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Transferts de technologie

Paris : CIHEAM  
Options Méditerranéennes; n. 27

1975  
pages 81-85

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To cite this article / Pour citer cet article

Behari B. **Technological adaptation in small-scale industries: An Indian experience.** *Transferts de technologie.* Paris : CIHEAM, 1975. p. 81-85 (Options Méditerranéennes; n. 27)



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**Bepin BEHARI**

*Joint Director  
A.T. CELL  
New-Delhi  
India*

# Technological adaptation in small-scale industries : an Indian experience<sup>(\*)</sup>

(\*) The views expressed in this paper are personal to the author and they do not necessarily pertain to the organisation with which he is concerned.

## POLICY

The village handicrafts and small industries in India have been accorded a very high priority in the programmes of the economic growth particularly from the standpoint of social equity. According to the Industrial Policy Resolution of 1948, the development of some large-scale industries, and the coordination of the programmes of cottage and small-scale industries were recognised as a responsibility of the central Government. The Industries (Development and Regulation) Act, 1951 which was promulgated in order to provide the organisational support to 1948 Policy Resolution provided scope for a coordinated development of cottage and small-scale industries within the general framework of large-scale development programmes. With the establishment of the Planning Commission when a series of five-yearly plans began to be formulated, the emphasis on small industries significantly increased. In 1955, the Planning Commission even set up a Committee on the Village and Small Scale Industries (Second Five Year Plan) under an eminent economist Professor D.G. Karve to prepare specific proposals, industry-wise and wherever possible State-wise, for the utilisation of the resources to be earmarked for the purpose of development of these industries. When the Industrial Policy Resolution of 1956 was announced, it also stressed the importance of structural relationship between different sectors of industries and recommended certain products to be exclusively reserved for small industries sector.

A concentrated attention to technological appropriateness in the small industries began in 1962 with the appointment of Professor E. F. Schumacher as a consultant to the Indian Planning Commission. The concept of "Intermediate technology" was seriously debated at several committees, seminars and conferences. In June, 1966, the Ministry of Commerce constituted a Committee on Khadi and Village Industries under the chairmanship of Asoka Mehta to make recommendations for strengthening and expanding the programme of this sector. The Committee also stressed the importance of evolving appropriate technology for small industries in rural areas and it recommended the constitution of a

small and compact research group for not only conducting researches into selected problems but also for collating and disseminating research results. The Approach document on the Fourth Five Year Plan published in 1969 specifically stated that there was a scope in India for the adoption of an intermediate type of technology. To provide a nucleus of activities relating to identification innovation, adaptation and extension of appropriate technology, the Ministry of Industrial Development after a series of inter-departmental meetings constituted in 1971 an Appropriate Technology Cell. The work-programme of Appropriate Technology Cell which made a significant impact made on country's industrial programme and on international forums emphasized the technological suitability in attaining the objectives of industrialisation. Therefore the Industrial Policy decisions announced on 2nd February, 1973 indicated that the Government would ensure that the industrial licensing decisions conformed to the growth profile of the plan and to the techno-economic and social considerations such as economies of scale, appropriate technology, balanced regional development and the development of backward areas. While inaugurating the second national seminar on appropriate technology at Hyderabad in July, 1973, the importance of appropriate technology was further emphasized by the then Union Minister of Industrial Development Shri C.

Subramaniam when he stated that there was an urgent need for reorientation in the country's industrial policy and therefore to redefine her policies in regard to technology in order to make them move in tune with local circumstances, resources and needs of consumption and for the large mass of the people. The Government of India is at present engaged in evolving such an appropriate industrial policy with right stress of "appropriate technology" for different sectors of its industrial development.

## PROGRESS

The small-scale sector in 1969-70 was estimated to contribute gross domestic product of Rs. 36 700 million, provide employment to more than 6.3 million persons and supply about two-fifths of

the manufactured items in the country. The annual rate of growth of small units was estimated to be around 11 per cent. By 1972, 232 846 small units were registered on a voluntary basis in the country.

The structure of modern small-scale industries has become very much diversified. They have now been manufacturing highly sophisticated capital goods, electronic equipment, electrical gadgets, ancillaries for transport vehicles, and components for telecommunication equipment. As a result of technological progress achieved in this sector, more than 175 articles have been reserved for exclusive production in small scale sector. Items like domestic electrical appliances, manual insecticide sprayers, clinical thermometers are now licensed only in small units. Production capabilities have also increased for items like baby food, cameras, electric lamps, photoflash batteries, and for engineering items like centrifugal chillers for airconditioning in multi-storey buildings, sealed and semi-sealed air-conditioning refrigeration compressions, machine tools, high frequency induction heating equipment, thread grinding machines, precision measuring instruments, drugs and pharmaceuticals; miscellaneous items like cement, automobile tyres and tubes, calculating machines, electric typewriters, welding electrodes and arc welding rods have extensive scope for their production in small scale sector.

The various kinds of assistance given to village and cottage industries have also been useful in dispersing such production units over a wider area. As a result of such dispersal and extension of small scale units, sex participation ratio has significantly increased, the degree of under-employment has reduced, and the production profile of rural and cottage industries has altered in an important way.

As a result of technical and financial help accorded to village and cottage and small industries, this sector has made noticeable progress. From the data regarding the entire factory sector in 1968, it has been worked out that the fixed capital per employee on an average in small-scale industrial units was as low as Rs. 3,170, as against Rs. 22,000 in a large unit. The small-scale sector accounting for 7.5 per cent of the

total fixed capital investment in the factory sector contributed nearly 28 per cent of the total output in that year.

The definition of small-scale unit which was essential in order to identify the units which could be helped has also led to several complications. The present definition of small-scale units in India is based on ad-hoc administrative considerations. This sector which covers a wide range of traditional and modern small-scale industries including handloom, khadi, powerloom, sericulture, coir, handicrafts, village industries and mechanised small-scale industries, has been defined as such in terms of capital investment in plant and machinery not exceeding Rs. 0,75 million or rupees one million in case of ancillary units manufacturing parts and components. Prior to 1966, the ceiling on investment to qualify for Government assistance accorded to small-scale industries sector was only half a million rupees but employing less than 50 persons. The employment criterion has now been waived and the ceiling on investments raised. This qualification has created certain difficulties in introducing appropriate technology in this sector. Any scientific definition which could be helpful in the present context should have been in terms of product type, system of work organisation, number of workers, capital investment in relation to energy inputs, physical measure of output and value of production, but even then none of these could be a standard criterion for general application.

This approach has made it possible for many metallurgical, electrical and chemical units to incorporate higher levels of technology. Those categories of production items which have standardised production operations and which could be carried out according to specifications, blue-prints and designs supplied by large-scale units, many efficient units have been established. But such a growth pattern has led to a kind of cartellisation. Many Small units supplying inputs to a few specified large-scale enterprises, or several inter-connected units each within the qualifying investment ceiling and working in a chain operations but catering to a particular nucleus large unit have been organised. Ownership of these units is not necessarily as dispersed as desired. Ma-

ny of them are actually pseudo-small units. Many times, one finds a large number of small units set up contiguously at times under the same shed but with separate (even fictitious) entities; many spurious units which do not exist for any identified production process have also arisen just to complete certain formalities in order to take advantages of special assistance provided to small units. Such diversions have been unhelpful for the emergence of appropriate technologies in different areas of production. In many cases, the cost of production has increased, and in others, quality of the final output, as is evident in automobile production in the country, has deteriorated.

This approach to small-unit development has certainly led to a wide dispersal of entrepreneurship; greater awareness of technological possibilities has also been aroused. But, the introduction of labour-intensive technology which has often been advocated as a desirable objective in developing countries has not been encouraged in any substantial manner. Even skill-formation which comes by working either under a master craftsman, or under specialised training programmes with the objective of raising labour and capital productivity has not been achieved. These repercussions of ad hoc administrative decisions in relation to identification of small units cannot be quantified, nonetheless their existence, emergence, and spread under modern industrial *milieu* cannot be authentically controverted.

## LESSONS

Rural industries are primarily agricultural and their social organisation characteristically distinct from other industrial communities. The rhythm of agricultural operations, the special cropping pattern and the postharvest agricultural operations create a special type of work-pattern and employment conditions quite different from factory type of industrial organisation. The central impetus towards rural industrialisation is given by mechanisation of farm operations and improvements in postharvest agricultural technology. Structural linkages between agricultural technology, agro-based industries, changes in social organi-

sations and consumption pattern of the rural population play a very significant role in village development programme.

From this main characteristic, certain secondary conditions arise which also must be acknowledged. Labour supply in rural areas is inelastic and the man-hour available for industrial work is fluctuating depending on seasonal requirements of agricultural operations. The levels of skill as well as the degree of specialisation are not very high. The demand pattern is not very sophisticated. The items of production which are primarily intended for local consumption do not have much incentive for sophisticated large-scale production. (This also explains the main interest of large-scale industrial units with such production items which are generally required by urban social elites). Divorce of manufacturing activities from agricultural operations generates inbuilt quality for stagnating rural economies.

The three special factors which intimately impinge upon technological status of small-scale industries are (i) distinct pattern of small unit production organisation significantly different from large units, (ii) imitative rather than innovative technology extensively prevalent among small scale artisan-entrepreneurs, and (iii) poor availability of managerial technology. In metallurgical, electrical and chemical units, product specifications are generally laid down by large-scale units as a result of which technologies for the same are greatly influenced by the practices adopted in large units but in other areas of production small units have to face much difficulties. Standardisation is introduced only gradually and through the adoption of the same in large-scale units. The Indian Standards Institution have already standardised more than 6 000 items of which a large proportion cover small scale industries. Some of these standards relate to sports goods, cutlery, utensils, matches, surgical instruments, bicycle and bicycle parts, automobile components, sewing machine and parts, cosmetics, edible oil, cattle feed, potteries, agricultural implements and tools, bricks and tiles, lime and mortar, drawing and survey instruments, leather and leather products. Such standardisations have certainly increased the marketability of these items and their acceptability by large-scale units, but the lack of specifications regarding the tools and equip-

ment as well as of production processes which could be adopted has not been helpful in the evolution and introduction of appropriate technology in those areas of production.

The small units do not have either adequate resources or the necessary inducements for establishing their own R and D organisations. Under Indian conditions, unless a small unit has an investment of Rs. 10 million, of which 2 to 3 per cent is earmarked to research installations there may not be any possibility of employing even a group of 2 to 3 engineers for this kind of work, which is the necessary minimum. Obviously, therefore, the stipulated investment ceiling precludes the small units from owning their own research installations. Cooperative research establishments in small industries have not yet made any headway. The production organizations in small-scale are considerably hampered by the manufacturing operations and industrial practices not being organically related to cultural and environmental factors of the rural communities. The metropolitan concentrations even in India to a great extent are very much similar to the Western industrial complex, but a wide gulf exists between the rural and the urban settings within the country itself. The advantages of scientific management techniques as applicable in streamlined industrial communities do not obtain in rural societies where human relationships are still determined by customs, tradition, conveniences and many other non-economic conditions. Lack of sociological support is generally and undefined dimension of industrial technology in Indian small-scale sector. To overcome such a situation, one will need much social education and proper psychological orientation which is indeed an uphill task.

The institutional structure existing in the country and the various new beginnings made in different sectors of the economy have been integrated together to foster appropriate technology. Some of the existing organisations which have played a vital role in their respective areas can neither be duplicated nor bypassed. For this reason, India has been welding together the various specialised institutions to mobilise their support and assistance to introduce appropriate technologies in different areas. In this pro-

gramme, some of the organisations whose contribution has been outstanding are mentioned below, though the listing by no means is comprehensive.

### INSTITUTIONAL SUPPORT

India has thus acquired a colossal scientific and technological infra-structure. But, the task of identifying the technological needs of different sectors and mobilising the existing technical know-how for satisfying such requirements is however often beyond the competence of any one specialised organisation. Even several other related programmes, such as field-testing, setting up of pilot projects, making comparative-cost studies, evaluating the comparative advantages of available technologies and such other items of work required a special type of organisational support. For this purpose, The Appropriate Technology Cell was constituted by the Ministry of Industrial Development in February, 1971. The primary aim of Appropriate Technology Cell is to compile different kinds of available technologies in identified areas to evaluate their relative significance, and to make them adapted to the specific needs of the region. The work programme of Appropriate Technology Cell links it with different research installations in a special way. It works primarily like a catalyst but it also gives direction to innovative work and makes the innovations adapted to special area requirements. The experiences gained by the Appropriate Technology Cell in this special type of works has given it a considerable insight into the problems of adaptive innovations in small scale and rural industries. Its pattern of work has developed on pragmatic considerations emphasizing the fact that the transfer of technology to actual needs of the people is an art which can be effectively implemented only with a broad vision and special expertise.

(1) *Small Scale Industries Development Organisation* (SSIDO) with central organisation at New Delhi and 16 Small Industries Service Institutes (one in each State, including the Union Territory of Delhi), 7 Branch Institutes, 55 Extension Centres, 2 Training Centres and 3 Production-cum-Training Centres is concerned with coordination, industrial development and industrial extension service. The technical service of the organisation is concerned with provision of (1) technical know-how, (2) know-how on machinery-process, costing and other ingredients, (3) problem oriented technical consultancy, (4) instant studies in depth, (5) design and drawings, (6) prototypes, (7) workshop and laboratory services, (8) training in technical trades, and (9) dissemination and training through mobile vans. The organisation has also separate wings on economic investigation and information service, management services and marketing services.

(2) *Rural Industries Projects* programme, now a part of SSIDO, has since 1962 when this programme was sponsored by the Planning Commission, been concerned with intensive industrialisation programme of 49 selected areas in different parts of the country. Under this programme, financial assistance, technical assistance, entrepreneurial help and allocation of scarce industrial inputs are given. The area of operation of each of the existing 49 projects has been extended to cover the entire districts (excluding towns with more than 15,000 population). Besides, five new districts were taken up in 1971-72 and steps are being taken to include 57 additional areas during the Fifth Five Year Plan under this programme.

(3) *The Khadi and Village Industries Commission*, Bombay, set up as policy making-cum-executive body, is concerned with purchase and stocking of raw materials, production of goods and commodities, designing of tools and instruments and manufacture and supply thereof, technical advice, training etc. The KVIC has been assigned free scope in planning, organising and implementing the programmes for the development of khadi and village industries. The KVIC has set up executive organisations in different states and got field level workers to implement its various programmes. KVIC have been given special responsibilities with regard to processing of cereals and pulses, ghani oil, village leather, cottage match, gurkhandsari, palm gur, non-edible oils and soap, handmade paper, village pottery, bee keeping, fibre, black smithy and carpentry, manufacture and use its products, manufacture of shellac, collection of forest plants and fruits and medicinal purposes, fruit processing and preservation, bamboo and cane work, manufacture of house-hold utensils from aluminium, manufacture of gum resins and manufacture of Katha.

(4) *All India Handicrafts Board* is concerned with handicrafts which had been products of old artistic skills. Items included under this category had been hand-knotted carpets (employing nearly 80 000 persons), art metals wares in traditional and contemporary designs including engraved brassware, and wood crafts including carved furniture, delicate and ornamental sandalwood objects, inlay work on wood and lacquerware toys and dolls, costumes and jewellery, special textiles such as brocades, patola, chanderi etc., embroidered shawls, zari: gold and silver-embroidered articles, intricate and painstaking ivory-carving, pottery, stone crafts, pith craft and basketry, and similar other crafts. There are such other Boards also connected with other areas of small industries.

(5) *The Council of Scientific and Industrial Research* employing 13,792 scientists engaged in 35 specialised national and regional research laboratories has been concerned with innovative research. The research results of these scientific installations are commercialised through *National Research Development Corporation*. Even risks involved in adopting new inventions are shared by the organisation. *Invention Promotion Board* now functions with NRDC and is primarily concerned with encouraging new productive inventions. *Indian Standards Institution* is engaged in standardising products and processed with regard to different products produced in India.

(6) The Government Departments concerned with different items such as agricultural projects, railways, shipping and transport, and such other subjects have many specialised research installations working in special areas. *The Indian Council of Agricultural Research*, *the Agricultural Research Institutes*, *the National Sugar Research Institute*, *the Cement Research Institute*, *the Hindustan Housing Corporation*, *the National Building Organisation* are some examples of such specialised research organisations. Even some research installations under different State Governments (such as, the *Planning Research and Action Institute*, UP) have made useful contribution.

(7) Almost all large-scale industries have their own R & D offices. Many research organisations like Sri Ram Institute of Industrial Research have been doing useful work in private sector; the technical academic institutions as well as many University Departments also have made valuable contributions.