

contributed to a low classification of most African universities in international rankings. To establish themselves as research universities, African universities will need to overcome enormous challenges, including lack of funding; inadequate training of their research staff; lack of appropriate structures for research evaluation; and a need to ensure research accountability, which is presently nonexistent.

In addition, African universities need to define what university research is, and what form of research (basic and applied) they want to prioritize, in order to meet their research mission. Research findings should benefit their respective national governments and communities and contribute to development and the knowledge economy.

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## India: World-Class Universities?

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Not long ago, Indian President Pranab Mukherjee declared, “If we provide enough funds to 10 to 15 top institutions for the next four to five years, these institutions will certainly storm into the top 100 of global academic rankings within the next few years.” Late in 2016, the ministry of human resource development issued a series of draft guidelines and regulations to create 20 World-Class Universities—10 public and 10 private. Unfortunately, this laudable goal will be difficult, if not impossible, to achieve in the short or medium run. Why?

### INDIA’S HIGHER EDUCATION ENVIRONMENT

India’s higher education and research sectors have for decades been generally underfunded, especially in view of the tremendous growth in numbers of students. Compared to the other BRIC countries, the percentage spent on education, 4.1 percent of GDP, is second to Brazil. But in terms of research expenditures, India is at the bottom, with only 0.8 percent of GDP. And India educates at the postsecondary level the lowest percent of the relevant age group among the BRICs. Although India now has the second largest higher education system in the world, following China, the pressures for expansion to meet both public demand and the government’s own targets are immense.

The higher education system is poorly organized to create world-class universities. None of India’s state governments seem to have an ambitious vision for the development of world-class institutions at the state level, and none provides funding for higher education that is adequate to main high standards of quality. The central universities are better funded and do not have the immense, and globally unique, responsibility for supervising India’s 36,000 colleges that the state universities have.

In the past, when India wanted to create new and innovative higher education institutions, entirely new schools were started—such as the Indian Institutes of Technology (IITs), the Tata Institute of Fundamental Research, the Indian Institutes of Management, and a few others. Indian planners did not want to grapple with the seemingly insurmountable governance problems of the existing universities. Indian regulations stipulate that eligible universities should have around 20,000 students. While international data shows that most world-class universities have around this number, many do not, and this guideline would eliminate the IITs—arguably the only Indian institutions with the spirit and governance that might permit rapid advancement.

Creating world-class universities requires careful thought, planning, and quite considerable funding over the long run. If recognition in the global rankings is a goal, the challenges are even greater because the rankings are a moving target, and the competition is fierce. For example, the Russian government is funding an initiative with the goal of five Russian universities entering the top 100 by 2020. More than US\$400 million is being given each year to 15 top universities. Japan recently started its Super Global Universities Project. China continues to spend heavily on its top universities, two of which have made it into the top 100 of the Shanghai ranking for the first time. India is very much a latecomer to the world-class party, and will not be spending enough to make much headway. Funding will be 500 crores of rupees (around US\$75 million) over a year period—or perhaps 5 crores (about US\$1 million) annually for each institution if funds are uniformly distributed. These amounts are entirely inadequate to make much of a difference.

### A WORLD-CLASS BLUEPRINT

We analyzed the experiences of ten new universities that have achieved considerable success in our book, *The Road to Academic Excellence: The Making of World-Class Research Universities* (World Bank, 2011). We found that all share some common characteristics. The following list provides necessary but perhaps not sufficient conditions for building successful top level research universities.

Among the key ingredients necessary for creating a new research-intensive university are the following: adequate financial resources to get started and sustain excellence over time; a balanced governance model that includes significant participation from, but not total control by the academics; strong leadership, not only a visionary president, but a professionally competent administrative staff able to implement the university's mission; autonomy from the interference of governmental or private authorities, but that allows for a reasonable degree of accountability to external agencies; academic freedom for teaching, research, and publication; top academic staff who are committed to the university's mission (including teaching), and who are paid adequately and provided with appropriate career ladders; highly qualified and motivated students; and a firm commitment to meritocracy at all levels.

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In our book, we also identified a number of "accelerating factors" that can play a positive role in the quest for excellence. The first factor consists in relying extensively on the diaspora when upgrading an existing university or establishing a new institution. As illustrated by the experiences of Pohang University of Science and Technology (POSTEC) in South Korea and Hong Kong University of Science and Technology (HKUST), bringing a large number of overseas scholars back to their country of origin is an effective way of rapidly building up the academic strength of an institution.

The second element is to introduce significant curriculum and pedagogical innovations. HKUST, for example, was the first US-style university in Hong Kong, a feature that made it distinct from the existing institutions operating according to the British model. The Higher School of Economics in Moscow was among the first Russian institutions offering a modern curriculum that integrates teaching and research and establishes a supportive digital library. These 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.

The third factor consists in using benchmarking as a guiding methodology to orient the institution in its upgrad-

ing 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. Concentrating on niche areas is another suitable manner of achieving a critical mass of top researchers more rapidly, as demonstrated by the examples of HKUST and POSTEC in Asia, or the Higher School of Economics in Russia. Many of the efforts to develop world-class universities have emphasized science and technology as the exclusive focus. These fields are certainly important, and they will bring dividends in the rankings because they produce many journal articles. Yet, the social sciences and humanities are increasingly relevant, and more recognized by citation counters that matter for rankings. The contemporary world needs focus on all aspects of knowledge to address our planet's big challenges (climate change, energy, food, health, etc.).

#### INDIAN REALITIES

India does not have a distinguished record of allowing significant autonomy from government directives and political involvement in such aspects as controlling the appointments of vice-chancellors and other senior officials. Indeed, most observers have pointed out that many aspects of higher education have been politicized, and the proposed guidelines indicate that no basic change in university governance will be possible. India's "reservation system" of linking up half of student admissions and faculty appointments to particular disadvantaged population groups may work for educational institutions focused on teaching and have many positive results, but will not permit the development of world-class research universities that seek to attract the most talented academics and students—the proposed guidelines indicate that the reservation system will remain fully in place.

India has certain advantages. The use of English as the medium of teaching and research in much of higher education puts India in the global linguistic mainstream. India has no shortage of well-trained and brilliant researchers, both at home and working abroad. A truly exciting and well-planned academic development can attract the Indian diaspora—but only if appropriate academic conditions and flexible governance arrangements are in place and if salaries are at international levels.

Current realities and past efforts suggest that the road to world-class universities in India may be extraordinarily difficult. Yet, with support from the country's president and with thoughtful planning and much creative thinking, the goal of building several world-class teaching and research universities in India may be achievable. However, the proposed levels of funding and guidelines for implementation

make success highly unlikely.

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## Enough Quantity: Time to Focus on Quality of Researchers in Pakistan

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Although many Asian countries have recently experienced financial problems, the economic downturn in Pakistan is particularly notable for numerous additional factors including increased incidence of terrorism, widespread corruption, lack of law enforcement, a hampering of private investment and foreign aid, political instability, energy shortages, and ongoing military operations. Since 2000, the gross domestic product has grown on average by 4 percent per year, which is not enough to keep pace with the fast population growth. However, despite the relatively low growth rate, Pakistani R&D funds and the number of Pakistani PhD graduates increased at a surprisingly high rate during that same period.

### IS PAKISTANI RESEARCH REALLY PROGRESSING?

To address the overall advancement of the Pakistani research sector, I performed an analysis using the database “Web of Science” to assess the research output quantitatively, by calculating the number of research articles by Pakistani authors in relation to the number of PhD graduates during the past 15 years. Articles produced by Pakistani institute affiliates increased by 687 percent between 1985 to 2015. Similarly, the number of Pakistani PhD graduates increased by 248 percent between 1947 and 2014. Further, citations of Pakistani research articles have increased by 419 percent over the last 30 years. The journal impact factor usually predicts the quality of an article and *Science* and *Nature* are among the highest impact factor journals publishing basic scientific research. Unfortunately, most research articles from Pakistan are published in low quality research journals (i.e., low impact factor journals). From 2000 to 2015, only nine articles were published by Pakistani researchers in *Science* and 11 in *Nature*. But even these relatively low figures represent an increase in periodical

publication rates, compared to the period between 1985 and 1999 (350 percent in *Science* and 267 percent in *Nature*). In comparison, overall publication rates for Pakistani research articles increased by 687 percent during the same time period.

Reviewing the comparative rates of articles published per higher education institution is also instructive. In Pakistan, the publication rates per institution are 0.13 in *Science* and 0.23 in *Nature*, while the same rates in India are 0.18 in *Science* and 0.48 in *Nature*, and 4.2 in *Science* and 5.6 in *Nature* in the United States. Acknowledging this gap, Pakistan has attempted to increase the number of local impact factor journals, from two such journals in 1999 to 11 at present (with a maximum impact factor of 1). Thus, while the number of research journals has increased, the perception of their quality remains very low.

I offer three relevant suggestions for Pakistani researchers, academic institutions, and university administrations, which may help raise national research standards.

### URGENT NEED TO RID PAKISTAN OF A CORRUPT EDUCATION CULTURE

Plagiarism is a major cause of low quality academic research in Pakistan. Authors often plagiarize others’ ideas by exploring easily available literature and then skillfully manipulating the idea to minimize the appearance of plagiarism. Pakistani students are learning the art of publishing papers in easily accessible journals and then manipulating the citations of their articles. One can question to what extent the students themselves are to blame. The Pakistani research environment—fashioned by incompetent faculty who are improperly trained to supervise students—is responsible for perpetuating plagiarism, as the Pakistani academic culture discourages independent thinking and forces students to be blindly obedient to their supervisors. Indeed, the pressure on students from supervisors to produce papers forces them to manipulate their work, which is then enormously difficult to publish in a high quality journal. If Pakistani researchers are spending such a huge amount of time plagiarizing papers, and are smart enough to pass through intensive review procedures utilizing their network connections, then why are they not willing to use their time and effort in the right direction? What causes students to cheat is the lack of ability of teachers to educate them on research ethics at an early stage of their academic life.

In addition, politics and favoritism are very common in Pakistan. Knowing your supervisor and examiners well will likely guarantee your graduation. Pakistan needs an organized infrastructure to enforce antiplagiarism laws and avoid politics and favoritism in science. Seminars and training workshops on ethics should be held to spread aware-