Computers were introduced into India in the early 1960s to help in the complex data processing work involved in formulating the country's five-year plans. This opened up a national debate on the ethics of computer use in a populous country with severe unemployment.

The fear that computers might displace workers held up their wider application until 1980 when the government decided in favor of economic and industrial liberalization and gave the green light to computer application in critical areas of production and research. Later the policy was extended to all areas in order to improve productivity and efficiency.

Expectations are now high that computer activity and exports will create more jobs, particularly for the educated unemployed. And even greater potential for absorbing this surplus labour is seen in the development of the software industry.

India's policymakers were conscious of the software potential right from the beginning. Even before the liberalization of computer use in domestic sectors, efforts were made to tap its export potential. Export-oriented software development groups were encouraged in the Exclusive Export Processing Zones (EEPZ). Government incentives helped to push up software export earnings from US$7.54 million in 1980-81 to $30 million in 1984-85. The figure for 1985-86, however, is likely to be lower because of a long labour strike in Bombay's Santacruz EEPZ, which now accounts for more than half of the country's software exports.

The government plans to expand the software production base beyond the EEPZs to avoid such mishaps in the future.

NEW SOFTWARE CENTRE

The government-created National Centre for Software Development and Computing Techniques (NCSDCT), in Bombay, has provided the R&D and human resources base for Indian software development and exports. This is now being enlarged and upgraded into a National Centre for Software Technology (NCST), to be the focal point for all software activities. Besides providing a policy framework for software development, use, and exports, the new agency will also provide training, disseminate software information, and offer consultancy services in both software and systems development for specialized applications.

Dr. N. Seshagiri, Additional Secretary in the Department of Electronics, explained that NCST will further develop the expertise that NCSDCT has already built up in data base management, computer-aided design, computer graphics, computer networks, digital-type design, and text processing of Indian language scripts.
schemes to handle all stages from inventory controls to marketing, using domestic software.

One important area not yet penetrated by computers is agriculture, which accounts for more than 60 percent of GNP. There is much potential for the development of software and computer services to serve the farm sector.

About 500 groups are engaged in software activities in India. The bulk of them (some 400) are software consultancy organizations. The rest are indigenous computer manufacturers with software development schemes, institutions with R&D facilities, or distributors of foreign software.

Indian companies have been developing software for different functions including banking, accounting, and materials management. Some of them have entered sophisticated areas such as computer-aided design and online system software development. And many are in the business of developing system components: assemblers, compilers, utility programs, simulators, screen generators, and so on.

Initially the software export projects executed by Indian companies involved the sending of professional teams to the foreign customer sites for specific assignments. Now there is a discernible shift toward contracted software, written or engineered in India itself.

It was the "unbundling" (separate pricing) of software in the early 1970s that marked the beginning of the Indian software industry. When computers were first introduced into the country, software was not priced separately by the foreign suppliers. Later, when the concept of modular software assumed importance, packaged software services were offered by some Indian firms linked with foreign parties.

ADVANTAGES FOR INDIA

Extensive English educational facilities in India have helped to create a large reservoir of personnel skilled in data processing. A number of other institutions also offer specialized courses in computer disciplines at the university level. Qualified people already working in computer establishments have good job opportunities in various areas of software and hardware application. These factors give India an edge over other developing countries engaged in the software business.

India's lower wages and cost of living make software produced there very competitive compared with software from the industrialized countries. This has helped some Indian software houses to enter the sophisticated markets of North America, Europe, Australia, and Japan. The Computer Maintenance Corporation (CMC), DCM Data Products, and Tata Consultancy Services are among the reputable Indian firms that have made a mark in software development and exports. Some firms have pointed out to the government that, with certain facilities and incentives, they could become very competitive in the international software market. The government is examining a set of suggestions by the industry.

A spokesman for the government-owned CMC felt, however, that the real opportunities for software groups would be in the domestic market. His point was that the growing use of computers in all sectors of domestic activity would generate a huge internal demand that the existing software groups may not be able to cope with.

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The following examples give some idea of recent domestic applications of software developed by Indian companies:

- A package intended to help garment manufacturers was originally developed for the export market, but has been bought by leading manufacturers in Bombay and Delhi.

- A hotel management system for front office, back office, catering, housekeeping, restaurant, and other facilities is being used by leading hotels in the country.

- The domestic airline, Indian Airlines, recently introduced a software system to handle reservations, cargo information, crew scheduling, and aircraft inventory.

- CMC has developed software for computerized news editing and switching of teleprinter transmission at the English-language wire agency, Press Trust of India. It is also working out a national rail reservation system for Indian Railways.

Among the system software achievements of Indian companies are: productivity tools such as program and system generators, skeleton generators, edit generators, and report generators. Software for designing Indian-language typewriter fonts is considered a major achievement. In addition, some of the companies deal in operating systems/cross compilers for BASIC, PASCAL, COBOL, and FORTRAN.

The Indian software industry, however, is about to face the major challenge of meeting domestic demand for computer aids in agriculture, poverty alleviation schemes, and rural development. In sophisticated areas, such as the country's space program, nuclear energy development, and oil exploration, the indigenous software industry has already made a mark.

Indian engineers are designing software to streamline the national railway's reservation system.