Role of science in development

Dawn 24/4/00 By Fateh M. Chaudhri

PAKISTAN is badly lagging behind other nations in the field of research in science and technology. Only 7000 are involved in R&D that comes to about 58 persons per one million population. By comparison, India has 150; Indonesia, 170; South Korea, 2000 and Japan, 5700.

South Korea's domestic scientific/engineering skill capability is 30 times and Japan's 100 times larger than that of Pakistan. If we were to consider the qualitative dimension of the comparison, the situation is even more grim. The share of Pakistani scientists' articles in the "main-stream" international journals is minuscule — 0.06% while that of Turkey, Brazil and India is 4, 10 and 30 times bigger than Pakistan.

The main reasons are not only the absence of national importance given to the issue but also the pathetically meagre amount of resources (0.02% of GDP) devoted to R&D. In other countries, the share of R&D in GDP is many times more than ours. The country's technical dependence on others has inevitably led to its ever-increasing economic and political dependence that we have witnessed in the past many years of our existence.

The propelling force in the twenty first century will undoubtedly be the S&T capability of a country. A deep and widespread realization of this fact is needed. Pakistanis are at the bottom of the league table of scientific capability and an all out effort is needed to build domestic community of scientists and engineers.

In a real sense, our frequent economic crises are due to the deeper and pervasive crises of science and technical knowledge. Our comparatively low productivity in agriculture and, therefore, a high level of food imports as well as the lack of competitiveness in manufactured exports and import-substituting activities are reflective of the grossly insufficient attention to the application of modern science, technical knowledge and management techniques to work in these areas. The East Asian Miracle did not happen just over night. These countries' focussed attention on science and technology was the main driving force behind their spectacular success.

A recent survey has shown that in a proficiency test in mathematics and science taken by 13 years old students, the three top positions internationally were secured by Asian countries (China, Korea and Taiwan) whereas USA ranked 15th in the table.

In order to build domestic community of scientists and engineers several things are needed: (a) deep and long-term commitment and patronage at the highest level; (b) a world class responsive education system that includes traditional science courses throughout the spectrum-putting class rooms on the frontline of the battle between poverty and prosperity; (c) free international contacts with scientists abroad and collaborative arrangements with them in R&D; (d) attract Pakistani scientists from abroad for participatory role; (e) people and citizens must exercise full support for scientific infrastructure and the government, together with the private sector leaders, must take full responsibility for creating such a scientific infrastructure.

In order to move towards an enhanced scientific capability, we must set a few basic goals:

(A) announce a meaningful commitment towards S&T at the highest political level and immediately establish a Presidential Commission of eminent scientists, educators and other experts to assess the initial conditions for building science infrastructure and review the existing policy-mix to promote it on a strong and sustainable basis;

(B) establish an institutional mechanism — National Council of Science and Technology (NCST) for interaction between policymakers in the government, business/industry organizations and domestic science community — DSC - this year; (c) main-stream and phase-in science education from primary to university level in the next 5 years; (d) increase R&D expenditures in universities and higher institutions of learning from the current 0.2% of GDP to 2.0% of GDP in the next 10 years; and (e) achieve 2000 scientists/engineers per million population as in Korea before 2010.

Within this framework of a strategy, we can also take important steps to jump-start Pakistan's S&T sector by developing a concrete plan of actions as discussed below.

The core of the technology development plan, can be described as a "partial privatization of the military R&D programmes." The presentation of this plan is divided into several actions. First, we will discuss the pros and cons of government as well as commercial R&D. Then, we will present a plan blueprint. Finally, we will wrap-up with concrete examples of similar plans and success stories in other countries.

There are several advantages and disadvantages to both military owned research, and military sponsored commercial research. The benefits of military research is that it can be conducted very secretly and the military has direct control over the exact nature of the project. The disadvantages of such research, however, are that military research is usually not aggressive enough in that jobs are not at stake in the event of late or non-productive results. Another disadvantage of military research is that this research and technical knowledge is contained solely within the military establishment and does not benefit the population in general.

The commercial research sponsored by the military should be targeted towards the creation of an indigenous information and high tech defence industry. The emphasis should be placed on advanced software and hardware development using off the shelf integrated circuits. Custom integrated circuits development is a resource-intensive process and should not be targeted, at least initially.

Several examples of successful implementation of such a plan exist and should be carefully studied further for introduction in Pakistan. The United States of America has a "dual-use" technology development programme. It regularly calls for proposals in various defence related critical technologies such as communications, battle simulations, mobile displays and computing systems, advanced space applications, and so on.

The US government's 1998 budget has $75 billion allocated to federally funded R&D of which the military accounts for almost $36 billion. Civilian research, increasingly conducted in university labs get about $35 billion. The distinction between the two categories continues to blur as greater emphasis is placed on dual-use, especially in electronics and information technologies. The programmes are being increasingly designed for both civilian and military applications.

This approach has an enormous pay-off to the country. In the communications area several shining examples of technology development exist. There are three companies in the Washington D.C. area alone which made use of such funding to produce communication systems for the military. All three of these companies have significant commercial efforts. Two of these companies have more commercial business than military business. One sells standard high tech communications products, and has gone public. Another has significant development contracts with multi-billion dollars conglomerates in the area of wireless communications.

Finally, Pakistan's neighbour, India, has also been successfully implementing such a strategy even before it became popular in the US. A company in India has developed a radar tracking system for the Indian military, and at the same time has spent at least half of its efforts developing boards, integrated circuits and software for large international firms. In fact, most the software industry in India, has its roots in military or communication systems development.

In Pakistan, there is an urgent need to follow the above mentioned strategy on a war-footing basis. It can lead to "leap-forging" acquisition in which some development stages are skipped and "flow-through components" like electronics and software are developed earlier to improve performance. Pakistan has lost many opportunities in the past but it is still not too late to identify "leap-ahead systems" along with serious efforts to establish and promote domestic science community for sustainable long term growth of the country. The suggested approach would not only promote a speedy development of the domestic science community but also enhance Pakistan's defence capability at the same time.

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