

S&T: search for a rationale

Athar Osama

Economist Robert Sollow, in his pioneering work proffers a theory that technology, and not capital or increase in workforce, is the key factor in economic growth of nations. His theory which brought him a Nobel prize in economic science in 1987 has influenced a whole generation of economists in search of a link between Science and Technology and the economic competitiveness of nations. Alvin Toffler, an established social thinker, takes this theory a step further when he presents his idea of the Third Wave. Toffler in his master piece, 'The Third Wave' analyses the changes taking place around the world and, basing on these facts, talks about the heralding of the techno-electronic age where concepts like information economy and knowledge-based work would be practically implemented. This, according to Alvin Toffler, would automatically put an end to the industrial revolution of the last century and would give way to a rise in service industries.

The economic scene around the world provides ample evidence in this regard. The industrialism that led the West to affluence has been overtaken by a new wave of economics based on science and technology. As factories around the world are automated by modern day's computerised systems and mind boggling mechatronic creations, thousands of jobs based on knowledge-related work are created and hundreds and thousands in the manufacturing sector get slashed each year, science and technology assumes a central role in the development policy of any nation with a sincere ambition to succeed.

A survey by the US Department of Labour provides a very strong evidence to this trend. Comparing the present job market (1990) with projections fifteen years later (2005), one finds that the areas which are going to experience a major boom are knowledge/S&T-based, like system analysts, computer scientists, programmers and management analysts, while among the losers are electronic-equipment assemblers, textile machine operators and machine-tool operators etc. The trend in the developed and semi-developed world is from low-tech. manufacturing to value-added high tech industries.

Most of the industrialised world is shifting its low-tech manufacturing jobs to the Third World not only due to the obvious advantage of low cost labour but also because it gives them the time and energy to concentrate on high technology which is going to

lead a nation to riches. It might be stressed upon as the mainstay of our economy due to obvious reasons, but in order to become competitive internationally we have to shift our emphasis to the high value added industries. Take Malaysia for example. Mohatir Mohammed, the ambitious Malaysian Premier, while understanding the importance of hi-tech industry has transformed the rubber/palm-rich country into a modern day technological giant. Consumer electronics, semiconductors, and microchips are the newly emerging industries in Malaysia. Their most recent success story is the Proton, the all-Malaysian car, a joint venture with Japanese giant Mitsubishi Corp. Mohatir aims to export 30 per cent of the total production.

Examples of the same trend can be seen the world over. Singapore's government invests in biotechnology, Taiwan aims at its share in world aviation market, India makes its mark in the world's software industry, European Community launches joint research programmes to retain its market share in tomorrow's high technology war with America. Programmes like Esprit, for information technology; Race, for communications technology; Brite/Euram, for new materials and manufacturing processes; and Eureka Audiovisual, for European version of HDTV provides the elementary research that materialised in the form of new technologies.

Technology has become a business, rather a big business. A leverage in tomorrow's critical technologies like semi-conductors, micro-electronics, new materials and biotechnology can mean continued economic prosperity for years to come. Experts believe that semi-conductors would constitute 4 per cent of the world's manufacturing output by year 2000 (i.e. US\$ 200bn in 1980 prices). New materials would revolutionise tomorrow's autos and aircraft by cutting cost, improving performance and life, and lessening the strains on world's ore reserves. The techniques developed through bio-engineering are also projected to make big business in the coming years. 75 per cent of all the seeds by 2000 would be bio-engineered. The market for bio-engineered pharmaceuticals would grow to a staggering US \$55 to \$70 billion (2000). One can well imagine what a breakthrough in these technologies means to any nation? Not less than billions of dollars in exports, and probably a perpetual growth scenario. It is for this reason that we find the industrialised nations concentrating on high-tech as they shed the low-tech portion of their manufacturing to the Third World.

In 1981, the Japanese Ministry of

time and energy to concentrate on high technology which is going to fuel their economies into the next century. While this might seem to be a good omen for the Third World, it is actually just the opposite. The newly emerging technologies have already affected the demand of the Third World's raw material industries. Super-tough alloys, plastics and composites replace metals in autos and aircraft; ceramics are likely to replace metal turbines in aircraft engines; optic glass fibre and communication satellites replace the requirement of copper in electronic transmission lines; and plastics used for packaging food and beverage cuts the demand of tin-plate by half. All this puts a lot of strain on the Third World, which is finding it increasingly difficult to make both ends meet. Evidence is strong that the Third World might quickly lose its advantage of cheap labour through the hands of western technology in the near future.

Take the case of textiles for instance. A few years back, the highly industrialised world was said to prefer importing textile from the Third World instead of involving themselves in this labour-intensive low-tech manufacturing. Today as automation increases, the trend has reversed. A survey conducted for 'Textile World' shows a trend in the US textile industry which is fast shifting towards the use of high-technology, automation and information systems to improve productivity, streamline operations and reduce manufacturing lead times and work-in-progress inventories.

Similar in the case of agriculture, the thing is quite obvious from the success stories of the newly industrialised nations. Agriculture cannot

thru world.

In 1981, the Japanese Ministry of International Trade and Industry (MITI) started a research and development programme on Basic Technologies for Future Industries (JISEDAL programme). The aim was to develop technologies that could spur industrial growth in the future. The project which goes well into the next century focuses on five basic areas, namely superconductivity, new materials, biotechnology, new electron devices and software. Eleven projects were completed in the first decade (ending 1991) costing about 66 trillion yen. Applications include high performance plastics, advanced composite materials, three-dimensional ICs, optical and bio-computers and high speed switching circuits. A similar initiative was the Japanese 'Fifth Generation Computer' programme aimed at developing the concept to Artificial intelligence and finding applications for this new technology.

All these things point towards only one fact. We are now entering an era marked with its insatiable desire of technology and the science that supports it. Future offices, homes, highways and classrooms would be high-tech needing a comprehensive ultra-high-tech backup infrastructure to produce it.

A small market share can mean billions. This would lead to an increased utility of developing an efficient S&T infrastructure now. Thus it leaves today's development planners and economists with no other choice but to buy tomorrow's riches today, by investing heavily and at times blindly in science and technology. We also ought to do the same if we are to ensure our economic well-being.