From science to technology

By Dr Farid A. Malik

TECHNOLOGY is the application of science. While science consumes, technology generates. Science is knowledge-driven whereas technology is market-driven. Now that the world of technology has been taken over by Information Technology (IT), most nations of the world, including Pakistan, are preparing for the IT revolution.

The ministry of science and technology has been entrusted with task of building the IT framework. As minister, Prof Attaur-Rahman, former director of the prestigious HEJ Research institute of Chemistry, is to lead the crusade.

In the past, several luminaries have occupied this coveted slot, including Nawaz Khokar, Shahnaz Wazir Ali and Syeda Abida Hussain, to name a few. Some of the secretaries have been: Parvez Butt, Dr S.M. Qureshi, Lt-Gen (retd) Javed Ashraf Kazi and Mr Javed Masud. The poor state of technology in the country calls for major soul-searching in our approach.

First of all, it must be understood that science is not technology. There should be a separate ministry for technology and science should go back to academia. The ministry of technology should be run by qualified technologists. Neither scientists nor bureaucrats nor retired generals are qualified to lead the technology movement. The link between science and technology can be defined and maintained, not taken for granted as is the current situation. While basic technology is being mismanaged, how can we achieve our cherished goal of developing the latest technology — IT?

Scientific investigations are carried out in controlled or monitored environments, usually in a laboratory. A scientist strives to unravel the mysteries in search of real data. Advancement of knowledge takes place. Scientists all over the world share information/results in technical symposia/publications. Economic considerations are not the determinants. Most of the scientific research is carried out with sponsored or donated funds.

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research landed in serious difficulties, with some of them going out of business. The massive Radio Corporation of America (RCA) is one such company. IBM has also focused on applied research with a major review of strategy. Companies like Intel and Microsoft started as IBM vendors. IBM even invested in these companies. Today, the stock value of Intel is many times the total assets of IBM. The same is true of Microsoft. Technological growth has brought prosperity to these organizations.

Pakistan must come out of the science syndrome. Research organizations like PCSIR, PAEC, NIE, MIRDC should be steered towards technology. Privatization or at least commercial discipline/leadership/profitability should be instilled. Items of commercial value must be developed and produced for the benefit of the people. Pakistan, for lack of input/participation of competent technologists, has only pursued science instead of technology. For any meaningful economic growth this must change.

Being market-driven, technology demands efficiency. Bureaucratic red tape invariably destroys the embryo of technology. The government has a role but it cannot control the avenues of growth. It must build a technology-friendly environment. Education is an important area needing attention. For meaningful transfer of technology, high standards of education are needed to absorb knowledge. According to Japan's ministry of education, the level of technological knowledge in 1960 was about 23 times the level of 1905. What is the level today? Where does Pakistan stand?

Committee after committee has been formed by the ministry of science and technology. Not a single recommendation of any committee has been implemented. In 1994, a series of meetings were held at the Aiwan-i-Sadar as the president took keen inter-

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Scientists are seldom burdened by the need to earn a living made difficult by market forces. Technology, on the other hand, has to face the real world. It has to fulfil customer needs of all classes. Technological achievements are not measured by peers but by customers who want a return on their investment. Efficiency of the system has to be greater than 100 per cent, which means the output has to exceed the input for the venture to be profitable. The product has to speak for itself. Its reliability, durability, functional quality and cost are all important.

Marketability drives technology. Research and development (R&D) is linked with market needs. The designers and researchers produce what the consumer demands. As the needs change, technology has to keep pace. Management of technology is management of change. The rate of change is the highest in IT. The technology giants: Intel, AMD, Microsoft, IBM, Compaq come up with new products all the time. The marketing and development departments work closely together in developing new products. IBM and Compaq are computer manufacturers who buy microprocessors from Intel and AMD while Microsoft produces the software to run the computers. What sells today becomes obsolete tomorrow. Timing is crucial and critical. Timely decisions have to be taken.

Education is a provincial subject. The federal ministry of education is under-utilized. The provincial education departments are fiefdoms. In Punjab the size of the department is as large as the Pakistan army (500,000-strong). The combined ministry of education and science can function quite well. Prof Atta-ur-Rahman and his team can move to this ministry to oversee applied scientific researches identified by the ministry of technology. In addition, the ministry of technology will identify the impediments in the way of growth and have them removed by the Chief Executive's office.

All modern industrial successes have come by way of technology. Japan, South Korea, Singapore, Hong Kong, Taiwan and Malaysia have developed because of technological growth — not scientific advancement. Technology does need a theoretical base, but theory alone with no application is only intellectual curiosity that a poor nation cannot afford. Pakistan should concentrate all its efforts on technology and leave scientific investigations for the rich and developed world. The country is seriously deficient in technology. The procedural methodology is non-existent. The approach is flawed.

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est in technology. Several proposals were approved, minutes were issued by the president's office. Yet there was no implementation.

Some important decisions included: (1) Formation of the Pakistan Technology Board under private sector leadership. Instead, an engineering board under bureaucratic control was formed. (2) Linking procurements with transfer of technology, which is a standard practice in India. No action till today has been taken because of the kickback mafia. (3) Developing and then improving upon procurement to indigenization ratio (P/I). Simple procurement has no benefit for the nation. Linking procurement with local manufacturing helps develop industry. The bureaucracy hates measurability: hence no action.

Two cardinal principles are followed in the world of technology: (1) What cannot be measured cannot be achieved; (2) mystery is always mischief. Both these rules are blatantly abused in Pakistan. Measurability is totally missing. No goals, no milestones, only cover-ups. Some of the standard cliches are: 'we will enter the 21st century as a respectable nation', 'Pakistan will soon be an Asian Tiger', 'Our future is bright'.

It is almost impossible to get information. The data culture does not exist here. The government thrives/survives by hoarding information. How can we enter the information age by acquiring appropriate technology when we are living in the stone age? The information highways cannot have roadblocks and speed-breakers; they have to be removed. A qualitative shift has taken place. The rules of the game have been changed. Knowledge is power and it cannot be contained. Information has to move for data-based decisions. As a nation we have a long way to go from the bureaucratic caves to the information highways. Only qualified technologists can lead this crusade, *baboos* and scientists cannot.