rebel violence and the lack of security in several states threaten the federal government’s plans to build world-class universities. In early March 2010, hundreds of people were massacred in the state of Plateau, which raises questions about the country’s image as a place where people of different beliefs can coexist peacefully and disagree in principle while still working together (Dickson and Abubakar 2010).

Malaysia is another country actively seeking to transform its top universities into flagship institutions. But recent disturbing political developments, from the burning of churches to the whipping of a woman for drinking beer in public, have cast a shadow on the country’s image as an open and tolerant society that supports the freedom of expression and the separation of state and religion (Sta Maria 2010).

Even the United States, with its long democratic tradition, is not immune to restrictions on freedom of movement and to threats to academic freedom having a negative impact on the country’s elite universities. Since September 11, 2001, the tighter visa regulations have prevented international graduate students from returning to finish their studies or
new international doctoral candidates to enroll at a U.S. university. Some scholars who conduct academic research on the Middle East have been subject to selective harassment (Cole 2010).

With respect to leadership at the national level, research universities are more likely to prosper when their role is embedded in a national vision for the future of tertiary education, as in India and China (both mainland and Hong Kong SAR, China). But individual initiatives can also be successful without being framed within a national vision, as shown by Pohang University of Science and Technology, Monterrey Institute of Technology and Higher Education.

Location represents another factor that can facilitate or complicate the development of a research university. The vibrant economy and society of Hong Kong SAR, China, provide a serious setting to attract top academics and students. Singapore is ideally situated between China and India. By contrast, cities located in hardship zones, whether climate or political, will have much more difficulty attracting and keeping talented academics and students.

Of all the building blocks of the tertiary education ecosystem, quality assurance is perhaps the only one that can be found outside the national borders. When Pontifical Catholic University of Chile and Monterrey Institute of Technology and Higher Education were improving the quality of their course offerings in the absence of a national accreditation system, they successfully sought international accreditation for many of their programs to boost their academic standing. In fact, Monterrey Institute of Technology and Higher Education was the first non-U.S. institution to be accredited by a U.S. accreditation agency. Reaching out to foreign quality-assurance providers contributed significantly to raising the quality and to enhancing the prestige of these two Latin American institutions.

Conclusion

The trajectories of the 11 institutions analyzed in this book offer valuable insights into the complex transformation process that institutions striving to become world-class research universities are undergoing, whether they chose “upgrading” or the “starting anew” path to academic excellence. With proper leadership and vision, existing research universities can drastically improve the quality of their teaching and research. Alternatively, when talent, resources, and governance are adequately aligned from the
beginning, new universities have the potential—though no guarantees can ever be given—to grow into high-quality research institutions within two or three decades. Even though the sample of institutions reviewed in this book is too small to be fully conclusive, the case studies seem to suggest that establishing a new institution is a relatively faster and more effective approach.

New research universities do face special challenges, however. To attract top academics and good students, they need to be sufficiently innovative to represent a convincing alternative to existing institutions. This difference seems to be more easily achieved with niche programs, as demonstrated by the experience of Indian Institutes of Technology, Pohang University of Science and Technology, Hong Kong University of Science and Technology, and Higher School of Economics.

Many valuable lessons can also be drawn from the African case study, which serves as a stern warning that success is fragile and that prestigious universities, like famous empires, are prone to fateful destinies should the fundamental enabling conditions disappear. These conditions, presented in the description of the tertiary education ecosystem within which universities can strive, are important to keep in mind.

All of the case studies in this book confirm the importance of maintaining the three sets of key factors put forward in the conceptual framework—concentrated talent, abundant resources, and favorable governance—well aligned. When it comes to transforming existing universities, however, leadership, governance, and management seem to be the key factors for starting a virtuous circle leading to momentous improvements. Indeed, visionary leadership, appropriate governance, and effective management make it easier to generate and manage additional resources, which, in turn, support building up a world-class group of professors and researchers and attracting talented students.

In his insightful book about highly successful companies, *From Good to Great*, Jim Collins (2001) studied the characteristics of leaders who played a catalytic role in bringing their firm to the top. Even though it is more difficult to define appropriate metrics of success for tertiary education institutions than for firms, whose results can be easily measured in terms of revenue and earnings, university leadership certainly warrants further research to understand the dynamics of change and progress in the academic world. The case studies unequivocally support the notion that exceptional leaders are at the heart of successful emerging research universities through their ability to formulate an inspiring
vision for the future of the institution, to rally their academic and administrative staff behind this vision, and to implement the vision in an effective manner.

A significant new finding from the case studies is the weight of the tertiary education ecosystem in influencing the performance of research universities seeking to achieve world-class status. The various features of the ecosystem—from the macroeconomic and political situation to key dimensions of governance to resource mobilization and allocation to location and the digital infrastructure—have a strong effect on the ability of research universities to make progress on the road to academic excellence.

Finally, even top research universities face the challenge of achieving a harmonious balance between equipping their students with technical skills and rigorous methodologies and imparting the ethical values needed to pursue scientific inquiries in a socially responsible manner. Several of the case studies, especially Hong Kong University of Science and Technology and the Pontifical Catholic University of Chile, illustrate the concern to maintain a curriculum that blends a strong scientific training and a deep humanistic conviction. In the words of Sri Sri Ravi Shankar, the founder of a new university that is being established in the Indian state of Orissa, “only an education that can nourish inbuilt virtues can impart true intelligence” (Sri Sri University 2010).
## Annex 11B Main Characteristics of Each Institution

<table>
<thead>
<tr>
<th>Institution (year established)</th>
<th>Number of students (that graduate)</th>
<th>Student-to-faculty ratio</th>
<th>Share of direct public funding (%)</th>
<th>Endowment (US$)</th>
<th>Annual budget (US$)</th>
<th>Per student expenditure (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Ibadan (1962)</td>
<td>19,521 (7,382)</td>
<td>16:1</td>
<td>85</td>
<td>0.2 million</td>
<td>46.7 million</td>
<td>2,390</td>
</tr>
<tr>
<td>Shanghai Jiao Tong University (1896)</td>
<td>43,000 (14,000)</td>
<td>15:1</td>
<td>40</td>
<td>120 million</td>
<td>700 million</td>
<td>16,300</td>
</tr>
<tr>
<td>Pohang University of Science and Technology (1987)</td>
<td>3,100 (1,700)</td>
<td>6:1</td>
<td>15</td>
<td>2 billion</td>
<td>220 million</td>
<td>70,000</td>
</tr>
<tr>
<td>University of Chile (1842)</td>
<td>30,702 (4,569)</td>
<td>9–15:1</td>
<td>11</td>
<td>0</td>
<td>520 million</td>
<td>17,000</td>
</tr>
<tr>
<td>Catholic University of Chile (1888)</td>
<td>22,035 (2,806)</td>
<td>8:1</td>
<td>11</td>
<td>0</td>
<td>453 million</td>
<td>20,500</td>
</tr>
<tr>
<td>Indian Institutes of Technology (first founded in 1950 in Kharagpur)</td>
<td>28,000 (12,000)</td>
<td>6:1 to 8:1</td>
<td>70</td>
<td>0</td>
<td>123 million</td>
<td>4,400</td>
</tr>
<tr>
<td>Hong Kong University of Science and Technology (1991)</td>
<td>9,271 (3,302)</td>
<td>19:1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>63</td>
<td>0.25 million</td>
<td>267 million</td>
<td>28,850</td>
</tr>
<tr>
<td>University of Malaya (1949)</td>
<td>26,963 (8,900)</td>
<td>12:1</td>
<td>60</td>
<td>0</td>
<td>271.6 million</td>
<td>14,000</td>
</tr>
<tr>
<td>National University of Singapore (1980)</td>
<td>27,396 (6,300)</td>
<td>14:1</td>
<td>58</td>
<td>1 billion</td>
<td>1.37 billion</td>
<td>39,000</td>
</tr>
</tbody>
</table>


(continued next page)
### Annex 11B  Main Characteristics of Each Institution (continued)

<table>
<thead>
<tr>
<th>Institution (year established)</th>
<th>Number of students (that graduate)</th>
<th>Student-to-faculty ratio</th>
<th>Share of direct public funding (%)</th>
<th>Endowment (US$)</th>
<th>Annual budget (US$)</th>
<th>Per student expenditure (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monterey Institute of Technology (1943)</td>
<td>25,705 (3,600) (Monterrey campus)</td>
<td>12.2:1</td>
<td>0</td>
<td>1 billion</td>
<td>1.15 billion</td>
<td>10,200</td>
</tr>
<tr>
<td>Higher School of Economics (1992)</td>
<td>16,000 (2,400)</td>
<td>—</td>
<td>33</td>
<td>0</td>
<td>45.5 million</td>
<td>2,843</td>
</tr>
</tbody>
</table>

**Source:** Author based on data from the chapters of this book.

**Note:** — = not available.

a. A significant number of nonregular faculty members has been brought on recently to address the increased program diversity and has moved the student-faculty ratio in the direction of 15:1 to 14:1.

### Annex 11C  Key Elements of the Strategic Approach Followed by Each Institution

<table>
<thead>
<tr>
<th>Institution</th>
<th>Public/private status</th>
<th>Direct public funding (%)</th>
<th>Autonomy</th>
<th>Student recruitment</th>
<th>Approach toward excellence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ibadan University</td>
<td>Public</td>
<td>89</td>
<td>Low</td>
<td>Selective</td>
<td>Upgrading</td>
</tr>
<tr>
<td>Shanghai Jiao Tong University</td>
<td>Public</td>
<td>40</td>
<td>Medium</td>
<td>Selective</td>
<td>Upgrading</td>
</tr>
<tr>
<td>Pohang University of Science and Technology</td>
<td>Private</td>
<td>15</td>
<td>High</td>
<td>Highly selective</td>
<td>New institution</td>
</tr>
<tr>
<td>University of Chile</td>
<td>Public</td>
<td>11</td>
<td>Medium</td>
<td>Highly selective</td>
<td>Upgrading</td>
</tr>
<tr>
<td>Pontifical Catholic University of Chile</td>
<td>Private</td>
<td>11</td>
<td>High</td>
<td>Highly selective</td>
<td>Upgrading</td>
</tr>
<tr>
<td>Indian Institutes of Technology</td>
<td>Public</td>
<td>70</td>
<td>Medium</td>
<td>Highly selective</td>
<td>New institution</td>
</tr>
<tr>
<td>Hong Kong University of Science and Technology</td>
<td>Public</td>
<td>63</td>
<td>High</td>
<td>Selective</td>
<td>New institution</td>
</tr>
<tr>
<td>University of Malaya</td>
<td>Public</td>
<td>73</td>
<td>Low</td>
<td>Selective</td>
<td>Upgrading</td>
</tr>
<tr>
<td>National University of Singapore</td>
<td>Public</td>
<td>58</td>
<td>High</td>
<td>Selective</td>
<td>New institution</td>
</tr>
<tr>
<td>Monterrey Institute of Technology</td>
<td>Private</td>
<td>0</td>
<td>High</td>
<td>Highly selective</td>
<td>Upgrading</td>
</tr>
<tr>
<td>Higher School of Economics</td>
<td>Public</td>
<td>33</td>
<td>High</td>
<td>Selective</td>
<td>New institution</td>
</tr>
</tbody>
</table>

**Source:** Author based on data from the chapters of this book.
## Annex 11D  Main Funding Sources of Each Institution

<table>
<thead>
<tr>
<th>Institution</th>
<th>Government budget</th>
<th>Tuition fees</th>
<th>Endowment income, donations, lottery, and corporate support</th>
<th>Competitive research funding</th>
<th>Consultancies, training, and contract research</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Ibadan</td>
<td>85</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Shanghai Jiao Tong University</td>
<td>40</td>
<td>10</td>
<td>5</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Pohang University of Science and Technology</td>
<td>6</td>
<td>7</td>
<td>34</td>
<td>47</td>
<td>6</td>
</tr>
<tr>
<td>University of Chile</td>
<td>11</td>
<td>23</td>
<td>1</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>Pontifical Catholic University of Chile</td>
<td>11</td>
<td>30</td>
<td>7</td>
<td>4</td>
<td>48</td>
</tr>
<tr>
<td>Indian Institutes of Technology</td>
<td>70</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Hong Kong University of Science and Technology</td>
<td>63</td>
<td>18</td>
<td>6</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>University of Malaya</td>
<td>73</td>
<td>11</td>
<td>10</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>National University of Singapore</td>
<td>58</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Monterey Institute of Technology</td>
<td>0</td>
<td>77</td>
<td>13</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Higher School of Economics</td>
<td>52</td>
<td>25</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Author based on data from the chapters of this book.

Note: — = not available.
Notes

1. In this chapter, the terms *world class*, *flagship*, and *elite* are used indistinctly to describe research-intensive universities that are considered to operate among the top institutions in the world.

2. One of the most ironic manifestations of anger came from France. After the publication of the 2003 Academic Ranking of World Universities ranking, two French university presidents wrote a formal letter of complaint to the Chinese ambassador demanding from the Chinese government that it forbid Shanghai Jiao Tong University from continuing to publish its world rankings. It is paradoxical that representatives of a country that puts freedom (*liberté*) as the first of three principles in its national motto (*liberté, fraternité, égalité*) would encourage the Chinese government to limit academic freedom. In May 2010, the Education Commission of the French Senate organized a round table on international rankings with the title of “Forget Shanghai” (*Oublier Shanghai*).


References


