Building Research Capacity *to Promote Innovation*

A Case Study in Mauritius*

by Dhanjay Jhurry

In this knowledge era, the capacity of a country to foster innovation is a measure of the performance of its economy. Innovation is recognized to be closely associated with scientific and technological development. As nations struggle to achieve economic prosperity and gain leadership positions in the technology-intensive and competitive world marketplace, they transit through phases of "not yet scientifically developed countries" to "scientifically capable developing countries" and finally to "scientifically advanced countries." The status of a country is determined by its levels of literacy, education, knowledge production and dissemination, advancement, and effective utilization of science and technology.

It is an alarming fact that the 4.8 billion people who live in developing and transition economies receive only 20 percent of global gross domestic product. A World Bank report (2002) warns that developing countries will have little success boosting economic growth and alleviating poverty unless they can close a growing knowledge or education divide between themselves and richer countries.

The irony of the knowledge society is the unwritten rule that its growth can only be fuelled by "knowledge," which besides the bits and bytes, depends heavily on human resources. This puts countries such as India and China at a great advantage. Mauritius, which has limited human capital, has to plan properly so as to create maximum impact with less people. Mauritius aims at making a quantum leap from the low/medium technology manufacturing sectors, such as food, beverages, textiles, and clothing, to high-technology sectors such as information communications technology and pharmaceuticals.

To foster innovation in these high-tech sectors, the support and active involvement of academia, educational institutions, public and private sectors, industry and of all Mauritians at large are essential. But innovation does not simply happen. It requires long-term and strategically directed investments in research, people, networks, equipment, and infrastructure. The transition time available to a country like Mauritius is relatively short and compressed as compared to those countries that took to the development trajectory much earlier. But scientists have the capacity to make a difference. Individual researchers and their institutions can do a lot to boost local R&D and industrial development and to create symbiotic relationships for global collaborative ventures.

How Are Research and Development Intertwined?

In the less developed and developing countries, research is hampered by a number of problems: funding constraints, inadequacy of laboratory equipment, lack of critical mass of researchers and trained technicians, lack of infrastructure, disconnection between university research and industry's needs, difficulty of commercialization of research findings, and lack of incentives (for example tax incentives) to promote private-sector research and development.

Mauritius is no exception. The University of Mauritius is gradually moving from a teaching institution to one actively engaged in research. Although its research performance is still relatively modest, it is by and large the leading research institution of the country. It is called upon to play a vital role in fostering innovation in Mauritius. The university has taken a number of measures to reinvigorate research. For instance, the research grants system has been restructured, financial support is now provided to enable researchers to participate in international meetings, and intellectual property rights management plans have been put in place. In order to enhance the university's participation in economic development, its research policy was recently changed so that it has a more strategic focus. With the creation of multidisciplinary centers of excellence, university research projects are now prioritized.

What is the Way Forward?

In the orchestration of a research program to foster innovation, a number of strategies had to be put in place. As depicted in the pyramid in figure 1, a multi-scaled approach was favored that took into account

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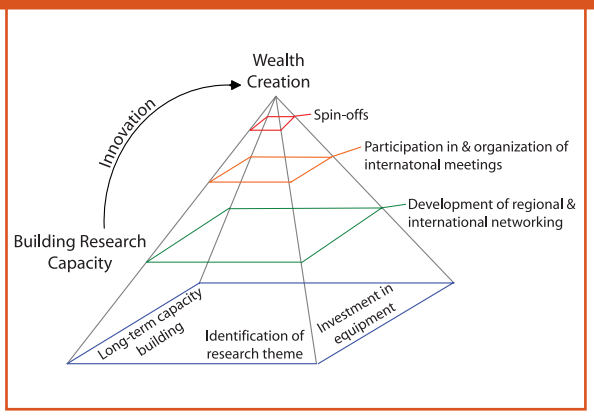

Figure 1: The pyramid of research capacity for wealth creation.

local, regional, and international dimensions.

It was first and foremost important to have a solid base with a well-defined research theme, whose development would depend on long-term investment in human resources and in equipment.

The central research theme developed by our group is the "Valorization of indigenous renewable resources." This theme was selected to (1) ensure the advancement of knowledge, (2) relate research to the country's needs by ensuring a mix of basic and developmental research, (3) ensure use of locally available resources, and (4) enable sustainable development.

Our research efforts have been mainly focused in the polymer field over a decade or so. However, one compelling idea to emerge under this new research paradigm is the development of a bio-based industry in Mauritius that would use renewable resources such as sugar feedstock or algae and seaweed. This idea ties in nicely with worldwide efforts to replace products derived from petroleum with those derived from sugars or carbohydrates. The bio-refinery concept, which is a facility that integrates biomass conversion processes and equipment to produce fuels, power, and chemicals, could be an attractive niche for Mauritius (see figure 2).

A research program can only prosper if supported by well-trained people. As Jawaharlall Nehru stated: "While it is relatively easy to put up a factory or a plant or a project, it is much more difficult, and it takes much more time to train the human being that will run a factory or a plant."

It is noteworthy that we invested in education by introducing the first undergraduate course in polymer chemistry in 1995. The success achieved by this program prompted us to set up a postgraduate course in the field in 2000. This proved to be a key element in attracting students to undertake research at the Masters and Ph.D. levels. To date, four students have attained Ph.D.s in the polymer field.

Development of a solid research program, especially in the chemical sciences, depends on access to sophisticated analytical instruments and equipment. Some nations have successfully set up regional centers with such sophisticated instruments, which cater to many research laboratories and university departments. In the Indian Ocean region, there are, unfortunately, no such centers even though some collaborations exist among universities. Through individual efforts and some local funding agencies, we have managed to secure funding to equip our laboratory with state-of-the-art facilities for chemical synthesis and characterization.

Infrastructure does not refer only to the provision of utilities such as water, electric power, gas and fuel, though these are vital and must be guaranteed and backed up. It also refers to the technical support in terms of trained personnel to run the facilities. This aspect of trained technical manpower has been addressed by our group by linking up with the Network of Users of Scientific Equipment of Southern and Eastern Africa (see NUSESA.org).

Development of Regional and International Networking

Networking of scientists and institutions within and across nations and continents is of paramount importance for the following reasons:

- interacting with peers for mentorship and guidance and to overcome intellectual vacuum
- acquiring support for the training of Ph.D.s, in terms of equipment and fund raising

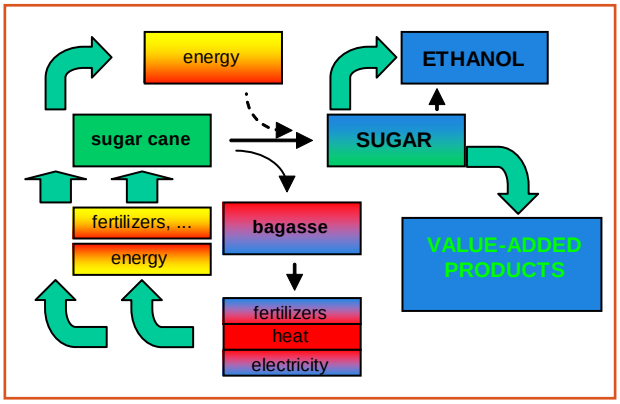

Figure 2: The bio-refinery concept.

Building Research Capacity

In 2008, the International Conference on Chemical Education will take place in Mauritius—see announcement on page 35.

- ensuring quality assurance
- achieving international recognition

We have set up quite successful exchange and twinning programs, both for researchers and students, with a number of foreign organizations in both English- and French-speaking countries.

Sugarcane and algae and seaweed are renewable resources available in Mauritius for the development of a bio-based industry.

Participation In and Organization of International Meetings

In June 2005, our Department of Chemistry hosted the 8th UNESCO School and IUPAC Conference on Macromolecules. This meeting attracted approximately 100 participants, including 70 from 17 foreign countries. Participants included high-caliber polymer scientists as well as young researchers and postgraduate students. The meeting gave young and more experienced scientists from the large Indian Ocean region, including Australia, India, and Africa, the opportunity to present their research findings, to network, and to foster research collaborations between the north and the south, all in the pleasant and relaxed Mauritian environment.

Conclusion

Our group at the University of Mauritius is building research capacity as an asset for local and international companies willing to invest in bio-based industries, in particular. Taking this concept even further, why not create a center of research in Mauritius for the development of bio-based resources? Several such institutions of excellence have been opened in Southern nations through the collective efforts of consortia of Northern institutions. This idea is worthy of emulation. Such linkages breed research training and collaboration, and help in solving problems of local and global concerns. Unfortunately, a research center like this in Mauritius would not be possible without international support!

Dhanjay Jhurry <djhurry@uom.ac.mu> studied at Bordeaux University in France and completed his Ph.D. in polymer chemistry in 1992. He worked as an R&D chemist at Flamel Technologies in Lyon for three years before coming back to his native land of Mauritius. He has since been working at the University of Mauritius, where he is an associate professor of chemistry. His research interests include a mix of basic and developmental problems in the broad area of the chemical sciences of interest to Mauritius and the region. He has also a keen interest in fostering innovative capacity in Mauritius and has various responsibilities at the national level, including chairman of the Mauritius Accreditation Service Advisory Council, board member of the Food and Agricultural Research Council, and president of the Chemical Society of Mauritius, which is currently an Associate National Adhering Organization of IUPAC.