

Sub-Contracting: Emerging Issues in the Indian Context

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Sub-contracting which is widely practised in Japan has been inferred by many as a major source of competitiveness of Japanese industries against the American and European counterparts. The gainful role of sub-contracting has been recognised significantly at the academic and policy making levels. Yet, its commercial application is not widespread in India. The present paper attempts to develop a better understanding of the nature, role and relevance of sub-contracting in order to facilitate identification of strategic elements both at enterprise and governmental levels for higher productivity and competitiveness of the Indian industries.

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In striving for competitive excellence, necessitated by the opening up the economy, firms have to look for new cost-efficient ways faster than it has been before. With the kind of revolution in the areas of technology (information technology, for instance) and management practices that are taking place across the world, it has become both a possibility and a necessity to manage industrial units at disaggregated levels starting from sourcing of inputs to the final sale and after-sale service. An important benefit of this development is the scope to specialise not only product-wise but also process-wise, to reduce unit cost of production at all levels. In this quest for creating and sustaining competitive advantage large producers increasingly concentrate on their 'core' activities, which usually include design, marketing, assembly and the production of some key components and subcontract or source externally an increasing range of inputs, components and services. Sub-contracting enables a symbiotic co-existence of large and small industries in their respective areas of specialisation. Sub-contracting which is widely practised in Japan has been inferred by many as a major source of competitiveness of Japanese industries against the American and European counterparts (Ohnishi, 1992; Kam, 1991). The gainful role of sub-contracting has been recognised significantly at the academic and policy making levels. Yet, its commercial application is not widespread in India. The present paper

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Sub-contracting: Meaning

Under perfectly competitive market conditions, knowledge of all kinds (including technology) required for the functioning of firms, are accessible without any transaction cost. Hence, firms engaged in complementary activities, buying from and supplying to each other do not need to co-ordinate their activities by exchanging any information. But the real world industrial economy hardly satisfies conditions of perfect competition, hence requires "direct relationships established by firms in complementary activities which are external to pure market transactions" (Lal, 1980). Inter-firm linkages are essential for the normal functioning of any industrial market with its broader objective of development of linked activities.

The term "inter-firm linkage" is used to encompass all possible forms of economic relationships between firms operating within an economy. A linkage usually implies a continual relationship involving recurrent transactions. Sub-contracting, one among the inter-firm linkages, aims at maximising competitive advantage at the disaggregated levels of firms. UNIDO (1974) defined sub-contracting as a relationship that "exists when a company (called a contractor) places an order with another company (called the sub-contractor) for the production of parts, components, sub-assemblies, or assemblies to be incorporated into products to be sold by the contractor. Such orders may include the processing, transformations, or finalising of materials or parts by the sub-contractor at the request of the contractor". Sub-contracting may be defined as the buyer-supplier relationship between firms accompanied by their contractual arrangement. Sub-contracting relationship could be combined with various other forms of inter-firm linkage(s) like technological, financial, managerial, marketing, etc., but these forms of inter-firm linkage(s), without the contractual buyer-supplier relationship among them, do not qualify to be called as sub-contracting.

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Sub-contracting is often confused with the more general type of inter-firm relationship. Sometimes firms procure 'bought-out' items from the market purely based on price and quality considerations without any prior written or verbal contract. This type of inter-firm relationship, usually between specialist manufacturers with invariably more or less equal bargaining strength, is often based on their technical strength. This can be analytically different from the sub-contracting relationship which is normally practised between a large firm and a small firm (with different endowment and unequal economic power) (Nagaraj, 1989). Sub-contractor usually undertakes manufacture only on getting transactional contracts from his parent firm.

Ancillarisation, a sub-set of sub-contracting, has a longer term relationship between the buyer and the supplier with guaranteed steady off-takes. An ancillary unit, as defined by the government of India to accommodate fiscal incentives, is an "undertaking having investment in fixed asset in plant and machinery not exceeding Rs. 75 lakhs and engaged in a) manufacturing of parts, components, sub-assemblies, tooling or intermediaries, or b) rendering of service and supplying or rendering or proposing to supply or render 50 percent of their production or the total service, as the case may be to other units for production of other articles, provided that no such undertaking shall be a subsidiary of or owned or controlled by, any other undertaking".

Types of Sub-contracting

Sub-contracting is feasible in industries whose production involves discrete (divisible) processes and/or the final product is constituted by a number of parts and sub-assemblies. Depending upon the stages at which sub-contracting is undertaken it can be classified as: Component sub-contracting, Activity sub-contracting, Assembly sub-contracting and Product or Marketing sub-contracting.

a) Component Sub-contracting

A parent firm limits its activities to the manufacture of critical (technology-intensive) components and assembly of a final product. Production of other parts and components which are not in line with the core activities of the firm are sub-contracted to others. But the product designing and final testing have been retained in-house, in most of the cases, by the parent firm. Depending upon the closeness of the inter-firm relation the parent unit provides raw-materials, tools & equipments and testing

facility to the sub-contractors. This type of arrangement is quite common in the engineering industry.

b) Activity Sub-contracting

Some production processes consist of distinct activities which if sub-contracted to small firm reduces cost of production. These activities range from highly labour intensive simple job-work to skill-intensive job-work. In this type of arrangement parent unit normally provides raw-materials and equipment to the sub-contractor. It is widely prevalent in the railway industry where all machine operations are usually done through sub-contractors.

c) Assembly Sub-contracting

In the industry groups where final product consists of a set of highly technology-intensive critical parts and components, large scale unit concentrates on its specialisation, the final assembly sub-contracted to small units. For example, production of electronics components like chips, capacitor, transistor, TV picture-tube etc. are capital intensive and require high technology, where as, final assembling of a TV set or a computer set is labour and skill intensive. The parent firm supplies the complete kit to the sub-contractor and takes away the assembled products for marketing under its own brand name.

d) Product or Marketing Sub-contracting

Under this arrangement the sub-contractor manufactures the complete product and the parent firm market the product under its own brand name. Product design and quality are generally controlled by the parent firm. The examples in the Indian context are domestic electrical appliances and leather products.

Benefits of Sub-contracting

Sub-contracting has been traditionally viewed as a palliative to distortions in the economy's factor prices (e.g. wage rates, interest rates). Hence, the benefits from sub-contracting will cease the moment such distortions get marginalised. It is also considered that the sub-contracting is developed in response to a policy regime which restricted expansion through vertical integration (Saha, 1993). As against this a more recent alternative view gaining popularity is that, the sub-contracting system has potential efficiency advantages over vertical integration or purely market based transaction schemes (World Bank, 1989). The Japanese system is often cited as a model for LDCs for the dynamic benefits of sub-contracting in stimulating technological diffusion, growth of small

enterprises and use of labour intensive techniques (Lal, 1980).

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In India also, the benefits of sub-contracting was thought to be governed by low labour cost at the sub-contractor level. With the development of the Indian industrial economy and complications in the production processes the relevance of other benefits like economies of scale, quality of product, and specialisation at firm level are gaining momentum. The motivation for sub-contracting depends on the extent of benefits derived by the participating units vis-a-vis in-house production or purely market based buying/supplying. The benefits from sub-contracting can be classified at three levels as:

- a) Large firm (parent) level
- b) Small firm (sub-contractor) level
- c) Economy level

The benefit at the economy level is a derived one from the first two. It occurs in the form(s) of increase in employment, proper division of labour, economies of scale, entrepreneurship development, favourable regional/personal income distribution, higher competitiveness and so on. Since the business rationality for sub-contracting lies at the large firm and small firm levels, here we will focus our discussion only at the first two levels.

a) Benefits at large Unit (Parent) Level

Keeping in view the higher benefits of sub-contracting over vertical integration or purely market-based transaction many large scale units are increasingly opting for sub-contracting. The major benefits from sub-contracting at the parent unit level can be outlined as:

i) Specialisation & Cost Advantage

The fundamental benefit of sub-contracting is specialisation and cost reduction. When a product is produced under various divisible production processes with many parts/components combined with the products at various stages, it may not be possible for a unit to specialise on each and every part/component or process. Specialisation at all levels may not be required also, since

many of these activities may not be in line with the core area of the unit. Under these circumstances some parts/components and/or job-works of different processes can be sourced through sub-contractors and component suppliers. In other words, the degree of vertical integration is being reduced and the share of the firm's turnover which is accounted for by the sourced inputs increases. For example, in a large Swedish engineering firm, the share of sourced inputs increased from 37 per cent in 1976 to 60 per cent in 1987 (Gadde & Hakkanson, 1992). It was also observed in Japan that in seven industries, sub-contracting ratios exceeded 70 per cent. (Transport machinery, electrical machinery, textiles, apparels, general machinery, precision machinery & metal products) (Govt. of Japan, 1989). There are certain inherent advantages in resorting to sub-contracting practice. These include:

- a) Wages in the small scale sector are lower than in the large scale sector but productivity is not proportionately lower than in the large scale sector (Ramaswamy, 1994);
- b) The small size of workforce in the small scale unit facilitates proper supervision/management which reduces overhead cost;
- c) Specialised knowledge with regard to the production of some parts and components and performance of some activities lies at the small scale level.

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ii) Easy Implementation of FMS & JIT

As a result of the intensification of competition and consumer sovereignty at the national as well as international markets, firms have to design and deliver products as required by consumers. Market segmentation on the basis of similarity in consumers requirement is the present day business strategy offered as a solution (Porter, 1980). Business structure must therefore be simplified to maintain flexibility in response to changes in consumer requirement (APO, 1994). Flexible Manufacturing system (FMS) is a present day organisational form to keep high flexibility in designing, assembling and delivering the final product. Product differentiation and market focussing in terms of price, quality, design,

delivery and after sale service have their bearings on the modifications of parts/components and/or processes of a unit, which ultimately determine the system's flexibility. Higher flexibility in parts/components and processes with in-house production system requires high capital investment. This may also lead to low capacity utilisation and high inventory carrying cost which in turn erode profitability of the unit. Sub-contracting is a way out of this. Constant buyer-supplier relationship helps in sourcing diverse nature and forms of parts/components and job-works without adding to capital cost of the parent firm. Sub-contracting facilitates easy and quick sourcing of parts/components at the right time when compared to in-house production. Since, JIT addresses to the firm as well as all of its sourcing and supplying entities, this kind of relation is more feasible among inter-dependent units with recurrent transactions than those based purely on market conditions. The *Kanban* system of production management, FMS and Just-in-Time (JIT) purchasing and delivery management are simply a manifestation of efforts to rationalize and recognise sub-contracting system (APO, 1986). Sub-contracting linkages have, thus, become a system's requirement to improve competitiveness at the enterprise level.

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iii) Insulation from Market Fluctuations

Day-to-day business fluctuations are necessarily associated with market oriented economies. Supply from sub-contractors can act as a buffer against any kind of market fluctuation experienced by large scale units. The sharing of market fluctuations minimises concentration of losses, not only in reduction in inventory cost but through quick response to changes in market demand also. There are evidences where large units successfully pass on burden of market fluctuations, to the sub-contractors. This is usually done by (a) delaying payment of bills (b) refusing to take delivery of goods and/or (c) postponing inspection of materials (Nagaraj, 1989). But in a healthy sub-contracting system, like that in Japan, much of the burden can be eliminated or shared mutually by the participants in order to keep a mutually beneficial long-term relation.

iv) Advantage of benefits/incentives given to the SSIs

All over the world, the governments and developmental institutions of various countries have been providing support in various fields and incentives to the small scale industries. The incentives/benefits that are provided to this sector include: (a) reservation of items (b) differential fiscal treatment (c) procurement of raw-materials, (d) concessional finance (e) preferential treatment for govt. purchase etc. Perhaps, because of this reason large scale units are increasingly concentrating on designing and marketing of the products and the production is sub-contracted to the small scale or informal units. The large scale units only use their own brand name. This kind of product sub-contracting is being practiced by Bajaj Electricals, Bata India Ltd. etc. Large scale units co-exist with small scale units to take advantage of the governmental policy.

b) Benefits at Small Scale Unit (sub-contractor) level

Normally the major difficulties faced by the small scale units are those relating to marketing of their products and the exposure to the latest technological developments. Many other problems of the small scale industries can be sorted out with a mutually beneficial sub-contracting relationship with large units. This may briefly be outlined as:

Assured Market: By tying with large units, small scale units can have assured long-term market. The market demand for the products of a small scale unit can invariably move with the market growth of the sub-contracting firm unless the unit is found to be unreliable with the agreed terms and conditions. This type of relationship is of great help to the new units who usually suffer from brand acceptability by the consumers.

Technological & Managerial Benefits: Kam (1991) has conceptualized four basic ways in which a small scale unit can benefit technologically from the parent unit. These are:

a) **Direct know-how transfer effect:** As a part of its efforts to sustain and develop the sub-contracting relationship, the parent unit may make conscious efforts and resource commitments to transfer certain technologies to its suppliers.

b) **Learning facilitation effect:** Even if the parent unit does not provide actual know-how of the operation of the process technology of the supplier, the very process of the parent unit implementing its stringent quality/performance assurance/control system over the output supplied by the sub-contractors may pro-

vide valuable feedbacks that will greatly facilitate the technological learning of the latter.

c) **Spillover or indirect effect:** The very process of carrying out transactions through the sub-contracting relationship itself often inherently imparts technological knowledge from the buyer to the seller. In addition, the existence of the relationship sometimes allows opportunity to access or exposure of the small scale units to certain information resources within the parent unit's environment in ways which are unintended by the parent units.

d) **Inducement effect:** The very existence of the sub-contracting relationship may induce the supplier to commit to technological investments that would otherwise not have been made in the absence of that relationship.

The relative importance of these four effects depends on the specific sub-contracting relationship in question. Depending upon the technology acquisition, absorption and adaptation capabilities the gain among different small scale units will vary accordingly. The small scale units are likely to benefit from exposure to the modern managerial practices followed in the parent units. This can take the form of shopfloor management to corporate planning to improve organisational productivity.

Reduction in Transaction Cost: Under the present day imperfect conditions, enterprise has to bear transaction costs of access to knowledge in production and marketing. Production scale being a constraint for higher transaction costs for small scale industries, sub-contracting can help in minimising cost in many ways. These include:

- Less expenditure in marketing and advertising
- Sometimes easy access/availability for raw-material procurement with the help of the parent unit
- Less stringent and less costly technology transfer from parent unit
- Access to the parent unit's product and process testing facility

Allows Specialisation: By concentrating on a few activities small scale unit (sub-contractor) develops specialisation. Specialisation being governed by division of labour, experience and learning by doing; assured market at the initial stages of establishment of a unit provides larger scope for specialisation. Achieving higher degree of specialization, sub-contractor may turn

into an independent producer at a later stage, a feature very often cited in the case of Japan (Ohnishi, 1992).

Experiences of Other Countries

Sub-contracting practices have assumed great importance in the developed countries. There has been long and established system of sub-contracting in Japan (Shitauke) which has played an important role in enhancing competitiveness of the Japanese corporations against their European and American counterparts. It has been observed that about two thirds of the SMEs in Japan have been involved in sub-contracting. The dependence on sub-contracting is particularly high for SMEs in the electrical/electronics and machinery industries with about 80-90 per cent. In Korea, the sub-contracting activities showed an increase in recent years. The proportion of firms that engage subcontractors has increased from about 38 per cent in 1982 to about 43 per cent in 1986. The rate of sub-contracting is the highest in Electrical/Electronics Industries (72 per cent).

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In Japan, many large corporations have developed hierarchical supplier system that have the responsibility for product development at the level of sub-system in a just-in-time supply environment. These first tier suppliers had in turn their own suppliers with a narrower or lower capability. More than one third of the SME sub-contractors themselves sub-contract to others. It has been found that the hierarchical structure is highly efficient in minimising communication and monitoring costs by the buyers (Bhote, 1989). The large corporations and the sub-contracting firms generally have continuous business dealings for many years. According to a survey by Govt. of Japan in 1988, nearly 60 per cent of the sub-contracting firms stated they had maintained business relationships with the same parent firms since establishment. 35 per cent of the sub-contracting firms have dealings with the same parent firm for more than 20 years. The impact of long term relationships upon cost-down efforts show that a parent firm in USA had difficulties in persuading vendors and barely achieved the cost-down by a mere 0.25 per cent, while the Japanese counterparts was able to reduce cost by six per cent (Dertouzos et. al., 1990).

The sub-contractors are generally chosen on the basis of technical capabilities they possess in terms of design, development and manufacture of products. The parent firms offer services with regard to quality control, production methods of new products and process design and development (Govt. of Japan, 1988). There is also continuous co-operation and close relationship between the parent firm and the sub-contracting firms. For example, a study on metal and machinery industries in Nagoya region in Japan revealed that 46 per cent of the sub-contracting firms took part in product design and development with the parent firm (Ohnishi, 1992). All these have led to the development of mutual confidence and trust. This in turn has minimised the cost of inspection of intermediates, since one party can perform these functions for the other. This inspection-less delivery system has been introduced by two-thirds of parent firms in Japan (Osaka Industrial Development Research Institute, 1990: cited in Ohnishi, 1992).

The emphasis on minimisation of transaction cost, proper quality control and JIT environment warranted to develop close and continuous relationships between the parent firms and its sub-contractors. This has manifested in reduction of the number of suppliers and concentration on few competent and reliable suppliers. For instance, Rank Xerox reduced its number of suppliers from 5000 in 1981 to just over 300 in 1986 (Gadde & Hakkanson, 1992). The future may be seen, perhaps by looking at the pattern in Japan. Already in 1984, Toyota had only 168 suppliers as against General Motor's 3500.

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Technology transfer is also an important factor in the development of sub-contracting systems particularly in Japan. Technology transfer plays an important role in accomplishing QCD (Quality of Parts and Components, low cost of production and quick delivery in the shortest possible time). Provision of technical guidance in terms of design, specification and implementation by the parent firm as well as exchange of technical personnel with the parent unit can be the major sources of technology transfer to the sub-contracting firms. A survey conducted by the Government of Japan in 1986 confirmed that sub-

contracting firms themselves highly appreciated the services rendered by the parent firms and claimed that their technology levels were upgraded more than that of their competitive firms. An increasingly large number of the SME sub-contractors have developed very advanced technological capabilities on their own and some of these suppliers have become increasingly independent and less willing to confine their growth to the dictates of procurement requirements of the large firms. The traditional sub-contracting system is, thus, entering a period of change, with a trend towards a more open market system (Govt. of Japan, 1989).

The Indian Scene

In order to promote the growth of small scale and ancillary units the Bureau of Public Enterprises (BPE) issued comprehensive guidelines in 1971 regarding procurement, price fixation, marketing etc. to all the public sector enterprises, spelling out the steps to be taken by them. Subsequent revisions and additional guidelines were issued for earmarking areas/items of ancillarisation in new/expansion projects. The information available upto 1985-86, shows that Public sector enterprises increasingly relied on the SSIs and ancillary units as shown by the value of off-takes by the public sector units.

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Small Industry Development Organization (SIDO) established 16 Sub-contracting Exchanges in the country. The objective of these Exchanges is to organise buyer-seller meets for sub-contracting, vendor development programmes etc. to help in the growth of sub-contracting practices. About 80 per cent of the units registered with the SCEs are from the private sector. Eventhough the number of units registered (i.e., buyer) with SCEs have remained in the range of 1200 to 1700 over the period 1981-82 to 1990-91, the number of units assisted (i.e., potential suppliers/by the SCEs have grown sharply by 243 per cent during the period. This is an indicative trend of the growth of sub-contracting in the country.

Some micro level studies show that the scope for sub-contracting is quite large particularly in the automobile and electronics sector. According to a study undertaken by World Bank (1991), it was found that the

extent of component sub-contracting in some of the automobile units was found to be between 55 and 70 per cent. One domestic electrical appliances manufacturer had 100 per cent of its products made through sub-contractors/vendors. Similar instances are observed in other engineering sectors, readymade garments etc. also. It is also observed that the number of vendors/sub-contractors is very high in some cases. For example, Bajaj Auto Industries Ltd. has about 700 vendors where as Telco has more than 1000 vendors. Discussions with some units particularly from the automobile sector, reveal that the component suppliers ratio is about 1:3. Most of the sub-contractors on their turn sub-contract out a part of their activities to others. This implies that the extent and level of industrial sub-contracting in India may be substantially more than what is normally understood through stray observations.

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Major Areas of Concern

In the modern industrial environment the relationship between large firm and its small scale suppliers has become extremely important. This is due not only to the absolute size of sourced inputs but also to other factors. First, just-in-time (JIT) and Total Quality Management (TQM) make deeper and long term relationship with suppliers a necessity. Second, the firm becomes more dependent on the supplier's technology in their area of specialisation. Often complete sub-systems are bought instead of components. This requires close co-ordination of the design work of the firm and it's suppliers in order to meet objectives of short lead time and cost efficiency. Openness and trustful relationships of a long term nature are at the core of these relationships between buyers and suppliers.

The major areas which have significant bearings on the development of a symbiotic relationship between large scale and small scale units can be identified as:

- a) Identification of items and suppliers for sub-contracting

- b) Maintainability of product quality and efficient delivery
- c) Price negotiations
- d) Payment of bills
- e) Development of a conducive policy environment

a) *Identification of Items & Suppliers for sub-contracting*

The scope of sub-contracting is primarily determined by the extent of items/activities which can be economically off-loaded to competent and reliable suppliers. Considerable efforts have been made at the governmental as well as non-governmental levels to earmark and vacate items/activities for sub-contracting and develop entrepreneurial ability at small scale level. Reservation of items for small scale units and issue of guidelines to the Public sector enterprises seems to have not contributed much as it was expected. Probably the immaturity of the small scale sector was an explanation for limiting sub-contracting activities to simple and highly labour intensive items/activities. Some established suppliers which enjoy monopolistic price and quality advantage often branded their product and prefer market based inter-firm linkages rather than of a sub-contracting type. This kind of cases are more observable in the automobile industry.

Sub-contracting is economical to conceptualize at the initial stage of setting up a unit or expansion/diversification of the existing unit by reducing capital cost and excess capacity. Sub-contracting of sophisticated items/activities often require training, monitoring and product testing of small sub-contractors which reduces prospective gains from sub-contracting. This cost may be minimized in the long run depending upon the learning and adapting capacity of the small subcontractors.

Where firms are integrated in networks require to build close relationship with an optimum number of competent and reliable suppliers. Many of the successful companies in the area of sub-contracting treat identification of sub-contractor as a continuous improvement process under the purchase department. The process of Motor Industries Company Limited (MICO) is worth mentioning here.¹ One of the major functions of the purchase department is to locate the potential suppliers to the company. Besides it's own efforts the company receives many letters from different units giving details of what they can supply. All the concerned persons are called for discussions and if found promising a visit to the workplace was organized by competent engineers to as-

sess the technical competence, plants & equipment and tooling, details about their customers, finances. After this, the company releases a developmental order and if the samples are found satisfactory a trial order is placed and then next bulk orders are placed. If these are accepted the supplier is placed in the Vendor Quality Rating (VQR) system of the company.

b) *Maintainability of Product Quality & Efficient Delivery*

As a result of the structural adjustment and economic liberalization, Indian Industries are poised to adapt in line with the international standards in price, quality and service to ensure their growth and survival in a competitive environment. This can be discerned from the finding of a survey conducted by NPC-IFC Group (1994). The organizations involved in various Total Quality Management (TQM) activity (in percentages) are found as:

ISO 9000	74
Continuous Improvement	60
Problem Solving	55
Quality Circle	52
Quality Improvement Team	42
Process Analysis	39
Kaizen	34
JIT	23

Organizations giving priorities in different areas of operational performance for measurement and comparison (in percentages) as:

Productivity	65
Innovation	52
Flexibility	32
Delivery Time	23
Reliability in Delivery	17

Keeping in view the parent unit's requirements, the small-scale units will have to improve their performance for the establishment or continuance of inter-firm linkages. This improvement will come about by focussing on production of quality goods in a cost efficient manner and generating enough surplus to plough back into business to improve productivity on a sustainable basis. In fact, quite a large number of ancillary units have failed, simply because they could not satisfy the quality requirements of the parent firms, in spite of having the advantage of preferential prices. Many large scale units expressed their reservation about Sub-contracting of relatively sophisticated and critical items due to the sub-standard product quality and unreliable delivery schedules by small scale units. Small scale units necessarily have to emphasise on quality management in order to grow side by

1. Taken from Raman (1986).

side with the large scale units. Some of the measures that small scale units may undertake include:

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- i) Understanding and treating client unit's requirement and specification on a priority basis.
- ii) Defining a clear-cut 'Quality Policy' and 'Quality Objective' for the unit.
- iii) Emphasizing quality management at all activity levels rather than concentrating only at the final production stage.
- iv) Developing a conducive environment to make the quality consciousness programme a self-sustaining one for continuous improvement.
- v) Qualifying acceptable quality standards like ISO 9000 series or it's counterpart indigeneous standards.

The parent units should also work hand in hand with the supplier units so as to upgrade quality of products and services. In this direction, parent unit can help the small scale units in technology upgradation, design implementation, improving quality testing and assurance. Deputing technical personnel by the parent unit to the sub-contracting units in achieving these improvements may have to be pursued. Similarly sub-contracting units may depute their technical personnel to the parent unit for training.

c) Price Negotiations

Price determination is a major area of concern for both the parties (parent firm as well as sub-contractor), since, any change in it has repercussions on the sharing of gains from sub-contracting. The cost of in-house production acting as the upper limit of price, large unit will try best to influence price as low as possible with other attributes of product remaining acceptable. The small scale unit treating cost of production as the lower limits, will try to influence price to move upward to maximise the gap between cost and price. Price is determined, at a level in between the upper and the lower limits, depending upon the relative bargaining strength of the participants. It has been observed that price is being determined differently in ancillarisation and sub-contract-

ing cases. In the case of ancillarisation parent and ancillary units normally negotiate and settle at a price determining formula or basis whereas competitive bidding of non-ancillary sub-contractors becomes the basis of price fixation in most of the cases. The ancillary units are found to be in a favourable position than the sub-contractors due to two reasons. First, the ancillaries are relatively protected from the competitive threats from non-ancillary units. Second, the ancillary associations have a relatively higher bargaining power than the sub-contractors' association in negotiating the price. There are many instances of complaints about undue price appreciation by small units and price depreciation by large unit to take advantage of the differences in their bargaining strength.

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d) Payment of Bills

Amongst the constraints facing sub-contractors are cash flow problems, as they have to give extended credit (usually 30 days) to the firms they supply, while often required to pay on delivery of raw materials themselves. In fact, the problem is not limited to this. It has become a common practice to delay payment beyond 30 days, to 90-120 days in most of the cases. The record of public sector is also poor in this respect (Nagraj, 1989). Understanding the severity of the problem, Govt. of India has issued an ordinance in 1992 to penalise for the delayed payment (payment beyond 30 days) by an interest rate which is five per cent higher than the "floor rate for comparable lending". This kind of legal measures may be desirable in extreme cases but a poor substitute to facilitation of mutual understanding and trust on each other's difficulties. If the parent unit is having some genuine cash flow problem the small units may accept a delay in payment. Likewise cash-flow assistance to small unit at the time of need could be mutually reinforcing the long-term relationship.

e) Development of a Conducive Policy Environment

With the new economic policies and structural changes taking place across the country, the government's role is to be directed towards creating a conducive environment for the development of industrial sub-contract-

Long Range Forecasting of Management Consultants in India

NPC Project Team

Management consultancy constitutes an important realm in the industrial scenario of the present day open economy. Its role in the acceleration of industrial growth and augmenting productivity being universally acknowledged, it becomes imperative to assess the current and future status of this discipline. This article presents a methodology for forecasting the long range requirement for Management consultancy.

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India is currently witnessing rapid changes on the economic and industrial scene. The bold initiative taken by the Government to liberalise the economy has forced business leaders and managers to re-examine their current approaches and develop new strategies for organising and doing business. Productivity has assumed added importance and there is an urgency to initiate and implement productivity improvement measures so that costs could be cut and industry made more competitive and vibrant. It is here that the role of management consultancy becomes very crucial and the Government of India has rightly adopted Management Consultancy as one of the infrastructural requirements for rapid growth of the industry and economy.

It is almost impossible to trace the exact beginning of management consulting practices in India due to the absence of any significant information. However, it is generally agreed that it is a post-independence development in India. Initially, it was undertaken by foreign consultants or in case of multi-national companies by their principals. Local management consultancy firms played a minor role at this stage. However, with large investments in the public sector during the mid-fifties a need was felt to develop a larger local consultancy base geared towards the specific needs and conditions of Indian industry.

The pioneers of consultancy in India took the industrial engineering route. The Government encouraged setting up of management consultancy firms and institutions like Administrative Staff College, National Productivity Council, A.F. Ferguson, Tata Consultancy and IIMs were established. However, major growth in management consultancy took place during 1960's and 1970's when persons with business management training from abroad and retired executives joined together and formed consultancy organisations. Financial institutions initiated

services related to feasibility and project appraisal for better project execution. The Oil Crisis of the seventies saw the development of Energy Management. The eighties brought consultancy to the areas of strategic planning and software development. The last few years have seen phenomenal growth in information technology and consultancy for infrastructural sectors.

Management Consultancy — Definition

Unlike other professions with well-defined activities, Management Consultancy is a unique profession which overlaps to some extent other professions like industrial engineering, economics, financial management and marketing, etc. Therefore, there is a need to have a clear-cut definition of 'Management Consultancy' and the broad areas which could be placed under its ambit. The Management Consultancy Association of India (MCAI) defines Management Consulting as "an advisory service contracted for and provided to business, public and other undertakings by specially trained and qualified persons. It is a process of interaction wherein the consultant in an objective and independent manner diagnoses and investigates problems and issues concerned with management practices, analyses these, recommends appropriate action and provides assistance when requested in implementation of recommended solutions..." Thus, while designing a tailor-made software package for a customer may constitute management consultancy, selling of standard software does not come under it. This aspect is very important as any data on management consultancy may lend itself to different interpretations in the absence of a standardised list of areas coming under its ambit.

Management Consulting is an advisory service contracted for and provided to business, public and other undertakings by specially trained and qualified persons.

Current Status

Management consultancy ranges from large organisations/institutions like TCS, NPC, IIM's, etc., to individuals in India. Between these two extremes are small and medium scale consultancy organisations. While it is possible to forecast for the organised management consultancy firms, there is no way to ascertain the floating population of individuals offering advisory services. Similarly, the advent of foreign consultancy firms in sig-

nificant numbers is a recent phenomena and information in this regard is hard to obtain. Thus, the forecasting of management consultancy would exclude estimates for the floating individual consultants and foreign consultancy firms.

This article presents a methodology to estimate long range manpower demand in the highly specialised and complex field of management consultancy. Manpower demand forecast can generally be arrived at by estimating the sales demand for the entire industry and linking it with a norm of revenue per consultant, etc. The real challenge lies in estimating sales turnover which is well nigh impossible in the case of Management Consultancy as no current data is available.

Management Consultancy Demand — International Experience

The management consultancy profession is a rapidly growing area throughout the world. It is expected to grow at a significant pace not only in U.S.A., Western Europe & Japan but also in the Middle East, India, Australia and Far east. From US\$ 22 billion in 1990 the demand for consultancy service is expected to burgeon to the region of 40 to 50 billion US dollars in the late 1990s. Management consultancy income as a percentage of G D P is 0.2 to 0.3 per cent in developed countries. This is less than 0.01 per cent in India which indicates the type of potential available.

It would be instructive to know the experience of other countries in arriving at sales turnover based on its linkages with various economic and industrial indicators. As regards USA, no valid correlation has been found for correlating economic indicators with management consulting (Roethle, 1993). However, it is felt that there may be 'inverse correlation' to the number of consultants as their demand goes up when the economy is very good as well as when it appears to have hit its low point.

UK has the longest uninterrupted series of statistics on Management Consultancy Fee income going back to 1970 (Dawson, 1993). Here GDP and Advertising Expenditure have been extremely useful in predicting short term (1 to 2 years) forecast on Management Consultancy fee. Singapore experience indicates that management consulting bears a close relationship to that of the overall economy (Kiat, 1993). In the 1980s relatively high economic growth of 3.6 per cent in Europe and USA was followed by a 20-30 percent annual expansion in the consulting industry. With slower economic growth in 1990 (1-2%), the consulting growth moderated, notching increases of 15-20 per cent.

Linking Consultancy sales Revenue with Economic Indicators

The approach adopted for long term forecast of consultancy sales revenue is illustrated in (Fig. 1).

Step 1

Selection of Economic/Business Indicators

Literature survey, the experience of other countries and DELPHI technique were employed to narrow down the list of business indicators which could be used for building the model. The DELPHI Panel Technique which is used for systematic solicitation and collection of judgment on a particular topic through a set of carefully designed questionnaires interspersed with summarised information and feedback of opinion from earlier responses was used by forming a panel of about 30 manage-

ment experts from all over the country. The following five most likely indicators were arrived at:

Rank	Indicator
1.	Gross Domestic Product
2.	Index on Industrial Production
3.	Index on Fixed Capital Investment
4.	Index on Net Business Formation
5.	Index on Foreign Trade (Imports)

Steps 2 & 3

The five economic indicators selected were used to develop regression models with Management Consultancy Sales Revenue (MCSR) as the dependent variable. The Model with best coefficient of determination (R^2) least standard error (S_y) and significant t-value was

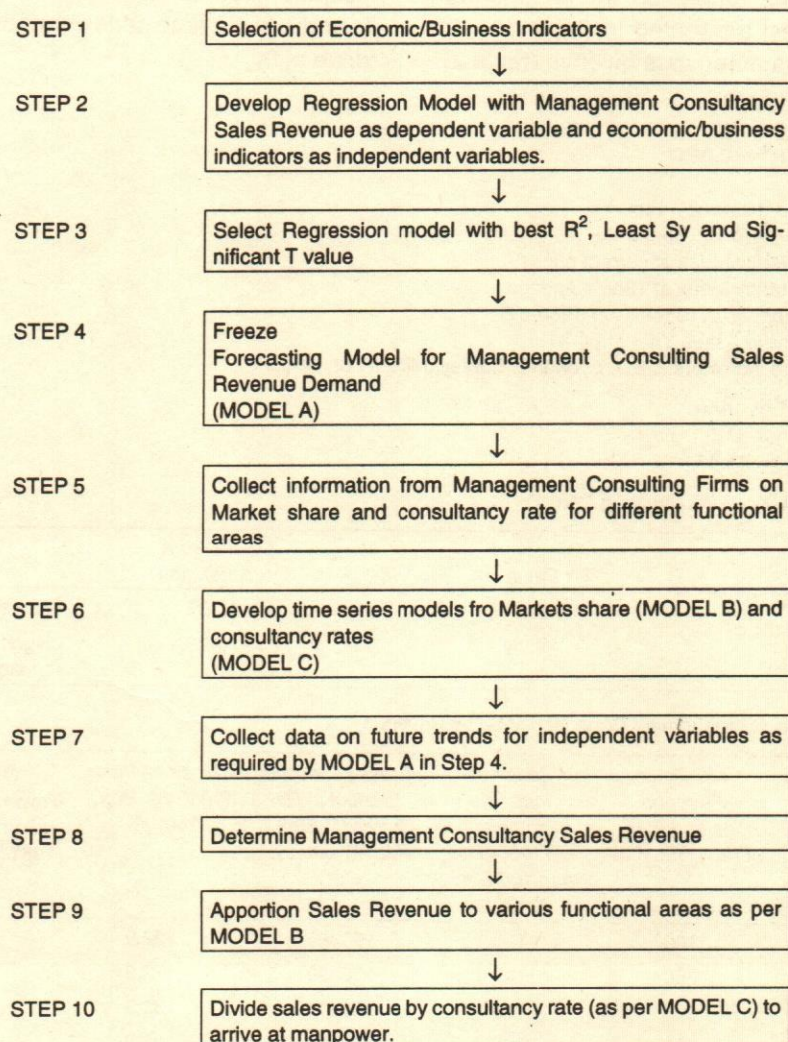


Fig 1. Forecasting Methodology for Management Consultancy Sales Revenue and Manpower

selected for forecasting Sales Revenue. As per this model, the independent variables selected were:

- (I) Gross Domestic Production
- (II) Index of Industrial Production

In this case, the values were —

$$R^2 = .9937$$

$$S_y = 33.1$$

In addition, both these variables tested significant on t test.

R — Coefficient of Determination

S_y — Standard Error

t — Significance level on a t-test

Step 4

The forecasting model based on the independent variable selected has been presented in (table 1). The basic data required for this purpose is given in (table 2).

Table 1: Regression Output (Model A)

Coefficient of Determination (R^2) = 0.9937

Estimating Equations

$$Y_1 = 21.52 X_1 - 11.63 X_2 - 1259.12 \dots \text{Eqn. 1}$$

$$Y_1 = 19.78 X_1 - 16.56 X_2 - 415.2 \dots \text{Eqn. 2}$$

Y₁: Management Consultancy Index at current prices

Y₁: Management Consultancy Index at 1984-85 prices

X₁: Index of Industrial Production (Base Year 1980-81)

X₂: GDP expressed as index (Base Year 1980-81)

Note: X₁, X₂ are published indicators, CSO, Economic Survey, Ministry of Planning.

Standard Error of Estimating Equation

Standard Error of Y₁: S_{y1} = 33.1

Standard Error of Y₂: S_{y2} = 45.47

Significance of Variables X₁ & X₂ (For Estimating Eqn. 1)

Variable	Observed t Value	t Value from t-distribution	Comments
X ₁	5.7	4.303	Significant at 95% confidence level
X ₂	2.96	2.92	Significant at approximately 90% confidence level

Table 2: Basic Data for Modelling Management Consultancy Sales Revenue

Year	MC Sales Revenue in Rs Crores (Source DSIR Report All Figures increased by 301)	MC Sales Revenue as an Index (1984-85, 100) Y ₁	Index of Industrial Production (1980-81 Base 100 Survey X ₁ CSO)	Gross Domestic Product in Rs Crores (1980-81 Prices) Survey, CSO	GDP as an Index (1980-81, Box 100) X ₂	MC Sales* Revenue Index (Corrected at 1981-85 Base) Y ₂	Urban non Manual Employees Price Index Base year: 1984-85 Source: Economic Survey, CSO
1984-85	11.42	100	130.7	150469	122.9	100	100
1985-86	40	350	142.1	156600	127.9	327.1	107
1986-87	60	525	155.1	162711	132.9	456.5	115
1987-88	80	700	166.4	170041	138.9	555.6	126
1988-89	97.14	850	180.9	187725	153.3	625.0	136

* The Collection has been done using Urban Non Manual Employees Price Index

Step 5

A specially designed questionnaire was administered to 750 consultancy organisations throughout the country. Based on the response received from more than 100 organisations, consultancy rates and market share of various functional areas like Corporate and General Management, Project Management, Operation Management, Financial Management and Marketing Management were collected.

Step 6

The time series equations used for forecasting the management Consultancy per diem rate is given in (table 3). Table 3 has five equations for the five functional areas of management consulting and they are the form of $Y = A + BT$ where Y is per diem consultancy rate, A is a constant term, B is the coefficient of time series variable T, and T is the time series variable with 1992-93 having a value of 0.

Table 3: (Model B), Time Series Forecasting Equations for Per Diem Consultancy Rate

Parameter: Per Diem Consultancy Rate : Y	Coefficient of Time Series Variable T : B	Constant Term A	Coefficient of Determination : R ²	Standard Error Sy
Corporate & General Management	169.891	1381.65	.9824	106.2
Project Management	203.57	1768.72	.93441	40.12
Operations Management	160.23	1076.15	.9188	26.82
Financial Management	175.85	1034.23	.9931	86.81
Marketing Management	90.153	1990.08	.9915	65.80

All the above equations are in the form of

$$Y = A + BT$$

Where, Y = Per diem Consultancy rate

A = Constant term; B = Coefficient of time service variable T

and T = Time series variable with 1992-93 having a value of 0.

It was also found from the sample questionnaire that the market shares of each of the functional areas of Management Consulting were to remain constant and thus no time series model was developed for market share; the expected values of market shares are presented in (table 4).

Table 4: Market Share of Different Functional Areas of MC

Area	Percent
Corporate & General Management	25
Project Management	22
Operations Management	21
Financial Management	19
Marketing Management	13

Steps 7 & 8

Data concerning future trends in GDP and Index of Industrial Production (IIP) were collected and sales

Table 6: Projected Management Consultancy Sales Revenue Upto 2005 A.D

Year	GDP Index Projected	IIP Projected	MC Index Current	MC Sales Revenue at Current Prices (Rs. Crores)	MC Index 1984-85	MC Sales Revenue at 1984-85 Prices (Rs. Crores)
1993-94	188.2	209.8	1067.0	121.9	618.1	70.6
1994-95	198.7	225.5	1283.1	146.5	754.8	36.2
1995-96	209.9	242.5	1517.6	173.3	905.0	103.4
1996-97	221.6	260.6	1772.3	202.4	1070.1	122.2
1997-98	235.0	200.2	2037.0	232.6	1234.7	141.0
1998-99	249.2	301.2	2323.8	265.4	1414.9	161.6
1999-00	264.3	323.8	2634.6	300.9	1612.0	184.1
2000-01	280.3	348.1	2971.2	339.3	1827.5	208.7
2001-02	297.3	374.2	3335.7	380.9	2063.0	235.6
2002-03	316.6	402.2	3714.6	424.2	2297.6	262.4
2003-04	337.2	432.4	4124.1	471.0	2553.0	291.6
2004-05	359.2	464.8	4566.6	521.5	2830.9	323.3

Projections are based on assumption of annual growth rate of 7.5% for IIP and 5.6% for GDP for 1993-94 to 1996-97, 6.05% for GDP from 1997-98 to 2001-02 and 6.51% from 2002-03 to 2006-07

Value for 100 index points of MC index is Rs. 11.42 crores

Source for projections of IIP is Economic Intelligence Service, June-1992, CMIE Bombay

Source of projections of GDP is Eighth Plan Document, Vol. 1, Table 2.14

revenue was calculated. Table 5 presents the future trends in GDP and IIP and (table 6) the projected management consultancy sales revenue upto 2005 A.D. The revenue projected has been calculated both in terms of current prices as well as at 1984-85 prices.

Table 5: Future Trends of GDP & IIP

Period	GDP Growth*	IIP Growth**
1990-91 to 1996-97	5.6%	7.5%
1996-97 to 2001-02	6.05%	Not Available
2001-02 to 2006-07	6.51%	-do-

* Figures for GDP growth are from Eight Plan Document, Vol. I, Table 2.14, Planning Commission

** Figures for IIP growth are from, Economic Intelligence Service, June 1992, CMIE, Bombay

Step 9

The total figures for the sales revenue were apportioned among various functional areas as per Model B.

Step 10

Using the time series data as shown in (table 3), the projected per diem consultancy rates for each of the functional areas in management consultancy were calculated upto year 2005 and the same has been indicated in (table 7).

Based on the projected sales revenue for each of the management consultancy area as well as the per diem consultancy rate, the consultant demand under each of these areas was calculated and is given in (table 8). For this purpose, average utilisation of 150 days per consultant per year has been assumed.

Conclusions

Presently, there are about 6,000 management consultants in the organised sector and this figure is projected to increase upto 11,000 by the year 2005. This is based on projected GDP growth of 5.06 to 6.51 per cent and IIP growth of 7.5 per cent over the years under consideration. However, the projected strength would go upto more than, 15,000 if we assume IIP growth of 7.5 per cent for years 1993-94 and 1996-97 and a growth of 10 per cent for remaining period upto 2005 AD while GDP growth figures remaining same.

Table 7: Projected Per DIEM Consultancy Rate (Rs/Day) upto 2005 A.D.

Year	CGM	PM	OM	FM	MM
1993-94	1382	1769	1076	1034	1990
1994-95	1552	1972	1236	1210	2080
1995-96	1721	2176	1397	1386	2170
1996-97	1891	2379	1557	1562	2261
1997-98	2061	2583	1717	1738	2351
1998-99	2231	2787	1877	1914	2441
1999-00	2401	2990	2038	2089	2531
2000-01	2571	3194	2198	2265	2621
2001-02	2741	3397	2358	2441	2711
2002-03	2911	3601	2518	2617	2801
2003-04	3081	3804	2678	2793	2892
2004-05	3250	4008	2839	2969	2982

CGM : Corporate & General Management; PM : Project Management; OM : Operations Management; FM : Financial Management; MM : Marketing Management

Table 8: Projected Consultant Demand upto 2005 A.D.

Year	CGM	PM	OM	FM	MM	Total
1993-94	1470	1011	1586	1493	531	6091
1994-95	1574	1089	1659	1533	610	6466
1995-96	1678	1168	1737	1584	692	6859
1996-97	1784	1248	1820	1642	776	7269
1997-98	1881	1321	1896	1696	858	7651
1998-99	1983	1397	1979	1757	942	8058
1999-00	2089	1476	2067	1824	1030	8487
2000-01	2200	1558	2161	1897	1122	8938
2001-02	2316	1644	2261	1976	1218	9416
2002-03	2429	1728	2358	2053	1312	9881
2003-04	2548	1816	2462	2136	1412	10374
2004-05	2674	1908	2572	2225	1516	10895

Market Share of CGM, PM, OM, FM, MM are 25%, 22%, 21%, 19%, 13% respectively
Consultants are assumed to work effectively for 150 days in a year

Based on these figures, the average yearly incremental demand is about 500 consultants which is quite low considering the size of the country. If we calculate the projected sales revenue as a percentage of GDP it hardly comes to .01 per cent as compared to 0.2 to 0.3 per cent in developed countries. Thus, there is a vast potential which remains untapped and projected revenue figures upto 2005 would also leave this gap unbridged. There is a need to initiate measures to bridge this gap and realise the full potential of management consultancy as has been done in developed countries. This would involve taking steps to put this profession on a sound footing as well as creating awareness regarding the benefits to be derived from it. Some of the steps which could be taken are as follows:

- Introduction of special courses for Management Consultancy in educational institutions
- Development of specialised courses for practising management consultants for further specialisation and updating skills
- Accreditation of Management Consultants
- Establishment of Data Bank and Information Centre for Management Consultancy

- Furthering alliances among management consultancy organisations within the country as well as with those of other countries.
- Rendering Govt. assistance in terms of subsidies, tax benefits and encouragement for exporting consulting services.

In brief, the forecast exercise undertaken reveals that the requirement for management consultants to take care of the projected economic growth is not very large and can be very well met by the existing educational institutions. However, there is a need to popularise and encourage management consultancy services so that the potential existing could be fully tapped and India could come up to the level of developed countries in terms of spending on management consultancy services as a percentage of GDP and deriving the ensuing benefits.

References

- John D. Roethlis** FCMC, President Anderson/Roethlis inc. Milwaukee, Wisconsin, U.S.A, 1993, Correspondance with the authors.
- Kenneth H. Dawson**, Managing Director, Alpha Publications Ltd., UK (1993), Correspondance with the authors.
- Koh Juan Kiat**, Policies & Strategies Relating to Human Resources Development and Exploiting ensuring calculating opportunism in Singapore, Paper presented at the APO Top Forum for Professional Series organisation, 6-10 Dec, 1993, Hongkong. □

Leadership & Competitiveness: The Case of Steel Industry

Tridibesh Mukherjee & Amit Chatterjee

Competitiveness is the by-word today in any industry that wishes to perform well in tomorrow's world. How the steel industry of the world is reacting to this concept has been brought out in the article. The authors outline how to stay ahead by cultivating industry foresight, incorporating technology upgradation and innovation and developing a competitive strategy based on sound HRD practices and R&D efforts.

International competition in the present day economic scenario is no more a matter of earning foreign exchange for the exchequer or making more profit for a company — it is a matter of sheer survival. The reasons are not far to seek. Trade and foreign investment have exploded since the 1950s and countries today are inextricably knitted together in the fabric of a global economy. The growing similarity in available infrastructure, distribution channels and marketing approaches is continuing. More products and brands are available everywhere, manifesting similar buyer needs in different countries. Large retail chains, word wide advertising and credit cards are just a few examples of once isolated phenomena which are rapidly becoming universal and India is no exception.

In its very basic form, enhanced competition implies that customers of a given output or service have the choice of acquiring the same from many more sources and not necessarily from the agency which has traditionally been serving their requirements. Such a trend assumes even more alarming proportions in a business like steel where the end product is basically semi-finished and undergoes several down-stream processing steps before it is actually put to final use, thus rendering it more susceptible to competition. And this is exactly what happened to the steel industry in America around a decade ago. The steel workers and management had a careless confidence that no matter what the industry made and however it was made, there would be buyers because it was made in the USA. The attitude was, "If Pete won't buy it, Joe will," as stated by Ed Sambuchi, Vice President of National Steel Corporation. "But now Pete is broke and Joe's out of business..... and Jack's buying from Brazil while Bill is getting his steel from South Korea." The picture today is succinctly brought out by Edward Jefferson, Ex-Chairman of Du Pont, USA, when he says, "We now live in an age of competition, not

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merely among companies, but amongst entire national economies."

A major company which cannot out-perform the economy runs the risk of coming under siege from corporate raiders and dissatisfied investors. Yet, within this slower flowing river of growth are the fast moving currents of opportunity that must be detected and seized before domestic and foreign rivals find them. To reach the leading edge and to remain there, companies must concentrate their resources on products and services that offer the best prospects for immediate growth and profitability while they carefully develop new businesses for the future. At the same time, mature business must be lubricated with productivity improvements and reduced costs so that they too will grow more rapidly than the economy around them.

Mature business must be lubricated with productivity improvements and reduced costs.

How to Stay Ahead

The first step in gearing up a company for competition is the quest for industry foresight. This involves gaining an understanding deeper than the competitors of the trends — technological, for example — that could be utilised to transform existing industry boundaries and to create new competitive space. Such a foresight gives a company the potential to reach the future first, with total control of the evolution of its destiny.

"The general who wins a battle makes many calculations in his mind before the battle is fought. The general who loses a battle makes but few calculations beforehand. Thus do many calculations lead to victory, and a few calculations to defeat; what would happen if there were no calculations at all? It is by attention to this point that one can foresee who is likely to win or lose," so goes an old Chinese saying. Perhaps the two greatest "calculations" any executive can undertake are breathing new life into a mature business and changing the "shape" of an existing corporation. When growth slows, management is faced with three basic choices: live with the fact, diversify or try to grow through innovation. Few managements do the first, most do the second, and occasionally, some do the third. It involves innovating quickly for maximum effectiveness, even changing the basic shape of the company.

The first step in gearing up a company for competition is the quest for industry foresight.

Sometimes certain products or services cannot be developed, and an organisation has to find something else to do with its resources. The best examples of changing shape through internally focused efforts are the Japanese. The list of companies that have made these transitions is long and includes:

- Fujitsu, changing from a machine tool manufacturer to a computer company.
- Honda, changing from manufacturer of small motors to motorcycles and then to cars.
- Nikon, changing from a manufacturer of high-end cameras to the leading supplier of wafer-steppers for semiconductor applications.

Canon is an instructive example of the use of innovation to change shape as well as to sustain growth in mature markets. Canon used to be just a camera manufacturer. Camera is a product that seems to mature, grow and then mature again. In the second-to-the-last maturing cycle, in the mid-1970's, Canon launched itself into the plain paper copier business in search of growth. It did grow, but it did not live long. By the early 1980s, Canon found itself in two slow growth businesses — cameras and copiers — deriving over 80 per cent of its revenues from these two lines of products; the remaining 20 per cent included calculators and portable typewriters. But by 1988, sales of cameras and copiers were less than 60 per cent of total revenue and virtually all of Canon's growth came from other products which included high-speed facsimile machines and laser computer printers.

The lessons that emerge from these examples for any organisation are:

- Anticipate changes in the competitive surroundings and be prepared to react quickly to them. This requires both a broad view of large market forces and a flexible, decentralised environment that allows quick decision-making at all levels of the company, especially at levels close to customers.
- Know your company's strengths and take advantage of them. Do what you do best. Stick to

your basic business and exploit high-quality market niches in which your company has unique advantage.

- Recognise that technology is a powerful weapon for corporate change, both as a source of new products and services and as a way of dramatically increasing productivity.
- Managing in today's highly competitive world and being able to adapt to the constantly changing environment demands a new kind of leader: someone who is not just a manager, but who also has the vision to understand what is changing in the business world and can take the lead quickly to take advantage of that change.
- Never lose sight of the future. At the same time, don't forget the present. Ideally, balance long-term advantages and goals against short-term performance pressures to create a business that is strong today and will be stronger tomorrow.

In general, to be able to develop a focused industry foresight, the management should be willing to move far beyond the issues on which it can claim expertise. It should realise that its expertise is based only on the past and it should be willing to debate about the future as equals, not as omnipotent judges.

Quite often, companies convince themselves that they are looking into the future by using standard techniques like technology forecasting, market research, etc. These are no doubt important, but may not necessarily give the desired results. This is because none of these techniques compel the management to conceive the corporation and the industry in which it competes. Until this is done, the race has just not begun.

Performance Evaluation

"Best-in-class" companies achieve top performance for a given function within an enterprise, measured against the world's best firms. Knowing best-in-class performance is critical to understanding how and where to push for improvement. The search for best-in-class examples must extend across the widest possible industry base to find the most aggressive yet realistic goals

The benchmarking process compares existing company performance with that of the best-in-class performer.

and hints on how to attain them. The benchmarking process compares existing company performance with that of the best-in-class performer. When done persistently for each company function, the management can develop a real-time feel for where improvements are possible and project realistic expectations of how much improvement is possible. It is important to note that effective benchmarking involves more than analysing the competition.

The importance of continuous performance evaluation, attention to quality and thrust for higher productivity can be illustrated by the recent productivity upheavals in General Motors, the giant American automobile manufacturer. GM was being beaten at its own game by the Japanese whose devotion to quality and productivity in manufacturing had produced an enviable reputation with car buyers and a cost advantage of \$1,500-2,200 per car compared to GM. During the postwar era, until the 1980s, GM had sold virtually every car it could make, except during recessionary periods and GM began to believe it was an American institution — "baseball, hot dogs, apple pie and Chevrolet", were the words of a non-running advertising jingle. But the more successful GM got, the less attention it paid to why it had succeeded. General Motors and the entire American automobile industry had no competition. Detroit was the automobile capital of the world. It got so bad that they tried to get their own divisions to compete with one another — Chevrolet vying with Pontiac, Oldsmobile with Buick, and so on.

But while Detroit was still fixated on power windows and plush interiors, i.e. peripherals, foreign competitors were concentrating on efficient high-performance cars. The Japanese cars in particular began to perform better and GM sales decreased drastically before it realised it had to compete on performance, and that technology adoption and management was the key to that. Today, GM has undergone a drastic transformation in all spheres of its activities and is set to become the model of the 21st Century manufacturer through attention to creativity and competition. Its competitive strength is being built on an entirely different foundation — the world's best manufacturing technology; computer networks to link design, production, etc.

Edward de Bono, the "guru" of creativity and lateral thinking, has introduced a novel but telling term to emphasise the need to be competitive. He says competition will no longer be enough in the future and there will be need to shift to "sur-petition". The word "competition" means "seeking together" which implies that you accept

Competition will no longer be enough in the future and there will be need to shift to "sur-petition".

you are running in the same race as your competitor. "Sur-petition" means "seeking above" or creating your own race — it means creating new "value monopolies" and is definitely something which would be very welcome in the case of steel usage and the steel industry.

These value monopolies will be largely based on "integrated values". For example, a car is no longer just a lump of engineering — the integrated values include the ability to buy, sell and insure the car. They include safety, security against theft, even the ability to park the car in big cities. It is now agreed that while the first phase of business was "product or service", the second phase of business "competition values", the third phase of business will be "integrated values". What would be the integrated values for steel? The company with the correct answer to this vital question will be ahead of its competitors.

Technology Upgradation & Innovation

In the competitive environment of the late Twentieth Century, innovations in competitive strategy have life cycles of ten to fifteen years. Each innovation is followed by major shifts in competitive positions and corporate fortunes. As these shifts occur, concerned managements struggle to understand the nature of their competitors' new-found advantage. However, like a military secret, the new source of advantage soon becomes understood and applied by all and is thus no longer an exploitable innovation. A new innovation must be found. Perhaps fortunately, innovations of large magnitudes are more difficult in the steel business — electronics is at the other end of the scale.

Until recently, innovations in business strategy were episodic. A major discovery, usually technology based, would upset the balance of an industry and corporate fortunes would shift. For example, in transportation the railroads drew hoards of customers away from river boats and horse-drawn overland transportation companies in the 1880's only to lose those customers in the mid Twentieth Century to trucking firms. Similarly, coal companies replaced wood companies in the market and were themselves upstaged by oil companies.

Historically, the risk of an episodic change has required that the management always be prepared for the unexpected, though it seldom was. Today, episodic changes in business strategy are fewer and they are being supplanted by evolutionary changes — a continuum of change. However, it appears that many companies are simply unable to cope with technological opportunities that require them to adopt new production methods, face new competitors or cultivate customers in different ways. And the steel industry is not the only example of this malaise.

It was in 1973 when researchers at Xerox completed work on Alto, the first computer to be designed and built for dedicated use by one person. The system incorporated a list of "firsts" like the first graphics-oriented monitor, the first hand-held "mouse" input device, the first laser printer, etc. All of this before the appearance of the Apple-II or IBM's attempts to be a force in the personal computer market. Why is Xerox's Alto not a household word today? A number of factors coalesced to deter Xerox from being a major player in the personal computer market. Most particularly, Xerox had lost its vision of the future or did not have the core competence for this business.

Xerox traditionally followed a deliberate, *albeit* expensive, plan for marketing technology. It had spent hundreds of millions of dollars over several years to develop copiers before bringing them to the market. But personal computing presented a different problem — a problem of how customers would react to the technology — how people would respond to computers. To answer these questions, Xerox would have had to spend \$10 million, may be \$25 million. But the Company chose not to spend this relatively modest amount. Xerox could not cope with a technology as different from copiers as digital computers.

Incorporating a new technology into a mature business may be an attractive option to stay competitive but it needs the help of a host of other factors to become a panacea for all the ills in the business. New technology can fail for many reasons: bad timing, wrong pricing, heavy competition. Roger A. More of the University of Western Ontario has developed a framework that breaks the process of technology adoption into various stages and relationships. More began by identifying some important "strategic decision stages" generic to both developers and adopters:

- Problem Recognition: the rationale for developing (or adopting) new technologies.

- **Need Analysis:** Defining the needs, payoffs and risks of the new product.
- **Product Concept:** Defining the product's performance standards and physical features.
- **Technology Choice:** Analysis and linkage of alternative technologies.
- **Financial Analysis:** Analysis of the financial viability of developing or adopting alternative products.

The challenge for top managers is to determine at what stage developers and adopters should interact and how that relationship should be developed into a success story. We have to pay much greater attention to this in India in the coming years if we want more success.

New Products & Business Areas

The idea of value to the customer lies at the heart of new product and service development; technologically new products that are successful can be more expensive than older products, but the services they deliver have to be "better" in a way that justifies the price. Such was the case with automobiles (which transported people and goods at greater cost than horse-drawn vehicles or trains, but more conveniently), pocket calculators (which initially did little more than the much less expensive adding machine and slide rule), dry copiers (which were more expensive than carbon paper), and computer-automated medical imaging equipment (which cost far more than conventional X-ray equipment). The same is often true of process innovations, which may initially add production cost but end in increasing quality, decreasing environment impact or allowing more flexibility in response to customer demand. Secondary steelmaking including argon rinsing, powder injection and ladle metallurgy are some examples from the steel business.

The idea of value to the customer lies at the heart of new product and service development.

While many Western organisations worked throughout the 1970's and 1980's to reduce their costs by focusing their operations, leading Japanese manufacturers began to move to a new source of competitive advantage — the flexible factory and later, flexible operations. In general, flexible manufacturers have policies

and practices that differ from those of traditional manufacturers along certain key dimensions:

- Length of a typical production run.
- The organisation of the process components.
- Complexity of the scheduling procedures.

In all cases, however, the goal is increased productivity. The more complex the process, the greater the productivity advantage can be. For example, since wire drawing is a process with very few steps, a flexible wire drawing factory might only achieve 50 percent greater productivity than a traditional one. Automobile fabrication and assembly is, by comparison, more complex and flexible automobile manufacturers can have productivity advantages over most traditional manufacturers of over 100 percent.

In the late 1970s Japanese companies exploited the benefits of flexible manufacturing to such a point that a new competitive thrust emerged — the variety war. A classic example of the variety war was the battle that erupted between Honda and Yamaha for supremacy in the motorcycle industry, a struggle popularly known as the H-Y war. Yamaha ignited the H-Y war in 1981 when it announced the opening of a new factory to make it the world's largest manufacturer of motorcycles — a position of prestige then held by Honda. In the no-holds-barred battle that ensued, Honda cut prices, flooded the distribution channel with new products, and boosted advertising expenditure. Most important — and most visible to consumers — Honda also increased the rate of change in its product line rapidly. Honda used expanding variety to bury Yamaha under a flood of new products. At the start of the war, Honda had about 60 models of motorcycles in its product line. Over the next 18 months, Honda introduced or replaced 113 models, effectively turning over its entire product line twice. Honda's massive new product introductions devastated Yamaha. Yamaha's bikes looked old, out-of-date and unattractive and the demand for Yamaha motorcycles dried up.

In the late 1970's Japanese companies exploited the benefits of flexible manufacturing to such a point that a new competitive thrust emerged — the variety war.

To avoid such a rivalry between companies in the same line of business, corporate alliances are rapidly becoming an important new strategic option touching

every aspect of world industry from small to large companies, from sunrise to sunset industries, and from manufacturing to services. The recent proliferation of alliances is having a profound effect on the structures of industries with significant impacts on the nature of competitive advantage in the 1990's. Over the course of this decade, competitive advantage has been based increasingly not only on a firm's internal capabilities but also on its arrangements and the scope of its relationships with other companies. Recognition of this fact is driving leading-edge companies to compete actively for allies. The drive to form strategic alliances is being fueled by a diverse set of pressures. These include the enormously high cost of technology development and commercialisation, coupled with the recognition that products costing a lot to develop may finally have life spans of less than two years.

Corporate alliances are rapidly becoming an important new strategic option touching every aspect of world industry.

All these factors are causing managers to re-evaluate the requirements of corporate survival and competitive success in the 1990's. In particular, they are being forced to reconsider the "go it alone" strategy. In today's intensely competitive marketplace, few, if any, firms will have the money, technological scope or international market presence to pursue such an approach. The Indian steel industry must also adopt this approach and governmental agencies can play the pivotal coordination role.

Customer Satisfaction & Customer Needs

Customers, some say, can be a nuisance — first, they want what they want, then, they want it when they want it and finally, they expect the quality of the goods or services purchased to be perfect. Sometimes it seems that they are never satisfied. The most attractive customers are often the most difficult to satisfy. These customers are demanding — wanting exactly what meets their needs, but if one can satisfy them, they will be reluctant to take their business elsewhere. They become dependent, and dependency can be profitable.

Being responsive to the needs of customers pays in the following ways:

- Customers are more loyal to suppliers who are consistently responsive to their needs.

The most attractive customers are often the most difficult to satisfy.

- Customers will pay a premium over the typical price to a responsive supplier.
- Customers will buy more goods and services from a responsive supplier.

Many steel companies in India, including Tata Steel, have witnessed this in the last few recessionary years.

Today's name-of-the-game is time-based competition. Demanding companies are altering their measures of performance from competitive costs and quality to competitive costs, quality and responsiveness. Giving customers what they want, when they want it, is the main theme. Wal-Mart is one of the fastest growing retailers in the United States — its stores move nearly \$20 billion of merchandise a year. Wal-Mart's success is due to many factors, not the least of which is responsiveness. Wal-Mart replenishes stock in its stores twice a week on an average; many stores receive deliveries daily. The typical competitor replenishes its stock every two weeks. Wal-Mart is growing three times faster than the retail discount industry as a whole and has a return on capital that is more than twice as high as the industry average.

Today's name-of-the-game is time-based competition.

Atlas Door is not the leading supplier of industrial overhead doors in the United States. In concept, these doors are simple; they are just very wide and high. However, the variations of width and height are almost endless. Consequently, unless the buyer is lucky and requests a door that is in stock, he could wait several months until the desired door can be designed and manufactured — that is, unless he orders from Atlas Door. Atlas can fill an order for an out-of-stock door in three to four weeks, one-third the industry average. Customers are rewarding Atlas Door's responsiveness by buying most of their doors from them, often at 20 percent price premiums.

Clearly, the time advantage is enabling time-based competitors to upset the traditional leaders of their industries and to claim the number one competitive and

profitability positions. Mini steel plants in India had benefited in the past on this account but now, even the integrated producers are aware of this fact.

In the early 1980's, leading Japanese companies and some small North American and European companies demonstrated the power of the two new dimensions of competitive advantage: low cost variety and fast response time. The latter has been illustrated by the examples of Wal-Mart and Atlas Door. To appreciate what low cost variety means, the case of anti-friction bearings may be elucidated.

In industries like anti-friction bearings, where competition was fierce in the late 1960's, the Japanese fielded product lines with one-half to one-quarter the variety of their larger Western competitors. Targeting the high-volume segments of the demand for bearing — bearings for automobile applications, for example — the Japanese used to low costs of their productivity focused factories to undercut the prices of their Western competitors. The Swedish firm SKF almost became a victim of these attacks. With many small factories scattered throughout Europe, the Company was a major target of the Japanese competitors with focused factories. SKF's initial reaction to the Japanese attack was to avoid direct competition by adding new products that the Japanese could not supply. These products commanded higher prices and appeared to SKF's management to be more profitable and therefore, more attractive than the products facing direct Japanese competition. However, because SKF did not simultaneously drop its low-margin products, plant operations became more complicated, reducing the firm's productivity and raising its overall costs. In effect, the more SKF sought to avoid competition with the Japanese by adding new, higher-margin products, the more it provided a rising cost umbrella for the Japanese to grow under by expanding their product offering and moving into more varied applications. As long as the Japanese stayed beneath the umbrella by maintaining a narrower product line than SKF, they could continue to pick off the parts of SKF's business that they wanted, driving SKF into smaller and smaller pockets of demand.

SKF finally adopted the Japanese strategy. After a review of its factories, the Company focused each factory

Many a time the customer does not know what he wants.

on the products it made most efficiently. If a product did not fit a particular factory, it was either placed in another more suitable plant or dropped altogether. This strategy not only halted SKF's retreat but also beat back the Japanese advance.

Another important feature of customer service is that many a time the customer does not know what he wants. Nobody had felt the need for minivans, 24-hour TV news or a walkman till innovative contrarians put such products into our laps. This indicates that foresight often comes not from being a better forecaster but from being less conventional.

Against this background, there are three kinds of companies: companies that try to lead customers where they do not want to go, companies that listen to customers and then respond to their articulated needs and companies that lead customers where they want to go without being fully aware of it. Companies that do the latter, or in other words, "create tomorrow", not only satisfy customers, they "amaze" them by constantly exceeding their expectations.

The Case of Steel Industry

The healthiest trend in the steel industry over the past decade has been towards greater concentration of effort on specific customer needs. Service centres and processors have benefited most directly from their natural 'closeness' to the actual customer. The most profitable steel producers during the past decade have been those with the most well-defined product focus. Major integrated steel producers in the US such as Inland, LTV and U.S. Steel are now working very hard to distinguish their products in the minds of their customers. They are finding that their best hope for the future is not in how much they can produce but in how well they can serve. Strong ties to customers have been the best antidote to new low-cost industry entrants such as Nucor and Chaparral Steel.

Best hope for the future is not in how much they can produce but in how well they can serve.

Historically, the steel industry has worshipped at the altar of market share. The rallying cry was more capital, more plant, more equipment and more tonnes. As long as producers were in the driver's seat, this strategy

helped in profit maximising. Today, and for the foreseeable future, the steel industry is customer-driven. This means that market perceived quality of product and services, not market share, is the prime determinant of long term profitability.

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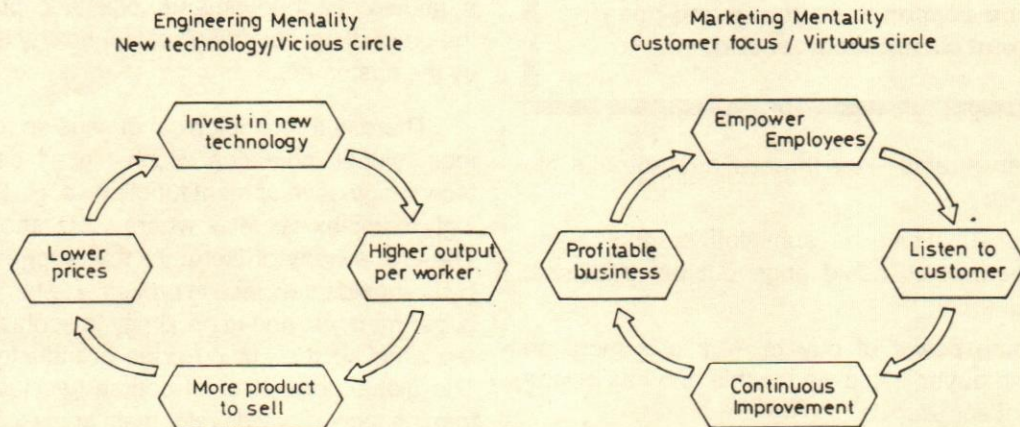
Beginning in the early 1980's, steel mills began focusing more on customer needs. Prior to that time the mills hid behind industry standards which were established to make even the worst mill capable of meeting them. An increased interest is now being shown by the steel producers in the application their material goes into and a desire to transcend their rigid specifications and meet the functional and even "cosmetic" requirements. There has been more willingness to look at the cosmetic side like surface appearance, shine, telescopicity in coils, packaging, etc. in the last five years.

With basic oxygen vessels instead of open-hearths now in use in most integrated steel plants, it is known within plus or minus five minutes of charging when the next heat is going to tap. It is not difficult to make what we want to make, when we want to make it. We can say "I am going to make this heat in order to fill this order" and we know that heat will be where it has to be at the caster or the teeming station and when it should be ready for the rolling and shipping schedule.

All such improvements lead to better customer service. If we can produce material the same day rather than have slabs sit in inventory while we are rearranging them for rolling and avoid any of those out of the processing line steps, it will all help to provide better customer service. Tata Steel have designed modernisation with this goal in mind. One tell a lot about people from their goals in life. Likewise, one can tell a great deal about companies from the goals they frame and the processes designed to achieve those goals. The traditional steel industry mind-set reflected the Engineering Mentality in which organisational goals are production-driven. A new mind-set however, is starting to blossom in some steel companies. This promising mind-set is what is referred to as the Marketing Mentality in which organisational behaviour is truly customer driven.

A new mind-set, however, is starting to blossom in some steel companies. This promising mind-set is what is referred to as the Marketing Mentality in which organisational behaviour is truly customer driven.

The 'vicious circle' between new technology in steel plants and high capital requirements will intensify and the reasons are obvious. Evolution in steel process technology is accelerating. Continuous casting has slipped from being tomorrow's technology to today's. More streamlined technologies for transforming iron units, both iron



Types of Company Focus

ore and scrap, into steel are fast approaching. The new technologies will lower both incremental operating costs as well as overall capital costs associated with steelmaking. The temptation to increase production via lower cost technologies and subsequently to slash prices to gain market share will intensify.

Competitive Strategy

Several investigations have been sponsored world wide, principally by American companies, to determine why the Japanese perform differently and better irrespective of the type of industry. During these investigations many closely held assumptions as to how costs and customers behave have been altered. It was found that instead of costs going up as run-lengths are reduced, they go down. Further, instead of customer demand being only marginally affected by expanded choice and better responsiveness, it is astoundingly sensitive to this better service — with the company that is able to meet customers' expectations for choice and response very quickly dominating the most profitable segments of demand.

It is worthwhile at this juncture to examine what exactly formulating a competitive strategy involves and what are the forces which dictate competition in an industry. The intensity of competition in an industry is neither a matter of coincidence nor the whims of lady luck. Rather, competition in industry is rooted in its underlying economic structure and goes well beyond current competition. The state of competition in an industry depends on five basic competitive forces which are:

Competition in industry is rooted in its underlying economic structure and goes well beyond current competition.

- Potential entrants — the threat of new entrants into the industry.
- Threat of substitution — substitute products being developed which could edge out the traditional ones.
- Bargaining power of buyers — this is more so when the buyer is knowledgeable and has a wide choice of suppliers.
- Bargaining power of suppliers — the threat of inputs to the industry rising in terms of cost or falling in terms of quality.

- Rivalry among competitors — or jockeying for the 'numero uno' position by indulging in price competition, advertising wars, product introductions and increased customer service.

All the five competitive forces jointly determine the intensity of industry competition and profitability. At the same time, different forces take on prominence in shaping the competition in a particular industry. In the ocean going tanker industry the key force is probably the buyers (the major oil companies) whereas in the tyre business, it is the powerful original equipment buyers coupled with tough competitors. In the steel business, the key forces are foreign competition and substitute materials. While the latter is not of alarming importance for the Indian steel industry in the foreseeable future, the former is definitely a factor and is becoming increasingly more important in today's changed economic scenario. Similarly, ecological aspects would also form the basis of competition in the Indian steel industry in the not too distant future.

In the steel business, the key forces are foreign competition and substitute materials.

Role of R&D

The role of technology needs no emphasis in an industry like steel. In formulating a competitive strategy, developing a new product or even providing satisfactory customer service, it is critically important to make the right choice of technology. This requires continuous analysis and linkage of alternative technologies with all the attendant attributes of economic and social acceptance. After all, the proof of the "pudding" of technology is in the "eating" by the customers.

There is a technological dimension to competition in most global industries which places demands on the technology development function i.e. R&D. One increasingly complex issue is where R&D should take place. There is a body of literature that suggests broadly that R&D should take place in proximity to large (or potentially large) markets, and in proximity to sophisticated markets representing the cutting edge of industry development. The global competitor of course has the option of performing technology development anywhere. In the Indian context, to increase steel usage, greater emphasis needs to be laid on our own steel plants and national R&D organisations, helping the customers directly to choose

appropriate steels for example, because the customers do not often have technically competent R&D set ups themselves.

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There are also many coordination issues involved in technology development for global strategy. R&D must play its role in product development for worldwide markets, which requires that the R&D function has an unusual knowledge of technical issues and buyer needs globally. Similarly, process R&D is often crucial in global industries to facilitate the development of global-scale economies and learning to achieve consistent quality. Not only must R&D develop new products and processes, but new process technology must often be transferred to facilities that operate under different economic circumstances. At the heart of competitiveness is "closeness to the customer", says John S. Mayo, President, Bell Laboratories, USA. "Allegiance to customers is more important than allegiance to function. We can no longer be satisfied with doing just a superb R&D job. We have to align R&D, manufacturing and business management into small highly focused, nimble units". This required Bell Laboratories to cultivate its sense of professional community, a vital factor in R&D effectiveness — a factor we need to take note of in India.

On the other hand, there are numerous examples, both around the world and in India, of another facet of R&D. Gloomy assessments of industrial research and development are now all too familiar. Evaporating government funding, rising costs of scientific manpower and equipment, and declining returns on product-oriented research are causing technologically advanced companies review the R&D policy and strategy. India also falls into this category, at least as far as Government funded R&D is concerned. Unfortunately, now that every outlay is receiving critical examination for its impact on the bottom line, reaction to the high-risk flavour of R&D expenditures can often become hasty and self-defeating. It is not uncommon to find a concerned top management diverting funds from the R&D budget to other segments that exhibit more immediate prospects for tangible returns, while at the same time exhorting the R&D team to come

up with better results within the restricted operational parameters.

Better results can come only from better management of the total R&D effort. Organisations that rely on technical innovation to increase market shares like those in the steel industry, will have to reap more from past as well as present investments in science and technology if they hope to maintain their competitive clout. One way of doing this is through the process of technology transfer and by adopting a consortium/collaborative approach towards R&D — something which has been lacking in India. A well-developed technology transfer programme can substantially increase the payback potential of the R&D effort in large and small organisations alike.

Human Aspects

To remain competitive, steel-makers and other industry personnel must change the way they think. They must play to win and, as far as human resources are concerned, they must empower their employees, invest in them through training and give them a financial stake in the business. Companies must realise that people are the ultimate competitive edge. There are numerous examples of how steel companies, like Tata Steel, realising the wealth in human resources, had got down to the business of investing in people right from the start. They realised only too well that self-directed work teams are not made; they are grown and like in any growth process, continuous hands-on-care and constant nourishment is required.

Consteel in England conducted a benchmarking study of its competitors to find its competitive gap in terms of employee morale and on this basis developed a model to bridge this gap. This involved six goals to be accomplished which were:

- Crosstrain employees and use statistical process control internally to make improvements.
- Discover the best practice reference plant in the world.
- Send 20 percent of its employees to work in the best reference plant.
- Facilitate rapid information gathering on new practices.
- Monitor and promote successful change.
- Become the best reference plant.

The company continues to use this model today and it has, in the last ten years, earned rich dividends in terms of labour productivity, quality, etc.

The example of British Steel is even more compelling. "Trying to teach a company of the size of British Steel about changing the human resource strategy is like trying to teach the elephant to dance," said Malcolm W. Ballin, the company's Director of Human Resources. Nevertheless, BSC's effort to change in the Eighties was successful and instrumental in helping the besieged company to turn around its less than lacklustre performance, close plants, downsize its employee population and somehow manage to put itself in the good books of British society.

British Steel's strategy for survival was born out of loss. In 1980, the company experienced the biggest loss at that time in the history of man. Faced with a threat to its very survival, the company developed a strategy that included:

- Closing uneconomic plants
- "Slimlining" manpower in ongoing plants.
- Making an active social policy contribution.
- Improving employee communication.
- Decentralising management decision-making and pay negotiation.

The impact of the company's survival strategy on manning/productivity can be seen in the illustration which follows. Over one decade, British Steel cut its work force by 145,000 people, 100,000 of whom were eliminated in the first three years of the restructuring programme. Simultaneously, it realised a 300 per cent improvement in

labour productivity (fig. 1). The labour cost reduction was the single biggest factor in making the company viable again, which made it possible for the British government to return the steel-maker to the private sector.

Gradual and incremental change is not enough and the key element in successful human resource strategy is the generation of quantum leaps in people performance. This has to service the overall improvements in the process being engineered in the business as a whole. In India, both the Management and the Unions have to be aware of this feature to make Indian industry more competitive.

Gradual and incremental change is not enough and the key element in successful human resource strategy is the generation of quantum leaps in people performance.

Piloting any company into the competitive sky of the Twentyfirst Century will require "vision". Senior managers in a company need a clear understanding of how their industry may be ten or more years from now, and how this differs from that of their competitors. When senior executives talk about competing for the future, they should ask three questions. First, what percentage of their time is spent on external rather than internal issues — on understanding, for example, the implications

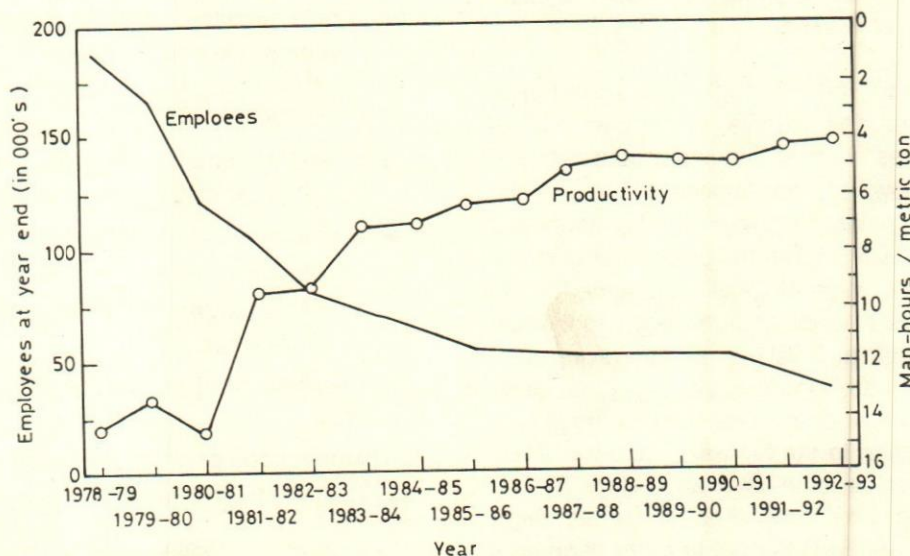


Fig. 1: British Steel's Manning Level from 1978 to 1993

of a particular new technology instead of debating corporate overhead allocations. Second, of this time spent looking outward, how much do they spend considering how the world may change in five or ten years rather than worrying about winning the next big contract or responding to a competitor's pricing move. Third, of the time devoted to looking outward and forward, how much do they spend working with colleagues to build a deeply shared, well tested perspective of the future as opposed to a personal and idiosyncratic view?

Developing a point of view about the future should be an ongoing project sustained by continuous debate within a company — not a massive one time effort. Unfortunately, most companies consider the need to regenerate their strategies and reinvent their industries only when restructuring and reengineering fail to halt the process of corporate decline. To get ahead of the industry change curve, top managers must recognise that the real focus for their companies is the opportunity to compete in the future.

Developing a point of view about the future should be an ongoing project sustained by continuous debate within a company — not a massive one time effort.

Uniqueness of the Steel Industry

To assess the competitiveness of the steel industry and what factors make a particular unit more competitive, attention needs to be paid to: the cost of capital, human resources, manufacturing, technology, pricing, energy, environment, government relations and international trade. Many of these issues have already been discussed and only the rest will now be covered.

Basically, a steel company is involved in manufacturing and its ability to manufacture efficiently obviously will have a significant impact on its competitiveness. To some degree, the ability to manufacture efficiently depends on the technology being used. The efficiency of about 40 international steel plants was evaluated in a study conducted at Carnegie Mellon University in USA. The study delineated several important characteristics of plants based on the electric arc furnace process and those on the classical blast furnace — oxygen steelmaking methods, i.e. mini-mills and integrated steel plants, respectively. It was concluded that though the efficiency of EAF plants varied greatly, there was a reasonable

correlation between technology implementation and efficiency. However, there were significant deviations from the general relationship that were revealing. In general, those shops with a high specific power (kVA/metric tonne) rating generally were more efficient owing to increased productivity and slightly decreased energy and electrode consumption. There seemed to be an optimum of about 700 kVA/metric tonne and further increases did not have any effect.

The optimum set of EAF conditions appeared to be:

- 150 to 200 metric tonne charge weight.
- 700 to 800 kVA/metric tonne power input rating.
- 50 to 60 minute tap-to-tap time.
- 350 to 400 kWh/metric tonne electricity consumption.
- 25 to 25 Nm³ oxygen consumption per metric tonne of steel.
- 1.2 to 1.5 kg electrode consumption per metric tonne of steel

While these figures may be slightly different for EAFs in India at present, new units should fulfil these norms.

Integrated plants are inherently more complex and difficult to assess than EAF plants because more unit processes are involved. The assessment of integrated plants, therefore, depends not only on the individual processes, but also on how well the processes are coordinated. For example, if there is a highly efficient oxygen steelmaking process but insufficient hot metal availability, the oxygen steelmaking furnaces cannot be utilised fully. The production bottleneck could lie with any of the processes or with the connections between the processes.

Looking at all the aspects in totality in this study, there appeared to be a correlation between technology and efficiency even in the integrated steel plants. It could be argued that the cost weighted average efficiency of all the processes is not necessarily the overall efficiency of the plant. The real efficiency of the plant is related to the cost of production. In any case, the study clearly revealed that simply implementing technology in a given process will not ensure an efficient operation. Technology implementation must be managed carefully to balance the operations and eliminate significant bottlenecks. The technology applied to a given process must provide a system that is in balance with the other processes and compatible with the quality requirements of the marketplace — an aspect often lost sight of in India when proven technologies from different sources are clubbed

together in one plant and then we are taken aback when the composite plant does not perform to expectations.

Simply implementing technology in a given process will not ensure an efficient operation.

From the entire study the following conclusions were drawn.

- There was a large variation between efficiency and the degree of technology implementation in steel producing units, but there appeared to be a general correlation between the two.
- Technology implementation alone does not ensure efficiency. Plants with similar technologies can have large differences in efficiency.
- Many plants can improve efficiency without major investments in new technology.
- For EAF plants, in particular, there appeared to be an optimum set of operating conditions to maximise efficiency.
- For integrated plants, technology implementation has to be managed carefully to ensure compatibility between the individual processes and marketplace requirements.

Some Features of Indian Steel Industry

Today India produces about 28 million tonnes of crude steel per annum and occupies the tenth position amongst the top steel producing countries in the world. The seven integrated steel plants have an installed capacity of 17 million tonnes and the secondary steel producers have another 11 million tonnes thus totalling 28 million tonnes per annum. The absolute level of unit manufacturing costs of the industry in US dollars is comparable to most producers in the developed world (table 1).

Table 1: Comparative Costs at Different Stages of Production, US \$

	Hot Metal	Liquid Steel	H.R. Coil
U.K.	136	188	280
Germany	137	176	290
Japan	140	165	300
India	85	130	260

India has the advantage of lower labour cost (about 15% of the cost of steel which is almost double in

countries abroad) but this advantage is neutralised by the abysmally low labour productivity of about 60 tonnes per man year as against 429 tonnes and 351 tonnes in USA and Japan respectively. This is an area which requires immediate attention if India has to be globally competitive in the long run.

The steel industry is technology driven, and can be the backbone of any country's economy. But for various reasons like control, licensing policies, pricing, etc. the steel industry in India has remained half choked. As a result, the steel consumption in India has registered a slow growth rate — an annual average growth rate of only 4.7% in the last 12 years (table 2). The per capita consumption after 47 years of independence has been only 24 kg compared to 62 kg in China, over 500 kg in Japan, USA, Germany, CIS and a world average of 150 kg — a rather bleak scenario indeed.

Table 2: Production and Consumption of Steel in the World vis-a-vis India

Countries	Crude Steel Production, MT		
	1981	1993	Annual Growth, %
USA	109.6	87.1	-1.7
Japan	101.7	99.6	-0.2
China	35.6	88.6	12.4
Developing Countries	56.2	127.8	10.6
India	11.0	17.2	4.7

The picture today, however, is definitely upbeat with the Government's new policies which have exposed the Indian steel industry to the world of domestic and international competition. An increase of 7.6 per cent expenditure in the development of infrastructure over last year has been provided in the 1994-1995 Union Budget. To balance the impact of price decontrol, considerable relief in customs duties on all steel products has been announced (from 130% in 1991 to 85% in 1993 and likely to be 20% by 1998). The perspective growth plan for the steel sector in India by the Steel Ministry Working Group has projected a growth in steel demand to around 35 million tonnes of finished steel by 2001-2002. The projected availability of crude steel in the same year will

Steel Ministry Working Group has projected a growth in steel demand to around 35 million tonnes of finished steel by 2001-2002

be around 46.5 million tonnes. We have to make sure that the plans get translated into practice and that appropriate technologies are absorbed.

Another aspect of the steel industry which has to be given much deserved attention is energy. Steel is a very

Total energy consumption is almost double in India.

energy intensive industry and a big challenge is to reduce energy consumption. Energy accounts for about 40 per cent of the cost of the steel production in India while it is about 28 per cent in the developed countries. A comparison of the energy consumption pattern for Tata Steel representing a typical Indian integrated steel plant and Kawasaki Steel, Japan shows that the total energy consumption is almost double in India (fig. 2).

85 per cent with the conventional route of 95 per cent with a slab caster. This is, therefore, an obvious area of improvement and Tata Steel, like many other integrated steel plants in India, is planning a continuous casting ratio of over 90 per cent in the next five years compared to 60 per cent at present.

Conclusions

Industry in India in general, and the steel industry in particular, is today at the starting line of a totally new race. Olympic class runners have been allowed to participate, handicaps have been abolished and at the end of the race, there is "wealth" for the winners but "curtains" for the losers.

"Que Sera Sera, whatever will be, will be, the future is not ours to see Que Sera Sera" had been the refrain we were used to but now that has to be changed to: "Que Sera Sera, it will be as we will it to be, the future will be for us to see, Que Sera Sera...."

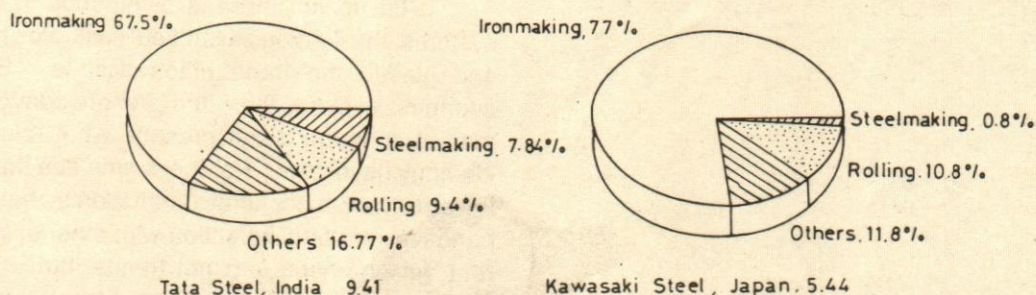


Fig. 2: Energy Consumption (G Cal/t) in Integrated Steel Plants

A significant portion of this energy can be saved by adopting continuous casting instead of conventional ingot casting. In the final processing of steel, cost of billets through the conventional ingot route is 15-20 per cent more than the continuous casting route. While most countries abroad have implemented continuous casting long ago and now 70-100 per cent of their steel production is by this route, India has nearly 70 per cent of its steel production through the ingot route. Continuous casting would also pay rich dividends in terms of high yields — at Geneva Steel for example, the yield rose from

This is the only way that steel, in India, will become the backbone of the nation and be competitive in the global race provided we have the will to win and the ability to work towards this goal.

Acknowledgement

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Changing Role of Trade Unions

C.S. Venkata Ratnam

What is the role of trade unions? Does it change with changes in environment? The article considers some of the emerging dilemmas of the trade unions in the light of the major transition the Indian economy is undergoing.

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Traditionally trade unions' role, has been to protect jobs and real earnings, secure better conditions of work and life and fight against exploitation and arbitrariness to ensure fairness and equity in employment. Some unions, particularly the left ones, perceive their role as being one to influence the type of economic system the society in which they function should have. In that sense, trade union roles and goals have been multiple, covering not only the immediate interests of their members but also entailing larger ideological and political questions.

To the extent there is divergence in the economic systems, the ideological and political roles mattered most and guided the trade union actions. But when the economic systems the world over are converging towards market economy as at present, what role, if any, does ideology have now? For those who see the current trend towards market economy orientation as being based on a negative vote of disaffection with other systems, the current developments are not trends, but a mere passing fad. There lies the relevance of not just ideology but idealism too to provide the necessary checks and balances that could prevent extreme swings to strike the much talked out "middle-path".

Dayal (1993) avers that the role of trade unions does not change. It remains protective. But perhaps the protective role has undergone a qualitative change with the passage of time in the wake of the long history of union movement and accumulated benefits under collective agreements, a plethora of legislation and industrial jurisprudence, growing literacy and awareness among the employees and the spread of a variety of social institutions — including consumer and public interest groups. Can we then say that the protective role of trade unions remains in form, but varies in substance?

The legal and institutional framework may not be responsive to external changes as much as industrial jurisprudence is. And the former is a major source of legislation in India. Not only the parliament, but

bureaucracy and judiciary too play an important role in influencing the industrial relations outcomes. The objectives of social partners, including trade unions, remaining the same, is it possible for the means to achieve the objectives to change? In the wake of changing employer strategies (Nandakumar & Aravind, 1994) in a liberalised environment (parallel production, subcontracting, ancillarisation, home work, downsizing, etc.) trade unions find themselves increasingly vulnerable to move away from their traditional means of protest and agitation and search for alternatives that could increase choice and discretion for themselves in order to maintain power balance in industrial relations.

In the wake of changing employer strategies in a liberalised environment trade unions find themselves increasingly vulnerable.

One of the most striking developments in 1993 concerns the landmark judgment of the High Court in Bombay sentencing each of the accused workmen of Bajaj Auto Ltd., Pune to Rs. One lakh fine for indulging in rioting, unlawful assembly and arson. In two other cases trade unions did not derive benefits of court judgments because of a threatened sale of the unit and an actual closure of the unit after the award. These developments are portents to the increasing vulnerability of unions due to economic, technological and structural changes and the attitudes of various groups in the society.

Trade Unions in India: At the Centre Stage or in the Periphery?

The trade union movement in India is over a century old. That it played a sterling role in achieving the country's Independence struggle requires no repetition and is well documented. It was originally assigned a major role in the country's economic planning. But today labour's role in planning is marginal. Its role in tripartite consultations is dwarfed by the very fact that tripartism itself is atrophied, despite the rhetorics about its revival in the context of structural adjustment reforms (Venkata Ratnam, 1993).

In the early 1990s, organised labour in India accounted for less than nine per cent of the population. Membership of the unions submitting returns to the appropriate authority under the Trade Union Act, 1926 was less than two per cent of the total labour force in the

country as of 1987. 47,014 unions accounted for a membership of 6,329,000. Thus the membership of the unions submitting returns under the Trade Unions Act constitutes only 30 per cent of the total work force in the organised sector. The degree of unionisation is considered to be very high at 90 per cent plus in the public sector while in the private sector it is much less particularly in small and medium scale units.

Only one out of five registered unions is affiliated to one or the other of the 10 major trade union federations at the national level. In a meeting with the representatives of all Central Trade Union Organisations (CTUOs) held by the Labour Minister on 15th May 1980, it was agreed that CTUOs which had a verified membership of at least 500,000 spread over at least four states and four industries would be considered as CTUOs for the purpose of their representation on various national and international conferences, committees and councils. No formal recognition to any of the CTUOs has been accorded so far on the basis of the norms evolved at the meeting. The 10 CTUOs which had participated in the general verification on 31 December 1980 continue to get representation in various committees, etc., even in the year 1993. Some of them have verified membership which is less than 500,000 but over 100,000. The release of provisional figures of membership verification carried out in 1989 had upset several trade union federations when they found that Bharatiya Mazdoor Sangh, an affiliate of Bhartiya Janata Party that ruled four Northern States in 1989 increasing its membership strength by 5 million and jumping to number one position, superceding, for the first time in post-Independent period, the Indian National Trade Union Congress. The National Labour Organisation is merging with Indian National Trade Union Congress and Hind Mazdoor Sangh was contemplating unity with All India Trade Union Congress. For the first time serious efforts are on the way for merger of national federations of trade unions. Simultaneously, several of the left-led trade union federations are thinking about a confederation along the lines of the employers organisations (who formed Council of Indian Employers) keeping the individual identity of the respective trade union federations.

The number of employees covered by collective agreements on wages and working conditions works out barely to one per cent of the total labour force in the country. While these numbers by themselves do not seem too large, the effective power of this vocal, predominantly urban minority could be gauged by their concentration in about 30 per cent of the parliamentary constituencies. It is this ability of the organised working class which gives them strength disproportionate to their

numbers. However, with regard to labour statistics in India that the footnotes, if any, reveal more than what the figures indicate. The incidence of non-reporting of data or non-submission of returns is scandalously high even with respect to statutory returns. Therefore, it is quite possible that the data reported may not accurately depict a complete and true picture about the size and relative strength of different trade unions. But we have no other source than what the official labour statistics provide.

The trade union "movement" has developed in a hydra-headed fashion with over a dozen national federations of trade unions split over ideological and other fractional considerations, each putting up exaggerated claims about their membership strength. There is politicised polarisation on many issues including the one concerning the method of selecting the representative union. The World Labour Report (ILO, 1993) summarised the trade

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union situation in the country in the early 1990s as follows:

"Indian unions are too very fragmented. In many workplaces several trade unions compete for the loyalty of the same body of workers and their rivalry is usually bitter and sometimes violent. It is difficult even to say how many trade unions operate at the national level since many are not affiliated to any all-India federation. The early splits in Indian trade unionism tended to be on ideological grounds — each linked to a particular political party. Much of the recent fragmentation, however, has centered on personalities and occasionally on caste or regional considerations."

Apart from the low membership coverage and fragmentation of the trade unions, several studies point to a decline in membership (Sheth, 1991; Sarath, 1992); growing alienation between trade unions and members (Sheth, 1991) particularly due to the changing characteristics of the new workforce (Sengupta, 1992); and the waning influence of national federations over the enterprise unions (Sarath, 1992). The new pattern points

to a shift from organising workers in a region or industry to the emergence of independent unions whose obsession is with enterprise level concerns, with no fora to link them with national federations that could secure for them a voice at national policy making levels. Social movements like that of the Naxalites, struggles for regional autonomy in several states and emotion charged protests over sensitive issues like Mandal and Mandir, have considerably weakened traditional trade union structures. The effect of the decline of communism in Europe on Indian trade union movement, though significant, cannot be properly assessed at this stage. Whether the recent events at Kanoria Jute Mills in Calcutta and Khatau Textiles in Bombay are portents of the future is also hard to guess.

Trade unions are hard pressed to live up to the rising expectations of the instrumental orientation of their members who consider membership in a union as a "meal ticket" (Sheth, 1991). It has resulted in a situation in Bombay, whereby, "The arduous task of organizing a trade union from scratch has suddenly lost its relevance: the easier path to ascendance as a leader is to take over existing organizations. Raiding and poaching rather than laborious organising are the norm. And yet, the fact is that, barring exceptions, the challenger enters not at his own initiative but at the behest of workers.

The emerging dilemma of the trade unions in India has been appropriately captured by a veteran trade union leader of mill workers in Maharashtra who became a General Manager of a large public sector steel mill in West Bengal and a Professor at the Tata Institute of Social Sciences: "Technologies displace jobs and yet enable the workers affected to bargain for higher wages; unions resist closure of sick units but can hardly defend working indefinitely as losing enterprises; unions do not generally like multinationals getting free access into the Indian industrial field but are attracted by the relatively higher emoluments and fringe benefits they offer; they favour the growth of the small industry but do not like the work of large units being contracted out to ancillary small scale industries ..." (Tulpule, 1992). The trade union dilemma is further evident from the fact that, "although both CITU and AITUC seem intent on finding new forms of struggle to channelise the growing discontent and anger of the working class, no new models appear to have evolved from the movements waged by these central trade unions" (Gupta, 1994).

The emerging macro issues can not be adequately tackled through protest, agitation and industrial action alone. The 1980s have seen many cases of prolonged

industrial action where trade union interests suffered. With the apparent decline of the influence of national/industry federations (this may be true of employer associations too), relative stagnation or decline of trade unions, court cases dragging for decades, workers' interest in strikes generally waning (as indicated by the relative decline of mandays lost to strikes — not lockouts — in the second half of 1980s and early 1990s) and structural, technological and other changes including management strategies and diminishing labour intensity, the time of reckoning has come for the trade unions in India. They have to go beyond protests, strikes and agitations and present alternative proposals to cope with the emerging dilemmas and macro and micro economic challenges. Local unions struggling for preserving jobs have begun to sharpen their diagnostic skills to present a series of options to revive and turnaround sick units in BIFR and non-BIFR companies. Should such vision and cooperation be restricted to overcoming the crisis or should it extend to the larger issues of employment, technological and other changes appears a moot point.

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Structural Adjustment & Transition

Structural adjustment reforms were introduced in India in mid-1980s and accelerated in mid-1991. The events in the former USSR and the Gulf War precipitated India's balance of payments crisis and forced the so-called reforms. Though at the time of Independence, India was the second most industrialised country in Asia-Pacific, by 1990s, it was replaced by the Asian dragons and tigers. Over the years, India allowed itself to get marginalised in a world that has become increasingly interdependent. India's share in world exports declined from 1.4 per cent in 1955 to 0.5 per cent in 1990; its share in world imports also declined from 1.3 per cent to 0.7 percent during the corresponding period.

One lesson learnt from our past experience is that import substitution may be a good strategy for the 1960s and export led growth strategies for the 1970s and 1980s. But in the 1990s where globalisation is punctured with regionalism and international trade agreements coexist with regional trade agreements and managed trade in an unequal world, there is a need for striking a balance rather than arguing for sudden transition from one end of

the continuum to the other end. We have no ready made model to copy from, and we need to strike a middle path, coping with developmental issues even as we preserve our great tradition of being the largest democracy in the world.

The competitiveness of India in terms of its human resources is considered to be the least. The World Competitiveness Report (IMD & WEF, 1990) puts India at the bottom of the 10 newly industrialising countries in terms of the competitiveness of its human resources. The World Competitiveness Report examines the competitive advantage of human resources on the basis of skills, motivation, flexibility, age structure and health of the people. The criteria included in this factor are: population, employment, unemployment, educational attainment, vocational training, public expenditure on education, management quality, income levels and health factors.

According to the 1992 UNDP Report on Human Development India ranked 134 out of a total of 160 countries in terms of the Human Development Index that takes into account three parameters, i.e., longevity (life expectancy), knowledge (adult literacy) and decent standard of living (per capita income). In terms of Human Freedoms Index, covering 40 indicators of freedoms to exercise choices in cultural, social, economic and political affairs, India scored 14 points and obtained medium freedom ranking (11-30 points) (UNDP, 1992).

Significantly, since the June 1991 reforms, our balance of payments position has improved and export earnings registered a perceptible increase. To what extent this is due to devaluation and whether we will continue to have such a positive trend when the exchange rate stabilises is difficult to ascertain. The most worrisome indicators are the shortfalls in job creation and the rise in inflation. The employers who initially welcomed liberalisation are now concerned about globalisation in the absence of a "breathing period" and "level playing field". Clearly, thus, the impact of the reforms show that they are not an unmixed blessing.

Which means that we should not uncritically either reject or accept the so-called reform package. We should be discrete in weighing the pros and cons of various elements of the package which itself is still evolving.

Trade unions, do not and cannot oppose structural changes *per se*. The trade unions in general, have, of course, been very critical of the adjustment process. *Fait accompli* consultation processes irk them. Trade unions need first to understand not only the implications of

change, but also, non-change and non-adaptation. They should welcome and guide change.

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Trade unions like the HMS, for instance, have been at the forefront in studying the implications of adjustment at industry and region level. HMS conducted workshops on textiles, ports and engineering. The workshops observed that job loss was occurring any way in textiles and ports and the introduction of CNC machines in public sector engineering firms in Bangalore did not result in job loss. We need more data and research to carry the debate to a constructive phase. It would be still better if trade unions could initiate studies on alternative scenarios of adjustment with and without Rao-Manmohan Bretton Wood twins inspired Zinda Tilasmat. The NCOA has raised serious questions on public sector reforms and set up working groups in certain sectors like power. It has gathered significant data to question the planned reforms. It should not stop there. It should also draw up a viable alternative programme of action. That and that alone will stir a meaningful debate and discussion and enable the trade union organisations to get across their views among the public.

Unfortunately, today, structural adjustment has come to acquire a negative connotation because its rationale, intent, content/process and outcomes are misunderstood, misrepresented and misinterpreted by both those at the giving and at the receiving end.

A useful way to stimulate constructive dialogue on the subject would be not to talk about the so-called adjustment reforms as given and irreversible. Better still to have discussions on changes required — not just in labour but all concerned — how we can make our economy vibrant and growing in an ecologically friendly way, make our industry and business competitive and secure productive employment and better quality of life for our people.

Social Costs of Adjustment

“Adjustment with a human face” and “Putting People first” are the catch phrases when it comes to discussions on minimising social costs. The discussion here is often

on how to minimise and mitigate the adverse affects than on creation and sharing of benefits through adjustment. With the result, often, discussions on adjustment lack positivism in approach. The arguments on GATT itself and the social clauses thereof, the concern for a world charter or workers’ rights and international labour standards raise quixotic dilemmas for trade unions.

The preamble to the ILO Constitution states that: “The failure of any nation to adopt humane conditions of labour is an obstacle in the way of other nations which desire to improve the conditions in their own countries.” With globalisation this argument becomes ever more relevant. Way back in 1947, the Havana Charter of the International Trade Organisation that produced GATT was, in order to avoid the depression of living standards and the introduction of unfair competitive conditions in world trade.” The Workers’ Group in the ILO and the free trade union movement can not but endorse its commitment to the social clause that is aimed at pursuing international labour standards. But at the national level, particularly in the Third World, the relevance of the above proposition is interpreted with particular reference to stages of development in an unequal world. The social partners in several Third World countries are now beginning to question the sequence of social development and economic development. Seriously, this is not just a “chicken or egg” question. Trade unions in developing countries are as much interested in the improvement of the quality of life of their members as anywhere else in the world. But, they are also concerned whether insistence on social clauses can serve to protect the interests of workers in the developed world at the expense of those in the developing world. More specifically, trade unions at national and local levels are interested in first preserving jobs and then talk about standards, benefits and rights.

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Employment Issues: Job Protection vs. Job Creation

Trade unions want more jobs and better jobs. Therefore, it is but natural that unemployment and poverty engage their attention most. The job crisis has now become a global issue, with widespread unemployment in both the developed and developing countries.

For a proper analysis of the problem we need to know not only its magnitude but also its dimensions. Given the high incidence of poverty, the poor cannot afford to remain without work in the absence of any social protection. Therefore our major problem is not unemployment, but underemployment. Though only half the population is literate (52% as per 1991 census), unemployment among the educated is alarmingly on the rise. Considering that the majority of the workforce is illiterate, the quality of workforce has an important bearing on the quality of employment generated. If a large proportion of the population remains illiterate and unskilled, we would only be continuing with low-skill, low-wage type of jobs which may result in the bulk of the employment being generated at around the subsistence level. Education for all should be an integral part, if not the first step in our quest for employment for all.

As per 1991 census, regular salaried employment in the organised sector accounts for less than 10 per cent (26.8 million out of 279 million). Government/public sector accounts for 60 per cent of the regular salaried employment in the organised sector. Casual wage employment in the unorganised sector accounts for 34 per cent and self employment accounts for 56.4 per cent of the workforce in the country. Nearly 69 per cent of the main workers as per 1991 census are still engaged in agriculture. The share of mining and manufacturing is 13.5 per cent while that of services 17.7 per cent. Structural changes in the occupational pattern are occurring rather slowly, but the direction seems to be clear. Services sector has already overtaken the manufacturing as a main provider of jobs in the organised sector.

Jobless Growth: Though job creation has been a major concern and objective of successive five year plans, over the years, fewer jobs were created per Rs. ten million investment. In the 1950s a leading economist, Mahalanobis estimated that Rs. ten million investment in infrastructure would create 11,000 jobs. During the 1980-87, 70,000 jobs were added in the organised sector. Capital formation in the public and the private sectors exceeded Rs. 700,000 million. Thus, Rs. ten million investment generated just one job on the average in the organised sector through a greater part of the 1980s. The Nava Shena Port in the public sector employs ten times less manpower and its wage cost as a proportion of total operating expenditure was 12 times less than that of Bombay. The integrated steel mill set up in the public sector at Visakhapatnam generated less than 14,000 jobs for an investment of over Rs. 80,000 million. A new joint sector steel mill proposed to be set up in Madhya

Pradesh soon will entail an investment of Rs. 400,000 million and provide jobs for 400 persons.

Does Job Protection Impede Job Creation: Changes in labour legislation during the emergency in 1975 required prior permission from the Government for lay-off, retrenchment and closure. Such legal provisions, court judgments and past collective agreements between employers and trade unions created rigidities in labour market. However, over the years, higher adjustment costs seem to have reduced the demand for labour in the firms in the organised sector, irrespective of whether they are owned by the government or by the private sector. A study of employment trends in 34 Indian industries, using the Annual Survey of Industries Data for the period 1976 to 1982 pointed to a long-term decline in the demand for labour at around 17.5% (Fallon & Lucas, 1991). The study noted significant inter-industry variations. Employment is estimated to have been reduced more than 5 per cent in 25 of the 35 industries, and more than 15 per cent in 7 of them. The rate of decline in employment was estimated to be over 33 per cent in textiles. Another study (Workers' Solidarity Centre, 1989) of 34 firms in Bombay during 1980 to 1990, estimated an average reduction in employment of 20.5 per cent over the decade.

A study of six industries — Plantations and textiles (West Bengal), power (Andhra Pradesh) major ports, engineering (West Bengal and Andhra Pradesh) and chemicals and pharmaceuticals (Maharashtra) — point to a decline in full-time employment and unionisation rates during the 1980s (Sarath, 1992). The study also indicated a rise in the incidence of casual and contract employment. The study of chemicals and pharmaceuticals revealed underreporting of employment by the private sector firms (to the extent of 57%). The data gathered through field visits to firms revealed that the actual number employed in the firms covered was, on average, 57 per cent more than the number as per the records of the Factories Inspector presumably to overcome the burden of legal coverage since coverage of several legislations progressively increases with the number employed.

Several studies (Goyal, 1984; Frensen, 1991) also point to a shift in employment from the organised to the unorganised sector through subcontracting, and emergence of a typical employment practices where those who work for the Organisation do not have employment relationship, but a contractual relationship (Mathur, 1989).

Structural adjustment policies are perceived to result in job losses in the short run whatever be the long run consequences. Further, more importantly, job losses are seen to occur more in the east and north east while a larger proportion of new jobs may be created in the west, south and north. This may escalate social tensions. In the absence of social insurance and unemployment benefits, there is widespread concern about the fall out of a thin organised sector employment becoming thinner. The Government has constituted a National Renewal Fund (NRF) with contributions through budget allocations, World Bank grant, allocations from public sector disinvestment proceeds. Though the avowed object of the NRF is to provide for retraining, redeployment and compensation for voluntary separations, so far the fund is used mainly to finance voluntary separation schemes. Therefore, some trade unions began to describe it as a "National Burial Fund." Several companies are busy preparing plans for work force reductions with a view to making their operations viable and competitive. Trade unions are asking such companies whether progressive reduction of work force constitutes part and parcel of human resource development strategies and whether it should necessarily come from liquidating human resources? Active labour market interventions with concrete proposals for productive job creation, reducing the gap between skills available and skills in demand, appropriate institutional framework for retraining and redeployment are some of the aspects which have not gained enough attention as yet.

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As the evidence is inconclusive, there is a further need to examine the trends in employment and other issues relating to industrial relations objectively. Some questions that readily occur are:

- Whether job loss is more with or without modernisation?
- Whether job protection laws have indeed impeded job creation as some studies by World Bank experts and others point out?

- Whether giving protection to those who have had a job would compete with the interests of those who did not have one?
- Whether our focus should shift away from employment to employability?
- If productivity, quality, costs, environment and quality of work life are all relevant and important, how can labour and management cooperate to realise these goals?

There is a need to look at these and other issues dispassionately in a problem-solving approach than with a view to apportion the blame on either or both or all sides.

Trade Unions & Public Sector Reforms

Trade union response to public sector reform, more importantly privatisation, was initially lukewarm or defensive mainly due to two reasons: ideologically, the free trade union movement faced the dilemma that opposition to privatisation goes against the concept of free enterprise they believed in; mounting dissatisfaction about the performance of public services and utilities did not provide a congenial atmosphere to win public support for public sector. The return to private sector was based on a negative vote with which they had to contend. It is the Trades Union Congress in the U.K. which ultimately put up a campaign on "Industries for People" which exhorted their members to tone up their efficiency and services to win public support for public sector. Trade unions would, find it difficult to rally support for public sector merely based on the ghost of imperialism and colonialism and heightening the apprehensions about exploitation of the profit minded private entrepreneurs. When people have had their difficulties with both the sectors, they would like to pitch one sector against the other, so that the resulting competition, if any, would have a positive effect on their orientation for the customers. Past experience reveals that not ownership but performance is the issue.

Trade unions in India are concerned among other things, about the possible drastic reduction of employment in the organised sector which is already thin and the reduction of the public sector, which they themselves find it difficult, in some ways, to defend. Even a leader of the AITUC observed in its 1990 Congress, "While extension of private sector in the area where the public sector is chronic defaulter either to meet the demand or to improve its financial performance may be considered, the general

line of privatisation is suicidal and must be resisted" (AITUC, 1990).

Privatisation and public sector reform can not be stalled by mere references to the historical reasons for their creation or origin in the first instance. It is essential to formulate alternative proposals to enable their continued viability. No value judgement is implied about the relative superiority of either sector (public/private) in terms of performance. It is just that public sector performance has greater public stake because of the nature of the business; additionally, public sector is more open and has greater public exposure and accountability than the private sector. The unity of the trade union movement and their persistence in coming up with several viable alternatives for the revival of Indian Iron and Steel Company, Burnpur is heartening.

Trade unions must realise the potential consequences of the manner in which they seek to protect the interest of their members employed in the public sector. Let us take the case of the bank computerisation agreement entered into by the Indian Banks Association with the bank employees' unions. The agreement provides that banks with 500 or less branches can computerise upto 1 per cent of the branches or a minimum of 3 in a year and banks with 500 or more branches can computerise upto 0.5 per cent of the branches or a minimum of 5 branches in a year. It will take over 160 years for the banks to achieve computerisation of the level obtaining in 1993 if we strictly go by the letter and spirit of the agreement. This in an area (computerisation) where changes are occurring once every three years. Foreign banks too are covered by the agreement, but they may not be affected much because the level of computerisation there is much higher than in public sector banks. The new private sector banks will also have less problem because when they set up new facility they can have state of art technologies. The agreement leaves the public sector banks in the lurch. Whether this means that those who seek to protect the interests of the nationalised banks also unwittingly harm their interests is a matter that merits reflection.

Labour-Management Cooperation

Structural changes and economic crisis and adjustment pressures at the enterprise level produced two opposite, paradoxical developments: On the one hand, one sees a tendency for conflictual relations to make way for cooperative, collaborative relations. On the other, a combination of factors seems to minimise, and in several instances, marginalise unions. Also, the quest for speed

in decision-making and the concern for secrecy in the face of intensified competition seem to produce pressures that may not be conducive for promoting information sharing, consultation and other forms of employee participation/involvement.

There are many examples of labour-management cooperation which was influenced largely by proper sharing of information and shared perception among both labour and management concerning the organisational reality. The following are some such examples:

- In the face of declining business opportunity in a pharmaceutical firm based in Goa, employees accepted voluntary unemployment till the firm implements a revival and restructuring programme. After restructuring for revival too, when the employees and the union realised that the firm cannot employ all the people, they agreed for voluntary lay-off for 15 days a month, based on rosters of employees prepared jointly by the union and the management.
- The unions in Indian Drugs and Pharmaceuticals Limited agreed to defer wage revision in a bid to save jobs. Similar attitude is discernible in a few other public sector undertakings like the Hindustan Copper Limited.
- The port and dock workers unions in Bombay agreed for the merger of Bombay Dock Labour Board with the Bombay Port Trust — a move that they resisted for over two decades — in the face of acute financial crisis in Bombay Dock Labour that resulted in non-payment of wages for the last quarter of 1991.
- In one company which was once a monopoly in industrial gases and where the Chief Minister of the State in which the company's headquarters and some plants are located, massive restructuring took place with union cooperation to reduce the workforce to a third and increase the output by three times in order to cope with the new challenges of competition at the marketplace.
- The public sector steel giant, Steel Authority of India achieved an impressive turnaround despite the fact that it had to contend with over 230 unions most of which are affiliated to virtually one or the other of each of the major national trade union federations.
- Several trade union federations and the management of Indian Iron and steel Company agreed to transform this sick and aged plant into a virtually

green-fields operation by proposition dismantling of the existing plant and machinery, radical modernisation, multi-skilling and redeployment of surplus labour after accounting for voluntary separations not only of regular employees, but also contract workers.

There are several more such instances in different parts of the country. It must be added, however, that, labour and management are beginning to cooperate mostly in the face of imminent threat of closure. In some cases the threat of sale and transfer of the enterprise to new owners resulted in workers agreeing to sacrifices to prevent such sale and transfer (e.g. Raptokas Bret & Co. in Madras where unions sacrificed the legal entitlement for double indexation of dearness allowance they earned after two decades of legal battle right upto the Supreme Court). In others, when the unions were not agreeing to management propositions, the latter were serving closure notices (e.g. Indian Oxygen in Kanpur and Binny Mills in Madras). In cases where such threats were mere paper threats (e.g. Textile mills in Coimbatore) the unions were getting what they wanted: When the case was referred to the Chief Minister of the State, she ordered the mill managements to pay at least as much bonus as they paid when her political adversary was the immediate Chief Minister. The mill managements paid the bonus which they considered was unreasonable and suicidal, and yet none of the mills became sick for paying such bonus.

Labour and management cooperate mostly in the face of imminent threat of closure.

It is also true that in cases where the government is undecided or unprepared for the consequences, the unions usually have had an upper hand. This is evident in the case of several of the privatisation decisions which were either withheld, thus far (IISCO, Burnpur, and Scooters India Ltd., Lucknow, for instance) or reversed (Dalla Cement, Uttar Pradesh, for instance). The VRS scheme in NTC Mills came to a naught with a Minister's statement that no NTC mill would be closed.

On the whole, the evidence seems to support the view that where managements are genuinely committed to change and restructuring, it has become possible to achieve it in many unionised organisations also within the same legal, political and socio-cultural milieu. Much depends on whether we are concerned with success

stories or failed incidents. True, success is more difficult to emulate and failure is easy to avoid. But one's belief systems make a difference to what one does or does not do. Our perceptions are equally important. As a recent HBR article argues, among other things, it depends on whether managements view unions as part of the problem or part of the solution.

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Trade Unions & Flexibility

The emerging paradigm shift in the world of work as a result of structural and other changes in Indian economy and elsewhere point to the need for developing high performance systems. In a competitive, market oriented economy, positive and productivity oriented work culture means, among other things, producing more with limited resources. Whether it means a preference for lean production systems is an issue that requires consideration. Notwithstanding our successes in respect of green, white and blue revolutions and achievements in frontier areas of research, the technological and productivity lag in Indian industry is too obvious to bear repetition. The few exceptions, if any, are exceptions. The technological obsolescence is accompanied by human resource obsolescence in a country that boasts of having the third largest pool of qualified people.

The industrial re-organisation that is taking place in most parts of the world suggests the emerging pattern of a modern business/industrial organisation which is flatter, less hierarchical, more flexible and adaptive than before. Parallely, there is a growing emphasis on mechanising routine skills, and recruiting smaller, more qualified, skilled, flexible, adaptive, and willing workforce. Broader classification of occupational skills and preparing workforce for multiple tasks/skills and careers seems to be the order.

The evolving "lean, mean, green, clean" organisations emphasise speed (of decision-making), continuous upgrading/updating of skills, and say and stake for the employees. A whole set of new ethos and new work culture is being sought to be built around the concept of "flexibility" of sorts. The key word for survival in a com-

petitive world is adaptability which relatively smaller (in terms of size of employment?) and flexible firms can provide.

Flexibility as an aspect of work system/culture and human resource/industrial relations policies has been a subject of study since 1970s, when the OECD countries were confronted with the need to make structural adjustment. In the 1980s, the third world countries also began to emphasise flexibility under pressure from structural adjustment reforms. The study group on flexibility in the International Industrial Relations Association, the work of the New Industrial Organisation programme at the International Institute for Labour Studies (IILS, 1993) the growing literature on lean production make the subject easily one of the most contentious aspects with immense implications for the human side of enterprise.

It is realised that what is flexible for one party in employment context may pose rigidity for the other. For instance, rigid occupational demarcations are considered helpful to workers in maintaining employment, present and potential, and limit the opportunities for the intensification and exhaustion of workers at the workplace. So, flexibility for whom and for what purposes? Is it possible to harmonise the effects of flexibility for labour and management so that there is a shared perspective?

Flexibility may promote customisation but affects uniformity and consistency in personnel policies. Flexibility may lead to greater secrecy and affect transparency. Should the interventions directed at promoting flexibility — numerical, functional, organisational, skills, pay, etc. — be considered on a stand alone basis or should they form part of an integrated/holistic approach? If they are to form a part of the integrated/holistic approach, what supporting/supplementary/complementary interventions/mechanisms are suggested?

Flexibility may promote customisation but affects uniformity and consistency in personnel policies.

Attitudinal changes are far more crucial than legal or institutional changes to promote flexibility. There has been considerable emphasis on changes in labour legislation (Section 9-A, V-B, etc. of Industrial Disputes Act). To what extent are they sine qua non for developing positive work culture? Looking at the examples of the BIFR companies and other turnarounds, it appears

flexibility is becoming acceptable only in the event of dire threat of closure of sick units, than as a proactive response. But, there are enough examples (Indian Aluminium, Kirloskar Oil Engines, Walchandnagar Industries, Indian Oxygen, etc.) around us of unions and managements resolving such vexing issues at local (plant) level through problem-solving approach. Given the same environment and macro-institutional framework, how could some firms achieve what is normally considered impossible? What are the gateways and barriers for flexibility? What lessons do they offer for us?

There is a need for a wider debate discussion on the above issues which reflect the transition in the world of work from Taylorism to Toyotism. Needless to emphasise that the rationale of flexibility requires a shared understanding and concern between employees/unions and management/employers. Consensus building requires information sharing through continuous, interactive two-way communication, consultation, negotiation and other measures for building trust and credibility.

Economic pressures are emphasising strategic linkage of human resource policies with the bottom line. We must, however, take lessons from history. Arnold Toynbee, in his monumental treatise called, "A Study of History," cautioned that the decline of civilisations occurs when a society goes to excesses in its success formula. Bateson warned us of the degenerative syndrome that he calls "schimogenesis" occurs where an attribute in the organisation perpetuates itself it becomes extreme and thereby dysfunctional. The current quest for flexibility needs exploration keeping this in view.

Trade Unions & Competitiveness

The popular notion among non-union circles in India is that unions impede productivity and competitiveness. Agreements like the one in the Banks over computerisation (October 1993) are cited to defend such thinking. It is inappropriate, though, to blame the unions alone for such agreements. Bank managements are equally, if not more, responsible.

It is true that in the unionised sectors of our economy wage rates are high. A recent study provides evidence about the rise in the relative price of labour in the organised sector. Another study points to the relative higher share of wage and interest costs in the total cost among sick units. Unions are also seen to affect competitiveness by interfering with technological and other changes, and insisting on the maintenance of restrictive and waste-

ful work practices. Perhaps in a protected economy, if you do less with more, more could be employed. But in a liberalised economy, the emphasis has to be on doing more with less resources, not just of labour. It is working smarter, not harder.

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The evidence on trade union's role in competitiveness is mixed. There are several, particularly private sector organisations where trade unions have extended cooperation to management in restructuring the enterprises so that they could become more viable and competitive. There are instances, where trade unions may have withheld cooperation either because they did not have confidence in the management (this is particularly so in companies rendered sick by managements) or for political (central public sector undertakings have been a victim of this attitude in some states ruled by opposition parties) or other reasons.

Though the evidence regarding unions and competitiveness is incomplete, a few studies indicate that unions are associated with more efficient production; and, in general, productivity is higher in the union rather than non-union firms (Freeman & Medoff, 1984). It is argued that rising productivity can offset higher wages in unionised plants. Also, to the extent union gains are at the expense of higher profits rather than higher prices, volume increases or spread effects of the benefits of improved economic efficiency will offset negative effects on employment, if any.

There are national and international trends which point to efforts at taking labour out of competition. At the national level there has been a decline in labour intensity in agriculture and manufacturing. This is attributable to technological changes, management strategies and myriad other reasons. But there are several instances where managements are trying to find short cut solutions by substituting labour with capital and technology and through phasing out operations, sub-contracting, etc. At the international level, the application of international labour standards and social clauses in trade agreements are aimed at taking labour out of competition.

Technological Changes & Trade Union Response

In technology intensive industries, technical advancements precede structural changes. Certain technological advancements, being imperative, leave little choice and discretion for nations, industries and enterprises. Same is true with structural adjustment pressures, particularly in countries which reel under the burden of heavy external debt. Therefore, often the decision-makers at macro and micro levels are pushed to the corner: (Technologically) change and (structurally) adjust, or perish. Recent publications like "The Machine That Changed The World" and the "Power Shift", among others, point to the power and potential of new technological advancements in the field of micro-electronics, etc.

Throughout human civilisation, change is resisted every time and everywhere, initially despite the realisation, ultimately, that only change is permanent. In today's context, the concern is not so much with change per se as with the pace of change. For those who lead change it could be evolutionary, but for many others who follow it, it could be revolutionary. If the alternative to planned change is imposed change, planned change is preferable.

Effects of Changes: It is possible to foresee the following effects as a result of technical and structural changes, even if the extent to which they take place may vary across enterprise and industries:

Effects on Work Organisation: The predominant trends in work Organisation point to a shift in focus towards broader definition of jobs, flexibility and team work. This fosters emphasis on communication and consultation and search for problem-solving mechanisms.

Effects on the Structure of the workforce: The numbers, categories and skills will change. This will mean changes in workplace demographics and employee aspirations.

Effects on the worker: Changes in job and income security, skill requirements, job classification, work organization, and social dynamics.

Effects on Unions: Dramatic decline in membership of certain crafts/categories. The status quo is disturbed affected demarcation between unions. Jurisdictional problems arise where craft unions persist. When technological changes are pervasive and imperative, unions may oppose, can delay, but fail, usually, to impede the changes. Thus unions become vulnerable. Managements need to be sensi-

tive not just to the power-balance between union-management, but also, inter-union power balance. If management actions/strategies, intentionally or otherwise affect union dynamics, the resulting misunderstanding and conflict will affect the enterprise functioning also.

Effects on Managements: New possibilities for shifts in locus of control: blue collar to white collar and perhaps to management.

Changes in levels of managerial decision-making: centralisation to decentralisation.

Effects on Collective Bargaining: National industrial relations systems influence the nature of effects. Technological and structural changes foster decentralised, enterprise level bargaining because the issues will be specific to enterprise. As a result power shifts from national federations of unions and employers to enterprise level unions and enterprise level management. Greater scope and influence for shop-floor labour-management interactions.

Union Response to New Technologies: Trade unions may oppose and resist new technologies. They can also make a significant contribution to make new technology instrumental in humanising work and generally enhancing workers' well being as well as in improving the efficiency of industry. (Ozaki, 1992). Economic recession and international competition have brought about a new trade union culture in some countries like Germany and Sweden where trade unions are assuming greater responsibility and involvement in most decisions on reorganisation and technological innovation from the planning phase. German unions are producing models of "humane" work and training works council members in the proper use of the existing legal instruments for influencing work organising. The Scandinavian trade unions are striving to build up technical resources within unions and among workers.

Trade unions have to prepare themselves to cope with the new challenges and the dilemmas that new technologies, new materials and processes entail.

It is not just new technologies, New materials — particularly dangerous chemicals — pose immense threats to the occupational safety and health of workers and the community at large. Ecological issues are also relevant in this context. Pollution prevention has im-

mense implications of jobs and competition. The recent happenings in Agra manifest the dilemma in the current controversy over the trade offs between environmental concerns and human concerns. Even the employers have voiced concern saying, "Taj hamara shan hai, Udyog hamara jan hai. (Taj is our pride, industry is our livelihood)."

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Workers Participation/Empowerment

Consultative processes take time and managers are wary of the costs and consequences of delays in decision-making even if the need for consultation and cooperation is more in a rapidly changing environment. Therefore it is apprehended that the main factor that could hinder labour management consultation could be the rapidly changing environment (Also see, APO, 1991). Add to this the adversarial mode of labour management relations. With mutual trust glaringly lacking, information sharing is a big problem: Balance sheets of corporations in India, are considered to be excellent works of fiction not only by the trade unions, but also by government officials and even, perhaps, minority share holders. With the result, even Scanlon type profit sharing incentive schemes become non-starters.

There is also the concern among trade unions about the trade off between collective bargaining and workers participation. It is argued that collective bargaining and workers participation can be mutually reinforcing than competing. There are several examples of workers' association in management (particularly Tata Steel) which originated from a collective agreement. Trade unions also are concerned about the impact of modern human resource policies of worker involvement on the traditional bargaining role of trade unions and the very existence of

With market economy orientation and customer consciousness, it is for trade unions to develop themselves as responsive organisations.

trade unions themselves. Worker involvement can not effectively substitute for trade union role. With market economy orientation and customer awakening and customer consciousness, it is for trade unions to develop

themselves as responsive organisations modifying their roles to suit the changing requirements of their members.

Reforming Industrial Relations

During the colonial period the Government policy in industrial relations was one of *laissez faire* and selective intervention at the most (NCL, 1969). Subsequently legislation provided for a machinery to settle disputes and for tripartite and bipartite consultations as well. The main thrust of legislation in post-colonial period was on dispute resolution than the promotion of sound industrial relations. The emphasis was on state intervention and adjudication than strengthening collective bargaining and bipartite relations. The major consideration was to safeguard the interests of labour than to dovetail the labour policies with economic and industrial policies.

Over the years, with the widening of regional disparities in economic growth, the emergence of regional parties, the gradual increase in the number of states ruled by the opposition parties, the splits in the political parties and their trade union affiliates, and the inadequate representative character of governments (central government cannot effectively represent the views of opposition led state governments on labour matters which are in the concurrent list of our constitution), employers and workers, one would wonder whether there is a unified labour policy in India. Labour being a concurrent subject, the tensions in the centre-state relations seem to affect industrial relations, particularly in the central public sector undertakings where the opposition-led state governments having responsibility for labour administration seem to use these enterprises to send some hard lessons to the government at the centre. There is a thinking, particularly in some political and employer circles whether it would be prudent to make labour as a state subject and let states pursue competitive labour policies. Trade unions, naturally, oppose such moves which they consider, perhaps rightly, a retrograde step.

The following are some of the unique features of our industrial relations system which negatively impinge upon industrial relations policies, processes and their outcomes:

- The three social partners — governments, employers and unions are not quite representative enough. The tripod is therefore weak and tripartism atrophied for various reasons.

In mid-1960s Kennedy argued that governments are tenderminded, employers legalistic and unions militant. Perhaps the same situation continues till date. Both

employers and unions have been excessively dependent upon government and legal sanctions than moral sanctions and consensual and commitment systems based on collective agreements. Management by agreement should have been the hall mark of industrial relations than management by third party which unfortunately seems to be the case with Indian industrial relations system.

- The discretionary powers of the government to intervene in labour matters is more pervasive in India than anywhere else in the democratic world. The Government can intervene not only when there is a dispute but also when it apprehends a dispute. This gives the government the power to create a dispute and proceed to settle it and influence the dynamics of unionism and union-management relationship.
- Parliament enacts legislation. But it does not always seem to keep track, well enough, to see whether it is given effect to. The bureaucracy, in other words, can set stall the parliamentary will.
- Most strikes are illegal. Yet, one of the usual conditions of settlement is not to invoke the provisions under Payment of Wages Act (deduction of eight days wages for each day's absence in an illegal strike), not to speak of no-work no-pay. Similarly, prior permissions are required for lay-offs, lock-outs and closures. Never ever, the Union Minister of State for Labour asserts, any labour minister — either at centre or in the states — granted permissions because it is obviously politically unwise to do so. Yet, he wonders, lay-offs, lock-outs and closures take place "somehow". Some overseas investors find it difficult to operate "somehow". If anyway "somehow" management is the rule than the exception why not make it legal is what they ask. Also, the clauses on prior permissions were of little avail to workers and unions, not to speak of employers. For, when the units remain in limbo, even statutory payments could be defaulted.
- The legal process is unusually tardy and judgments not often quite predictable. Several thousand cases drag on for decades, before they are disposed of. Even in cases the courts — High court or Supreme court — held decrees, there is no guarantee that they will be implemented. True, the erring parties can be held liable for contempt of court. But, in recent years we see a tendency whereby the state administration does not necessarily pursue court orders effectively (for example, consider the case of the lock-out in Nellimerla jute

mills in Andhra Pradesh which was declared illegal, but the lockout is still to be lifted). In other cases, employers feel compelled to close shop or sell the property because they feel they cannot abide by the court decrees. For instance, when Raptakos Bret threatened to sell the Madras unit, the union signed a new settlement with the management forfeiting the benefits it obtained for its members through a Supreme court judgment after two decades of legal wrangles.

- India is one of the few countries in the world where an impression has been created that only the workers have rights, and managements have none.
- India is perhaps the only country in the world where all registered unions have *de facto* industrial relations rights. This is detrimental to the cause of not just management, but also of workers and their unions and industrial relations and enterprise performance in general. Craft, category and caste-based unions can and do play havoc.

Trade unions, along with other social partners, should recognise the need for the transition and transformation of our economy to be fully integrated into the global economy as a major and competitive player where its citizens can enjoy an enhanced quality of life. The objectives of the labour policy should reflect the following concerns:

- The need to work towards fuller and better employment.
- The need to create a highly skilled, trained, versatile and adaptable workforce willing to welcome and lead the changes.
- The need to improve quality and productivity of all resources.
- The need to promote sound and harmonious industrial relations and positive work culture.
- The need to promote safe and healthy working and general environment.
- The need to promote consultation and cooperation through strong and effective, independent and interdependent organisations of workers and employers that are necessary for pursuing active bipartite and broadbased tripartite consultations for social coherence and progress. Broad basing the tripartite constituencies, with a view to making them more representative and also to enable social coherence and consensus have important im-

plications for trade union federations in retaining their traditional oligopolistic hold.

- Bipartism needs to be strengthened along with tripartism. So far tripartism thrived on government support and patronage. In a period where the state is progressively withdrawing its presence in economic matters, it is possible that tripartism may suffer making it vital for bipartism to provide the crucial link with tripartism.
- Both labour/unions and management/employers should realise that law can not be what they want to be. For, it has limitations on the extent to which it can give legal relief to the myriad real and assumed problems. The degree of maturity in industrial relations and the intensity of legalism and legal sanctions are inversely related. Legal obligations become least significant when industrial relations are harmonious and productive.

Traditionally both employers and unions have depended rather excessively on the government in the sphere of industrial relations. While accepting the crucial role of government in making change possible, there is a need to look at it in a fresh perspective. Time was when, for instance, in Britain, and subsequently in India too, public ownership in docks, decasualisation, etc. were considered to be the alternatives to end the exploitation and vagaries of the dock workers. But today, one sees a reversal in the trend towards private ownership and coincidentally casualisation. It is easy to condemn the current and emerging trend. It is difficult to get to the bottom of the matter and find out why we are moving in circles. There is clearly a glaring gap in our understanding of the problem as well as our ability to cope with it.

Labour and management need to develop a shared perspective and learn to serve common cause and institutionalise from within and without. There is a lot to learn from the story of the hen that lays the golden eggs. The enterprise is the hen. The eggs are to be shared by the labour and the management with the community. If they quarrel among themselves go to the monkeys as in the case of the two kittens with a loaf of bread.

Continued reliance on legal sanctions and third party interference does not speak well of either party. It reflects a glaring lack of maturity in the relationship between labour and management. Stressful relations lead to loss of energy, productivity and initiative, weakening the parties, the enterprise and the wider social system. Since both the parties can benefit, in the long run, only through productivity, it augurs well if they learn to cooperate and

collaborate and manage their affairs by mutual consent with constantly renewed competence and commitment.

Labour and management can benefit only through productivity, it augurs well if they learn to cooperate and collaborate and manage their affairs by mutual consent.

References

- Asian Productivity Organisation (APO)** (1991). "Labour-Management Consultation in Asia." Tokyo: Asian Productivity Organisation.
- CMIE (Center for Monitoring Indian Economy)** (1992). "Basic Statistics Relating to the Indian Economy". Bombay: CMIE. August.
- Dunlop, J.T.** (1958). "Industrial Relations System". New York: Holt.
- Dayal, I.** (1993). "Emerging Demands on Trade Unions." Indian Journal of Industrial Relations. October 1993.
- Fallon, P.R. & R.E.B. Lucas** (1991). "The Impact of Changes in Job Security Regulations in India and Zimbabwe," The World Bank Economic Review, Vol. 5 (3).
- Freeman, R.B. & J.L. Medoff** (1984). "What Do Unions Do?" New York: Basic Books.
- Frensen, J.** (1991). "Subcontracting and Inequality: The Case of Hindustan Lever in India". Nijmegen: Third World Centre, Catholic University of Nijmegen.
- Goyal, S.K.** (1984). "Small Scale Sector and Big Business". New Delhi: The Corporate Study Group of the Indian Institute of Public Administration.
- Gupta, S.P.** (1989). "Planning and Development in India: A Critique". New Delhi: Allied.
- Gupta, Tilak D.** (1994). "Meeting Challenge of Economic 'Reforms': Signals from Two Trade Union Conferences." Economic and Political Weekly, April 30.
- Hoerr, J.** (1991). "What Should Unions Do?" Harvard Business Review, May-June 1991.
- International Institute for Management Development (IMD) and World Economic Forum (WEF).** "The World Competitiveness Report, 1990." Geneva: IMD and WEF.
- International Labour Organisation/Asian Regional Team for Employment Promotion** (1993). "India: Employment, Poverty and Economic Policies. New Delhi, December.
- Mathur, A.** (1989). "Industrial Restructuring and Union Power: Micro-Economic Dimensions of Economic Restructuring and Industrial Relations in India." New Delhi: ILO-ARTEP.
- Nandakumar & Aravind Shrouti** (1994). "Management Strategies and Industrial Relations". Bombay: Maniben Kara Institute. Mimeo.
- National Commission on Labour (Government of India)** (1969). "Report of the National Commission on Labour". New Delhi. Government of India. Ramaswamy, E.A. 1988. "Worker Consciousness and Trade Union Response". New Delhi: Oxford University Press.
- Ozaki, M. et. al.** (1992). "Technological Change: Labour Relations". Geneva: ILO.
- Sarath, D. (Ed.)** (1992). "Employment and Unionism in Indian Industry". New Delhi: Frederick Ebert Foundation.
- Sengupta, A.K.** (1992). "New Generation of Organised Workforce in India: Implications for Managements and Trade Unions", in J S Sodhi and S P S Ahluwalia (Eds.) Industrial Relations in India: The Coming Decades". New Delhi: Shri Ram Centre for Industrial Relations and Human Resources.
- Sheth, N.R.** (1991). "Some Thoughts on our Trade Unions", Ahmedabad: Indian Institute of Management.
- The Workers Solidarity Centre Against Job Losses and Closures** (1989). "Report of the Workshop on Job Losses and Industrial Closures." Seminar on Social Movements, Human Rights and the Law. 27-30 Dec. 1989. Bombay.
- Tulpule, B.** (1992). "New Industrial Policy, Employment and Structural Adjustment in India." Indian Worker, August.
- United Nations Development Programme (UNDP)** (1992). "Human Development Report". New York: Oxford University Press.
- Venkata Ratnam, C.S.** (1993). "Adjustment Through Privatisation: A Case Study of India". Geneva: ILO Interdepartmental Project on Structural Adjustment, Mimeo. □

Trade Unions & Economic Restructuring

S.R. Mohan Das

Trade Unions have a very important part to play if the current economic restructuring is to become a resounding success. Unfortunately, unions in India have always assumed an adversarial role and have severe limitations when confronted with drastic changes as in the present. The author points out the faulty features on which the edifice of Indian labour movement has been built and offers concrete suggestions to rectify the problem.

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The role of labour in the organized sector of the economy has acquired deeper significance in the context of economic restructuring. Various issues are sought to be brought into focus, such as the changing role of trade unions in post liberation era, their part in management decision-making (participative management), and in the unorganized sector, their responsibility in multi-skill and redeployment processes, category-wise unions — contract jobs, collective bargaining, — the proposed I.R. Bill, the relevance of the present trade union laws etc. Role of Unions regarding sick industries, social security options for developing countries, constitutional and economic implications of the right to work, flexible work systems, union power, depoliticalisation and deunionisation of labour, the increasing number of non-unionised labour force and the threat to Indian unionism are other pressing issues. All these are vital and relevant to the current and future situations. However, these cannot be adequately analysed unless the evolution of unionism in India as a process is understood.

Industrialisation in India

The origin of unionism in India is yet to be precisely identified. Many authors have attempted this and done a fairly reliable job. These efforts however relate to the actual events without an attempt at evaluating their characteristics and situational logic existing then as a context to obtaining a better perception of their relevance for contemporary times and challenges.

The organized system of industry for production of goods or/and services became the main character of the economic life. It involved a collective performance in which everyone had to contribute to everybody else's functions, to arrive at an on-going collective result of the organization. In this context, two paradoxical yet highly reconcilable factors emerge. One is the natural partisan interest claims of the constituent groups such as ownership, management, labour and workmen within the organization, and the outside interest groups such as the

Government, the suppliers of goods and services to the organization, the clients and customers of the organization and finally the societal setting under which the industrial system exists and seeks to thrive.

While each of these constituent groups are highly partisan, seeking to maximise their self interest, they are all willing to collaborate for running the industrial system, and in the process convert their maximisation of interest claims to feasibilities within the constraints of joint working.

While each of these constituent groups are highly partisan, they are willing to collaborate for running the industrial system, and in the process convert their maximisation of interest claims to feasibilities.

Thus the system is fundamentally an integrated and collaborating one, but functionally and responsibility assumption-wise a conflicting system. The latter needs to be constantly monitored to optimise the effectiveness of the total "team" of the industrial system.

Indian Unions: Origin

The origin of Industrialisation of India came about under the auspices of the state sector in 1850s when the British Indian Government set up the Arsenals and Ammunition factories in such places as Kirkee (near Pune), Aravankadu in Nilgiris, Ishapur, Nagpur and so on. These factories were structured on the basis of civil service methodologies in relation to handling all the human resources. The British Indian Government had certain clear cut priorities relating to role responsibilities to be allocated in the factory system. The highly strategic skills and trades of any industrial system were reserved for Britishers, Anglo-Indians and Indian Christians in that order, the first group predominating. The British realised that trade and artisan groups in industry, and engineers had intrinsic strategic and bargaining power, and they reserved these role positions to "reliable citizens" as outlined above, and they did encourage organization of these interest groups, and did bargaining with them on collective matters.

They opened up employment opportunities for Indians in two types of functions — white collar trades and professions and manual labour — both areas having

abundance of manpower. The British, though running the industry on the lines of civil service, did have a highly enlightened approach to both the individual and collective problems of the employees. They practised what might be called "accountable unilateralism" under which their actions and decisions within the industrial organisation could be appealed against, contested, demanding review, rectification, compensation etc. In collective matters, there was a system of collective representation permitted provided the collective representative organization accepted certain behavioural norms, which, while including the right to complain, protest etc. however, did not permit adversary and destructive behaviour. In return for the acceptance of such a behavioural norm, the association was recognized and on collective matters affecting the employees, discussions with the association or through systems like the "Whitley Councils" interests of the employees were constantly monitored and catered to.

The British, practised "accountable unilateralism" under which their actions and decisions within the industrial organisation could be appealed against, contested, demanding review, rectification, compensation etc.

The British also realised that unless appropriate systems are designed and initiated, even the best of intentions could go awry. Whenever an employee association was recognized (Employees included ALL including ICS officers who were also allowed to have associations for common interest matters) the British administration realized that playing the role of an employee on contract of employment could clash with an employee assuming the role of an office-bearer of the association. The British, under the Civil Service Conduct Rules insisted that the office-bearer of the association should do that work full time, but his salary and emoluments were to be borne by the association. The association was provided with reasonable accommodation, communication and other facilities, all of which were charged for. This was done on the principle of "Deputation Leave" to the office bearer of the association, who did full time association work and was paid the same salary, allowances etc. by the association but was notionally credited with service increments, promotion, if any etc. and the lion on his job. On his ceasing to be an office-bearer of the Association, he rejoined his regular employment and resumed his earlier

as well as the notionally credited benefits. This system provided a non-parasitic form of organizational behaviour. Unions even today in such departmentally-run industries like the Railways, Posts & Telegraphs, Civil Aviation, Civil sections of Defence operate on the above basis which had stabilised union behaviour while providing them the required facilities for doing legitimate association work. By this system the British Indian Government ensured that there would be no conflict of interest between the role of employee under his obligations of contract of employment on the one hand, and his role as an elected representative of the collective employee association. In the post-independent situation in India, the industries never learnt from this highly commendable British Indian practice.

Growth of Unions

In tracing out the historical aspects of unions, there must be perceptual clarity between employees as a group and their unions. Employees do not automatically mean union or association, nor does a union or association automatically mean employees.

There must be perceptual clarity between employees as a group and their unions. Employees do not automatically mean union nor does a union automatically mean employees.

In the 1880s even though there were no unions at all, collective employee protest in the form of a strike took place in the textile industry, when the millowners, due to claimed recession in business, decided to cut the wages of textile workers from 2 annas per day to $1\frac{1}{2}$ annas a day.

This reduction in pay was strongly resented and there was a spontaneous strike. The millowners called the worker representatives for a discussion within a few days. The discussions resulted in not only the cancellation of the wage cut, but also a concession of 25 minutes break period in work to enable workers to eat their food. The workers did not need any union. The next milestone in the emergence of some loose organisation on behalf of "labour" was the Bombay Millhands Association by Mr. Lokhande, a Social Reformer who formed this association as a legal personality in order to appear before the Royal Commission on Labour. The Royal Commission on labour was set up not because of any endeavour by

Indian labour, but on a complaint by the British Millowners in England against their colleagues in India. The British *Indian* Mill-owners were accused of dumping cheaply made Indian cloth in the British market on the basis of low wages paid to Indian Textile workers. The British Mill-owners pressurised the U.K. Government to improve the conditions of Indian labour — even as our Indian Industrialists today demand a "level playing field in competition" over foreign competition. The British Government sent the Royal Commission on labour to India to have hearings, and Mr. Lokhande appeared before them and made a convincing plea for improving the wages and working conditions of textile workers in particular and Indian labour in general. His pleas were successful. After this the Bombay Millhands Association evaporated.

The next milestone was the Madras Labour Union formed in 1917 by another religious and social Reformer Mr. B.P.Wadia, who had an omnibus geographical union of all workers of Madras city. He sponsored a strike of the workers of Buckingham & Carnatic Mills. The British Government applied the British legislative enactment repealed in England but applied in India for banning this strike. viz Act to Prevent Conspiracy Against Freedom of Trade". The Company also threatened to sue Mr. Wadia for economic damages arising out of the strike. Confronted with the pressures of criminal prosecution and civil damages claim, Mr. B.P. Wadia called off the strike and went back to his Theosophical Society Work.

Genesis of Labour Movement

An important milestone in the labour movement was the setting up of the International Labour Organization at the end of World War I as a part of the League of Nations. The enlightened employers of the European Continent and England had been campaigning from 1905 onwards for arriving at International Industrial Labour standards to ensure that the industry did not dehumanise society. These resulted in the ILO which was structured as a Tripartite body comprising membership of countries through their effective Governments. The methodology of the ILO was to generate acceptance of various industrial and labour standards through persuasion and convert such accepted standards into conventions which were required to be made laws by member countries. When the first inaugural conference of ILO was held at Washington in 1919, British India which had become a founding member of ILO, sent a British Civil Servant as Government delegate for British India, another British Civil servant as labour delegate from India and requested

the British Employers' Association to act on behalf of Indian Employers.

Enlightened employers of the European Continent and England had been campaigning for arriving at International Industrial Labour standards to ensure that the industry did not dehumanise society. These resulted in the ILO.

This sending of a British Civil Servant to ILO as representing Indian labour evoked critical comments from among the intelligentsia in India. The British Government which was more responsive to public opinion than the Government of Independent India seems to be, explained that in the absence of an All India Labour Organization and Employer organization, they were compelled to do what they did. They assured that if an All India Labour Organization and employer organization were formed they would be happy to have them represent their respective constituencies. This generated an attempt by Indian intelligentsia comprising social reformers, nationalists, democratic socialists and Marxists of the period to come together and form an organization called the All Indian Trade Union Congress in April 1920. Mr. N.M. Joshi, a veteran social reformer of the Servants of India Society became the General Secretary and he became the authorized representative of Indian labour right from the beginning until 1949. The convention of ILO on Rights of Association, accepted by the member Governments provided the scope for enacting the Trade Unions Act 1926 providing legal personality to the Trade Unions of employees and employers.

Among the very first unions registered was the union of employees of the Currency Office of India, which subsequently became the Reserve Bank of India. The workers, predominantly peons, chose for their leadership such mill magnates as Lala Sri Ram, Sri Harikrishna Vallabhdas of Kanpur and made these millowning employers, play advocate's role for workers before the British authorities of the Currency Offices. The mill-owners played the role effectively and dynamically.

Simultaneous to these was the development of employee organizations in Ahmedabad and Rajkot under the auspices of Gandhiji, whose projection of the working class was in terms of their total life and not just the industrial side of it. Gandhiji did not understand the industrial system and its radical ramifications. His was a

highly paternalistic and "looking after" approach, but with ethical and moral emphasis. The social democrats, the social reformers, and the marxists also viewed the workers as dependent children to be emancipated by evangelist father figures as represented by them. The Marxists believed in violence, "sharpening of the class struggle for revolution" and the intelligentsia would be the "vanguard of the working class".

Faulty Features: Factors for Failure

Automatically assuming an adversarial role for labour in the industrial — organizational system based on class conflict has been accepted as the only option in the Indian situation with the only difference being the use of violence or non-violence.

Another important background for organizational structuring for economic wealth generating organisations has been the civil service as an organizational model for industrial organizations. The whole society was new to industrial organizational awareness having been used to simple, slow tempo, small stakes and individual oriented agrarian or craft activities. When industrialisation and organizational enterprises came about, the only model of organization available was the Civil Service.

While the Industrial/Enterprise organizational system has to be a wealth generating system through performance, the civil service, being primarily engaged in maintenance of law and order, collection of revenues, rendering criminal and civil justice, and defence, cannot be a model for industrial organizations. The business of civil service requires control-oriented systems while wealth generating systems require both control and optimisation of performance and close collaboration and integrated functioning.

Civil Service, cannot be a model for industrial organizations. The business of civil service requires control-oriented systems while wealth generating systems require both control and optimisation of performance.

Industrial organizations were thus structured on Civil Service methodology of status based hierarchies instead of responsibility holding hierarchies the former producing fragmentation instead of integration.

Unions in India never had a reference point for their business activities. They heavily relied on the intelligencia which spawned them. The main reason was the predominance of the English language as a vehicle of communication in vital matters of industrial/organizational functioning and the litigatory processing systems for management-employee problems. This necessitated a heavy reliance by even highly sophisticated workers on external leadership having knowledge of litigation, which in turn, was more concerned with the retention and control of the constituency than on building a powerful, self-reliant business unionism.

There are two ways to generate an organization, one is "uniting for" such as we do in founding a cooperative Housing Society, an industry or a company. The other is "uniting against" a genuine, partially genuine or a non-existing hostility target. During the movement for independence, it was very easy to unite against the hostility target of British Rule, which could be a focus to unite against. After the British left, we have had to find other targets inside and outside to remain united against.

Most of the unions emerged only on the basis of uniting against the management of the organization. In this game of uniting against, competitive adversariness produced increasing crescendo of aggressive postures as the basic characteristic of unionism. This produced a severe dilemma for unions. Having aggressively promoted adversariness, the unions have been finding it very difficult to transact, because any transaction means compromise.

Most of the unions emerged only on the basis of uniting against the management. Having aggressively promoted adversariness, the unions have been finding it very difficult to transact.

These factors have prevented the unions from taking any positive decision concerning the issues they raise. For instance, Indian unions only know how to call a strike, but not when and how to call it off. The managements are no better. Unions can put demands, send a charter, but will not be able to decide at what point they could and would settle. This does not mean settlements do not take place. They take place through an elaborate process or a charade.

There is another structural reason why unions cannot function as business-like organizations. In the name of

democracy unions design a horizontal hierarchy in which only representational activity can take place. Union office bearers are required to be only "representatives" not mandated to be decision-makers, having an executive decision-making authority. Unions are unable to develop competent union managers. The treatment meted out to elected union representatives by the rank and file of workers is that of a "dependent child" to a "father figure" totally declining to accept any adult responsibilities, but all the time demanding that the "father" must fulfil without fail the ever growing appetite of the child. This is not the fault of the rank and file of workers, but an inevitable process of encouraging constantly a vested interest in the benefits of permanent backwardness; workmen decline to grow up at all as adults, self-reliant to a reasonable degree. Dr. Ambedkar made these observations in an interview with this writer in 1950. His method of dealing with backwardness was to put such people in a cosmopolitan setting like industry where people will have to compulsively and quickly grow up into adults as Industry was a continuously interacting system purely based on occupational logic and making socio-cultural factors irrelevant. This effort by Dr. Ambedkar resulted in a silent revolution under which a large percentage of Industrial work force in Bombay and other places in Maharashtra had become declassified and decastecised in the cosmopolitanism of Industrial occupations. They are part of the urban society without any problems.

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Conclusion

All the above factors reveal that we do not have a "Trade Union Movement" but only a generalised "labour movement". What a performing society needs is not just a 'movement' but well-established organizations with self-reliance and strength financial, manpower and long-term business goals. All these are absent in the labour movement in India which is very weak and has to rely on the umbrellas of bail-out by political parties or the Government. The only consolation the labour movement can have is the fact that managements are even weaker than the unions, which at least have the asset of solidarity and

dynamism, both qualities which a collective performance system called industrial organization needs. Unfortunately both these qualities are absent in most managements, and by and large the unions are able to thrive not through their excellence, but the weakness and confusion in the managements of organizational systems.

What a performing society needs is not just a 'movement' but well-established organizations with self-reliance and financial strength, manpower and long-term business goals.

Given this scenario, unchanged and perhaps deteriorating in the past two decades, beyond pious platitudes and self-righteous postures, unions are unable to make any contribution to meet the challenges of change, arising out of liberalisation and globalisation of the economy. They are not able to contribute anything to the time span action-oriented decision-making process as they have not done any positive business activity. Their capacities unfortunately are restricted to organizing negative, adversary activities such as frequent strikes, bandhs, but not in positive business such as taking over and running industrial canteens, transport services, schools etc. They are unable to take responsibilities for anything including the smallest things. They are unable to integrate due to rivalries which fragment them, and they make everyone in the society pay even while accus-

ing everyone but themselves of "Divide and Rule" techniques. In short, the only thing unions could do creatively in India is to respond positively if managements and the government were to take the initiative and tangibly offer unilaterally about 75 percent of the intended affordable benefits, providing the unions extraction satisfaction over the remaining 25 percent. Wherever Unions have been pragmatic and understood the economic imperatives of the working industry, they have quickly worked out very good economic packages of severance, tighter manning etc., which provided a very good cushion when out of job and options for independent occupations. Where unions did not know these trends, they have only contributed to the death of the industrial organization concerned and their own suffering and demise. Intelligent managements which could play a catalytical role in helping unions achieve adulthood, are few and far between, but where they existed there has developed very good results benefitting all concerned.

To conclude, the problem of unions is how to cast off a dependent child status always seeking a "father figure" and become responsibility assuming adults, learning the principle of mutuality and reciprocity. The liberalisation and globalisation processes are compelling everyone to expedite this change which once gone through, will ensure stable relationship and development.

Once the above mentioned processes are understood, innovative methods can be initiated to make the unions stronger and develop as one of the main pillars of democracy instead of the present role of being a "shouting brigade" and "strike committees." □

The bigger the world economy, the more powerful its smallest players. That is the *global paradox*.

— John Naisbitt

Participation & Union-Management Relations

Anil K. Sen Gupta

In the last four decades, India has experimented with various forms of participation none of which however has taken roots. Participation has become a necessity for the survival and growth of organisations in India in the context of the liberalisation and globalisation of her economy. The paper argues that if participation has to succeed the management must strongly support it and ensure employee and union support.

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Indian economy has been witnessing major structural changes since the late 1970's. This process has intensified since 1990 when the programme of economic liberalization was officially launched. One result of these changes is that competition in the market place has increased manifold and the survival and growth of Indian enterprises now depend on their ability to compete not only in the domestic market but in the international market as well. Whether or not they succeed in this endeavour will depend on whether they are able to produce high quality goods and services, offer competitive prices through substantial increase in productivity or reduction in costs and respond quickly to changes in market demands by breakthroughs in research and development. All this in turn demand that among other things, workers must be committed and involved in their jobs. Participation as a means to developing this commitment gains significance in this context. In fact participation has received renewed emphasis in management literature in recent years precisely for this reason (see for example Guest, 1987).

Participation as a means to developing commitment gains significance.

Participation is, however, not new to India.

Participative Management: First Phase

Workers' participation came to India after the Independence largely at government initiative. It proceeded in two distinct phases: the first phase came in the wake of the country's development strategy in the 1950's while the second phase followed when this strategy failed in the late 60's (much of the data used in this section has been taken from Khanna, Ghosh & Sengupta, 1981).

India's development strategy was designed to foster capitalist development under the leadership of the State.

Its success demanded among other things, peace and also high productivity in industry. Workers' participation was conceived as an integral part of this development strategy. Thus the planners declared: labour should be a "partner in the common task of development" and "participate with enthusiasm" (Planning Commission, 1955, p. 49). Accordingly, joint consultation was recommended at the enterprise level whose objectives were elaborated as follows: "Such a measure would help in promoting increased productivity for the general benefit of the enterprise, the employees and the community, giving employees a better understanding of their role in the working of industry and of processes of production and satisfying the workers' urge for self-expression, thus leading to industrial peace, better relations and increased cooperation" (Planning Commission, 1955, p. 577). However, the planners at the same time stressed the need for strengthening trade unions and collective bargaining and clearly delineated the areas for collective bargaining: "matters or disputes in connection with wages, allowances and other terms and conditions of service or matters which are appropriate for mutual discussions" should be left to collective bargaining (Planning Commission, 1955, p. 576). In order to strengthen trade unions, the planners also stressed the need for one union for one industry and statutory recognition of the bargaining agent. Besides it was felt desirable to curtail the number of non-workers in the union executive just as it was necessary to protect union leaders from victimization. The state also introduced the scheme for workers' education to facilitate the growth of internal leadership and development of responsible trade unionism.

India's development strategy was designed to foster capitalist development under the leadership of the State. Its success demanded peace and high productivity in industry.

In pursuance of the above mentioned objectives, Joint Management Councils (JMC) were launched in 1958 on a voluntary basis which were to be introduced in relatively large organizations (500 workers or more) having well-established strong trade unions and where employers, workers and trade unions would be willing to try out the experiment in a spirit of willing cooperation. The JMC provided for information-sharing in certain matters (general economic condition of the firm, state of market etc.) and joint consultation in some other matters

(introduction of new technology, rationalization, closure etc.) besides entrusting responsibility to the Council for administration of welfare measures, operation of vocational training, etc. Still earlier in 1947, constitution of works committee (WC) was made mandatory for organizations employing 100 workers or more through the Industrial Disputes Act.

Factors for Failure

Both these schemes however failed. Of the factors which contributed to their failure, management opposition was the most critical one. It is well-known that power is highly centralized in industry which in fact sets the style for the management in an organization. In fact managements in both the private and the public sectors in general had been reluctant to either share information about their organizations with the workers or to consult workers on any important issue. This opposition to participation was strengthened by two important factors. One of these is that the industry operated (particularly upto the mid-70's) in a highly regulated environment. Consequently there was very little or no pressure to improve its competitiveness in the market. Further, upto the mid 60's industries grew at a high rate. The rate of industrial growth was 6%, 7 $\frac{1}{4}$ % and 8% during the First, Second and Third Five Year Plans respectively. The individual organizations also benefitted from this industrial boom. Consequently there was no necessity for the management to examine the effectiveness of its style of functioning or to change it.

The other factor was that the management did not perceive any strong connection between participation and desirable organizational outcomes like higher productivity, better quality etc. The idea of participation came from the top but it was not clear what the planners really meant by participation and in what way participation was expected to contribute to desirable organizational outcomes. In fact participation was proposed primarily as a philosophy and consequently this was seen as an end in itself. The objectives of the two schemes that were promoted during the period i.e. the JMC and (WC) were also vague. It was not clear whether the authors of the JMC deliberately kept the objectives vague or the vagueness resulted from an idealism which did not seriously take into consideration the realities of the Indian situation (Paylee, 1975). This was also true of the works committee. Although this was introduced in 1947, only in 1959 an illustrative list of functions of the committee was worked out by the Indian Labour Conference.

The trade unions too had been apathetic to the cause of participation even though they had formally demanded

participation for a long time. The fact is that like elsewhere, the first priority of the trade unions in India also is collective bargaining and despite the recommendations of the planners, the State did practically nothing to strengthen unions or collective bargaining. In fact, the workers' representatives in these participative committees often tried to convert them into bargaining forums. Lack of enthusiasm of unions towards participation also rose from their apprehension that participation especially in the context of high degree of fragmentation of the union movement and intense inter-union rivalry would further weaken their hold on the workers.

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Second Phase

In the mean time, various factors led to the precipitation of a severe economic crisis in the country in the late sixties. The growth rate of industrial output as a result plummeted from about 8 to 10 per cent in the 1955-65 period to 3 to 4 per cent thereafter. It was actually negative in 1966-67. Planning had to be abandoned altogether for about three years and short term efforts had to be taken to stem the crisis and unrest that were set in motion. But despite mild recovery by the early 70's, the growth rates achieved during 1955-65 were never to be equalled again. It was after this economic crisis in the mid-60's that India's development strategy was given a gradual goodbye. This period was also marked by high degree of labour management conflict which continued till the mid-70's.

Participative management received a second boost during this period with the scheme of a worker-director in early 1970's in nationalized banks and a couple of public sector units and the scheme of shop and joint councils in the manufacturing and service sectors during the National Emergency in 1975-76, Participation was then proposed as an institution of crisis management and as a mechanism of raising production and productivity as well as ensuing worker discipline. The scheme for shop councils and plant councils provided that all decisions of these councils were to be taken on consensus basis. However the scheme did not provide for workers' right to informa-

tion in respect of such crucial matters as financial position of the company, the state of the market and so on in the absence of which more power in decision-making in production, productivity and employee discipline made little sense. Be that as it may, in so far as the Constitution was now committed to establishing a secular, socialist and democratic society, the workers' participation programmes were in consonance with it. But what was not consistent was the growing concentration of economic, social and political power and a general undermining of democratic institutions. As the economic crisis set in, planning and control of economic activities gave way to greater incentives for the private sector and the rural rich.

As was to be expected, both the schemes met with resistance from the managements. The trade unions also did not show any interest especially towards the scheme of the shop and plant councils. In fact the overall political and economic situation of the country was not favourable either for the functioning of participative institutions or for union-management collaboration.

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It was however, during the Emergency, that some public sector organizations and government departments experimented with another participative scheme: the scheme for semi-autonomous work group in order to improve the quality of working life of the workers, at the advice of a proponent of the quality of working life movement. In fact the high degree of labour-management conflict in the country which centered primarily around wages and conditions of employment and also workers' lack of concern for productivity during this period were interpreted as resulting from poor quality of working life (De, 1975).

The work-redesign programme also could not be sustained. Data from BHEL Hardwar where the first experiment on this new scheme took place shows that productivity and efficiency increased in the experimental site following work-redesign along with a few other desirable organizational outcomes. But the interest of the workers in the experiment could not be sustained because they demanded a share in the gains of productivity

which the management rejected (De, 1981). Obviously management did not allocate money for developing worker commitment because they did not perceive this effort as an integral part of the business activity of the firm. incidentally, this shows that while people want to realize their higher order socio-psychological needs in their jobs, their interest in intrinsic need satisfaction cannot be sustained for long unless it can be ensured that their extrinsic needs are simultaneously satisfied.

Major macro-level changes were initiated in the late 1970's leading to increased competition in the market. This in turn put great pressure on management to increase labour productivity and reduce labour costs. The balance of power in industry also shifted in favour of management during this period (Sen Gupta, 1993). Management then increasingly used such techniques as productivity bargaining, farming out jobs to contractors and so on. It is in this context that one more participative scheme i.e. Quality Circle (QC) emerged in India.

QCs came to India in 1982. It was first tried in BHEL, Hyderabad. Report of its success in BHEL, particularly its contribution to productivity etc., made it extremely popular in management circles. In fact more than 200 organizations accepted QCs. Though managements became attracted to QCs for its different benefits (Sen Gupta, 1987), interest in QCs considerably faded with the passage of time. One of the important reasons for this was that the QC remained a peripheral activity in organizations not linked to strategic objectives. Besides it is also recognized now that QC as a 'stand alone' activity cannot be sustained for a long time (Hill, 1991).

Conclusion

Participation failed in the country in the past primarily because of lack of support by management. This in turn happened because participation was seen more as a philosophy and as an end in itself rather than as a means to achieving strategic objectives. Moreover, there was little or no pressure on organizations to improve their competitiveness. The organizations worked in a regulated environment and especially upto the mid-60's they benefitted from the economic boom that the country witnessed. Consequently, there was no compulsion for them to examine the effectiveness of their styles of functioning and to change them. But things have changed drastically especially since 1990. The organizations are now under tremendous pressure to improve their effectiveness. And this demands that the workers be involved in their jobs. If participation has to succeed in the new context then it will have to be integrated into the

strategic objectives of organizations. It will then receive strong management support which is a precondition for the success of participation. The Japanese have successfully solved this issue by integrating participation with quality through Total Quality Management (TQM). In the Japanese quality improvement activities, 'market-in' is a major focus which means bringing customer needs into every possible part of the organization, thereby increasing uncertainty and pressure for change. They also provide a lot of business information on performance and environment to employees including those at lowest levels along with necessary training so that they can understand the information that is being provided to them. Finally they are also empowered to act on such information. The senior managers support participation as this helps them to achieve better alignment between the organization and the environment. On the other hand, the "emphasis on customer satisfaction tightens perceived connections among quality, job security and employee satisfaction connections among quality, job security and employee satisfaction ... (Employees) can see a connection between their own job security and company goals like customer satisfaction and increased market share. These connections also provide an avenue for union cooperation in quality improvement initiatives (Cole, Bacdayan & White, 1993, pp. 77-78).

Strong management support is a precondition for the success of participation.

Many leading companies in the West have increased their competitiveness by embracing TQM. Several Indian companies are also moving towards this direction. For this movement to be successful, it must be supported by appropriate changes in the human resource management systems of the organizations. Among other things, this will require cultivation of collaborative relationships with trade unions where these do not exist. In fact labour-management relationships should be such that make unions "partners" in the organization's success and regard them as "critical players" in helping the organization achieve its goals... The union also assumes responsibility for quality, thus creating opportunity for more systematic thinking and more creative problem solving. These relationships also help create a climate in which employees participate in many of the important decisions affecting quality. In the absence of union support for employee problem solving and union/employee participator in improvement groups, there is a danger that

employees will not trust the process, and that the union will ultimately reject the activities that are part of the total quality program' (Bowen & Lawler III, 1992).

This in fact demands that trade unions must be internally strong. However for various reasons, the trade unions in India are weak. Steps will, therefore, have to be taken to strengthen them. In this, the State will have to play an important role and bring in necessary changes in the trade union law. The need of the hour is emergence of a new type of industrial relations which center around constructive, cooperative relationships between labour and management rather than ones which are adversarial in nature.

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References

- Bowen, David E. & Lawler III, Edward E. (1992). 'Total Quality-Oriented Human Resources Management' *organisational Dynamics*. Spring.
- Cole, Adhert E., Bacdayan Paul & B. Joseph White, (1993). Quality, Participation and Competitiveness. *California Management Review*, spring.
- De, Nitish R. (1975). 'Contents and Discontents of Work Commitment'. *Lok Udyog.*, Vol. 9. No. 1.
- De, Nitish R (1981). 'Participative Redesign of Work System and Enrichment of the Quality of Work Life'. Venkata Ratnam, C.S. (ed.) *Indian Industrial Relations*. NIPM, Visakaha branch.
- Guest, D (1987). 'Human Resource Management and Industrial Relations'. *Journal of Management Studies*. Vol. 24, No. 5.
- Hill, S (1981). 'Why Quality Circles Failed but Total Quality Management Might Succeed'. *British Journal of Industrial Relations*, Vol. 29, No. 4.
- Khanna, Sushil, Ghosh Saila K.L. and Anil K. Sengupta (1981). *Workers' Participation and Development, The Indian Experience*. ISS. The Hague.
- Paylee M.V., (1975). *Worker Participation in Management, Myth and Reality*, N.V. Publications, Delhi.
- Planning Commission, (1955). *Second Five Year Plan*.
- Sen Gupta, Anil K. (1987). 'Made in Japan: Quality Circle Comes to India Some observations'. *Decision*. Vol. 14. No. 2. pp. 53-66.
- Sen Gupta, Anil K. (1993). *Trends in Industrial Conflict in India (1961-87)*. Friedrich Ebert stiftung, New Delhi. □

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John Young, CEO,
Hewlett-Packard Company

Labour & Industrial Democracy

Albert A. Blum

Industrial democracy has been the goal of labour movements the world over, though the elements of the former have been shrouded in the lack of clarity. The article elaborates on the tenets of industrial democracy with particular reference to American unions and concludes with a few lessons for the third world.

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Oscar Wilde wrote that there are only two tragedies: 'One is not getting what one wants, and the other is getting it.' The labour movements in many countries are and were the victims of both tragedies. For years, until the Second World War, they suffered through the first tragedy as they sought to secure a protected place in society. What they wanted was to be the workers' voice, in industry and in politics, in order to achieve what they believed was a better life for their members. They succeeded in many places as much as most groups can hope to achieve. As a result, the second tragedy took place. The labour movement got what it wanted. And what followed? The labour movements are now losing members; their influence is declining; their future is unclear. An alternative which Wilde forgot to mention is what happens when one gets what one wants and then begins to lose it, a form of classical tragedy. That is what is being acted out by unions around the world (Blum, 1968).

Union Power: Gain & Loss

Unions, as the protagonists, are now struggling with superior external forces and with themselves to protect what they have, and are being defeated. The weakening of unions as one of the 'countervailing powers' in society may result in a tragic loss for all of us. There are many reasons for this loss of union power. One is that the movement is the victim of its own past. In the beginning, its power grew in many countries as local unions bargained with local companies over local market issues. Then, as the market became regional and eventually national, local unions joined into national unions and negotiated with managers concerning national market issues. But in recent years, the national markets have increasingly become international and the managers have their bases anywhere and the companies they control are everywhere. But American unions still continue in the nationalist ways they remember. They do not try to practice trans-national bargaining since they are trans-

fixed by national boundaries while managers, who are not, are able to follow the dollar anywhere. So unions have become weaker as they wonder, 'Where Oh Where Have the Bosses Gone?' Unfortunately, they think they still reside in some nearby city. (Blum, 1991).

When they do find the bosses, they discover that many of them are pursuing goals that are making unions appear redundant (Blum, 1987). Many companies are installing technological changes which reduce the need for workers in manufacturing where unions once were strong and are altering the nature of work among service and 'white collar' workers where unions have been weak. In addition, unions still believe they are the only fighters for worker rights and that the only way to secure those rights is the way they have followed all along — namely collective bargaining. Many of them have not recognized that the worker definition of rights may be broader and different from the way in which unions have perceived them.

Unions still believe they are the only fighters for worker rights. Many of them have not recognized that the worker definition of rights may be broader and different.

Industrial Democracy: Origin

The fight for industrial democracy began in Europe in the wake of the union struggle there for political democracy — something already a part of the workers' heritage in some countries, like the United States. As unions in Europe secured the political rights an American worker already had, they began to focus their attention on the struggle for industrial democracy. They soon recognized that government-owned companies, such as the postal systems in the western democracies and all industry in the Soviet Union, did not necessarily bring about more worker rights in the operation — nor did worker ownership of companies. Employees could be exploited whoever be the owner. Privatization does not necessarily result in harsher treatment of workers. Therefore supporters of industrial democracy became increasingly convinced that the issue was not who owned the means of production, but rather, who helped to make decisions concerning its use.

At the same time, managers began to change their 'philosophies of management.' As businesses became

more affluent in the post World War II period and as those who ran firms tended no longer to be owners of the companies they ran but professional managers trained in engineering, business or the liberal arts, these professional executives began to look at the workplace differently from their predecessors. These new executives began to learn at the universities they attended, the executive development courses they pursued, and the magazines and books they read, that they could satisfy their idealistic needs, their 'peer-group pressures', and their drives for more productivity through increased participation in decision-making — an element in industrial democracy.

Also, some politicians, particularly in Europe, viewed the tenets of industrial democracy as a key to a better, and a more lasting democratic society. In West Germany, for example, it was seen as one method of preventing a resurgence of Nazism. These changing views of unions, managers, and politicians concerning who should be involved in decision making in companies became stronger in recent years in western society. They were aided by selective perception from observers of what they viewed as the positive effects of participative management in the country so many of them now study as a model, Japan.

Features of Industrial Democracy

What does the term 'industrial democracy mean? There is no exact definition we can give. It consists in varying amounts of a number of components, all of which involve employee participation decision in the firm. One component is co-determination, that is, worker representatives on the board of directors. Second, there may be some form of work council present in plants or offices where employees, along with managers, meet regularly to discuss and make recommendations concerning the problems facing a firm. In Europe these two have been the result of legislative action. The third, collective bargaining, whereby workers and managers can negotiate and resolve a host of issues, which become a part of a contract (or constitution) that affect how a company operates, is usually the result of union pressure. Then, there is job or work design and participative management, products of management initiatives, in which the management is concerned with enriching the work of the employee so that he/she will not only be paid adequately and have enough time off work but will also be satisfied and enriched by his/her work. To achieve these goals there is supposed to be more autonomy at work and also more involvement in decision-making by those at the workplace. An employee is no longer to be viewed as just

'a' commodity in the production process; he/she is 'the' commodity, who along with the technical processes, will, it is hoped, raise the productive level of the company and thereby the standard of living of the society.

Clearly all of these components reflect a concern with employee participation in decision-making. It does not necessarily mean, at least not yet, majority rule. Rather, it is concerned much more with communication than with counting. Supporters of industrial democracy however fail, to pay adequate attention to other aspects of industrial democracy essential to its fulfillment. First, they have not sufficiently recognized that a bulwark of industrial democracy however fail to pay adequate attention to other aspects of industrial democracy should involve the protection of the rights of individuals or minorities at the workplace—a fundamental concept in political democracy. Labour legislation, court decisions, grievance procedures, arbitration and labour courts may be available to protect some workers, but not all workers, against unilateral action by managers. There are, moreover, very few protections for workers vis-a-vis unions or for managers vis-a-vis other managers.

Industrial democracy should involve the protection of the rights of individuals or minorities at the workplace.

Second, industrial democracy, to succeed in reflecting meaningfully the involvement of employees in the firms' decisions, requires that employees have the right to participate in society's decision-making. Industrial democracy has to go hand-in-hand with political democracy, otherwise decisions made at the level of the firm become a sham since the more important decisions are made in the political sphere. Consequently, worker participation in management, for example, as it once existed in Yugoslavia, was an example of the illusion of industrial democracy fostered by an authoritarian regime.

Third, a republican society requires that there be interest groups who will, at times, be in conflict. Similarly industrial democracy requires that interest groups, such as managers, manual and non-manual workers, have the right to and do reflect their own interests which at times will be in conflict with the views of other groups. Thus, participative schemes which existed in fascist countries and still exist in some authoritarian and paternalistic societies, where the goal is enforced harmony among

interest groups, are not examples of industrial democracy. They are instead methods of control over the interest groups by a political clique.

Industrial democracy requires that employees have the right to participate in society's decision-making.

Not all of these additional ingredients or all of those described earlier are needed at one time for a society to have industrial democracy. An American judge once said, in describing political democracy, that it involved 'a state of becoming.' This is also true of industrial democracy. One never achieves perfect political or perfect industrial democracy. Rather, the measures are the direction taken and the rate of speed with which a society or a firm is moving toward the goal of industrial democracy.

Benefits: Real or a Mirage?

Another difficulty in analyzing industrial democracy is that, like political democracy, it is a messy system. An authoritarian or bureaucratic firm is a blessing to a student even if it may be a torment for those who work there. Everything appears clear and neat. Each of the elements already described in industrial democracy, however, is neither clear nor neat. For example, co-determination has had its major expression in West Germany and perhaps more research has been done on this subject than anywhere else. West German co-determination has had a lengthy history but what it has accomplished there continues to be unclear. (Are workers on the Boards true representatives of the employees who choose them? Is anyone better off, and in what ways, because of co-determination?) In some other countries, like the United States, membership on a firms' board of directors has been the product of collective bargaining, often when the firm, desperate to secure something from the union, permits the union to have some representation on the Board. (Does this token representation make any difference in terms of democracy, or anything else, to the firm or to the employees since the workers usually do not directly vote for their representatives and the company only grudgingly puts them on the boards?)

Similarly, work councils, among other things, play an important role in providing advice to management and in being a conduit for information to workers. They are usually a product of legislation. But many worker-

management advisory groups have also evolved without legislation for consultation with employees over specific issues — for example, quality circles. In the United States, some consultative committees are a product of collective bargaining and regularly meet to discuss all kinds of issues. I once studied such a committee of a major symphony orchestra where union and management representatives met after a Friday afternoon concert to discuss a host of things including the program for forthcoming concerts. The ubiquitous committees at American universities where the faculty make all kinds of management decisions, has resulted, to some professors' dismay, with a court ruling that faculty members in private universities often cannot make use of the law to bring about collective bargaining since they are viewed as part of the management. In all of them, how much of involvement is an illusion or a fact?

In addition, collective bargaining, which to American and other unions is the key, and to some, the only ingredient to industrial democracy, involves workers in a host of activities (including the negotiating of an agreement) which has them sharing a discussion table with the management. The negotiated contract forms the basic constitutional framework for what takes place during the term of the contract when both sides may meet regularly to deal with evolving problems. But these agreements have not always benefited the industry or the workers. As a result, managers and labour leaders now may be seen marching hand-in-hand to the government to plea, for example, for a tariff, to help an industry harmed, partially, by the past negotiated agreements. (Blum, 1985).

Worker Involvement: Threat or Boon?

Despite the lack of clarity about the elements in industrial democracy, the management and the unions have had to respond to the demand for it. There is, of course, a great variety in these reactions. Management's responses have been confusing because on the one hand, managers talk increasingly about one of the key elements in industrial democracy — namely, participating and sharing in the industrial decision making — and, on the other hand, they declare their opposition to sharing power with workers, particularly if the pressure for that sharing comes from the government or unions.

It is this managerial confusion that prompted me years ago when I had completed a talk on participation in decision-making before a professional association to answer a question raised about the sincerity of all of the speeches being given by top managers concerning the

values of participation. I said then as I would now: 'If I were a union official and read one of those speeches by a company executive about the values of employees participating in decision making, I would xerox a copy of that speech and go into the next collective bargaining session and tell the executive that, as a union official, I agreed that participation in decision-making is a great idea and that I want it for the workers. What would happen is that the executive would turn pale, and hem and haw. He had not been talking about workers when he was talking about participation; he had been talking about managers. I then would ask for a higher wage increase in lieu of the participation and probably get it. (Blum, undated)

This managerial negative reaction to manifestations of industrial democracy for *all* employees often lessens as employers work with the system. Many worker representatives turn out not to be the threat to management rights that many managers had feared but instead usually make decisions, for example on capital expenditures, similar to those made by managers. That this behaviour should surprise managers reflects a cultural lag in their belief that workers represent a class conscious group. The fact is that placed in position of shared power, and given shared information, worker representatives, sometimes to the dismay of their unions and the employees who voted them into power, often act like responsible managers. Some workers in fact have become disillusioned with industrial democracy as they think they seek their chosen representatives make decisions as if they wore grey flannel suits rather than overalls. And they are correct: worker representatives often take off their overalls. They may not, however, put on suits, but they probably at least put on ties. Industrial democracy often results in another change: management may be forced to take off *their* jackets and communicate with their worker-fellow-decision makers. In fact, worker representatives and managers, by communicating and negotiating with each other in industrial democracy, must come to some agreements in order to continue to enjoy the support of their respective backers. This results in a form of class collaboration rather than class conflict, whatever be the public pronouncements.

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Lessons for the Third World

When unions, in the United States, as a major first world country, are unsure about their attitudes to industrial democracy, what is the attitude of unions in third world countries? Some have recognized that political and industrial democracy make up a strange two-sided coin which has no fixed value, but grows in value as it incrementally, though usually slowly, buys workers more power in government both at the workplace and in society. As a result workers would have voice, even if only a whisper, in deciding their future not only at the ballot box but also at the factory. And the fight in third world countries, therefore, has to be not only for the ballot

Political and industrial democracy make up a two-sided coin which grows in value though, slowly, buys workers more power in government both at the workplace and in society.

and guaranteed civil rights for everyone, but also for legislation or negotiations to provide workers with a larger

share of decision-making power over what happens at the place where they work. Without political and industrial democracy, democracy can become a meaningless term, and the resulting coin needed to acquire it will prove to be only fool's gold.

Thus the tragedy unfortunately may not only be, as Wilde said, in unions getting or not getting what they want, but rather in the high drama in which unions and management may play as they struggle to secure the democratic process in industry and society that lets them share in the decision as to what they get or do not get — a drama which all of society should applaud.

References

- Albert A. Blum, "Why Unions Grow," *Labour History* (Winter 1968).
- Albet A. Blum, "Workers of the World Disunited," *Challenge*, November-December 1985.
- Albet A. Blum, "Where have the Bosses Gone?" *Business in the Contemporary World*, Feb. 1991.
- Albet A. Blum, "Union Reactions to Technological Change," *Indian Journal of Industrial Relations*, September 1987.
- Albet A. Blum, *Industrial Democracy and Management*, International Studies of Management and Organization, Vol. XVII, No. 2. □

We need never ending improvement
to establish better economy.

W. Edward Deming

Economic Liberalisation & Industrial Relations Reforms

J.L. Rastogi

Economic liberalisation to be meaningful has to be accompanied by similar reforms in all associated areas. The existing Industrial Relations System in India with weak bilateralism and excessive government paternalism and control is not compatible with the emerging needs. It should be realised that industrial relations reforms are the responsibility of all concerned, viz., the government, the employers and the trade unions.

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One of the significant changes in Indian economy in recent years has been the initiation of liberalisation, since July 1991. It aims at the acceleration of the process of growth by removing bureaucratic controls, encouraging private initiative and entrepreneurship and integrating the country's economy with the world economy through withdrawal of restrictions on foreign investment. The most important aspect of this policy has been reduced Government involvement/intervention in economic activities and greater autonomy to commerce and industry to act according to the needs of the environment.

The opening up of the Indian economy as a result of the new economic policy has created new opportunities/challenges for Indian business/industry. Depending upon their assessment of the emerging environment and their own SWOT analysis, efforts have been made by Indian organisations to evolve and adopt appropriate strategies to retain their share in the domestic markets and increase acceptability of Indian products abroad. Some of them with positive product images owing to their attention to local/domestic flavour and needs, consumer satisfaction, quality and cost, have opted for individual approaches and adopted expansion, diversification, R&D, aggressive advertising and marketing and exploration of new/underdeveloped markets within the country, as means to attain their goals. Others which are exposed more to national and international competition, have gone for collaborative strategies, and entered into strategic alliances with potential multi-nationals to survive in business, through mergers, market segmentation, increase in foreign equity and permission to use internal marketing infrastructure. Again with a view to improving international acceptability of their products, many Indian organisations have acquired or trying to acquire ISO-9000.

However, these market oriented strategies by themselves are not enough to give an edge to Indian products

in a competitive market. To be most effective, these have to be accompanied by such production oriented approaches which would help improve overall performance. Optimisation of human resources, perhaps, deserves the most attention. Besides appropriate HRD components like appreciation of the role of human element in economic resurgence, urgency motivation, people's development and involvement, and personnel information system, optimisation of human resources, in a fast changing environment calls for harmonious industrial relations based on positive values, mutual trust and confidence and autonomy in regulation of relations in the context of inter-dependence between the actors.

A fast changing environment calls for harmonious industrial relations based on positive values, mutual trust and confidence and autonomy in regulation of relations.

Industrial Relations — An Integrating Concept

Industrial relations are the natural concomitant of the growth of the employment sector in the wake of industrialism with distinctive characteristics some of these being:

- Emergence of diverse stake-holders/actors in economic activities each with its own needs to fulfill, interests to protect and aspirations to promote; often needs, interests and aspirations of one conflicting with those of others.
- Dependence for a living on organisations which provide means and avenues for satisfaction of human needs and aspirations; thus making working organisations a success becomes a common concern of diverse stake-holders/actors inspite of their conflicting interests.
- Task being performed in specifically demarcated premises with tools and equipment provided by the organisations according to the prescribed/ predetermined norms under strict work discipline.
- Increasing significance of quality of work life as reflected in the terms/conditions of employment.

However, the number of stake-holders/actors and the very complexion of industrial relations have undergone a change over time. Initially capital and labour had been recognised as the actors directly involved in an industrial relations situation, although later, particularly towards the

closing years of the 19th century, the Government was also accepted as an actor in its capacity as a custodian/guardian of broader social/national interests.

With the increasing size of modern commercial and industrial organisations, particularly in the post-war II period, requiring huge capital investment, financial institutions have emerged as a separate stake-holder/actor in industrial relations along with the owners of capital. Similarly with the separation of ownership and management in modern organisations because of growing complexity of organisational working, managerial employees have come up as a distinct stake-holder/actor in industrial relations along with the working people. The situation has been further complicated with the growth of the public sector requiring the Government to assume the additional role of the employer along with its traditional role of a custodian/guardian of social/national interests.

In recent years the very complexion of business and industry has undergone a change and with it, the role of industrial relations. Business and industry are no longer regarded as ventures of the owners of capital alone. These are recognised as cooperative endeavours of various stake-holders/actors. Commenting on the relative role of capital and labour in modern production activities, Bhagwati, (1983) observes:

"In fact the owners of capital bear only a limited financial risk and otherwise contribute nothing to production, while labour contributes a major share of the product. While the former invest only a part of their money, the latter invest their sweat and toil, in fact their life itself. The workers, therefore, have a special place in a socialist pattern of society. They are not mere vendors of toil, they are not a marketable commodity to be purchased by owners of capital. They are producers of wealth as much as capital — nay very much more. They supply labour without which capital would be impotent and they are at the least, equal partners with capital in the enterprise".

In yester-years industrial relations were mainly concerned with resolution of grievances, disputes and confrontations. However today industrial relations cover much more and aim at integrating the needs and aspirations of the stake-holders to optimise benefits to all.

In yester-years the relationship between the stakeholders/actors was based on conflicting interests, industrial relations were mainly concerned with resolution of grievances, disputes and confrontations. However, today industrial relations cover much more and aim at integrating the needs and aspirations of the stakeholders/actors to optimise benefits to all.

Industrial Relations System in India

Like any other country with growing employment sector, India did develop its own industrial relations system. But being a product of its own environment, it has characteristics of its own:

Inadequate Development of Bilateralism

In spite of more than 100 years of commercialisation and industrialisation, the industrial relations system in our country continues to be in a nascent stage of development. No doubt, it has moved from militant opposition to armed truce stage on the continuum of industrial relations, but it is yet to attain working harmony and has to go a long way to develop into creative relations.

The significance of collective bargaining, the most important institution under bilateralism for regulation of mutual relations and determination of terms and conditions of employment has not yet been adequately recognised. Efforts to promote bilateralism through voluntary codes, viz. Code of Discipline in Industry, Model Grievance Procedure, Voluntary Arbitration, Code of Conduct for Trade Unions and Criteria for Recognition of Trade Unions and Exclusive Rights of the Recognised Unions, under the auspices of the Indian Labour Conference during mid-50s aborted, and their important aspects had, since, been incorporated in the relevant labour laws.

The slow progress of bilateralism in India has been due to the low propensity of the actors to initiate and develop free and voluntary relations. While the employers continue to believe in the commodity concept of labour and are by and large hostile to trade unions, the workers and trade unions lack the necessary competence and motivation to promote and participate in healthy bi-lateral relations.

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The employers' hostility to healthy bilateralism can be attributed to slow professionalisation of management in India. Although the employment of professionals and technically qualified people at various levels of management is fast increasing, because of the traditional organisational climate, they could not make any significant dent in the prevailing management practices, nor could they initiate and adopt modern management concepts including that of free and effective bilateral industrial relations. While workers remain as apathetic to industrial relations as ever, the deficiencies on the trade union front in this connection are still more alarming. Although trade unions are today accepted as an inevitable part of our society, their growth continues to be stunted in terms of membership, leadership, resources, objectives, functions or structure, adversely affecting their propensity to effectively participate in free bilateral industrial relations.

Government Paternalism in Industrial Relations

Government paternalism in industrial relations is the second important dimension of Indian Industrial Relations System. It has arisen out the role of the Government as a custodian/guardian of broader social/national interests, and is based on the following presumptions:

- There is a wide spread disparity of income, status and opportunities in society.
- The lower strata of society, due to inequality of consciousness and strength, are not in a position to take care of their own interests; hence are subject to serve exploitation.
- It is the responsibility of the Government as the custodian of social justice, to protect the interests and promote the welfare of the weaker sections of society by laying down and implementing the minimum norms and standards of benefits and facilities.
- It is also responsibility of the Government, with a view to ensuring justice and fair play, to regulate industrial relations within the broader framework of national philosophy, objectives and priorities.

The paternalistic role of the Government with regard to industrial relations in India initiated during the closing years of the 19th century with the implementation of the Factories Act, 1881, continued during the rest of the British rule, and was ultimately confirmed by the constitution of free India mainly through the Preamble and Parts III and IV, dealing with the Fundamental Rights and Directive Principles of State Policy respectively. It is well reflected in a wide variety of protective and regulatory

labour legislations strengthened, enacted and implemented since independence.

While the protective legislations prescribe the minimum norms and standards of working conditions including health and safety in various sectors of employment, a variety of emoluments and various social security benefits, the regulatory ones promote a legal institutional base of industrial relations, on the one hand, and regulate the conditions of employment, industrial disputes and strikes and lockouts, on the other.

Plus Points

In a country like India, where workers have not yet reached a level of maturity to take care of their own interests and rights, the Government paternalism has played an important role. Some of its positive contributions in this connection have been:

In a country like India, where workers have not yet reached a level of maturity to take care of their own interests and rights, the Government paternalism has played an important role.

- It has not only prevented exploitation of workers by laying down the minimum norms and standards of working and service conditions in different sectors of employment, but also has helped in their improvement by adjusting these to the changing social consciousness and expectations from time to time. Thus the workers in India today are enjoying wages, hours and working and service conditions which they would not have dreamt of in the absence of Government paternalism.
- It has provided workers with a high degree of security of employment unknown in yester-years. While the tenure of civil servants is regulated by Articles 309 - 311 of the Indian Constitution, right to livelihood of the public sector employees is guaranteed by the Fundamental Rights under Articles 14 and 21 of the Constitution. In other sectors, workers are protected against unfair termination of employment under the Industrial Employment (Standing Orders) Act, 1946, and the Industrial Disputes Act, 1947.
- It has helped workers and their families to enjoy adequate security against unforeseen odds

through a system of social insurance, 'which an individual of small means cannot effectively provide for by his own ability or foresight or even in private combination with his fellows'. Thus Indian workers are much better equipped to face the contingencies arising out of loss of employment, sickness, employment injury, maternity and premature death of the bread-winner, and to fall back upon after superannuation.

- It has promoted bilateralism based on dignity of labour and principles of justice and equality by :
 - Requiring the involvement of the workmen, or their trade unions or other representative bodies in determination of conditions of employment as a part of the process for certification and modification of standing orders under the Industrial Employment (Standing Orders) Act, 1946.
 - Encouraging voluntary collective bargaining by providing legal sanctity to agreements arrived at otherwise than in the course of conciliation proceedings under S.2(p) of the Industrial Disputes Act, 1947; increasing weight to conciliation and voluntary arbitration in settlement of industrial disputes; and liberty to the actors to improve upon working and service conditions where the minimum norms and standards have been prescribed.
 - Striving for greater association of workers in management at different levels in the working of commercial and industrial organisations.

Negative Contributions

However, Government paternalism has not been an unmixed blessing for healthy and dynamic industrial relations in the country. It has resulted in a number of serious dysfunctionalities:

- While protecting workers' interests and promoting their welfare, it has failed to encourage a democratic framework of industrial relations. Instead it has promoted a dependency culture. The workers in India have developed a habit of looking towards the Government for securing their rights and privileges. Very often, even when they resort to industrial actions, one of their intentions, probably, is to invite Government intervention to get relief. Thus it has crippled private initiative and efforts in industrial relations and stunted the growth of healthy bilateralism.

- Although the legislative provisions are not necessarily antithetical to growth of collective bargaining, in the absence of the Government's total commitment to promote the concept, Government paternalism could not adequately motivate the actors to go for collective bargaining not only for regulation of their mutual relations and determination of terms and conditions of employment, but also settlement of their disputes. S.2(p) of the Industrial Disputes Act, 1947, provided only limited coverage to agreements arrived at otherwise than in the conciliation proceedings fulfilling the prescribed conditions.
- In the absence of adequate development of collective bargaining, what was intended to be minimum by various labour legislations, has in practice tended to be the maximum. Thus the Government paternalism has deprived Indian workers of the benefits and privileges which they could have obtained through their own initiative and efforts.
- It has also resulted in over-politicisation of industrial relations in the country. An active Government involvement in matters regarding labour and industrial relations necessitates political lobbying and support. Probably this had been one of the important reasons for continuing association of workers' unions with political parties with all associated dysfunctions.

Bureaucratic Control of Industrial Relations

However, the most distressing aspect of Indian industrial relations system has been that the Government paternalism has consciously or unconsciously degenerated into bureaucratic control of industrial relations. It has been considerably facilitated by growth and expansion of the public sector. Some of the dysfunctions resulting from such control are as follows:

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Non-judicious Use of Discretion

Labour legislations in India have provided a high degree of discretion to the Government over a wide variety of issues but it has not always been properly used.

For instance, the discretion enjoyed by the appropriate Government in making reference of industrial disputes under S.10 of the Industrial Disputes Act, 1947, is well known. Unfortunately not only has this discretion been not always judiciously exercised (Ram Avtar Sharma & others vs State of Haryana), but often it has been flouted in clear violation of the basic intentions of the Act.

The situation has been even worse in relation to the employees of the public sector and departmental undertakings. There have been many cases where public sector disputes had not been referred to for settlement, even though the Industrial Disputes Act does not discriminate between private and public sectors. This irregular use of discretion was legalised by adding S.36B to the Industrial Disputes Act. The appropriate Government now has the discretion to exempt, conditionally or unconditionally, any industrial establishment or undertaking from all or any of the provisions of the Act.

Abuse/Misuse of Authority

The actual role of the Government as the employer had not been any different from that of the private employers. In dealing with the public sector and departmental undertakings' employees, it has completely lost sight of its role as a custodian/guardian of justice and fair play and often adopted a rigid bureaucratic/undemocratic attitude like any other employer. The Government had not only backed out from its commitments many a time, but examples can be cited in which it had adopted all kinds of strike breaking techniques including non-payment of wages earned, arrest of union leaders during negotiations, harassment of family members of union activists, and demoralisation of strikers through use/misuse of mass media, which probably would not have been permitted/tolerated if resorted to by private employers.

Stalling of Industrial Relations Reforms

In spite of professing protection/promotion of workers' interests, the Government has failed to live up to the role of custodian/guardian of broader social/national interests in the context of industrial relations. Because of its vested interest as the biggest employer, it has stalled industrial relations reforms and has not been serious in development of institutions which would reduce its authority and discretion:

Trade union movement in India has been a direct victim of the lack of political will on the part of the Government to support and promote strong, independent and responsible unions. Most of the ills of present trade union

in the country can directly be attributed to the deficient provisions of the Trade Unions Act, 1926. As this Act was passed by the British at a point of time when trade unions in India were in the initial stage of formation and fighting for survival, it provided the workers only the right to organise and register themselves as such. However, more than 45 years after independence, trade unions in India are yet to be granted industrial relations rights.

A high degree of discretion to the appropriate Government under the Industrial Disputes Act, 1947, and its non-judicious use have been matters of serious controversy. The National Commission on Labour had recommended as early as 1969, the replacement of the existing industrial relations machinery by a formal arrangement consisting of independent Industrial Relations Commissions and Labour Courts. Till today we are debating on the need for change of the proposed machinery. Besides others, the Government itself has been a powerful opposing force to industrial relations reforms, as any such change in the industrial relations framework would deprive the Government of all its control over and discretion in industrial relations.

More than 45 years after independence, trade unions in India are yet to be granted industrial relations rights.

Thus the existing industrial relations system in India is not only inconsistent with our philosophy, ideals and aspirations, but also incompatible with the environment created by economic liberalisation, hence the need for industrial relations reforms, and sooner, the better.

Industrial Relations Reforms & Role of the Government

Although healthy and harmonious industrial relations are a common concern of the stake-holders/actors, the Government bears a direct responsibility for industrial relations reforms. As a custodian/guardian of social/national interests, while taking care of the interests of the weaker sections of society by prescribing and enforcing the minimum norms/standards of working and service conditions, it is supposed to provide the necessary direction to industrial relations keeping in view the national ideals, objectives and priorities. In a mixed economy with a sizeable public sector, it has also to set an example for others by providing appropriate managerial leadership for optimising results while integrating the interests and

aspirations of different stake-holders/actors, as the employer.

With a view to facilitating the above roles by the Government in our country, what is needed is a long-term, clear-cut/realistic and non-discriminatory industrial relations policy. However, to serve the best interests, it should be compatible with:

- our democratic ideals providing for an active participation of people at all levels with the least Government intervention;
- principles of justice, equality and human dignity;
- accelerated economic growth; and
- present/emerging needs, and interests of the industry, society and the nation.

What is needed is a long-term, clear-cut/realistic and non-discriminatory industrial relations policy.

The role of the Government to prevent exploitation and ensure the minimum norms/standards of working and service conditions cannot be over-emphasised. But in the wider interests of the society efforts should be made to promote a work culture based on mature bilateralism, creating a spirit of mutual dependence, trust and responsibility amongst the stake-holders/actors, on the one hand, and enhancing their commitment to the national ideals, objectives and priorities, on the other. Thus, the necessary statutes, protective or regulatory, may be designed/adapted to ultimately promote and strengthen healthy bilateral relations, while addressing themselves to their immediate purposes.

Efforts should be made to promote a work culture based on mature bilateralism, creating a spirit of mutual dependence, trust and responsibility amongst the stake-holders and enhancing their commitment to the national ideals, objectives and priorities.

Collective Bargaining & Trade Union Reforms

With a view to boost bilateralism, free collective bargaining should be recognised as an important instrument

of industrial relations in India, and suitable steps should be taken to promote and popularise it. For the sake of uniformity the Government may prescribe the basic framework and the rules of the game, leaving the details to be worked out by the stake-holders/actors. However, in order to prove the Government's commitment to the concept, it may be initiated/introduced in every public sector undertaking employing a specified number of persons or in which the capital invested exceeds a specified amount, at an early date.

Drastic trade union reforms are needed to make collective bargaining and industrial relations reforms a success in our country. In this connection some of the recommendations of the National Commission on labour, 1969, would be very useful. For instance, compulsory registration of trade unions would remove many of the unscrupulous unions from the scene. Similarly increasing the minimum number of members for union registration, further restrictions on outsiders on union executives, encouragement and development of worker-leaders, and limitation on simultaneous holding of political offices, as recommended by the National Commission, would help strengthen trade unions in the country.

But the issue of union recognition for the purposes of collective bargaining and other associated functions presents the most formidable problem. Any solution to be acceptable has to be pragmatic, particularly in a multi-union situation like ours. For collective bargaining to be meaningful, recognition should be accorded only to the majority unions because it is only these which can honour their commitments. However, where majority unions do not exist, the unions may be encouraged to constitute joint negotiating panels with majority support, and the necessary recognition may be granted to them.

In order to make industrial relations function more meaningful, besides the right to represent their own constituencies in negotiating, the recognised unions or the constituents of the recognised panels may also be granted certain exclusive industrial relations rights including the right to information excepting that which is either confidential or would prejudice the interests of the organisation; the right to time off to certain proportion of office bearers for legitimate industrial relations activities, and to certain percentage of union members for industrial relations training; and the right to routine facilities at the work place, e.g., placing notice boards within the premises, holding union meetings after working hours, inspecting places where members are employed, check-off of union dues, etc.

Industrial Relations Authority

As regards other reforms in the context of industrial relations, fortunately India need not start on a clean slate. The existing industrial relations structure can well be adapted to give effect to desirable imperatives. However, instead of ad hoc amendments to legislations which prove to be dysfunctional in the long run, it calls for an integrated law strengthening the positive features of the existing framework, removing its weak spots, on the one hand, and taking care of the emerging/anticipated needs of the environment, on the other.

It calls for an integrated law strengthening the positive features of the existing framework, removing its weak spots, on the one hand, and taking care of the emerging/anticipated needs of the environment, on the other.

In order to restore its credibility, administration of industrial relations function may be entrusted to an Industrial Relations Authority (IRA), independent of Government control and intervention and easily accessible to the stake-holders/actors, both at the Centre and the States. Each IRA may have two segments: Advisory/Administration; and Conflict Management. The Advisory/Administration segment may be entrusted with the following functions:

- Advising the stake-holders/actors on all aspects of bilateralism and collective bargaining including negotiating the procedure, contents and format of an agreement, and enforcement of collective agreements
- Helping the stake-holders/actors in resolving jurisdictional and recognition disputes
- Registering collective agreements negotiated and finalised between the employers and the recognised unions/joint negotiating panels.

The Conflict Management segment of the IRA may, on the other hand, be concerned with the settlement of industrial disputes. It may have two wings: Conciliation and Adjudication. In the first wing, each IRA may appoint one or more conciliation officers with specified jurisdiction to promote the settlement of industrial disputes, or constitute Boards of Conciliation to facilitate the settlement of specific disputes which are likely to have wider repercussions on production or the industrial

relations climate. As the existing conciliation machinery had been working fairly satisfactorily, the relevant provisions of the Industrial Disputes Act may be retained with suitable modifications.

The Adjudication wing of the IRA may act as a separate labour judiciary and consist of Labour Court(s) and an Industrial Relations Commission. The composition of these adjudicatory authorities as recommended by the National Commission on Labour may be adopted. However, the power for establishing Labour Courts and the Industrial Relations Commission and its branches and appointment of Presiding Officers of the former and President and other members — judicial and technical — of the latter, may be vested in the appropriate IRA rather than the appropriate Government with a view to retaining their independent character.

Thus each IRA may constitute one or more Labour Courts with exclusive jurisdiction to adjudicate upon any industrial dispute relating to any of the specified matters. Similarly it may establish an Industrial Relations Commission and constitute as many of its branches to be located at such places as it thinks fit to adjudicate upon disputes other than those within the jurisdiction of a Labour Court. The Industrial Relations Commission may also be granted the power to entertain appeals against the awards of the Labour Courts within its jurisdiction. Besides, the Central IRA may be authorised to constitute a National Industrial Relations Commission for 'adjudication of any industrial dispute which in its opinion involves any question of national importance; or is of such nature that industrial establishments or undertakings situated in more than one State are likely to be interested in or affected by such dispute'.

In order to make the best use of the above mentioned authorities for settlement of industrial disputes, various procedures may be resorted to in proper sequencing. Thus in the settlement of any industrial dispute, individual or collective, preference should be given to mutual discussion between the employer and the recognised union/negotiating panel. The process of conciliation may be encouraged only on failure of mutual efforts in resolving the dispute. In order to make conciliation more effective, however, it should be made a little more active, and if it fails to bring about a satisfactory settlement of the dispute within the prescribed period, the stake-holders/actors may be persuaded to refer it to arbitration. Adjudication as a process for settlement of industrial disputes may be used only as a last resort, after all possible alternatives have failed; and during emergencies.

The process of conciliation may be encouraged only on failure of mutual efforts in resolving the dispute.

The discretion of the appropriate Government to refer industrial disputes to either Labour Court or the Industrial Relations Commission, subject to their respective jurisdiction, may be retained. But the stake-holders/actors involved in a dispute may also be provided direct access to these authorities, of course, after all other avenues have been used.

No industrial relations reforms would, however, be fruitful unless they provide for and encourage responsible use of industrial actions on the part of the stake-holders/actors. An industrial action on the part of workers may be defined to include all forms of combined action disruptive or obstructive of production, and be permitted only after all possible alternatives for settlement of the dispute have failed and the action has been approved by the negotiating union/panel supported by a majority of not less than three-fourth of the members of the constituency; after giving to the other party, a requisite notice in this regard. Similarly employers may be allowed to go for an industrial action as the last resort and after giving due notice to the workers/union(s).

However, no industrial action on the part of any stake-holder/actor may be permitted during pendency of proceedings before a Conciliation Officer/Board, arbitrator(s), Labour Court, Industrial Relations Commission or the National Industrial Relations Commission and the prescribed period after conclusion of such proceedings; and during any period in which a settlement or award is in operation in respect of any of the matters covered by such settlement or award, as at present.

Employers' Initiative

Although appropriate Government policy and legislative reforms would provide the necessary framework for industrial relations, these alone would not be fruitful until industrial relations practices are adopted to the changing needs of the environment. In this regard the major initiative has to come from the stake-holders/actors directly involved in the process of industrial relations.

It calls for a total change in the managements' attitude towards workers and trade unions. The commodity concept of labour has to yield place to that of human resources, and trade unions recognised, not as a neces-

The commodity concept of labour has to yield place to that of human resources, and trade unions recognised, not as a necessary evil to but as responsible agencies of workers with competence to guide the members' energies into constructive/productive channels.

sary evil to be accommodated for industrial peace, but as responsible agencies of workers with competence to guide the members' energies into constructive/productive channels. The employers must appreciate that:

"The working masses in India are as rational in their approach as people elsewhere, and it has been well established that they are second to none in intelligence and hard work. Given the proper environment, resources and trust, they are sure to react in a positive manner. Even trade unions would not necessarily be antithetical to the broader interests of the business/industry and the nation. They fully understand that the welfare and aspirations of their members are closely linked with the economic interests of the nation. They would rather welcome and even ask for economic reforms if they are convinced that the strategies adopted are essential to meet the environmental pressures and would help the working masses in the long run than exploit them through manipulative techniques'. (Rastogi, 1994)

Unfortunately because of their manipulative/exploitative behaviour in the past, any action/decision on the part of the employers likely to affect workers' performance or their working and service conditions, is suspect. In order to get the maximum cooperation from the workers and trade unions, therefore, their credibility has to be regained through words and deeds. Under the prevailing circumstances the response of workers and trade unions to employers' strategies adopted to deal with the challenges/opportunities created by the new economic policy, would depend on how they attend to some of the issues arising out of these.

If the challenges/pressures of the environment are anticipated, and actions planned proactively in consultation with the relevant trade unions in a transparent manner, taking adequate care of the interests of the people involved while protecting and promoting the overall organisational goals, the workers and trade unions would rise to the occasion and make use of their talents, creativity and ingenuity.

Trade Unions' Responsibility

Trade unions cannot afford to remain complacent toward the challenges/opportunities created by economic liberalisation. It would be in their own interest to read the writing on the wall and adjust their strategies to the needs of the emerging environment. In the wake of growing competition, many organisations are losing ground, and because of fast changes in technology, skills are becoming redundant, eroding the base of trade unions and threatening their very survival. In such a situation confrontational approach is not likely to work. Unions have to extend their full cooperation and support to the employers to deal with the dysfunctions of liberalisation in a constructive/creative manner.

M.O.U.

The employers and concerned trade unions should sign a Memoranda of Understanding assuring that:

- All unfair labour practices both on the part of employers and trade unions/workers would be dispensed with
- Any change in organisation, management or working of the unit would not adversely affect either emoluments, employment or other terms and conditions of service
- Trade unions/workers would not oppose any reforms and would fully cooperate with and involve themselves in the task of organisational resurgence by contributing their best
- An equitable share would be given to all from the benefits of increased productivity.

The new economic policy is likely to be a boon in development of healthy industrial relations in India, if taken in the correct perspective. It would not only create a community of interest amongst the employers and workers/trade unions and motivate them to collaborate to improve performance, in terms of output, quality and cost to ward off doomsday for organisations and the people involved, but also pave the way for better understanding between them by creating lasting harmonious bi-partite relations.

References

- Rastogi, J.L.**, Need for Human Resource Strategies, Financial Express, New Delhi, April 22, 1994.
- National Textiles Workers' Union v. P.R. Ramakrishnan** (1983-1 LLJ 45).
- Ram Avtar Sharma & Others v. State of Haryana & Another** (1985 Lab. I.C. 1001). □

Work Culture & Co-determination: German Steel Industry Experience

P.K. Mohanty

Work culture refers to the norms, values, attitudes, ideologies and involvement of people in the organization. Work culture in an organisation is shaped partly by the culture of the society and partly by its internal management. This paper discusses the role of trade union, employers and the legislation in shaping work culture through co-determination in Krupp-Hoesch Steel company in Germany.

Culture is a characteristics of all organizations, through which their individually and uniqueness is expressed at the same time. The culture of an organization refers to the unique configuration of norms, values, beliefs and ways of behaving that characterise the manner in which groups and individuals combine to get things done. The distinctiveness of a particular organisation is manifested in the folkways, mores, and in the ideology to which members defer, as well as in the strategic choices made by the organization as a whole (Eldridge & Crombie, 1974). Work culture is shaped by the structure, communication, participation, motivation etc. in the organisation. The concept of work culture is interrelated with most other concepts in organizational behaviour. It is also related to economic, organizational and human issues. The share of human issues in work culture is more important than other organizational issues. Culture develops when the underlying values are shared by most organization members. Culture, then, shapes behaviour within the organisation. The main argument of this paper is that work culture in an organization is shaped partly by the culture of the society (its norms, values, and ways of doing things) in which it functions and partly

Work culture is shaped by the structure, communication, participation, motivation etc. in the organisation.

(mostly) by its internal management involving people (decision making, motivation etc. through participation).

Objectives & Methodology

A study was conducted to assess how the work culture in an organization is influenced and improved

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through the process of co-determination and the role of legislation, trade unions and the employer's association in this process. Data for this study was collected from both secondary and primary sources. A questionnaire was administered to the employees of Krupp-Hoesch Steel Company at Dortmund in North Rhine Westphalia state of Germany in June — July, 1994. Besides, discussions were held with the employees and the works council members to elicit some relevant information.

Codetermination

The German industrial relations system is highly regulated by law. Trade unions are formed at sector/industry level on the principle of 'one union in one industry'. The German Federation of Labour (DGB) is the biggest trade union organisation in the country covering more than 80 percent of the employees in different industries. The other notable federations are German white collar Worker's Union (DAG) and the German Christian Trade Union Federation (CGB). At present there are only sixteen trade unions functioning in the country covering all branches of industry. These unions are affiliated to DGB. Collective bargaining takes place at the regional level covering the whole branches of industry between the trade union and the concerned employer's association under the Collective Bargaining Law, 1949. Co-determination in Germany is about five decades old. At present there are four laws on Co-determination in the country: Montan Co-determination Law, 1951, Works Constitution Law, 1952, Works Constitution Law, 1972 and the Co-determination Law, 1976. The Work Constitution Law, 1972 makes provision for Co-determination at the plant level; whereas the other three laws make provisions for co-determination at the company level. The Montan Law is applicable to coal, iron and steel industry employing 1000 or more employees. The Works Constitution Law, 1952 applies to all industries other than iron, coal and steel employing 500 to 2000 employees. The Co-determination Law, 1976 applies to companies other than coal, iron and steel with 2000 to 10,000 employees. The provisions applicable to steel industry only are mentioned in this paper.

Under the Montan Law, the supervisory board in steel industry consists of eleven members, The stockholders elect five board members, and the trade union appoints five members. The ten members of the board then elect a neutral eleventh member to avoid ties. It is customary, though not required by law, that stockholders' representative be elected board chairman and the senior union official vice-chairman. The supervisory board elects the

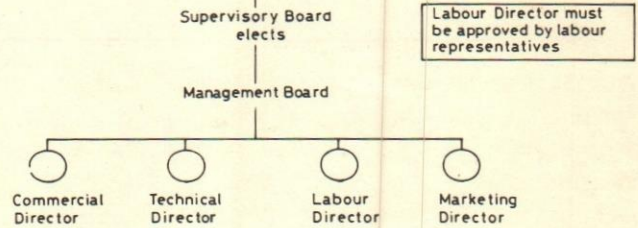
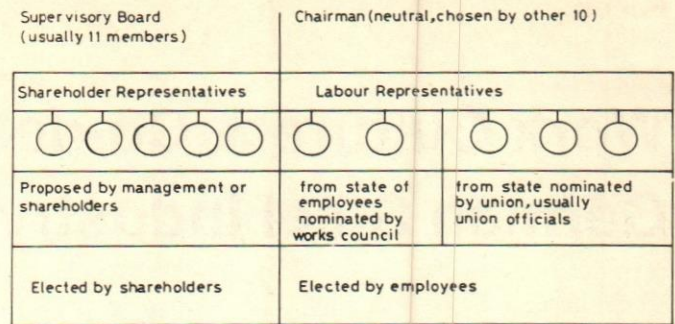


Fig. 1 Co-determination under Montan Law, 1951 in Coal, Iron and Steel Industry

management board which is responsible for the administration of the company. The Labour Director in the management board can not be appointed without the approval of the employee representatives in the supervisory board (Fig. 1). This right is not accorded to employees in companies other than iron, coal and steel.

The Work Constitution Law, 1972 regulates the labour relations at the plant level and applies to all organisations having five permanent employees. The basic institution of the work constitution law is the works council. According to the law, works council is constituted for a term of three years consisting upto thirty members depending on the size of the organisation. Unionised employees as well as independent persons are legible to contest the elections of works council. This law distinguish between rights to co-determination, consultation and co-operation, and right to information, complaint and hearing. As a rule of the thumb, these rights are strongest in social matters and internal work regulations (e.g. working hours); they are mostly of the medium type in personnel matters, such as engagement, regrouping, discharges and transfers. In business issues, the works constitution law mainly gives rights to information, with respect to technical involvement, closing and opening of new plants and financial matters. The 1972 law has also increased the individual employee rights in matters concerning his or her own employment, but these rights are more or less confined to legal claims to information and hearing and the right to complain as

well as to employ the members of the works council in case of conflict at the work place.

Co-determination & Work Culture

The most basic duty of the works council is to 'co-operate with the employer as well as the unions and employers' associations present in the plant for the good of the plant and its workers'. To safeguard the internal harmony of the plant, the law strictly forbids councillors from making use of strikes as a means of settling disputes. Rather, conflicts are to be resolved by means of an arbitration board consisting of an equal number of works councillors and employers' representatives and a neutral chairman acceptable to both sides. In cases of continued disagreement, the decisions of the chairman are binding. Work councillors are further barred from political activity in their official capacity. The union can declare strike only if negotiation fails and a compromise is rejected either by employers' association or the union. To go on strike, the union requires the support 75 per cent of its members. The incidence of strike is very low in Germany. In iron and steel industry the percentage of workers involved in strike was 11.7 during 1950-59, 15.4 during 1960-69, 10.5 during 1970-79 and 3.1 during 1980-89. The percentage of working days lost was 5.4 during 1950-59, 7.9 during 1960-69, 18.2 during 1970-79 and 0.5 during 1980-89 (Jacobi et al, 1992). Due to the very low incidence of strike, production is not affected at all. The existence of unitary trade union means that the possibility of rival trade unions, divided along the lines of political ideologies and engaging in a kind of competition whereby one union seeks to outdo the other(s) is eliminated. Therefore, inter union rivalry is an impossibility.

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Accurate and objective information is the key to successful bargaining; access to financial information accorded to the works councils and supervisory boards allow the workers representatives to make an objective assessment of the employers' arguments. It also contributes to a culture of co-determination which prevents both sides getting bogged down with claims and counter

claims and allows the interests of both sides to be fairly represented without threat to the enterprise concerned. Co-determination concentrates the interests of workers within the plant's decision making forums and it also helps to create a stable power base for bargaining. The unions do not see wage policy in isolation. They know that wage demands which adversely affect the performance of the overall economy will ultimately worsen the position of workers, even if they increase their relative share of wealth in short term. Because German economic efficiency ensures shorter working time, higher wages and better working conditions, German unions do not see the achievement of national economic objectives as an obstacle to their social policy aims (Bechtold, 1992).

The management relies on the works council to share responsibility for awkward personnel problems, using the latter's authority over the workforce when attempting ambitious technological change. Works councils are sometimes asked to take over disagreeable managerial functions e.g. to select workers for transfer and down grading or for dismissal, Works councils neutralise and absorb some of the pressures from the labour force that

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would otherwise have a direct impact on the management. The co-operative problem-solving role of the works council brings the two conflicting groups together by identifying the areas of mutual concern and reducing the level of adversarial behaviour in the work setting. These functions of the works council contribute to a better work culture in the plant. Some managers have even expressed the view that, 'if works councils did not exist, they'd have to be invented (Müller-Jentsch, 1992).

Cultural Ethos & Work Behaviour

An industrial setting is but a part of the society where it is located and cannot but reflect the cultural conditioning of the vast majority of the people of that society. As life can not be totally compartmentalized, what is learnt in childhood, what is observed and accepted as tradition, belief, and way of thinking, persist and extend into the

better education. In order to initiate scientific management, firms needed a workforce being adopted to quick, steady and disciplined work, but it were just these habits which laid the ground for the eight hour movement. Scientific management and eight hours movement thus stood in a dialectical relationship to each other (Deutschmam, 1984).

Employees' Perceptions

The views of the employees in steel works were analysed in the study. Table 1 indicates the views regarding organisation structure and policies. The opinions revealed that the structure of the organisation helps in communicating with the employees regarding their work, supervising and giving feedback and solving personal problems quickly. An atmosphere of acceptance and permissiveness was felt in the organisation which is important for all aspects of group guidance. German firms put much emphasis on the technical abilities of the employees. There are facilities for vocational training for about 400 vocations in the country. The number of production workers in general is more than other employees in the organisations. Because of the

emphasis on technical skills the German workers have high average skills which might be the main reason of developing a sense of attachment to the job (Table 2). Most of the workers feel satisfied with the work they do.

The production manager in Germany has more freedom to move workers around to satisfy immediate manning needs. It is easier in a German factory to cover manpower gaps due to sickness and holiday absenteeism and to deal with changes in short term manning needs deriving from changes in output priorities, re-scheduling of jobs and additional assignments. The freedom enjoyed by German production managers to re-deploy workers is not absolute. A worker who is frequently redeployed may complain to the works council. But in reality the workers rarely complain for such movements are necessary for the interest of the organisation. The managers also pay due attention to the individual workers' readiness and ability to be redeployed. This close relationship with peers and supervisors (table 3) is conducive for higher production. In purchase meetings persons with experience at the shop floor are involved. Foremen attend meetings with managers to discuss investment plans and machinery purchase. It is a standard

Table 1: Views of employees on organization structure and policies (N = 42)

Items	Strong-ly agree	Agree	Un-decided	Disagree	Strong-ly dis-agree	Average score
You know very well your position and task in the organization.	8	7	20	5	2	3.33
The policies and structure of the company are clearly explained to you.	10	21	8	3	—	3.9
You usually get informations from the top very easily.	8	17	14	2	1	3.69
Your work is checked regularly to see if it is done properly and on time.	6	12	18	4	2	3.38
You have the access to the management in case of a personal grievance.	18	14	7	2	1	4.09

Scale: Strongly agree = 5, agree = 4, Undecided = 3, Disagree = 2, Strongly disagree = 1.

Table 2: Views of employees on jobs and conditions of service (N = 42)

Items	Strong-ly agree	Agree	Un-decided	Disagree	Strong-ly dis-agree	Average score
Your job is challenging and provides scope for learning	7	12	14	5	4	3.31
Your job gives you the feeling of doing something worthwhile.	10	17	5	6	4	3.54
You are informed regularly about the quality of your work.	12	16	8	4	2	3.76
Your skills are appropriate for your job.	15	15	4	5	3	3.81
Your pay is according to the type of work you do.	5	6	8	15	8	2.64
The promotion in your job is based on merit.	5	7	17	8	5	2.97
All things considered, you like your job very much.	10	12	13	3	4	3.5

as well as unionists are prepared to learn the German pattern. The success of the German firms cannot be ascribed to the cultural and traditional elements of German pattern but the efficient structuring of management and industrial relations. Unitary trade union assures that interunion rivalry is eliminated and the workers are traditionally conditioned to eschew labour conflicts. Germany generally presents herself as a country with little propensity to strike. The relative absence of strikes mainly contributes to the fact that Germany enjoys a relatively long, stable and rapid economic growth.

The German pattern of work culture can be transferred to India if the socio-cultural aspects of German pattern are given a proper consideration, and managers as well as unionists are prepared to learn the German pattern.

The unified centralisation of collective bargaining in Germany is increasingly supplemented by company centered bargaining and informal agreements between management and works councils at the plant level. The works council plays an important role because it is directly concerned with pertinent issues at the company and shop level. The occupational training at the company level is receiving increasing importance in Germany. Obviously this internal qualification and training can easily support loyalty to a company (Park, 1984).

Under Indian conditions with multiplicity of unions it requires the co-operation of all unions as well as the management to educate workers to improve the work culture. It obviously requires the readiness of all concerned to learn from the German system and to put it in practice. The works committees in India may be revised by assigning them more rights. These committees may deliver the goods in line with the works councils in Germany if the management and the workers as well as the

Under Indian conditions with multiplicity of unions it requires the co-operation of all unions as well as the management to educate workers to improve the work culture.

unions agree to eschew labour conflicts and rely on the committee to regulate labour relations at the plant level. The task may be initially difficult, but not impossible, The co-operation of all unions is necessary in this regard.

Conclusion

Participation (co-determination) in Germany is understood in the broad, legal, institutional and political context. To stimulate productivity, all kinds of formal and informal communication/co-operation at the shop floor level are in practice. The most important legal form of co-determination is the representation of interests through the works council since this level of participation is closest to the day to day work routine. High trust and low conflict situation is possible due to the works council and hence the works council has been successful in creating a better work culture at the plant level.

Acknowledgement

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References

- Bechtold, Hartmut, (1992) 'Participation and Efficiency' Die Mitbestimmung, Special English edition, Hans-Böckler — Foundation, Düsseldorf.
- Deutschmann, Christoph (1984) 'Working Hours in West Germany and Japan' in Bergman, J. & Tokunaga, S. (ed) Economic and Social Aspects of industrial relations, Campus, Frankfurt.
- Elridge, J.E.T. & Crombie, A.D. (1974) A Sociology of Organisations, Allen and Unwin, London.
- Jacobi, Otto, Keller, Berndt. & Müller — Jentsch, Walther (1992) 'Germany: Co-determining the future?' in Fermer, Anthony & Hyman, Richard (ed), Industrial Relations in the New Europe, Blackwell, London.
- Kuppachi, Rama Murthy, (1992) 'Managing by Consultation — Global & Asian Experience', Sage Publications, New Delhi.
- Müller — Jentsch, Walther (1992). 'Conflict Partnership', Die Mitbestimmung, Special English edition, Hans — Böckler — Foundation, Düsseldorf.
- Parker, S.R., Brown, R.K., Child, J & Smith, M.A. (1977). The Sociology of Industry, Allen & Unwin, London.
- Park, Sung — Jo (1984) 'Socio-cultural Vs Socio-economic Determinants in the Industrial Relations Systems of Japan and Germany — Comments on Converging Trends' in Bergman, J. & Tokunga S. (Ed), Economic and Social Aspects of Industrial Relations, Campus, Frankfurt. □

framework. Exploitation of labour and the use of child labour still continue and minimum wages are to be guaranteed through the legal provisions. In a frantic bid to sustain in the business, production at times is restricted at the cost of consumer service to raise the prices or to push the 'seconds'. Quality is often compromised with still cheaper inputs even at the cost of health hazards of the consumers. In such an environment money making seems to be the overriding goal of the organizations, whereas corporate social responsibility appears to be far from reality.

Legitimacy of business derives from societal acceptance of its actions. In a resource constrained economy like ours, even safety provisions have to be incorporated through the legal framework.

Can our large corporate houses afford to fulfill social responsibility in the name of business? When units are becoming sick day by day and are being advised to become cost conscious and generate surplus to sustain themselves, corporate houses may not be expected to operate as social responsibility centres at the cost of profitability and the national exchequer. In fact, 'no new recruits policy' has already become the slogan of many a large organization to improve productivity and competitiveness. With the advent of the liberalized economic policies of the government, when our corporate houses are expected to compete with the international agencies even for the domestic market without any protection, social responsibility as a goal distinct from corporate profitability objective, may perhaps remain just a dream for a developing country like ours.

When our corporate houses are expected to compete with the international agencies even for the domestic market, social responsibility as a goal distinct from corporate profitability may perhaps remain just a dream.

Fulfillment of social responsibility may not be the corporate goal or a criteria for decision making. Organizations can not be expected to undertake extra-economic and extra-legal obligations involving ethical or discretionary issues. However, as the organizations

move towards the path of profitability, they create an impact on the consumers, the national economy, the society and above all on their own employees. The corporate strategies in terms of decisions and actions would have to be in tune with the needs of the changing external scenario. The level of technological advances, the condition of the supply and the labour market, the purchasing power of the masses, the growth of the industrial sector and the political and the socio-cultural environment or in other words, the state of the economy of the country guide the corporate managers in choosing the appropriate socially responsible path to reach the profitability target.

Economic Scenario & Organizational Strategies

When the economy is at its initial stage of development, accompanied by rapid growth in population, the majority of the population is below the poverty line. The prices of the goods and services decide the level of consumer demand. Product quality may not be that much relevant at the existing state of need hierarchy of the consumers. The industry goods faced with increased level of demand to meet the pressing needs of the country's economic growth has less concern for quality with the limited financial resources at its disposal and the technology being at its infancy. Organizations adopt the available labour intensive technologies within the affordable price and continue to use plant facilities to deliver the maximum output till the machines really stop producing. The acute unemployment problem in the country favours the organizations to hire the necessary manpower at minimum level of compensation with an eye on reducing operating cost. Quality is often compromised in a bid to produce more and keep the price within the purchasing power of the consumers while still making adequate profits. Higher level of profits from more production generate the necessary funds for further growth and development in tune with the ever increasing demand. Such phenomena are presented in (Fig. 1).

As the economy gradually develops, with more industrial organizations in the game of business to make money, organizations start competing amongst themselves. Promotional measures are in the fray to retain market share. Any compromise in quality at this stage means the loss of market in favour of the competitors. In a bid to produce more of acceptable quality at still a cheaper price to outstrip the competitors, choice of technology assumes importance. In the era of technological advances all around, plant facilities need to be gradually modernised. Restrictions on imports may not be effective

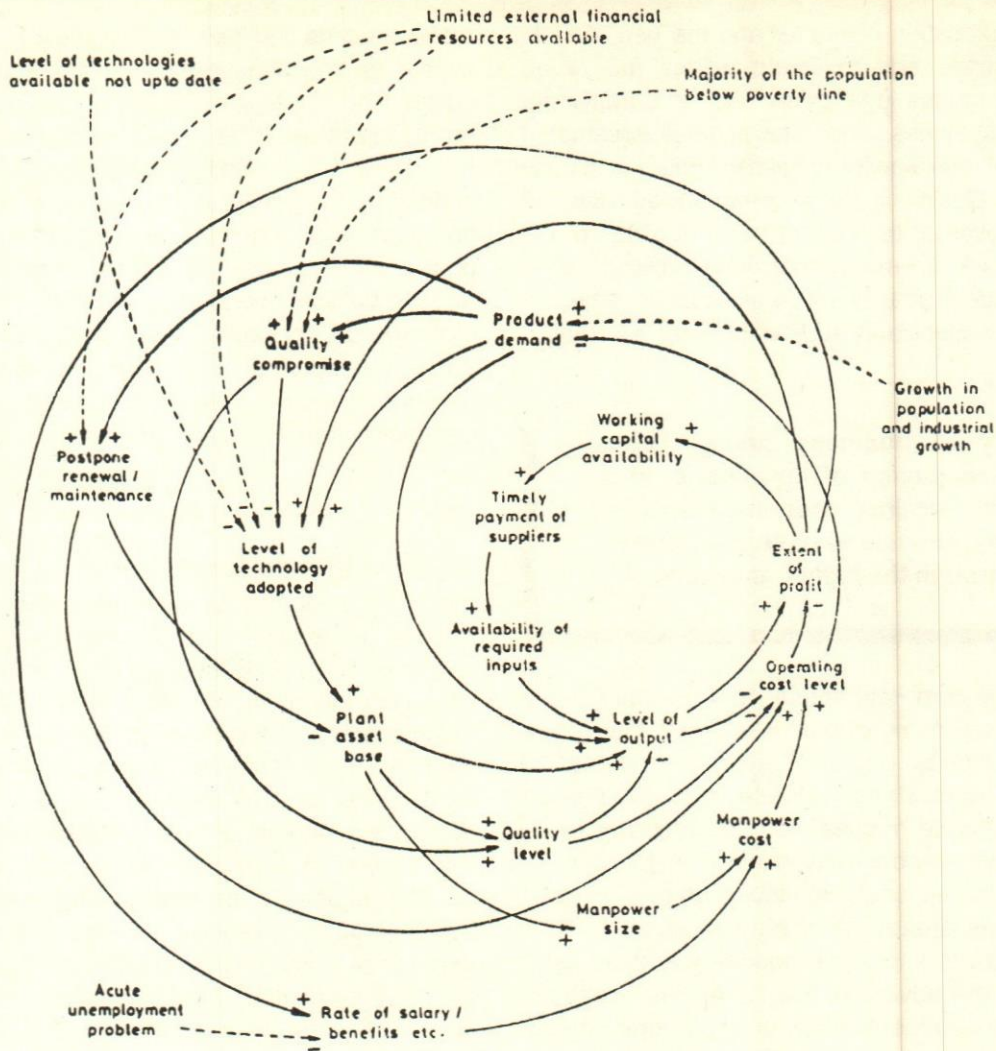


Fig. 1. Organizational strategies and their consequences: Economy at its early stage of development.

to motivate the organizations to go in for developing indigeneous technology, to optimize the risk-return profile they would prefer to use the imported technology and make their products competitive. Higher level of foreign exchange earning through exports would perhaps be the means to deal with import restrictions. The modernized plant facilities require less manpower which remains no longer so cheap. The wages and welfare policies need to reviewed upwards, not only to conform to the provisions of the legislations introduced but to keep the employees happy, particularly when they are more aware of their strengths and rights. With the technological advances and the accompanying changes in the products and processes, meeting the suppliers dues in time may not be sufficient to ensure smooth availability of required inputs to sustain the desired quantity and quality of production. Efforts need to be made to develop new suppliers and nurture the new relationships with the existing ones.

In a bid to produce more of acceptable quality at cheaper price to outstrip the competitors, choice of technology assumes importance.

Besides the development of the usual internal and external asset bases, the growing competition forces the organizations to think in terms of building up their goodwill and image before the bankers, the government and the society at large. With increasing awareness about the consequences of industrial pollution, organizations become keen to recycle the wastes as much as possible through modernization of plant facilities to improve profitability and at the same time to maintain to public image through environment protection. In addition, or-

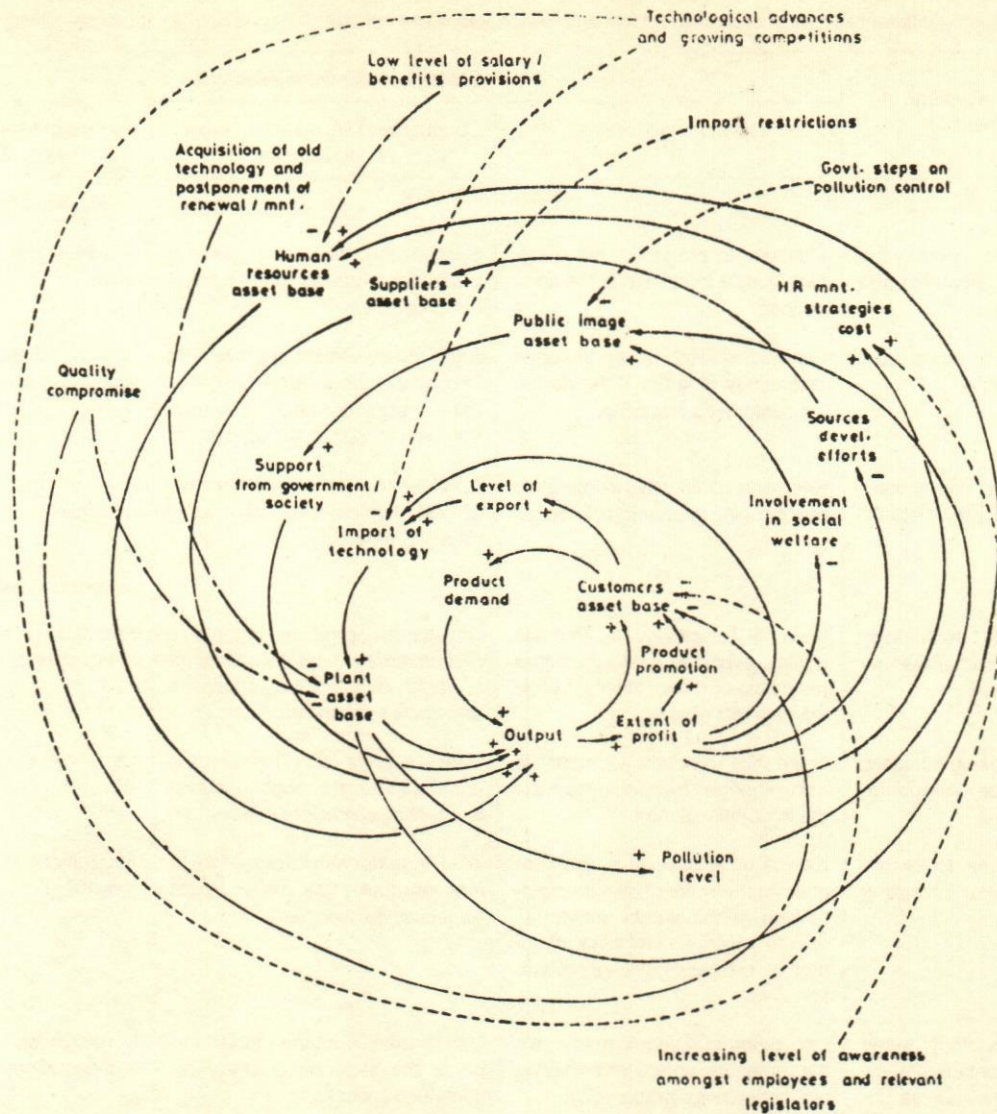


Fig. 2. Organizational strategies and their consequences: Developing economy.

organizations associate themselves in various community development and social welfare projects to strengthen their goodwill. Such phenomena are reflected (Fig. 2).

Organizations associate themselves in various community development and social welfare projects to strengthen their goodwill.

Economy at its advanced stage of development

As the economy develops further rapid technological advances and acute competition mark the external en-

vironment in which organizations need to manage themselves for sustained success. Adoption of imported technology is no more viable to keep the competitors away, innovative methods have to be used to find out new products, materials and processes to add more value to the products and services. With focus on excellence, efforts are made to strengthen the research and development base of organizations. Innovation being the key to success, higher level of salary and welfare provisions alone are not enough to harness the latent potentials of the human resources of the organizations. Appropriate strategies need to be adopted to update their knowledge and skill, to maintain their morale and motivation so as to channelize their creative talents towards the success of the organization. In the midst of acute competition, organizations in their own interests associate themselves in

Table 1 : Strategies during different stages of economic growth and development and fulfillment of corporate social responsibility.

Economy at its early stage of development	Strategies adopted relevant to		
	Developing economy	Economy at its advanced stage of development	Areas of fulfillment of social responsibility.
			<i>Relevant to Consumers</i>
Produce more to meet the demand of growing population and industries	Continue to produce more but of high quality to survive in the competition	Sustain the increased level of production through more innovative products.	Availability of goods and services.
Produce more at cheaper rate, compromising quality.	Improve quality using imported technology to improve the declining customer asset base.	Bring out significant improvement in quality using creative talents of the organizational human resource for sustained success.	Quality and reliability of goods and services available.
Reduce cost through quality compromise and exploitation of labour.	Keep cost competitive at improved quality using imported technology.	Continue to keep cost competitive at still higher level of quality through innovations.	Cost of goods and services available.
			<i>Relevant to national economy</i>
Purchase available technology within limited funds rather than try to develop technology.	Improve technology to improve quality, export to deal with import restrictions rather than try to develop technology.	Develop new products, processes and material to face the challenge of rapid technological advances and acute competition.	Facilitation of the development of indigineous technology.
Meet the everincreasing domestic demand at low price, even compromising quality.	Make the products competitive using imported technology to enter the international market.	Boost exports with more value added products through ingenuity and technological innovations.	Earning of foreign exchange.
Pay suppliers in time to ensure availability of inputs for increasing level of production	Extend more support to the suppliers in the wake of growing competition in the supply market to ensure smooth availability of inputs for increased level of production.	Work together with the suppliers to innovate new materials as inputs for sustained success.	Facilitation of industrial growth.
Use available technology within limited funds with consequent low productivity of input resources.	Use imported technology to make the products competitive having high input factor productivity.	Use innovative method to still improve the factor productivity for continued success.	Conservation of scarce natural/national resources.
			<i>Relevant to society</i>
Go in for labour intensive plant rather than automated one in view of abundance of cheap labour and shortage of financial resources.	Replaces gradually labour intensive technology by automated plants to keep the products competitive.	Innovate ways and means to make the machine work for the man to have better utilization of the human asset.	Extent of employment generation (Direct)
Exploit acute unemployment problem to make nominal investments in welfare provisions to its otherwise large labour force.	Invest more towards welfare provision as the employees become aware of their strengths and rights.	Invest in welfare provisions to continue to harness the creative talents of the human asset.	Extent of employment generation (Indirect).
Adopt low level of technology and continue to postpone the renewal and maintenance with no concern for environment protection.	go in for hi-technology to keep the products competitive with consequent low level of pollution.	Make your industrial complex 'Green' to become the ideal for others to follow.	Level of pollution of the environment.
Mind your own business with limited resources rather than concern for the society.	Develop concern for the society in resonse to legal provisions or to maintain public image.	Develop more concern for the society to build up the image and manage the external environment for sustained success.	Participation towards development of society.

Economy at its early stage of development	Strategies adopted relevant to		
	Developing economy	Economy at its advanced stage of development	Areas of fulfillment of social responsibility.
Take advantage of acute unemployment problem to go in for low rate of employee compensation.	Increase the rate of compensation as the employees are more aware of their strengths and rights.	Compensate adequately not only for utilizing but also for developing and protecting the most important asset of the organization.	<i>Relevant to employees</i> Extent of improvement in the living standards of the employees. Concern for the quality of worklife in the organization. Developing the potentials of the employees.
Take advantage of acute unemployment problem to support minimum welfare provisions.	Support higher level of welfare provision as the employees are more conscious of the strengths and rights.	Invest more in welfare provision to maintain and protect the human asset.	
Adopt low level of technology using limited funds with less emphasis on quality of work life.	Improve quality of work life in response to employee demand and legal provisions besides the favourable impact of hitech.	Invest more to improve the quality of work life to get the best out of the human asset.	
Go in for low level of technology and exploitation of cheap labour with very little emphasis on employee development and quality.	Provide opportunity to employees to learn on the job to get the best out of the machine.	Adopt suitable training and development strategies to get the best out of man.	

the areas of social interests to build up and strengthen the public image to exploit the sentiments of the financiers, the government and the society to make still more profits. Such phenomena are presented in (Fig. 3).

Corporate social responsibility redefined

The different organizational strategies that are likely to be adopted by the corporate houses to achieve their profitability objective at different stages of economic growth and development are significantly different. In fact, the variation in strategies pertains to different areas of concern relevant to different interest groups as reflected in table 1.

Consequent to such a likely variation in strategies, as an organization moves towards the path of profitability, the extent of favourable or adverse impact in the different areas of concern of the different interest groups would be different. Perhaps, the corporate social responsibility may be redefined to reflect such an impact on the other interest groups (other than the shareholders), herein termed as 'other than profitability performance' as an organization moves towards the path of profitability.

The extent of fulfillment of corporate social responsibility, so defined, may be assessed for any organization on a periodic basis by measuring the impact on the different areas of concern of different interest groups

directly, or through appropriate surrogate measures (Kolay, 1993) wherever necessary and attaching suitable priorities to the different interest groups like the employees, the consumers, the national economy and the society at large and also suitable priorities to different areas of concern within each interest group. The weightings may depend on their relative importance depending on the national plans and policies which may vary over time.

Corporate social accounting practices

The extent of fulfillment of corporate social responsibility in the form of 'other than profitability performance', as proposed, may be viewed in the context of social accounts as practiced by corporate houses in India. Table 2 presents the comparative areas of concern relevant to the different interest groups.

As regards the areas of concern of the employees, besides their living standards and the training and development, physical working conditions, particularly the safety measures, may be important reflecting the quality of work life. Besides welfare measures, total compensation in terms of wages and salaries and benefits may be more relevant than the benefits alone to influence their living standards. Lay off and involuntary termination may not be a threat to employees of today's corporate

Table 2: Areas of concern relevant to different interest groups : Practised vs. Proposed

Areas of concern	
<i>As practiced by corporate houses in India</i>	As proposed in the redefined measure
<p>A. For the employees as the interest group</p> <ul style="list-style-type: none"> • Living standards reflected through: <ul style="list-style-type: none"> (i) Level of benefits and perquisites (other than wages & salaries) (ii) Level of welfare provisions (iii) Extent of layoff and involuntary termination (costs) (iv) Extent of extra hours worked without payment (costs) • Training and Development <p>B. For the consumers as the interest group</p> <ul style="list-style-type: none"> • Not considered <p>C. For the local community as the interest group</p> <ul style="list-style-type: none"> • Environment protection/improvement • Community development reflected through : <ul style="list-style-type: none"> (i) Extent of taxes paid to the local authorities (ii) Extent of contribution towards community development projects i(ii) Level of employment generation for the local community i(v) Level of business generation for the local community (v) Extent of increase in cost of living (costs) <p>D. For the general public as the interest group</p> <ul style="list-style-type: none"> • Extent of research and development efforts • Extent of earning of foreign exchange • Extent of taxes paid to the State and Central Government • Level of business generation • Extent of services and facilities (State/Central government) consumed (costs). 	<p>A. For the employees as the interest group</p> <ul style="list-style-type: none"> • Living standards reflected through : <ul style="list-style-type: none"> (i) Level of compensation i.e. wages & salaries and benefits & perquisites. (ii) Level of welfare provisions • Quality of work life. • Training and development. <p>B. For the consumers as the interest group</p> <ul style="list-style-type: none"> • Service level • Quality level • Level of cost effectiveness <p>C. For the national economy as the interest group</p> <ul style="list-style-type: none"> • Indigenous technology development • Extent of earning of foreign exchange • Facilitation of industrial growth • Conservation of scarce natural/national resources <p>D. For the Society as the interest group</p> <ul style="list-style-type: none"> • Level of employment generation — direct • Level of employment generation — indirect • Environment protection/improvement • Community development and social welfare.

sector in India; instead, the employment opportunities created may be more relevant. The extent of extra hours worked without payment may not be relevant, when the workers can no more be exploited to put up extra hours without any remuneration in the present day legal framework and the concept of working hours may not be applicable to the executives who are responsible for managing the organization.

Besides the interest of the employees themselves, the interest of the consumers is no doubt important and the relevant areas of concern i.e. the service level, the quality level and the level of cost effectiveness have been reflected in the redefined measure of corporate social responsibility.

The local community and the general public are the two other interest groups in the social account of the corporate houses. Development of local community is no doubt important but perhaps it may be only one of the areas of concern of the society at large as the interest

group. The extent of research and development efforts, earning of foreign exchange, business generation etc. do ultimately affect the general public but perhaps such areas of concern are directly related to the national economy as the interest group rather than to the general public.

As regards the areas of concern of the local community environment protection is of top priority in today's industrial world. Similarly, the extent of contribution, be it local taxes or otherwise, facilitates the development of the local community. However, the level of total employment generation (both direct and indirect) is more relevant rather than employment opportunities created only for few locals. Increase in the cost of living in the community,

The level of total employment generation (both direct and indirect) is relevant.

Organizational efforts in the area of corporate social responsibility may be better reflected by the extent of conservation of the scarce natural and national resources of the country.

Conclusion

Social responsibility may not be an alien aspect corporate objective, different from profitability, particularly when the corporate houses are struggling to improve their performance to continue to be in the business. However, as organizations move towards the path of profitability, they adopt different strategies depending upon the state of the economy and consequently cause varying levels of

adverse or favourable impact in the areas of concern of other interest groups i.e. the consumers, the national economy, the society and the employees, other than the shareholders. Such an impact reflects the measure of corporate social responsibility. A measure with suitable priorities to the different areas of concern relevant to the different interest groups in tune with the national plans and policies may provide the corporate houses a common basis to account for and report their periodic social performance.

References

- Krishnamacharyulu, C.S.G & D. Dakshina Murthy** (1986). 'Research on Corporate Social Responsibility', Productivity, Vol. XXVII, No. 1.
- Kolay, M.K.**, (1993). 'Measuring the total performance of an organization', Productivity, Vol. 34, No. 2.
- Corporate Annual Reports of SAIL, MMTC etc.**

Quality is never an accident, it is always the result of an intelligent effort.

John Ruskin

Buyer-Supplier Relationships: The Case From Indian Dairy Cooperatives

Madan Mohan T.R. & Singh N.P.

Buyer-supplier relationships within an industry reveal the firm's choices, power and control in the network and the cost of operations. There has been a lack of empirical evidence from multi-tier or hierarchical organizations about the types of networking and cost of operations. Indian Dairy Co-operatives have a three-tier structural arrangement: primary production centers at village society level, processing at district union level and product marketing overseen by a state level federation. The materials management function is located at the district level union and the materials requirement is managed by both the state federation and union. This paper based, on empirical study of nine federations, attempts to map the dynamics of buyer-supplier dairy cooperatives relationships.

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With increasing demands on product variety, delivery performance, and recognition of the strategic role of suppliers on competitive strategy (Schonberger, 1989), there has been a spurt of interest among managers and management scholars in the strategic aspect of the 'materials' function. Studies have recognized the influence of environmental uncertainty (Ouchi, 1980; Pfeffer & Salancik, 1978; Wernefelt & Karmani, 1987), opportunism (Provan & Skinner, 1989), information sharing (Weick, 1969; Dobler et al., 1990) and transaction uncertainty (Clark, 1989) on materials management dynamics and material management performance (Chao, 1989). Researchers have observed that under conditions of increased uncertainty, firms in the value chain engage in collective action in order to stabilize their environment (Ouchi, 1980; Pfeffer & Salancik, 1978). Researchers have also observed that to combat high variability in demands, and instability within the manufacturing plans, materials managers seek to either increase responsiveness by stocking for variations or by spreading the procurement over a large number of small firms (St. John & Heriot, 1993). Firms have been found to employ supplier base consolidation and interorganizational interdependence strategies towards uncertainty management (Hahn et al., 1986). Most of these studies have been carried out from the point of view of a typical organization, where the management decisions and actions are within the realm of the firm. There are, however, other forms of organizations, wherein the materials management

Materials managers seek to either increase responsiveness by stocking for variations or by spreading the procurement over a large number of small firms.

decisions and activities may be influenced by decision making at structurally higher tiers of organization.

Cooperatives are organizations with multi-tier linkages, with value addition occurring along the chain of transactions. Typically, cooperatives have a primary unit undertaking procurement and production, and a second level unit handling the marketing of the produce from different primary production centers. Little is known about the dynamics of the material management function in these multi-tier organizations and hence a study was attempted towards this end.

Material Management Function in Indian Dairy Cooperatives: An Overview

Indian dairy cooperatives have a three tier structure, termed as Anand Pattern of cooperatives (derived from the highly acclaimed AMUL experiment at Anand, Gujarat). The primary raw material is collected at village level societies and processed at district level member unions. While the member unions themselves do the marketing of liquid milk, the marketing of value-added final products is undertaken by a state level federation of unions. The federation charts out the production plan for each union based on the market requirement. Till date there are 15 state federations covering around 166 district level unions and more than 60,000 village level primary societies (NDDDB, 1992). Members of the village society elect a managing committee to supervise the day-to-day operations. The governing body at the unions comprises a Board of Directors consisting of nineteen members. Of these twelve are democratically elected as representatives from the societies in different villages and the remaining are nominees from financial institutions and federal nominees with three individual members. The Board of Directors elects a Chairman and Vice-Chairman. The Board frames the general policy for the union with regard to milk procurement, supply, processing and distribution. The Board employs a Chief Executive Officer (C.E.O) and a team of managers oversee the day-to-day operations of the union. Representatives of various district unions within a state elect a Board of Directors which forms the governing body at the federation level. The Board members at the federation include nominees from the federal agency, namely, National Dairy Development Board (NDDDB) and from financial institutions.

Anand-pattern cooperatives have a unique experiment with regard to materials management. Every federation, each year identifies and negotiates for high

value items such as packaging material, with the suppliers covering the production requirements of all its member unions. The typical procedure is as follows: The materials manager from each member union raises an indent as per anticipated market requirements. Towards meeting this demand, the federation invites quotations from the suppliers. After screening the supplier on various parameters, the federation intimates each union's materials manager about the designated suppliers and the terms of contracts. The federation also stipulates that the member unions spread their requirements across the designated suppliers to reduce the emergence of a dominant supplier. Typically, members are required not to place more than 30 per cent of their total requirement with a supplier and/or a specific number of units (say 1,00,000 cans/supplier). However, the option of buying from any supplier other than the designated ones or from the local market is open to the union's materials managers, especially towards meeting contingencies. Additionally, in some cases the federation is also involved in the purchase of high consumption, high fluctuating products such as gunny bags and controlled products such as sugar and molasses.

The materials manager at the district union is also involved in the purchase of other high value items and engineering spares. The typical purchase procedure begins with the materials department receiving from the user sections. Enquiries are floated, item-wise rates are compiled and a comparative statement is sent by the materials department to the top management for approval. In some cooperatives, a purchase committee (usually consisting of department chiefs, C.E.O and two designated members from the elected board) oversees the purchases. Once the purchase is approved the materials manager supervises the inspection and delivery of the materials.

Methodology

A study of seventy-one union-level materials management executives, drawn from nine federations was attempted. Of the seventy one managers, seventeen were from state federations and the rest from different unions. The profile of the respondents is provided in table 1. Apart from collecting responses to the basic questions, a few open-ended discussions with the executives were also generated. Material consumption data for past three years was used to elicit A, B, C classes of items and the number of suppliers for each.

Table 1: Profile of Materials Managers

Age		
Age	No. of Respondents	% of Respondent
25-35	25	35.21
35-45	38	53.52
>45	8	11.27

Experience (Years) in Material management		
Experience	No. of Respondents	% of respondents
<10	38	53.52
10-20	28	39.44
>20	5	7.04

Academic Background of the Respondents		
Qualifications	No. of Respondents	% of Respondents
Graduate	40	56.34
Post Graduate	20	28.17
Graduate with Professional qualifications	11	15.49
Total	71	100.00

Provan and Gassenheimer's (1994) construct was used to measure the emergence of a single dominant supplier on the basis of the percentage of total annual purchases provided by each supplier. The mean score was used for the purposes of identifying supplier-buyer dependencies. The dominance (in terms of bargaining power and control in the buyer-supplier relationship) of federation was measured using a three item measure on the lines of Pfeffer and Salancik (1978). Executives were asked to rate the extent to which they could influence the delivery schedules from supplier, control batch sizes and hold the product prices. To assess the power and control vested in a union, the contribution it made to the total sales of federation and the extent to which it could influence business decisions at the federation level (based on a two-item measure) were used as the measures. All items were measured on a Likert type five-point scale. The coefficient of reliability, Cronbach Alpha, for these variables ranged from 0.56 to 0.78.

Results & Discussion

The strategies used for material supply management in Indian Dairy cooperatives are listed in table 2. For items where no pooling takes place (i.e., federations do not pool up the requirements and bargain), the following types of buyer-supplier relations seem to emerge. Promotion of a group of small local vendors (35 per cent),

a dominant supplier and few small vendors (58 per cent) and a supplier with long-term partnership (7 per cent) were the buyer-supplier strategies resorted to. The antecedents for these strategies is as follows: The first strategy is predominant in cooperatives with a relatively small business, but varying in demand, and situated farther off from industrial centers. These cooperatives distribute their risks over a number of small suppliers and were also seen to be more dependent upon the federation for operational issues. Materials managers of these cooperatives attributed their exploration of alternative sources as the primary reason of spreading the requirements and covering the risk of their low bargaining power. This finding provides empirical support to the arguments of St. John and Heriot (1993) that material managers in situations of varying demand and low bargaining power seek to increase responsiveness by stocking for variations or by spreading the procurement over a large number of small firms.

Table 2: Buyer-supplier strategies

Strategies	Number of co-ops (percentage)	Antecedents
Group of small local vendors	25 (35%)	Low volumes Locational disadvantages Distribution of risk Apex body involvement Supply uncertainty
A dominant supplier & few small vendors	41 (58%)	Large volumes Proximity to mature markets Maturity of cooperative Low market uncertainty
Long-term partnership	5 (7%)	Very large volumes Maturity of supplier Market supplier Industry leadership

The second type of buyer-supplier relationship, i.e., one of a dominant single supplier and a small group of vendors, is associated with large volume-based, mature cooperatives (average age around 25 years) in close proximity to mature and regulated markets (such as agricultural produce markets, traditional mandis, and industrial districts). Additionally, most of these cooperatives have an impressive track record of financial performance and a major share of the local market. This type of relationship is emerging in situations where the union materials management has had a proactive role in developing alternate vendors. These cooperatives capitalized the production capacity of the vendors and the buyer-supplier relationship in these repetitive transactions was co-operative in nature. This finding provides

empirical support to the hypotheses of Skinner and Guillan (1986) that organizations with a substantial volume of trade (a proxy for purchasing power) in proximity to mature markets provide opportunities for suppliers to invest in relationships and overtime pave the way for the emergence of a single dominant supplier.

Relationship, of a dominant single supplier and a small group of vendors, is associated with large volume-based, mature cooperatives in close proximity to mature and regulated markets, an impressive track record of financial performance and a major share of the local market.

The third type of buyer-supplier relationships, namely, the long-term cooperative type, is related with unions of large business volumes and operating with a high range of products. Interestingly, most of these unions were the early proponents of the cooperative form of business in India and have enjoyed a virtual monopoly in some of their products. Incidentally, the long-term relationships emerge when there are few suppliers for the product, service or technology. Examples include unions using cooperative venturing option and equity participation. Examples of relational contracting also do figure, especially in the purchase of raw material for cattlefeed plants.

The long-term cooperative type, is related with unions of large business volumes and operating with a high range of products.

Table 3 shows the average cost/unit of some of the centrally purchased items and their respective average market prices. As seen, the cost/unit of these items is

Table 3: Comparative prices for some centralized purchase items

Product	Average cost/unit of pooled items (Rs)			Average market prices (Rs)		
	1990-91	1991-92	1992-93	1990-91	1991-92	1992-93
Polythene of packaging (KG)	60	58	54	62	60	57
Ghee Bottle	2.12	2.31	2.58	2.20	2.40	2.75
Gunny Bags (per 100)	1600	1600	1580	1610	1610	1595

** Prices have been adjusted across unions

lower than the prevailing market prices. It should be noted that these are Class A items and the annual average consumption of a typical 1 lakh 1pd dairy would be around Rs 35 million. The buyer-supplier relationships for these items were typically ones of high dependency, but mutually rewarding. For most of these products, at least two suppliers were observed to be meeting almost two-thirds of the demands of each federation. The results indicate that centralized purchases in multi-tier organizations increase the bargaining strength and offer better price discounts, supporting Williamson's (1975) markets and hierarchies hypotheses.

Centralized purchases in multi-tier organizations increase the bargaining strength and offer better price discounts.

Based on the measure of dominance (in terms of bargaining power and control in the buyer-supplier relationship) on the lines of Pfeffer and Salancik (1978) discussed earlier, the types of buyer-supplier relationships emerging in the dairy industry can be summarized as shown in (Fig. 1). A dominant federation may not only bargain for the best deal, but also insist on the unions to spread their purchase across suppliers, thus, leading to an emergence of a small supplier network. However, when a union is dominant (referring to scale of operations and contribution to the federation's sales), the supplier relationships move between a long-term cooperative relationship (in some cases, joint ventures) and various forms of nonstandard contracting. The dominance of both the federation and the unions results in the emergence of a single dominant supplier and relatively low inventories at the union level. This may be because of the following reasons: Firstly, the unions with their large scale of operations have learnt to exercise their decision-making role. Secondly, these unions, in business for more than three decades, have learned to manifest their bargaining power and thus shift the stocking option at the

FEDERATION DOMINANCE

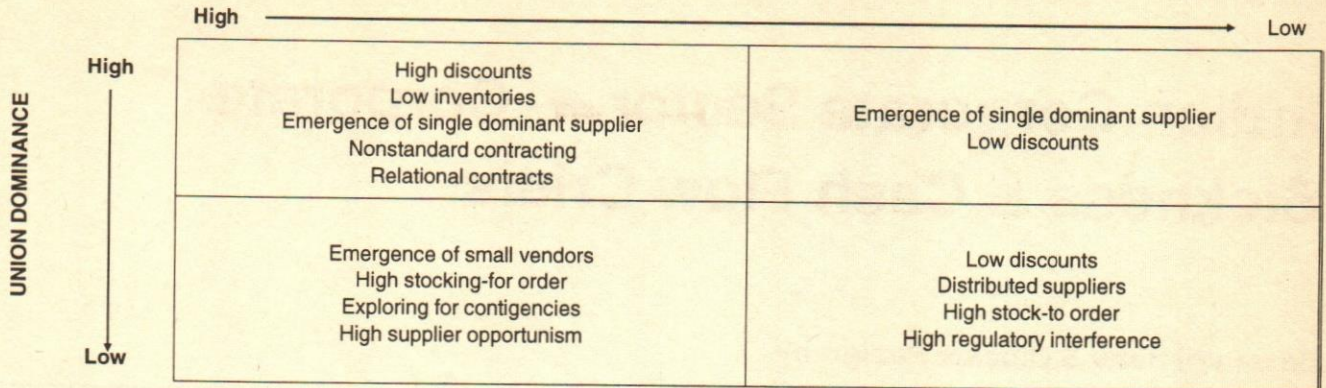


Fig. 1. Types of Buyer-supplier relationships

supplier end. In cases where both the federation and the unions are less dominant, and the state has a stake in the business, interferences from regulatory agencies in purchase decisions were found to be high, thus propagating the emergence of an 'old school boy' type of networking. For example, the dairy cooperatives were directed by the authorities to buy sugar from sugar cooperatives with low discounts. Similarly, purchase of stationery from the state-owned cooperative results in high stocks.

Concluding Remarks

Several shortcomings of the study need to be mentioned that may limit the impact of the findings while suggesting avenues for further research. Firstly, the sole reliance on data generated from buyers alone. Inclusion of suppliers would have offered more useful insights into the dynamics of the dependencies and antecedents, defining the emergence of a particular type of networking. Secondly, measures such as opportunism and transaction uncertainty were not included in the study. Although these issues may in some way limit the impact of this research, the extreme lack of empirical work on materials management in hierarchical organisations makes this study a useful contribution to the literature. Further research is needed to explore the antecedents for particular buyer-supplier relations, reaction to externalities, the nature of interdependencies, and the coordination mechanisms so as to enhance the understanding of control behaviour in hierarchical organisations.

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References

Chao, Chiang-Nan., "Purchasing Performance Measurement: Views of Purchasing Managers, Buyers and Internal Customers from Different Industries", Unpublished Ph.D thesis, Arizona State University, 1989.

Clark, K.B., "Project scope and project performance: The effect of parts strategy and supplier involvement on product development". *Management Science*, Vol. 35, October 1989.

Dobler, D.W., Burt, D.N., & Lee, L. Jr., *Purchasing and Materials Management*, New York, McGraw-Hill, 1990.

Hahn C.K, Kim, K.H. & Kim, J.S., "Costs of competition: Implications for Purchasing strategy", *Journal of Purchasing and Materials Management*, Vol. 22, No. 3., 1986.

National Dairy Development Board (NDDB), *Monthly Progress Report*, Anand, March, 1992.

Ouchi, W.G., "Markets, bureaucracies, and clans", *Administrative Science Quarterly*, Vol. 25, 1980.

Pfeffer, J & Salancik, G.R., "The External Control of Organizations", New York: Harper Row, 1978.

Provan, K.G. & Skinner, S.J., "Interorganizational dependence and control as predictors of opportunism in dealer-supplier relations", *Academy of Management Journal*, Vol. 32, 1989.

Provan, K.G. & Gassenheimer, J.B. "Supplier commitment in relational contract exchanges with buyers: A study of interorganizational dependence and exercised power", *Journal of Management Studies*, Vol. 31, 1994.

Schonberger, R.J. "Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity", (New York, Free Press, 1989).

Skinner, S.J. & Guiltinan J.P. "Extra-network linkages, dependence, and power." *Social Forces*, vol. 64, 1986.

St. John, C.H. & Heriot, K.C., "Small suppliers and JIT purchasing", *International Journal of Purchasing and Materials Management*, Vol. 29, 1993.

Weick, K.E., "The Social Psychology of Organizing", New York, Addison Wesley, 1969.

Wernefelt, B. & Karmani, A., "Competitive strategy under uncertainty", *Strategic Management Journal*, Vol. 8, 1987.

Williamson, O.E. "Markets and hierarchies: Analysis and antitrust implications", New York: Free Press, 1975. □

Indian Corporate Sector — Corporate Sickness & Cash Flow Crisis

Dasarathi Sahu & Dibakar Panigrahy

This paper aims at designing a Cash Flow variable model to predict corporate sickness. It identifies and determines the relative significance of Cash Flow ratios in detecting and predicting corporate sickness. It also examines other determinants having a bearing in monitoring the Cash Flow of an enterprise. The study outlines the managerial implications of cash flow and also suggests remedial measures to overcome Cash Flow crisis of an enterprise.

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One of the important tools of analysing the financial performance of an enterprise is the Cash Flow Analysis. Cash flow normally appears in the form of a stream of funds which flows into or out of a business. The simplest way to view cash flow is to define it as the difference in the cash balances of a company on two dates. A cash flow ratio is a quotient of two variables meaningfully selected from the balance sheet and/or the income statement of a given business period. A study of cash flow ratios so computed for an enterprise over a period of its life indicates the several facets of its financial positions e.g. liquidity, profitability, strengths and weaknesses of the financial structure. As such, cash flow ratios can be used to detect the failing tendencies in a business organization as early as they set in its financial structure.

A study of cash flow ratios so computed for an enterprise over a period of its life indicates the several facets of its financial positions e.g. liquidity, profitability, strengths and weaknesses of the financial structure.

A study was conducted to verify empirically whether cash flow ratios can be observed as detectors of failure, and if so, how early in the life of the enterprise. Thus cash flow ratios are considered as predictor variables and are studied in the light of the users of financial statement information, to find out the predictive power of such variables as far as five years prior to the date of sickness.

Management of Cash Flow

Cash is the basic input for keeping the business running. It is also the ultimate output of the firm's opera-

tions. In the recent past the thrust was only on sufficient funds to meet any requirement. Once the sufficiency of funds was accomplished, cash flow management was considered to have reached the desired objective. But in today's competitive business, when cash, like any other asset of the company, is a tool for profit, the emphasis is on the right amount of cash at the right time, at the right place and at the right cost. Therefore, an optimum level of cash should be retained on a continuing basis as paucity of cash will disrupt the business. At the same time, excess cash remaining idle will contribute nothing towards the firm's profitability. So care should be taken to optimize the flow of cash into and out of business. It is a matter of paradox that a company needs cash to grow but ill managed cash would also lead growing companies into bankruptcy.

In today's competitive business, when cash, like any other asset is a tool for profit, the emphasis is on the right amount of cash at the right time, at the right place and at the right cost.

The importance of cash flow management can be gauged from the comment made by Harrold Williams, the former chairman of the Securities and Exchange Commission U.S. quoted in Forbes "If I had to make a forced choice between having earning information and having cash flow information, today I would take cash flow information". The Financial and Accountancy Standard Board (FASB) U.S. issued exposure drafts in November 1981 and December 1983 that, every corporate financial statement should include information on cash flows during the particular period. The FASB further contended that "The greater the amount of future net cash inflows from operations, the greater the ability of the enterprise to withstand adverse changes in operating conditions." Cash flow management is concerned with minimising unproductive cash balances. It helps in investing temporarily held excess cash advantageously. Cash flow forces attention on future operations and gives the management information for planning payments to creditors and shareholders, making temporary investments of excess cash, detecting cash shortages promptly, planning for expansion and asset acquisition, compensating for seasonal variations and controlling operations. The absence of a proper cash flow system can have many adverse effects on business, such as

impaired credit rating, strained relations with suppliers and bankers, losses of invoice discounts, employee discontent and possible bankruptcy for the business.

Cash flow forces attention on future operations and gives the management information for planning payments, making temporary investments, detecting cash shortages, planning for expansion, compensating for seasonal variations and controlling operations.

A sick industrial unit is defined by the Reserve Bank of India as one which has incurred cash loss for one year and, in the judgement of the bank is likely to continue to incur cash losses for the current year and which has an imbalance in its financial structure, such as a current ratio of less than 1:1 and worsening debt-equity ratio. The Sick Industrial Companies (Special Provision) Act, 1985 defines a sick industrial company as an industrial company (being a company registered for not less than seven years) which has at the end of any financial year accumulated losses equal to or exceeding its entire net worth and has also suffered cash losses in such financial year and the financial year immediately preceding such financial year.

There are many more definitions of a sick industrial company, but one common issue among sick units becomes clear — it is the lack of sufficient cash generation from internal sources. In India it has been found that business houses continue to operate as long as cash continues to be available in the form of loans, grants, subsidies etc.. By the time sickness is detected the entire net worth of most of the industrial units has been eroded. Therefore, it can be said that the real problem of sickness starts when cash stops flowing into the business. This also holds true in case of healthy companies because business moves only on cash but not on profit. So cash flow is the basic yard-stick to gauge the success or failure of a company. In other words, cash flow acts as the barometer of corporate health.

Cash flow is the basic yard-stick to gauge the success or failure of a company.

Review of Empirical Studies

Many researchers have undertaken empirical studies on corporate sickness to predict the event of business failure before its actual occurrence. They have used different sets of financial ratios as predictor variables to study corporate health with the help of sophisticated statistical tools. Most of these studies focus on the use of several combinations of varieties of financial ratios. However, none of these studies has dealt with cash flow and its related ratios as potential predictor variables. More recently, however, researchers have carried out studies on corporate failure using cash flow information. Gale and Branch (1981) made a study using the Profit Impact of Market Strategy (PIMS) business data for the period 1970-79 assembled by the Strategic Planning Institute. Their empirical study demonstrated that in a business's competitive position, the growth rate of its market and its current strategic moves had a predictable effect on the cash flow. Such studies help the business firm to evaluate the trade-off among alternative strategies to use the cash.

In their study, Casey and Bartczak (1984) selected 60 companies that had filed petitions for bankruptcy during the period 1971-82 and matched them with 230 viable companies chosen at random from similar industry groupings. They considered three variables, namely, operating cash flow, operating cash flow divided by current liabilities and operating cash flow divided by total liabilities. Using the multiple discriminant analysis, they found that cash flow measures proved to be poor predictors when compared to six accrual based financial ratios used in the model. Even the cash flow measures taken together with the accrual based ratios failed to improve the predictive accuracy. The predictive accuracy of cash flow based measures was found to be 60 per cent for operating cash flow, 75 per cent for operating cash flow/current liabilities and 72 per cent for operating cash flow/total liabilities one year prior to failure, whereas the accrual based financial ratios provided 86 per cent classification accuracy one year prior to failure. They, therefore, concluded that cash flow based measures are poor indicators of corporate bankruptcy as compared to accrual based financial ratios.

Gentry, Newbold and Whitford (1985) illustrated how the trends of funds flow components aid in determining the financial health or weakness of a company. Analysing a matched sample of 33 failed and non-failed companies in a particular industry, they found that the mean and the deviation of each cash flow ratio for the failed and non-failed firms are different from each other. Their study

indicates a marked difference between the means of the bankrupt company and the financially healthy companies. In their study they also used the probit model taking 12 funds flow components to predict the probability of failure. The predictive model classified the failed companies from the non-failed ones at 83.3 per cent accuracy one year prior to failure. The study clearly showed that dividends are more important in distinguishing between failed and the non-failed companies. Also the predictive value of net cash flow, receivables and investments changes dramatically as a company approaches failure.

In the Indian context too, prediction of corporate sickness has been made by a few researchers. Gupta (1983), for instance, carried out a study to determine the important ratios for monitoring corporate sickness. His study concluded that profitability ratios had relatively more predictive power and companies having low or inadequate equity base (reserve strength) were more prone to sickness. While these studies have employed different financial ratios for determining corporate sickness, there has been no study exclusively devoted to cash flow variables as indicators of corporate health. For the first time in India, in order to explore the potentiality of cash flow ratios Panigrahy and Sahu (1993) selected 90 matching sick and non-sick companies that had become sick during the decade 1977-1987. They considered 16 cash flow variables under two groupings Traditional Cash Flow (TCF) and Operating Cash Flow (OCF). Using the multiple discriminant analysis, they found that operating cash flow variables proved to be poor predictors when compared to traditional cash flow variables used in the model. They also found that the mean and deviation of cash flow ratios of the sick and non-sick companies are different from each other. Their study concluded that the cash flow to total liabilities is the most significant variable in distinguishing between the sick and non-sick firms. Their predictive model classified the sick companies from the non-sick ones at 86.6 per cent accuracy one year prior to sickness and 62.22 per cent five years prior to sickness. In order to understand the potentiality of cash flow variables, this study exclusively considers cash flow information for predicting the corporate health status.

Research Design

Before the collection of data, it was necessary to identify and organise the information required for the study. The study needed the following information:

- A set of sick companies and matching non-sick companies in the private manufacturing corporate sector.

- The information required for the above identified companies in respect of industry, size, age and type of organization.
- The financial statements of both sick and matching non-sick companies from one to five years prior to the event i.e. sickness.

The selection of sick companies for which the financial data could be obtained was the most difficult task of data collection. The primary list of sick companies was taken from the Bombay Stock Exchange Official Directory. The compiled list of sick companies was condensed into a list that satisfied the following conditions:

- The company reported had become sick during the period under study (1977 to 1987, both years included)
- The company is a public limited company in the private corporate sector.
- Finally the availability of financial data of the company for five years before failure.

The definition of sickness of a company, for the purpose of inclusion in the final list of sample was:

- Companies making continuous cash losses
- Companies not paying dividend for many years
- Companies whose share's market value had been very low
- Companies with a negative net worth.

The final list contained 45 companies on which financial data could be obtained for all the five years before becoming sick. The frequency distribution of the financial year of failure is presented in table 1. The industrial composition and size classification of sick companies in the sample is presented in the tables 2 & 3.

Table 1: The frequency distribution of failure

Year of sickness	No. of sick companies
1977	1
1978	0
1979	1
1980	5
1981	6
1982	2
1983	9
1984	13
1985	4
1986	1
1987	3
Total	45

Table 2: Industrial composition of sick companies in the sample

Industry	No. of sick companies
Cotton Textiles	6
Jute Textiles	1
Sugar	3
Food Products	5
Iron & Steel	6
Electric Equipments	2
Machinery & Accessories	7
Chemicals & Pharmaceuticals	7
Plastic	1
Tyres	2
Cement	2
Paper & Paper Products	3
Total	45

Table 3: Size Pattern in Sick Companies in the Sample

Capital employed in Rs. (000)	No. of sick companies
1000-10000	13
10000-50000	18
50000-100000	8
100000-150000	2
150000-200000	2
200000-and above	2
Total	45

To match non-sick companies and to reduce sampling bias, sampling of non-sick companies was based upon the following criterion:

- Non-sick companies were chosen from the same industry as that of the sick company
- They were almost of the same capital employed size as that of the sick company
- The data collected were of the same financial year as that of that sick company.

The paired sample design was chosen to reduce and control the impact of the other factors like industry, size and fiscal year, that otherwise would have blurred the relationship between cash flow ratios and corporate health/sickness. Thus, the final list of sample contained 90 companies i.e. 45 sick and 45 non-sick companies.

Cash Flow Ratios

For the purpose of the study the cash flow has been divided into two different groups; Traditional Cash Flow (TCF) and Operating Cash Flow (OCF). For calculation purposes, the TCF represents the earnings before depreciations and tax (EBDT), and the OCF represents

earnings before depreciations and taxes plus or minus changes in the current operating accounts such as sundry debtors, sundry creditors bills receivable, bills payable and inventory/stock. Following the above procedure the ratio values comprising eight ratios of TCF and OCF each were calculated for both sick and non-sick companies for a period of five years prior to the sickness.

Insufficiency of cash flow leads to imperfections and irregularities in the operation of an enterprise over time and also reflects a decline in liquidity and solvency. The following ratios both in TCF and OCF group were chosen because of their ability to detect impending sickness:

- Cash flow to total assets
- Cash flow to total liabilities
- Cash flow to net sales
- Cash flow to net worth
- Cash flow to current assets
- Cash flow to current liabilities
- Cash flow to interest
- Cash flow to total capital

Insufficiency of cash flow leads to imperfections and irregularities in the operation of an enterprise over time and reflects a decline in liquidity and solvency.

Cash Flow to Total Assets

This ratio is a measure of the true productivity of the company's assets. It indicates how effective the assets are being employed in generating cash. This is the real test of economic success or failure of the firm, because the survival of a company depends directly on the earning power or its assets. This ratio assures that assets of the company are not channelised in the wrong direction i.e. toward losing or less profitable projects and reflects the cash generation efficiency of the assets. Therefore, this ratio appears to be appropriate, particularly for studies dealing with prediction of corporate health. A smaller CF/TA ratio of a company is claimed to provide premonition of financial crisis in the future. A higher CF/TA ratio shows signs of stronger financial health of a company, because as long as the company generates enough cash to pay off its obligations, it does not face any problem.

The survival of a company depends directly on the earning power or its assets.

Cash Flow to Total Liabilities

This ratio is a measure which indicates the company's capacity to withstand financial pressure and shows the long run liquidity position of the firm. As expected the greater the cash flow to total liability, the more likely the firm is to be classified as a non-failing firm. The CF/TL ratio relates resource inflow to total claims, thereby showing the long run liquidity of the company. Since a firm's ultimate existence is based on its credit availing and fund raising capacity (both from outsiders and shareholders) this ratio gives sufficient indication to the investors to extend or restrict credit to the company. Further more, insolvency in a failing sense occurs when the total liabilities outweigh the cash generating power of the company. A smaller CF/TL ratio of a company portends impending sickness and a higher ratio reflects the company's strength to meet its obligations as they mature. So this ratio appears to be particularly relevant for studies dealing with corporate failure.

Cash Flow to Net Sales

This ratio shows the operating efficiency of the company in generating cash from business. Greater the cash flow to net sales, lesser is the amount of sales unrealised, lower is the cost of sales and *vice-versa*. Thus the CF/NS relates the resource inflow to the amount of sales of the company, since the basic aim of business is to generate cash through sales. This ratio also reveals whether the company would be able to survive on its own or not thereby indicating its internal cash generation ability. Another important aspect of this ratio is that it analyses the operational liquidity of the company. The cash generated per rupee of sales is a reliable indicator of the ability of the enterprise to generate enough cash for its operational requirements. Thus the higher the amount of cash generated per rupee of sales the greater would be the operational liquidity of the company.

Cash generated per rupee of sales is a reliable indicator of the ability of the enterprise to generate cash for its operational requirements.

Cash Flow to Net Worth

Many analysis believe that the greater the cash flow to net worth ratio, the better the financial structure of the company. But extensive reliance on net worth (owner's equity) can be expensive and may mean loss of potential business opportunities. On the other hand, undue reliance on outside borrowings can lead to liquidity problems (the consequence of which can be very severe in the context of commitments for repayment) particularly when the cash generation capacity of the enterprise is low. Therefore, this ratio must not be looked at in isolation to evaluate whether the company has utilised the owner's fund efficiently or not. The objective of studying this ratio is to examine the financial solvency of a company in terms of its ability to avoid financial risk.

Cash Flow to Current Assets

By analysing this ratio a considerable insight can be obtained regarding a company's ability to manage its working capital in the form of receivables, inventories, payables as well as inter related sales credit and purchase credit policies. The important thing to remember in this context is that while the most current liabilities are indeed current, this is not necessarily true of all current assets viz. inventories and receivables. So if any analysis is made without the idea of the realisability of current assets, this ratio can give misleading results. This ratio becomes more significant in the prediction of corporate health especially where a large portion of the current assets of the company comprises obsolete stocks or debtors outstanding for a long time. The company may fail in spite of its strong liquidity position.

Cash Flow to Current Liabilities

As expected, the greater the cash flow to current liabilities, the more likelihood of the company to be classified as a non-failing company. This ratio is an indicator of short term solvency of the company. It shows liquidity in the sense of the ability of a firm to meet current obligations when they become due for payment. Thus the CF/CL ratio fits best to measure the short term financial strength of a firm. It is a rigorous measure of a firm's ability to service short term liabilities and widely accepted as the best available test of the liquidity position of a firm.

Cash Flow to Interest

This ratio is very important from the lender's point of view. It indicates whether the business would earn/generate enough cash to periodically pay the interest charges. The higher the ratio, the more secure the lender. This ratio also indicates how much of the

generated cash can be ploughed back or be invested outside the business. Lower the pay out ratio, the higher will be the amount which can be retained in the business and vice versa. Thus a lower interest pay out ratio or higher retained earning ratio means a stronger financial position of the company. A business firm continues to stay in operation as long as it provides for its debt incurred. This ratio reveals how much the cash generation capacity can come down before it becomes difficult to service the debts or how much ahead of crisis, the firm is functioning before it faces fund shortages. So this ratio is more relevant to the study of corporate health as most of the companies continue to operate even after eroding their net worth.

Cash Flow to Total Capital

The term total capital refers to long term funds supplied by the creditors and owners of the firm. A comparison of this ratio with the industry average and over time provides sufficient insight into how effectively the long term funds of owners and creditors are being used to generate cash for operational and other purposes. This ratio, in a sense also measures the ability of the company to pay out dividends, as cash is needed to make any payment of dividend. It reveals the safety margin available to the owners. This ratio also has wider coverage and examines the ability of the firm to pay interest on loan, dividend, redemption of debentures etc. Therefore, it appears to be very important to judge the financial soundness of the firm.

Analysis

The analysis of the study concentrates the predictive power of individual ratios based on either the ratio's trend or its magnitude. The primarily objective is to find out systematic difference and to judge the general relationship between the cash flow ratios of the sick companies and their counterparts. The analytical procedure involved in testing the potential predictive power of cash flow ratios are: comparison of mean value of cash flow ratios of sick and non-sick companies and dichotomous classification test.

Comparison of Mean Values of Cash Flow Ratios

The first step is the comparison of the mean value of cash flow ratios of sick companies with their counterparts. But this does not reflect on the statistical significance of the mean difference. Hence, the student's t-test, has to be applied to measure the difference between the mean values of cash flow ratios of sick companies and non-sick

ones. Thus this test was administered to specify whether any significant difference exists between the ratios of sick and non-sick companies.

The mean and t-values of sixteen cash flow ratios, eight each, both under TCF and OCF group for sick and non-sick companies have been computed by the use of EPISTAT package with the help of IBM PC compatible system and are presented in tables 4 & 5 respectively. These values explain the differentiating power of cash flow ratios by denoting the difference between the group means of sick companies and their counterparts. The "t" test reveals that there is significant difference between the ratios of the sick and non-sick group in fourteen out of sixteen cases at 0.05 level of significance. These results also reveal that the traditional cash flow group ratios possess higher differentiating power than operating cash flow group ratios. Moreover, the traditional cash flow to total capital (TCF/TK) ratio is found to be the most significant ratio followed by traditional cash flow to total assets (TCF/TA) and traditional cash flow to total liabilities (TCF/TL) ratios in differentiating between the two groups on individual basis. Further, the traditional cash flow ratio shows a remarkable difference in mean values of sick companies and non-sick companies throughout five years prior to the year of sickness.

Dichotomous Classification Test

The statistical mean difference of ratios fail to reveal the predictive power of cash flow ratios. Hence the dichotomous classification test was applied. In this test, for each ratio, an array was constructed, and the ratio values of sick and non-sick companies were put in the respective array. By visual inspection, the optimum cut-off point was ascertained for each ratio. Calculation was made to find out the correct classification of each ratio for a period of five years prior to sickness. The percentage error for sixteen cash flow ratios on dichotomous classification is presented in table 6.

The dichotomous test also illustrates the superiority of traditional cash flow ratios over the operating cash flow ratios in predicting the corporate sickness. The classification accuracy range of TCF ratios is between 86 percent and 98 percent whereas the OCF ratios have an accuracy range of 70 percent to 89 percent one year prior to sickness. The test also shows that traditional cash flow to net worth possesses the highest predictive power with 98 percent accuracy. In the first year prior to sickness the classification error of traditional cash flow to net worth (TCF/NW) is only two percent, which is the lowest compared to the error percentage of other ratios. Similarly, in

Table 4: Mean Values of Cash Flow Ratios for Five Years Prior to Sickness

	Mean Value									
	One year		Two year		Three year		Four year		Five year	
	S	N.S	S	N.S	S	N.S	S	N.S	S	N.S
TCF Ratios										
TCF/TA	-0.1008	0.0966	-0.0779	0.0985	-0.0203	0.1145	0.0011	0.1244	0.0428	0.1337
TCF/TL	-0.0788	0.1573	-0.0688	0.1660	-0.0167	0.1944	0.0093	0.2249	0.0570	0.2292
TCF/NS	-0.1407	0.0684	-0.0776	0.0710	-0.0931	0.0837	-0.0901	0.0907	0.1161	-0.1377
TCF/NW	-1.8647	0.3303	-1.1843	0.2079	-1.8852	0.3460	-0.4097	0.3786	0.1915	0.3905
TCF/CA	-0.2442	0.1598	-0.1617	0.1597	-0.0928	0.1832	-0.0182	0.2097	0.0950	0.2342
TCF/CL	-0.1337	0.2235	-0.1233	0.2192	-0.0453	0.2419	0.0072	0.2947	0.0883	0.2680
TCF/INT	-0.7394	7.0148	-0.6333	10.0941	-0.1009	8.3218	0.1856	6.4421	0.6705	9.1765
TCF/TK	-0.7923	0.9523	-0.4299	0.5392	-0.0234	0.9233	0.1600	0.9989	0.4449	1.0312
OCF Ratios										
OCF/TA	-0.0131	0.0871	-0.0436	0.0343	-0.0308	0.1077	-0.0012	0.0985	0.0283	0.0774
OCF/TL	-0.0065	0.1406	-0.0353	0.0580	-0.0315	0.1785	-0.0011	0.1671	0.0326	0.141
OCF/NS	-0.0185	0.0567	-0.0215	0.0116	-0.0847	0.0729	-0.1558	0.0742	-3.0448	-0.143
OCF/NW	-2.1127	0.3001	-0.5161	-0.1204	-2.2639	0.3681	0.0075	0.2961	0.1828	0.158
OCF/CA	-0.0355	0.1579	-0.1054	0.0582	-0.1200	0.1613	-0.1349	0.1590	-0.0743	0.138
OCF/CL	-0.0352	0.2067	-0.0757	0.0872	-0.0816	0.2096	-0.0422	0.1977	-0.0490	0.160
OCF/INT	-0.0145	6.9164	-0.1504	10.6395	-0.5423	6.7688	-0.1352	5.2806	0.6877	4.229
OCF/TK	-0.0002	0.7732	-0.4031	0.0729	-0.2312	0.8298	0.0799	0.7336	0.2733	0.664

S Denotes sick companies

N.S Denotes non-sick companies

Table 5: T-Values of Cash Flow Ratios for Five Years Before Sickness

	One year	Two years	Three years	Four years	Five years
TCF Ratios					
TCF/TA	8.2727	7.7804	8.3513	7.0139	3.6697
TCF/TL	8.1366	7.9208	8.3243	7.6493	4.1121
TCF/NS	5.1770	2.9137	5.3198	4.0926	0.8924
TCF/NW	3.0352	4.7778	1.9850	3.2391	2.1378
TCF/CA	5.3676	7.0112	7.0107	4.7857	2.2356
TCF/CL	6.4333	6.3002	7.1332	5.6979	3.1286
TCF/INT	1.5706	2.0063	2.2180	3.1785	2.1790
TCF/TK	8.3918	3.5627	7.1160	6.7948	3.4235
OCF Ratios					
OCF/TA	2.7227	2.4777	5.1960	3.0986	1.7318
OCF/TL	3.3533	2.4292	5.2333	3.2346	2.3564
OCF/NS	2.5506	0.4016	3.9587	1.9417	1.0454
OCF/NW	2.6999	0.4205	2.1037	1.3033	0.2072
OCF/CA	2.2014	3.1322	4.9863	2.8064	1.7030
OCF/CL	3.1733	2.8909	5.9000	3.1962	2.0762
OCF/INT	1.3130	1.3696	2.0426	2.4175	1.9766
OCF/TK	2.2727	1.2446	3.4040	2.4724	1.3665

Table 6: Percentage Error for Sixteen Cash Flow Ratios on Dichotomous Classification Test

Ratio	Year before sickness				
	1	2	3	4	5
TCF Ratios					
V1 TCF/TA	14	16	22	28	39
V2 TCF/TL	14	16	22	28	39
V3 TCF/NS	14	18	21	29	38
V4 TCF/NW	2	10	23	29	39
V5 TCF/CA	14	16	22	29	49
V6 TCF/CL	14	16	22	28	40
V7 TCF/INT	14	16	22	28	39
V8 TCF/TK	12	29	22	24	33
OCF Ratios					
V9 OCF/TA	30	38	27	39	46
V10 OCF/TL	28	38	27	38	41
V11 OCF/NS	31	36	28	37	42
V12 OCF/NW	11	24	23	33	40
V13 OCF/CA	31	37	28	40	43
V14 OCF/CL	28	39	26	41	43
V15 OCF/INT	29	39	27	38	44
V16 OCF/TK	28	34	26	38	40

OCF ratio group the operating cash flow to net worth ratio possesses the highest predictive power with 89 percent accuracy in classifying sick companies from the non-sick ones.

Traditional cash flow to net worth possesses the highest predictive power.

Table 7: Paired Sample of Sick and Non-Sick Companies

Sick Companies	Year of Incorp.	Year of Sickness	Capital Base, 000	Non-Sick Companies	Year of Incorp.	Year of Matching	Capital Base, 000
Raghuvansi Mills Ltd.	1929	1983	34492	Sutlej Cotton Mills, Ltd.	1934	1983	35575
The Hukumchand Mills Ltd.	1914	1984	51560	Ruby Mills, Ltd.	1917	1984	50240
Cawnpore Textiles, Ltd.	1920	1985	33816	Rajapalayam Mills Ltd.	1936	1985	34150
Himachal Worsted Mills, Ltd.	1974	1983	20361	Jawahar Mills Ltd.	1937	1983	17230
L.D. Textiles Industries Ltd.	1965	1986	40293	Modern Suitings, Ltd.	1977	1986	52027
Mayur Syntex, Ltd.	1979	1987	68519	Bombay Silk Mills, Ltd.	1945	1987	79751
The Agarpara Co. Ltd.	1927	1977	9400	Anglo-India Jute Mills Co. Ltd.	1917	1977	11221
Central Pulp Mills, Ltd.	1960	1985	171251	National Newsprint & Paper Mill, Ltd.	1947	1985	229322
Pondichery Papers, Ltd.	1974	1983	39671	Rollainers, Ltd.	1968	1983	38398
Coastal Papers Ltd.	1974	1983	45727	Ajay Paper Mills Ltd.	1973	1980	9515
Madhya Pradesh Electricals, Ltd.	1972	1979	18940	Punjab Anand Batteries, Ltd.	1972	1979	16829
Globe Auto Gujarat, Ltd.	1974	1981	4372	Electra (India), Ltd.	1971	1981	5096
Premier Cables Co., Ltd.	1962	1984	83036	Industrial Cables (India) Ltd.	1955	1984	88997
Galada Continuous Castings, Ltd.	1972	1984	5229	Stovec Screens India, Ltd.	1973	1984	8655
Chase Bright Steel Co., Ltd.	1959	1985	67396	Cominco Binani Zinc, Ltd.	1962	1985	88221
Triton Valves, Ltd.	1975	1983	14033	B.D. Steel Castings, Ltd.	1972	1983	12927
Indian Bright Steel Co., Ltd.	1960	1981	7229	Mohta Industries, Ltd.	1972	1981	6496
United Wire Ropes, Ltd.	1960	1982	5531	Mahatta And Heckel, Ltd.	1962	1982	6469
Maharashtra Electro Smelt, Ltd.	1974	1983	147108	Ferro Alloys Corp., Ltd.	1955	1983	162811
Shriram Bearings, Ltd.	1960	1985	17291	San Engg. & Locomotive C. Ltd.	1969	1985	20590
Amcol Tools, Ltd.	1947	1981	20380	Kunal Engg. Co., Ltd.	1956	1981	22505
Lynx Machinery, Ltd.	1960	1980	11412	Gujarat Machinery Manufactures Ltd.	1962	1980	12265
Hada Steel Products, Ltd.	—	1983	3223	G.G. Dandekar Machine Works Ltd.	1939	1983	4461
J.K. Satoh Agricultural Mach. Ltd.	1969	1983	15532	Maharashtra Scooters, Ltd.	1975	1983	18674
Andhra Pradesh Scooters, Ltd.	1974	1980	22098	Mcnally Bharat Engg. Co., Ltd.	1961	1980	24227
Calcutta Chemicals Co., Ltd.	1916	1982	4146	Terpene Industries, Ltd.	1972	1982	6477
East Anglia Plastics (India), Ltd.	1946	1980	28651	BASF India, Ltd.	1943	1980	27086
Kutch Salt & Allied Indu. Ltd.	1950	1984	4381	Indian Plastics, Ltd.	1944	1984	8227
Tamil Nadu Chromates & Chem, Ltd.	1972	1983	25264	United Carbon India, Ltd.	1962	1983	27963
Gujrat Aromatics, Ltd.	1975	1983	123110	Rallies India, Ltd.	1948	1983	120931
Mysore Acetate & Chem. Co. Ltd.	1963	1981	78661	IDL Chemicals, Ltd.	1961	1981	84447
Raj Prakash Chemicals, Ltd.	1973	1984	26475	Bharat Chemicals & Pert., Ltd.	1977	1984	29700
Cawnpore Sugar Works, Ltd.	1894	1984	78552	Britania Industries, Ltd.	1978	1918	91875
Rajasthan Vanaspati Products, Ltd.	—	1984	3908	The Bhopal Sugar Industries Ltd.	1943	1984	9713
Sathe Biscuits & Chocolates Co. Ltd.	1949	1984	1879	Hoogly flour Mills, Co., Ltd.	1911	1984	2700
Indo Lowenbrau Breweries, Ltd.	1970	1980	24042	Tulsipur Sugar Co., Ltd.	1959	1980	22641
Nizam Sugar Factory, Ltd.	1973	1984	280563	Tata Oil Mills Co., Ltd.	1917	1984	155192
Sri Chamundeswari Sugars, Ltd.	1970	1984	60803	Hindustan Cocoa Products, Ltd.	1948	1984	69769
Dempo Dairy Industries, Ltd.	1975	1984	31673	Laxmi Starch, Ltd.	1945	1984	38312
Usha Oil Udyog, Ltd.	1977	1984	8881	Corn Products Co. (India), Ltd.	1931	1984	9738
Premier Tyres, Ltd.	1959	1981	59887	MRF, Ltd.	1960	1984	56355
Apollo Tyres, Ltd.	1972	1981	306975	Dunlop India, Ltd.	1926	1981	322213
The Mysore Lac & Paint Works, Ltd.	1947	1984	4294	Garware Paints, Ltd.	1937	1984	18689
Panyam Cement & Mineral Ind. Ltd.	1955	1987	180222	The India Cement, Ltd.	1964	1987	212560
A.R.C. Cement, Ltd.	1978	1987	43958	Deccan Cement, Ltd.	1979	1987	54280

Findings

The study reveals the following:

- Fourteen out of sixteen cash flow ratios have the ability to discriminate the sick companies from the non-sick ones.
- There is a relative difference in the discriminating power of cash flow ratios.
- Cash flow ratios could provide the signals of survival of failure of companies at relatively higher degree of accuracy.
- The cash flow ratios belonging to TCF group have more differentiating and predictive power than ratios belonging to OCF group.
- The classification accuracy range of TCF group ratios is higher than those of OCF group ratios one year prior to sickness.
- Cash flow to interest ratio both under TCF and OCF group is found to be insignificant, thereby implying the fact that, debt servicing is not important in differentiating between the sick and non-sick companies.
- Cash flow ratios should be observed together and not independently for best results as detectors of sickness.
- A study of cash flow ratios for a shorter period e.g. less than 5 years before failure may not reveal the detective ability of the ratios.

Managerial Implications of Cash Flow

When a company fails to generate sufficient amount of cash, it finds itself in financial crisis. In such situations cash becomes scarce, outside source of fund dries, internal ones seem inadequate to cover current needs, lenders becomes nervous, employees are frightened and suppliers are worried about not getting paid. Even members of the board of directors look for excuses resign.

At this juncture, in order to enhance the cash flow it becomes necessary to evolve a suitable cash policy in the company. In this connection, different avenues of restricting the outflow and increasing the inflow, should be found out. This also calls for a change of production, marketing and advertising, dividend policies etc. In such situations a suitable cash policy ensures of a satisfactory level of cash, so that the paucity of cash will not disrupt the business.

How to Overcome Cash Flow Crisis

A cash crisis is not a fundamental problem. Rather it is a sign that something else has gone wrong. A company may be having more than one problem at the same time — bad product, marketing, regulatory, public perception and other crisis. But ultimately it all comes down to cash. In such a situation, the company has hardly and needs plenty of cash. Often a company not only comes down to zero cash balance but also negative balance. Sometimes for a short while it may be flushed with cash which dries up later. In a situation of cash crisis, what usually follows is the most critical phase: financial failure as the cash runs out, panic and collapse.

A cash crisis is not a fundamental problem. Rather it is a sign that something else has gone wrong.

Here are some clues to get rid of the situation, because managing a cash flow crisis is basically an exercise of buying time.

The first thing to do is to find cash, protect it, enhance it and control its flow. Try to increase the inflow and restrict the outflow. Do it personally. Uncover the pools of cash which have not been tapped. Look into the payment terms which have been extended to the customers, try to shorten them. Start with the most favoured customers who have got your sales people agree to sweet terms-cutting down their payment terms from sixty to thirty days will buy a month's cash.

Take the opposite approach with suppliers. Tell them straight and bluntly where things stand and try to lengthen your payment terms e.g. lengthening the payment from fifteen days to forty five days will buy you one month's respite. Collection of cash in a decentralised manner and payment of cash in a centralised manner would ensure quick inflow and late outflow of cash. In addition to these, try to dig deep into the corporate structure to find other sources of cash. Look for worthwhile but idle and non essential assets that can be sold. Stop, slow or postpone cash draining programmes; know how much cash is on hand at all times, how much would be spent soon and what would be the remaining level. Thus insist on continuous monitoring of cash, and be prepared to take action if cash starts to slip out of control.

Once you take control of cash the next step is to locate the cash bleeders i.e. the cash consuming, non-es-

sential operations. Then try plug the points where you are bleeding the worst. Thus by controlling and monitoring the cash wastages, you would be able to have a firm grip on the cash outflow system.

Once you take control of cash the next step is to locate the cash bleeders i.e. the non-essential operations.

After trying to gain control over the cash outflow system, the next thing is to close down few worst cash drains. You will hear all sorts of objection. It would not be easy for you. But do not listen. Close the cash drains to rebuild your business.

After closing cash drains it would be crystal clear for you to find out your core business which should be enhanced. At the same time try to tap some unrecognised cash products which are to be promoted. While doing so think in terms of cash and only cash, because reporting profit is not important at cash crisis stage, because it is cash that keeps you alive.

Now it is time for a short range plan, look to the next ninety days. Forget strategic concern; figure out how you are going to make it to the end of this month, and when you get there, the next one and the next. If you survive this period, try it again. Little by little, as you accomplish your plans, you will prove your staying power, by doing so you would confound those who expect to write you off. Once things are partially established, then prepare a longer plan and prepare to sell it to your team members.

After implementing the strategic short range plan, it would be wise on your part to raise cash from new sources which till now have not been tapped. It would be a vital step to move ahead and to take a new lease of life. Try to raise a loan with a banker/financier who is familiar with your operation. If the plans are convincing, it would

not be impossible. Try to do this seriously, even if you have to relinquish some control of your management or sacrifice some independence. This would relieve you from day to day scrounging around to ensure mere survival.

If you have progressed through the preceding steps, then you are poised to pick up some momentum. Because by now the worst is actually behind you. In this connection, it would be right to conclude that, "Past days are always good", because they are passed. Now you have to start shedding the "loser" image, and try to meet your obligation as scheduled. This would project yourself as one who has successfully accomplished a turnaround.

After turning around, project your company as a survivor to your own employees as well to shareholders, lenders and the media. Develop a winner's attitude in public. Proclaim your Company as a new, reborn outfit with a mission and vision of the future.

The next step is to report a small and honest profit. It should not be a one-time occurrence, it will have to be followed by other such reports. Then only can you relax your concentration on cash and begin to plan for the future.

References

- Altman, E.I.** (1968), *Corporate Financial Distress: A complete guide to predicting, Avoiding and dealing with Bankruptcy*, John Wiley and Sons, U.S.A.
- Casey, C.J. & Bartczak, N.J.** (1984), "Cash Flow — It's not the Bottom Line", *Harvard Business Review*, July-August.
- Gale, B.T. and Branch, B** (1981) "Cash Flow Analysis: More Important than Ever". *Harvard Business Review*, July-August.
- Geantry, J.A., Newbold, P & Whitford, D.T** (1985), "Predicting Bankruptcy: If cash flow's not the bottom line what is? *Financial Analysts Journal*, Sept. - Oct.
- Gupta, L.C.**, "Financial Ratios for signalling corporate failure", *The Chartered Accountant*, Vol XXXI, No-10 April, 1983.
- Sahu, P.K. & Panigrahy, D.** (1993), *Cash Flow As Detector and Predictor of Corporate Sickness*, Kanishka Publishers, Distributors, Delhi. □

Organization as a Laboratory for Learning

P.N. Rastogi

Flexible organization structure, culture of productivity and excellence, and creative human resources, are the complementary facets of the basic organizational capability of an industrial enterprise. The organizational capability of a company is the necessary condition for supporting and sustaining the development of its technological capabilities. The common conceptual denominator of both the organizational and technological capabilities is however, the process of organizational learning and continuous improvement. The author delineates the need for and the steps involved in transforming an organization into a laboratory for learning.

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Continuous improvement requires and engenders learning. Developing a product, inventing a process, evolving a technique, enhancing the efficiency of an operation, and solving a technological problem, involve learning and the use of knowledge. In the absence of new knowledge and learning, individuals and organizations can only repeat old practices. Organizations have to recognize the basic link between learning and continuous improvement, and refocus themselves around it. Organization learning relates acquisition of knowledge to improved performance. The latter, in turn, generates new contexts for learning

Learning occurs if through its processing of information and generation or accumulation and use of knowledge, an organization's capabilities are enhanced, and its range of potential behaviour is changed. Learning goes beyond an accumulation of formal knowledge. It creates or enlarges capacities for intelligent action(s). It is engendered by outside competition and improvement over prior performance. It is stimulated by lofty goals that stretch the existing resources and performance capabilities of an enterprise.

What is a Laboratory for Learning?

A laboratory for learning is a learning organization. Learning organizations are places "where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together" (Senge, 1990). To achieve these ends the use of five "component technologies" is needed: Systems thinking, personal mastery, mental models, shared vision, and teamwork. Learning organizations are 'knowledge-creating companies'. They are places where "inventing new knowledge is not a specialized activity — it is a way of behaving, indeed, a way of being, in which every one is a knowledge worker" (Nonaka, 1991). Such companies use metaphors, and organizational readiness to focus

A learning organization is a holistic system that integrates problem solving, internal knowledge, innovation, experimentation, and external information.

thinking, encourage dialogue, and make tacit, instinctively understood ideas explicit.

In a learning organization, activities and operations are oriented toward the creation, collection, and use of knowledge. The managerial practices and underlying cultural values of such an organization constantly renew and support the processes of knowledge and learning. A learning organization is a holistic system that integrates problem solving, internal knowledge, innovation, experimentation, and external information. It is "skilled at creating, acquiring, and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights" (Garvin, 1993). Learning organizations are effective not only at creating and/or acquiring new knowledge, but also in applying that knowledge to their own tasks and activities. Rapid realization of new technology into products is a core competency of a learning enterprise.

In a learning organization, the nature of one's job at any time is defined by the problems and challenges facing the organization as a whole. It combines concern and respect for persons with high expectations of performance from them. It is characterized by a wide distribution of information throughout the system, and its rapid diffusion across horizontal levels. Wide and open flow of information in the company promotes equality of relationships and mutual interaction among its people, and facilitates informal systems of sharing knowledge.

Bases of Organizational Learning

Organizations acquire knowledge from both internal and external sources. They require it for use in both current and future tasks and operations. In terms of these sources and uses of knowledge, the bases of organizational learning i.e., creation and control of knowledge may be seen to be consisted of the following five critical categories of activities:

- Problem-solving relating to current operations
- Integration of internal knowledge across functions, projects, and programmes
- Development of technology to build for the future

- Innovation and experimentation toward improved structures, policies, methods, procedures, and decision-making
- Monitoring of environment and integration of external flows of information.

All of the above five categories or sub-systems of knowledge are distinct. Each has its own primacy of focus. All of them are however, meaningfully interrelated across the entire spectrum of enterprise operations. They need to be mutually aligned and effectively coordinated toward designing a learning organization. It is their planned alignment and coordination toward facilitating the achievement or organizational goals, that distinguishes an organization as a laboratory for learning.

Skills Needed by Learning Organizations

Learning organizations need to be skilled in five main activities (Garvin, 1993):

Systematic problem solving

For this, among other things employees need to be provided tools in four areas as in Xerox company

- Generating ideas and collecting information (brainstorming, interviewing, surveying)
- Reaching consensus (list reduction, rating forms, weighted voting)
- Analysing and displaying data (cause-and-effect diagrams, force field analysis), and
- Planning actions (flow charts, Gantt charts).

These tools need to be applied to real problems by business-unit teams.

Experimentation with new approaches

This activity essentially involves the systematic searching for, and testing of new knowledge, through the use of the scientific method. It is usually motivated by opportunity and expanding horizons, not by current difficulties or problem solving. It may involve stages of knowledge from superficial to deeper understanding, from knowing how (standards of practice, and settings of equipment) to knowing why in terms of underlying cause-and-effect relationships; and interpreting exceptions, adaptations, and unforeseen events.

Learning organizations need to be skilled in five main activities.

Operating knowledge, for example, can be depicted in a hierarchy, moving from limited understanding and the ability to make few distinctions to more complete understanding in which most or all contingencies are anticipated, and controlled. Experimentation and problem solving foster learning by upgrading knowledge from the lower to the higher stage.

Learning from Own Experience & Past History

This implies that companies review their successes and failures, assess them systematically, and record the lessons in a form that employees find accessible. It requires a mind-set that enables companies to recognize the value of productive failure as contrasted with productive success.

Learning from the experiences and best practices of others

This involves 'benchmarking' among other things. Benchmarking refers to investigating and learning from the best industry practices after a careful study on one's own practices and performance. It involves uncovering, analysing, adopting, and implementing such practices.

Transferring knowledge quickly and efficiently throughout the organization

Knowledge and ideas have maximum impact when they are shared broadly. Transferring knowledge is best done through teaching the behaviour needed and creating opportunities for actively experiencing things. Knowledge is more likely to be transferred when the right incentives are in place. If managers and employees see new ideas as being in their own best interest, their motivation to accept and adopt them will be high.

Three Stages of Learning

Organizational learning can usually be traced through the following three overlapping stages (Garvin, 1993).

The first stage is cognitive wherein the members of the organization are exposed to new ideas/concepts/insights, expand their knowledge, and begin to think and look at things differently.

The second stage is behavioral. At this stage, employees begin to internalize new insights and alter their behaviour.

The third stage relates to performance improvement with changes in behaviour. The changes lead to

measurable improvements in results with tangible gains.

For becoming a learning organization, a company must however, know the concrete changes required in behaviour, and the programs and policies that must be in place. It must know how to get from here to there.

Building a Learning Organization

Changing an organization into a laboratory for learning requires sustained purposive effort. It needs to be designed, created, maintained, and strengthened continuously through communication of values and vision; the checking of policies, structure, methods, and procedures for congruence and consistency; and above all the adoption of holistic systems thinking. Such an effort moreover, must embrace every level of the organization with a focus on interrelationships, not things; processes, not descriptions and patterns, not details.

Changing an organization into a laboratory for learning requires sustained purposive effort. It needs to be designed, created, maintained, and strengthened continuously through communication of values and vision.

Transforming an organization into a laboratory for learning is a process of gradual and cumulative development. It involves careful and sustained efforts whose results may unfold slowly over time. A useful beginning in this direction can however, be made through the following three steps (Garvin, 1993):

Fostering an open and supportive environment conducive to learning by providing employees time and facilities for reflection and analysis, training in and cultivation of problem-solving skills, participation in and autonomy of work teams/groups.

Stimulating the exchange of ideas, ensuring fresh flow of ideas, and providing the opportunities for consideration of competing perspectives. This necessitates the loosening and removal of internal organizational boundaries which inhibit the flow of information. It also involves the creation of horizontal structures for communication and sharing of ideas across the organization. Some of the devices that can be used for this purpose are conferences, meetings, and project teams. These devices may cross

organizational levels, or link the company and its customers and suppliers.

Creating 'learning forums' i.e., programs and events designed with explicit learning goals in view. These programs and events can take a variety of forms: Strategic reviews which examine the changing competitive environment and the company's product portfolio, technology, and market positioning provide an important forum for learning. System audits which review the working and coordination of important cross-functional processes and delivery systems provide another such forum. Other possible forums include internal benchmarking reports, study missions to leading worldclass organizations, and symposiums which bring together customers, suppliers, external experts, and internal groups, for mutual learning and sharing of ideas. These 'forums' foster learning by requiring employees to confront new ideas, competing perspectives, hidden issues and their implications.

The foregoing steps help build a learning organization by reducing and eliminating impediments to learning, by creating and promoting the knowledge sharing systems, by creating commitment to learning for improvement, and moving the acquisition, production, and use of knowledge toward the top of the organizational agenda.

In the context of changing toward a learning organization, a company may create and use the following structures and devices:

Structures & Devices for Organization Learning

- Cross-disciplinary teamwork
- Organization wide collaboration through various forms of small group activities.
- Removal of internal barriers through cross-functional integration or process-based management.
- Redefinition of the firm's outer boundaries to include suppliers, customers, and strategic alliance partners as insiders, and tapping them systematically for ideas and insights.
- Effective feedback and performance measurement systems which deliver strategically relevant information in real time.
- Benchmarking of best practices, not only of the direct competitors, but also of anyone from whom something useful can be learned or adopted.
- Training and deployment of the firm's 'environment interface' personnel (delivery, sales repair,

and market research etc;) as sources of customer feedback and market information.

- Strategic use of temporary personnel assignments and rotations between business units, and with suppliers, customers, and strategic alliance partners.
- Travel by "lower level" workers as a conscious learning too both to benchmark competitors, and to enhance morale, and the systematic sharing of results with coworkers upon return.
- Extension of training concept to include life-long learning for everyone, with stress on group learning experiences.
- Focus on practices likes TQM and JIT including Kaizen.
- Spectrum of activities and structures encompassed by the management of technology.

And so on.

Uncovering Assumptions

Besides the foregoing structures and devices, the concept of organization learning goes deeper toward uncovering and evaluating the implicit and unstated assumptions about the firm, and its business environment. Such assumptions though seldom scrutinized, often govern the firm's behaviour in important ways. They can range from geopolitical judgement ("Russia is too politically unstable to do business with") to consumer evaluation ("Americans and W. Europeans will never buy cheap Korean cars."). Organizational learning is more than simply acquiring new information, insights, and knowledge. It also involves unlearning old views, rules, ideas, and standards when they have lost their relevance. Organizational learning is concerned with exposing and obliterating obsolete assumptions, and reducing the discrepancies between external reality, and internal mental maps of the firm's decision-makers.

Organizational learning is more than simply acquiring new information, and knowledge. It also involves unlearning old views, rules, and standards when they have lost their relevance.

The overall thrust and direction of organization learning is toward converting a company into a knowledge-

based enterprise i.e., one which accumulates (observation and feedback), generates (innovation and problem-solving), and uses (decision and actions) knowledge as a high value resource in its steering and competitive strategy.

Deeper Loops of Learning

Organizations need to engage in systematic learning about their internal and external realities toward generating knowledge for problem-solving. Learning may be of two types: Single loop and double loop (Argyris & Schon, 1978). Single loop learning occurs as organizations compare their performance to a set of pre-established standards, and try to make appropriate adjustments. Successful firms accomplish this procedure of performance improvement based on learning, very well. Double loop learning, on the other hand, requires that enterprises periodically reassess their valuation standards and premises themselves. Such a reassessment is vitally important for ensuring that the operating standards and premises remain valid and relevant, and that the decision-makers do not become trapped into fixed mindsets. Double loop learning is a difficult and disturbing process, because the old standards and assumptions become closely tied to managerial goals, expectations, and world views. Their re-appraisal often does not lead to a challenging re-evaluation in the light of emerging signals, new conditions, and current developments. The exercise only results in their refinement and reinforcement. Failure to accomplish double loop learning tends to make the current mindsets more narrowly focused and fixed, and thence increasingly out of sync with emerging reality.

Firms therefore need to consciously organize themselves as "laboratories for learning". They should make systematic efforts toward mapping, challenging, and improving the mental maps that their people use to see, understand, and act on the dynamic complexity all around them (Senge, 1990).

Japanese Firms' Focus on Knowledge

A key dimension of the emerging new business strategy of Japanese companies is their focus on knowledge as the determinant of success in global economic competition. They cultivate leadership in all important knowledge areas: technology, marketing, organization, management, training, and firm control of "brain capital" (Drucker, 1993). To gain access to new knowledge, Japanese firms are making substantial investments in U.S. and European companies, as well as,

financing research in Western universities. *Every major Japanese industrial group has also developed its own research institute, whose main function is to bring to the group knowledge of new developments in technology, management, marketing, finance, and training all over the world.* Mitsubishi group for example, plans to be restructured around its research institute within next two decades (Drucker, 1993). Such a restructuring represents a radical departure from the existing pattern. Hitherto all major industrial groups in Japan have been organized around the group's bank or trading company.

Knowledge as the Most Basic Economic Resource

The concept of corporation as a "laboratory for learning" is basically related to the fact that *knowledge constitutes the most basic economic resource today.* Its importance far exceeds that of the capital or raw materials. Technology, for instance, is essentially knowledge or knowhow only. Productivity and innovation similarly represent basically the application of knowledge to work. Globally competitive firms are those which have the insight and foresight to mobilize and allocate knowledge to new productive uses. Organizational learning as the means of acquiring and generating knowledge and skills (i.e., operational knowledge) thence becomes a key internal driver of the externally focused enterprise strategy.

Globally competitive firms are those which have the insight and foresight to mobilize and allocate knowledge to new productive uses.

Factors such as cost and quality which were once the source of commanding competitive advantage, have been reduced to being the mere minimum entrance requirements for staying in the global competitive game. Organization learning thus has the crucial and continuing responsibility for capitalizing on knowledge as the source and base of a leading competitive edge. "The rate at which individuals and organizations learn may be the only source of sustainable strategic advantage" (Stata, 1989). Organizational knowledge and learning may thence replace control as the major concern, and the basic test, of apex level management and leadership.

"In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage

is knowledge. When markets shift, technologies proliferate, competitors multiply, and products become obsolete virtually overnight, successful companies are those that consistently create new knowledge, disseminate it widely throughout the organization, and quickly embody it in new technologies and products. These activities define the knowledge-creating company, whose sole business is continuous innovation" (Nonaka, 1991).

Successful companies are those that consistently create new knowledge, disseminate it widely throughout the organization, and quickly embody it in new technologies and products.

The fundamental thesis here is that firms will be differentiated by their ability to leverage knowledge and intellect in creating greater value, than by an exclusive focus on exploiting their physical assets and skills.

References

- Argyris, C. & Schon, D., (1978). *Organizational Learning*, Addison-Wesley, Reading, MA.
- Drucker, P., (1993). *Managing for the Future*, Tata McGraw-Hill, New Delhi.
- Garvin, D., 'Building a Learning Organization', *Harvard Business Review*, July-August, 1993.
- Nonaka, I., 'The Knowledge-Creating Company', *Harvard Business Review*, Nov.-Dec., 1991.
- Rastogi, P.N. 'Global Competitiveness: Lessons for Industrial Enterprises', *Productivity*, Vol. 34, No. 3, 1993.
- Senge, P., (1990). *The Fifth Discipline*, Doubleday, New York.
- Stata, R., 'Organizational Learning — the Key to Management Innovation'. *Sloan Management Review*, Spring 1989. □

Crosby on How to be a Centurion

- *Implement the 'principles of completeness'.*
Cause employees, suppliers, and customers to be successful.
- *Adopt a 21st century management style.*
Plan and create something so well that it is immediately becomes effective.
- *Avoid 'my way' management.*
Arrogant managers reduce the possibility that really good people will ever join the organization.
- *Make employees successful.*
Realize that people are the most critical asset to success.

Biotechnology Research in India: A Policy Framework

S. Suresh Kumar & Ashok Pandey

Biotechnology is one of the most promising technologies with tremendous potential to contribute to the welfare and prosperity of mankind. It necessitates the development of complementary capabilities to enable transformation of scientific knowledge into new products and processes on commercial basis. This paper dwells on a few policy imperatives to be considered when formulating S & T framework for developing countries like India.

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Biotechnology can be defined as the use of biological organisms or their constituents, such as cells and DNA, for the transformation of inputs into commercial outputs. It involves the conversion of various raw materials into a variety of products through biological transformations. The potential of such new technologies can be enormous and would extend not only to agriculture (biotechnological advances through tissue culture for enhancing and improving the base for food) and livestock development (substrate enrichment through fermentation technology with particular emphasis on solid state fermentation) but also to various industrial sectors and processes, including pharmaceuticals, food industries, speciality chemicals and additives, environmental applications, commodity chemicals, energy production and bio-electronics.

The potential of new technologies would extend not only to agriculture and livestock development but also to various industrial sectors and processes.

Biotechnology for LDCs

In terms of economic infrastructure countries can be classified as industry-based or agriculture-based. As far as biotechnology is concerned, each country may be located at a point in a three dimensional coordinate system with the degree of industry base as an abscissa coordinate, the degree of agriculture-base as another abscissa coordinate, and the degree of technology development as the ordinate. Countries such as Japan, Korea and China are recognised as industry-based countries while India which heavily depends on agriculture (although a considerable amount of industrial

products are exported) is classified as agriculture-based country.

We will begin our analysis with the implications of biotechnological product diffusion for the less developed countries (LDCs) like India, classified as an agriculture-based country, although substantial S & T and industrial infrastructure are available. While biotechnological developments are mostly in various stages of advanced research and testing, several biotechnology based products have already begun to be marketed in LDCs. A great deal of biotechnological research has been concentrated on human health applications, particularly for serious illness. Diagnostic kits developed from monoclonal antibodies were among the first such products. Several other products are in various stages of testing and approval like High Fructose Corn Syrup (HFCS) produced with the use of immobilized enzymes, and microbially produced sweetener, Aspartame which is being increasingly substituted for sugar. The production of edible oils like palm oil has been increased by 30 per cent (in terms of yield per year) as a result of the cloning of the palm oil plant. At the same time there are parallel developments with implications for the commodity based economy of the developing world. Production of rare plants in industrialized countries which were produced only in developing countries is an example; varieties of plants like schikonin having medicinal properties and which were produced mainly in China and in the Republic of Korea are now being produced in bulk through tissue culture techniques in Japan by the Mitsui group. This is bound to affect the commodity exports from the developing countries. Genetic engineering is also being used to develop new plant varieties that are suited to the temperate climate of developed countries. One well known example is the development of so-called Ice-minus organisms, for tomato cultivation in cold climates, thus wresting of advantages based on climate based produce. A developing country like India, with its S & T infrastructure can always capitalise on such developments besides initiating some suitable innovations.

Biotechnology is more knowledge intensive than capital intensive. Yet, there are significant economies of scale in marketing and distribution. For this reason, new biotechnology firms even in the developed world have to enter into agreements with larger companies like Trans National Companies (TNCs) for the marketing of their biotechnology-based products. Generally, most of the research and technological skills come from rather small firms and the large firms have developed substantial capabilities on production and marketing of biotech-

nological products, though this need not always be the rule. Needless to say LDCs like India, with their developments in infrastructure would have to depend on TNCs for a long time to come not only for the effective marketing of products from indigenous R & D but also for technology transfers in advanced areas like agro-chemicals and pharmaceuticals etc., because of the resource commitment required. But LDCs with adequate S & T infrastructure can nevertheless reap benefits from such opportunities.

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Features of Biotechnology

The development of bioindustry greatly depends on new knowledge and new technologies in the area of life sciences, applied chemistry, process engineering, and mechanical and computer sciences. It would be difficult for a single company to cover such a broad area. This necessitates the cumulative efforts of academic institutions, industries, and the government. International collaboration generally brings better benefits. For the LDCs, biotechnology offers both threats and opportunities. The threats are posed by the possible substitution of new products for the traditional ones which may be the major source of income. A typical example is the increasing use of new sweeteners which is posing a threat to the sugar industry. On the other hand, several new opportunities may arise. It, however, would largely depend on the technological capabilities of LDCs to reap the benefits arising out of these opportunities. Obviously, the commercial development of biotechnology depends on the national level of science and technology together with other local factors.

The biotechnology industry is characterized by a wide range and diversity of the products ranging from low-value commodity chemicals to high-priced therapeutics. The products of biotechnology industry can be classified as in table 1 (Yoshida, 1990)

While the first two categories figure mostly on low-technology industrial agenda, policies need to be formulated in respect of the last two categories particularly in

regard of research-industry linkage and technology management strategies.

Table 1: Classification of Biotech. Products

Category	Example
High volume and low value	Ethanol, biomass for animal feed, effluent treatment
High volume and medium value	Organic acids, amino acids, baker's yeast, polymers for food industry
Low volume and high value	Antibiotics, enzymes, vitamins
Small volume and very high value	Hormones, lymphokinase, monoclonal antibodies

Implications of Regulatory Aspects

The issue of the regulation is probably more important in the area of biotechnology than in other industrial fields because biological organisms, which constitute the basic elements of biotechnology, interact in complex ways with the biological eco-systems of which they form a part. Accordingly, adequate care must be taken to ensure that biotechnology related activities do not produce negative external effects on society. An example was the approval by the US Department of Agriculture (USDA) for marketing of a genetically altered virus. In April 1986, USDA had to review its approval process because of widespread public criticism (Stewart, 1991). As a result, the developed world will eventually take recourse to product testing and trial marketing in developing countries, through various arrangements. LDCs can capitalise on this opportunity through foresight and positive planning.

Adequate care must be taken to ensure that biotechnology related activities do not produce negative external effects on society.

Intellectual property rights presently constitute the central aspect of biotechnology. Biotechnological developments upto the early 1970s were largely in the public domain. In recent years, however, there has been significant increase in privatization of biotechnology through trade secrets, plant breeder rights and through patents, on new crop varieties and seeds, on drugs and other products, and even on new life forms created through gene manipulation. The increased privatization and commercialization of biotechnology undoubtedly present serious problems for developing countries. The

choice may well be either to provide a greater package of incentives for indigenous research in various biotechnological fields, or to pay the fairly heavy cost of availing of foreign patents in these fields; this entails the growing dependence of international technology transfers even with respect to agricultural and live-stock developments, apart from the other industrial uses of biotechnology. The nature of the biotechnological research and developments in the advanced countries will compel them to be more and more restrictive on state-of-art technology transfers (Ali, 1991) This means that the developing world has to be more selective about technology transfers from abroad. Moreover they should form apex bodies for cooperative research and bargaining in respect of indigenous effort and international diffusion, respectively. The shifting globalization patterns can be advantageously utilized. Such cooperative bodies can present a coordinated forum in negotiations regarding coupling mechanisms and transfers. They can help in effective policy making, as well as help avoid problems of diffuse funding.

In several cases, biotechnology has led companies in industrialized countries to extend their production or marketing to new product groups. Examples are the shift by agrochemical companies in the area of seeds, or the move of fermentation-based companies in area such as food and alcoholic beverages into new biotechnology based products such as pharmaceuticals. Given a sound knowledge base and coordinated platform, the agencies and companies in LDCs can very well collaborate with TNCs in a mutually beneficial tie-up.

Given sound knowledge base and coordinated platform, companies in LDCs can very well collaborate with TNCs in a mutually beneficial tie-up.

Linkages & Coupling Mechanisms

A number of countries all over the world have drawn up strategic short and long range plans for biotechnology. Some developed nations such as France, UK and USA have established national biotechnology companies to increase links between R & D and industrial production. Recently the two major biotechnology trade associations in USA announced that they would merge to form a unified organization to serve the industry better (George, 1993). The new organization, the Biotechnology Industry Organization (BIO), will combine the 150 members of the

International Biotechnology Association (IBA) and the 340 members of the Association of the Biotechnology Companies (ABC). In UK and USA, universities have played a very important role. Several universities, particularly in USA, are now engaged in a race for patents on biotechnological processes and products. Among the companies, the TNCs are becoming increasingly involved in biotechnology research as well as in the marketing of the products and processes based on biotechnology.

In Japan, in 1981, the Science and Technology Agency (STA) started the "System for Exploratory Research for Advanced Technology" (ERATO) for implementing selected research projects in biotechnology. Several other such programmes exist in Japan with the successful partnership of the governmental agencies, academic institutions and industry. In the Republic of Korea, a long term master plan for the development of biotechnological products was drawn up in 1987 in which nearly 35 companies are actively participating. The Government of China has also designated biotechnology as a strategic industry and in 1984, a Development Centre for Biotechnology (DCB) was established as a non-governmental organization to promote and upgrade the biotechnology industry.

In the European countries, the biotechnological developments are enormous. There are very strong linkages between academic research and its (industrial) applications. A number of European Community (EC) biotechnological programmes are undertaken, jointly by the university departments and companies of member countries as "Contract" research (Irish Biotech News, 1993). From its launch in 1989, the Biotech Forum Europe (BFE) also has been fully committed to the ideals represented by the member countries (Simpson 1992).

In industrialized countries, there has been rapid growth of small biotechnological companies, often financed by venture capital. Several universities and local governments have set up industrial parks adjacent to the universities leading to active industry-university linkages in biotechnological research. In USA, where such linkages are perhaps most numerous, nearly half the companies engaged in such R & D have arrangements with universities. In certain cases, agreements have been entered between the companies and the universities in different countries, reflecting the increasing dimensions of globalization. A recent survey (UNIDO, 1991) showed that many US companies are locating their R & D groups in Japan. This is significant on account of the relatively low interest in Japan until recently in basic research and fundamental studies. There is no reason

why a developing country like India can not participate in this globalization process and benefit by it, since it already has built up sufficient infrastructure and expertise base for such an effort. Oriented policies have an important role here, i.e. specifically focussed efforts and funding for prior identified topics of current interest and relevance, particularly to the country's context.

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Biotechnology in India

Recognizing the importance of biotechnology, in India in 1981, the government established a National Biotechnology Board (NBTB). In 1986, the NBTB was replaced by the Department of Biotechnology (DBT) and was given the primary responsibility for the promotion of the biotechnology at all levels (Ghose 1990). In 1990, the need to have an institutional mechanism to ensure close interaction between research and development, pilot plant studies, market survey, certification and technology developments has led to the creation of the Biotech Consortium India Limited (BCIL, 1990)

Under the auspices of the Scientific Advisory Committee of the DBT, thirteen Task Forces were constituted which covered practically all the important disciplines of biotechnology, including man power development (Ramachandran, 1991). More than 200 researchers, drawn from university departments, national laboratories, industries and governmental organizations, are involved in identifying new areas as well as upgrading modifying the ongoing programmes.

Some basic issues: The essential components of biotechnological projects are man power expertise and appropriate resources. At present in India, there are not many organizations which can independently take up a project from inception to the market. Close association between a variety of laboratories is required. DBT and BCIL are jointly working on these vital issues.

Technical feasibility issues: Assessing the technical feasibility requires an understanding of the state-of-art and the ability to use the appropriate technology. Improper assessment results in failure. Some important such factors are listed in table 2.

Table 2: Factors associated with project assessment

Technical	Laboratory scale Commercial scale
Economic	Product cost vs market value Capital outlay vs existing products Feed stock cost vs existing processes Purification costs vs Future processes
Safety evaluation	
Social factors	Pollution, fashion
Political factors	Government attitudes, geography, multinational power

Source: Ghose (1990)

Commercial practices: Generally, bench scale scientists assume that the production of recombinant products is simply a question of scale. Biotechnologists should be aware of such problems. There are problems in the large scale fermentation of *E. coli* or *B. subtilis*, two of the most popular hosts used in the laboratory gene studies.

Economic issues: It is essential to generate data regarding the annual product requirements in terms of weight and purity evaluation, cost of routine production and comparison with a realistic assessment of the likely market cost. Atkinson and Mavituna (1983) estimated that the routine running cost of fermentation can be about 50% for raw-materials, 20% for labour and 20% as fixed costs.

Safety consideration: Toxicological evaluations of the safety of the biotechnological products, mainly recombinant products, must take into account the risk/benefit ratio which is really difficult to estimate accurately. Safety evaluation is always a cost-intensive and time-consuming facet of biotechnological product development. Table 3 provides an example of likely costs required to complete adequate safety evaluation.

Safety evaluation is a cost-intensive and time-consuming facet of biotechnological product development.

Promotion of biotechnology industry in India: With the creation of BCIL and the new liberalized policies of the government of India, several companies have set up modern facilities for large scale production of antibiotics like penicillin, tetracyclines, and streptomycin etc: A plant was put into operation for the production of HFS near Madras. A few companies have launched their

Table 3: Cost of product safety evaluation

	New Product (\$ million)	Existing Product/new processes (\$, 1000)
Pharmaceuticals:		
Terminal/ occasional use	0.50-0.60	10-25
Repeated use	1.20-1.50	50-100
Food additives	1.20-1.50	20-40
Agriculture	1.20-1.50	10-25
Cosmetics	0.02-0.15	5-10
Chemicals	0.03-0.30	5-10

products, based on tissue culture. One such big plant was set up in Cochin. Several pharmaceutical firms are marketing immuno-diagnostic kits for the early detection of pregnancy and diseases like amoebiasis, hepatitis and typhoid. Recently, an indigenously developed kit for early detection of pregnancy was launched. Many other diagnostic kits are likely to touch the market soon. A number of new industrial licenses/foreign collaborations in the area of agriculture, environmental and food biotechnology have been approved by the government of India, and yet many more are under active consideration.

Technology Flows & Internationalization

Since most of the global efforts in biotechnology are concentrated in the industrialized countries, developing countries have a vital interest in international flows of such technology. These can be largely through linkages with TNCs and specialised biotechnology companies in industrialised countries and will take the form of foreign affiliates, joint ventures, technology licencing, and research contracts. In Japan, about 100 companies formed a trade group to avoid duplication in R & D and hold symposia and train personnel. The charter members of the group include some of Japan's largest TNCs. Such cooperative efforts have to be nucleated through appropriate S & T policies in India and other developing countries for presenting a coordinated forum in negotiations regarding coupling mechanisms and transfers. Such forums will help the LDCs in effectively bargaining, and collectively benefitting from internationalization be-

Forums will help the LDCs in effectively bargaining, and collectively benefitting from internationalization besides avoiding duplication in indigenous efforts.

sides avoiding duplication in indigenous efforts (Dembo & Morchouse, 1987).

For developing countries, most of the really critical biotechnological supplies and equipment will have to be obtained from industrialized countries. There is a degree of vulnerability that access to vital equipment and supplies may be restricted. This is only to be expected in the face of the stiff competition for technological superiority and market advantages (Arakaki-Emity, 1984; Reddy & Zhao, 1991). There may be less problems with the supplies of biochemicals and other biotechnological raw materials which sometimes may be available in the country itself. This mainly includes carbon and nitrogen sources which are generally obtainable from agriculture and chemical industries. Some developing countries are initiating anticipatory strategies. In India, the Centre for Biotechnology Research at New Delhi coordinates to some extent the procurement of a wide range of biochemicals such as restrictive enzymes etc. from several firms of North America and Europe and makes them available to Indian R & D institutions. Efforts are on to make the required biochemicals within country itself. Countries such as India, China, Brazil and Mexico also have a relatively advanced scientific infrastructure and can achieve a significant measure of self-sufficiency in consumable supplies. There is, however, little actual experience, because industrial production based on advanced biotechnological techniques is extremely limited. The Chinese experiments of 'SPARK' (Shi, 1983) and 'TORCH' (Boachen, 1991) for linked-up scaling of bench level projects and industrial diffusion in rural areas are worthwhile efforts.

Both the agricultural and industrial applications of biotechnology provide a challenge and opportunity for developing countries. While the responses need to be country-specific, there are several issues which lend themselves to joint action. These include: cooperation in the development of products particularly suited to the developing countries' conditions like edible oils, food grains, industrial enzymes, vaccines and diagnostics for ailments particularly prevalent in developing countries, cooperation in training for biotechnology, including exchanges of personnel and trainees, and cooperation in the acquisition of complementary capabilities and complementary assets, including adaptation and incremental innovations with respect to foreign biotechnology.

Prospects for Developing Countries

The developments regarding the university-industry-government relationship in biotechnology are of special

concern to the developing countries. There are growing restrictions in the free flow of information among scientists and universities and research institutions. This would be further accentuated with the greater number of agreements between the universities and corporations abroad (Blumenthal, 1986). Another area of concern involves the increased emphasis of research primarily on products and processes of direct benefits to industrialized countries and towards products and processes which provide high profit margins for the companies involved.

The developments regarding the university-industry-government relationship in biotechnology are of special concern to the developing countries.

In USA and some other industrialized countries, venture capital has played an important role in financing new biotechnology companies. Advent Eurofund, for example, is funding European ventures, through major financial supports from a US-based TNC. This alternative may not be available in most of the developing countries. Public stock offerings may constitute a second means of funding local biotechnological companies. This alternative may also have limited applications in developing countries till biotechnological developments and applications become better known. TNCs provide a third means of entry of biotechnology through various arrangements, including TNC subsidiaries for joint ventures or TNC-financed venture capital funds; and licensing arrangements between TNCs and local companies. The fourth method is direct government support. Of these alternatives, the latter two appear to be the most promising for developing countries.

Efforts to build national capacity in biotechnology in developing countries at an accelerated pace developed only in the 1980s. There is still a wide gap between the plans on paper and programmes actually implemented and a concerted effort needs to be made to ensure that these programmes do in fact contribute significantly to the achievement of their objectives. The formulation of specific programme components also tends to be too ambitious for the resources available, financial and human (Gaffe, 1992). There has been inadequate commitment of resources, specially financial, to the programmes that have been prescribed. There has also been a reluctance to establish specific targets. There is also a tendency to follow biotechnological research priorities

that are popular in industrialized countries. This leads to efforts which may be less relevant to the urgent socio-economic needs of the developing countries concerned. Also crucial is the continuing drain of some of the best scientific talent in biotechnology from the developing countries to major R & D centres in industrialized countries. The phenomenon of privatization of not only commercial developments but also supporting scientific works renders the task of the developing countries more difficult. At the same time, the experience of the developing countries demonstrates that a sound and effective beginning has been made, which can result in much more rapid growth in future.

There is a wide gap between the plans on paper and programmes actually implemented a concerted effort needs to be made to ensure that these programmes do contribute significantly.

There are several global trends in biotechnology which are significant for its development in India. One of the most important is the increasing privatization of technological knowledge, since LDCs with S & T infra structure can attract foreign expertise and funds. This trend is reflected in the activities of several TNCs that have either set up or are exploring the establishing of R & D units in the country. It is also reflected in the promotional activities of the DBT in seeking to obtain foreign technology inflow through Indian companies. Foreign companies are attracted to India, among other reasons because of the considerably lower research costs and the substantial pool of trained scientific and technical personal.

A more problematic trend is the attraction of the highly qualified Indian personnel to foreign R & D centres, which typically provide substantially higher compensation and better research facilities. India's response to such brain-drain is found in schemes such as the Visiting Scientists programmes, Overseas Associateship schemes and the North American Advisory Committee which are designed to increase the links with the advanced centres of research in industrialized countries and to attract Indian scientists back to India, for short periods of permanently.

Research priorities of considerable importance. Emphasis at the global level, atleast where it involves more advanced techniques of genetic engineering, has been

on human health, with secondary attention to agriculture and animal husbandry, food processing and energy. It is to be considered if this should be the sectoral emphasis. It is to be considered if this should be the sectoral emphasis for India also. In fact, India should focus on specific areas of locality relevance and topical interest rather than diffused efforts and funding on too many areas of current focus and fashion internationally. Internationalization in advanced areas and selective globalization should form the corner stone our S & T policies.

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Conclusions

In this context, it will be pertinent to point out some significant conclusions derived out of studies on agricultural biotechnological research and development schemes and investments in some Latin American countries. The survey on Argentina, Costa Rica and Venezuela showed that the R & D investment and efforts were basically higher on education sector activity with only small productive sector involvement (Jaffe, 1992). There are signs that the investment was insufficient for an efficient research effort. The following policy issues can be highlighted:

- Orientation of technology strategy: Offensive R & D strategies are lacking without which leadership in the field is not possible, and this required much higher investments and funds than in vogue. Countries can not compete on the edge of the technological frontiers with the low investment levels in R & D. Instead, they should invest in the few areas in which advantages could be taken of world-wide developments in competition with

The concentration of investments in academically oriented organizations suggests that the R & D efforts could be irrelevant for the productive sector.

locality specific plus points, and strive to create conditions for technology transfer. This would mean a greater emphasis on applied and adaptive research in the productive sector or in institutions closely linked to it. The concentration of investments in academically oriented organizations suggests that the R & D efforts could be irrelevant for the productive sector.

- Commercial effectiveness: The finding is also low and dispersed among too many personnel and is hence not sufficient even for good scientific research, leave alone commercialisation trials. It is very important to attain critical masses of resources for commercially effective R & D in selected areas. There is need harness the efforts and resources of different organizations towards common goals. National funding schemes should provide incentives for promoting this.
- Increase of investment levels: This can be achieved mainly through mobilization of additional financial resources from the public sector and industry sector so that funds are concentrated on a few commercially-viable projects, which will also require political support from interested sectors.
- Industrial involvement: Institutional changes are needed to facilitate and stimulate nexus between scientific personnel in the academic and public sector with industry. an increase in the industrial investment in the introduction, adaptation and development of biotechnological products is of vital importance. In short, the principal problem is the lack of technological dynamism characterizing the industries. Liberalization policies should help reduce this problem along with the joint efforts and contractual arrangements, if aptly negotiated.

Thus, biotechnology in agriculture and related areas together with applications in health and diagnostics is of prime importance for the majority of the developing countries/LDCs (with particular focus on carbohydrate-based substrate and biomass sources) and techno-economic, political and institutional instruments are required to give it a sharp edge in serving not only the

research needs but also for revitalizing the productive sectors in the developing world.

Acknowledgement

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References

- Ali, S. A. (1991) Regulation in technology transfers to developing countries. *Science and public Policy*, **18**, No 5 (1991)
- Atkinson, B & Mavituna, F. (1983) *Biochem. Engg. and Biotechnol. Handbook*. London, MacMillan.
- Arakaki-Emily, A. (1984) A study of US competitive position in biotechnology, High-technology industry: Profiles and outlook — biotechnology, Washington DC, International Trade Admin., US Dept. of Commerce
- Biotech Consortium India Limited, New Delhi (1990) A portfolio of activities
- Blumenthal, D. (1986) University-industry research relations in biotechnology. *Science*, **13**
- Boachem, W. (1991) Chinese government support for S & T. *Science and Public Policy*, **18**, No 4
- Dembo, D. & Morehouse, W. (1987) UNIDO Technology Trends Series No 6, UNIDO Document, IPCT 132
- George, K.H. (1993) *Trends in Biotechnology*, **11**
- Ghose, T.K. (1990) Report of APO Meeting, Japan.
- Harris, W.J. (1985) In — *Biotechnology: Applications and Research*, Lanc. Tech. Publi.,
- Irish Biotech News, (1993) Issues No 34-35
- Jaffe, W.R. (1992) Agricultural biotech R & D investment. *Science and Public Policy*, **19**, No 4
- Ramachandran, S. (1991) *Biotechnology — Research, Development and Demonstration*. Puhl. & Infor. Directorate, New Delhi
- Reddy, N.M. & Zhao, L. (1991) Technology transfers from developed countries to LDCs, *ASCI, J. Management*, **21**, No 2-3
- Shi, G.C. (1983) In — *New Frontiers in Technology Applications — Integration of emerging and traditional technologies*. Tycooly, Dublin
- Simpson, K. (1992) *Biotech Forum Europe*, **9**, 596
- Stewart, A.C. (1991) Ethical and social implications of the human genome project. *Science and Public Policy*, **18**, No 2
- UNIDO Trend Series No 15, (1992) prepared by International Industrial and Licensing Consultants, Inc. UNIDO, IPCT 138
- Yoshida, T. (1990) Report of APO Meeting — *Biotechnology in Asia*. □

Reorganization of Business Functions through Team Engineering

P. Aravindan & N.L. Hiregoudar

The traditional system divides industry into groups of components which are physically or functionally similar. This 'grouping by speciality' is evident by the way specialized management skills are brought together in functional departments, labelled with appropriate engineering disciplines like Marketing, Sales, etc. The team engineering concept challenges the traditional focus on compartmentalisation and group activities with different functions together to form a team, to meet certain overall objectives of the individuals, the team, and the organization as a whole. The article proposes a methodology, based on group technology technique, to form groups and human network for increased productivity in routine business.

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In recent years globalisation has rendered the industrial world small, highly interactive, and information intensive. The greater demand for flexibility and adaptability in managing and operating industries, in view of the major shift in manufacturing process from product orientation to customer orientation (Kelley, 1965), have rendered the existing organisational structure and management concepts obsolete (MaBerg, 1993). It seems inappropriate to enter the twenty-first century with business processes that are fundamentally designed on eighteenth century principles. Most approaches for increasing productivity are narrow in concept, that is, machine technology oriented; with little or no reference to the role of human beings in business (Edwards & Fazakerley, 1973). As human resource still forms a formidable percentage of the assets in an organisation, especially in developing countries, the integration of manufacturing and business processes and human network is that for an enterprise to become responsive and agile in dealing with the complexities of the everchanging global markets (Savage, 1992).

The integration of manufacturing and business processes and human network is that for an enterprise to become responsive and agile.

In recent times the attention of manufacturers has shifted from technological benefits to social benefits involving human factors and human productivity. The management perception too has undergone a gradual change from individualism and specialisation concept to team working concept. The nature and composition of the teams are determined by the basic structure of the

organization and the method of the division of work. As interdependence is a common feature of large and complex organizations the efficacy of successful organizations depends on team work at different levels. The new demands upon the manager's organizational and strategic planning include catering to market demands by advanced production system, autonomous production and supporting work groups (Sigvard, 1992). Long term success can be built only on the foundations of good team work in accomplishing the various functions of a business. A new approach is built around business processes with teams of people performing the entire process. Thus, a team is defined as 'a group of dedicated individuals who cooperate and collaborate with one another to achieve the goals of the individuals, the team and of the overall organization'. Thus, a modern manufacturing system can be provided by the integration of Human Intelligence and Computer Assistance [HICA] to increase the productivity of routine work (Hiregoudar & Aravindan, 1993, Aravindan & Hiregoudar, 1994).

Need for Team Engineering

Research and experience reveal that the existing organizational structure presents obstacles to effective team work (Griffin & Hauser, 1992). Because of the great gulf between planning and execution areas and because of the many decision makers and interfaces, there are friction losses in the document processing, which lead to long, and intolerable throughout times and very often to information faults (MaBerg, 1993). The nature of tasks and technology, personal attitudes and beliefs, organizational values and culture contribute toward effective team work. The increasing global competition and growing complexities of manufacturing and selling of products or services, have provided a strong argument for applying the systems approach to the problems in industry on a wider scale. The systems approach requires that all entities associated with various sub-systems of enterprise are arranged in networks. The different activities must be intimately connected or associated with one another for making entire operations of business effective, economical and prompt. Every organization needs to create a network of business relationships both inside and outside the organisation. There is a significant link between networks and organized work. Internal network deals with diversity, serendipity, conflicts, and bottlenecks encountered from bosses and subordinates. External networking is critical to foster and maintain relationships with customers, clients, suppliers, and even competitors. In addition to product range, price and quality, time factor has become a decisive factor of winning in competition.

With these in view Team Engineering (TE) proposes a holistic approach of forming teams by analyzing manufacturing and services in greater detail, examining their contribution toward effective functioning and managing integrated teams with computer systems and networks.

The increasing global competition and growing complexities of manufacturing and selling of products or services, have provided a strong argument for applying the systems approach to the problems in industry.

Team Engineering Concept

Team engineering (TE) approach crosses department boundaries of traditional hierarchical and autocratic organizations toward a lower degree of specialization, flat hierarchies, shell structures, consideration for human assets, for flexibility and efficiency of a company. The main essence of TE is to replace the traditional organization structure by self driving organizational nodes/cells and teams so as to quickly respond to the requirements of present and future manufacture. It conceptually involves reconstructing organization to reflect team based responsibility rather than functional responsibility (Figure 1). TE concepts are developed by integration of principles and laws of Engineering, Science and group technology for forming groups of human activities in the various functions of business to boost overall manufacturing productivity (Figure 2). TE is concerned with human behavior, identification of team leader and team members, and controlling the performance of the team, so identified by group engineering.

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Organization of 'TE'

Increased interdepartmental coordination and communication suggest changes to be made to both organizational structure and interdepartmental communication patterns (Fazarkerley & Hyer, 1986). TE

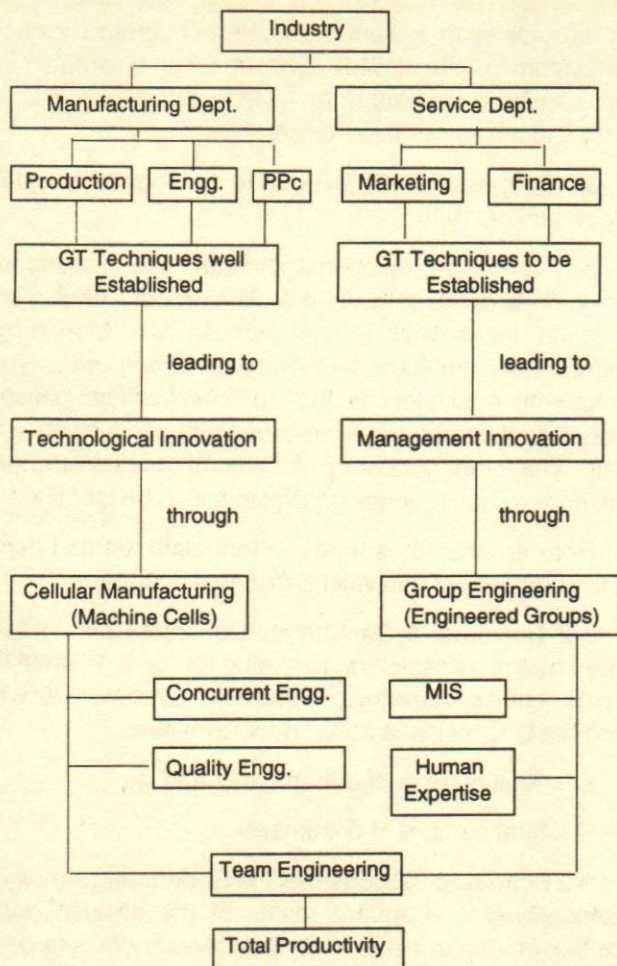


Fig. 1 Concept of Team Engineering

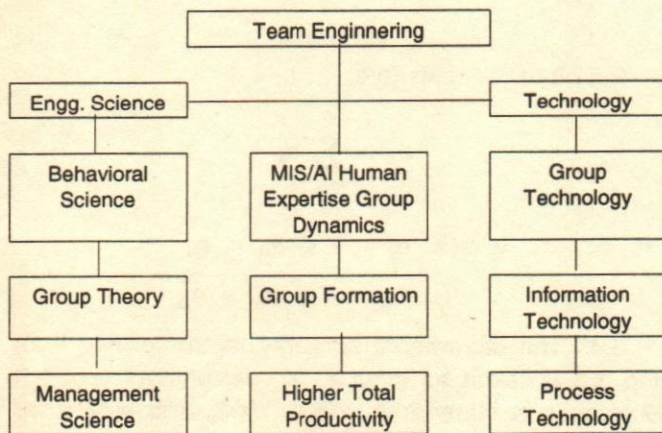


Fig. 2 Concept Formation of Team Engineering

integrates the various allied areas associated with manufacturing and service, extensively making use of management techniques, information systems (IS), human expertise, artificial intelligence (AI) and group dynamics of enhancing control, performance and productivity.

All the activities in a business organization can be classified under two main departments:

Manufacturing departments: Activities/tasks in the manufacturing department are directly associated with manufacturing of the product(s).

Service departments: The activities in the service departments support the activities in the manufacturing departments to enhance performance by providing the relevant material and information related to manufacturing. These departments mainly comprise human resources, which contribute significantly to increased productivity through effective performance (Figure 3). 'TE' is basically concerned with grouping of different busi-

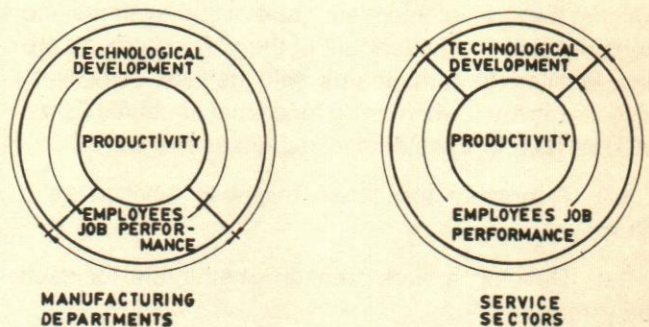


Fig. 3 Productivity of Manufacturing Vs. Service Sectors

ness activities, viz., purchasing, accounting, marketing, etc., based on group technology (GT) concept to form teams (Wemmerlov & Hyer, 1987). Thus, team engineering, organizationally, can be defined as an amalgamation of dissimilar activities which are grouped together to form a 'team'. Unlike in a GT cell, space is not the main constraint, since the team members can interact with one another through the communication network. Thus, the principle of GT is used to form a team with a certain degree of autonomy with regard to control over the administration and way of working for achievement of the end result (Jadhavrao, 1986). This, to a certain extent goes against the concept of specialization where specialists, handle their respective functions (e.g. Accountants handle accounts, Materials personnel handle procurement, etc.) but the logical grouping of activities reduce conflict and prevent problems from being pushed up to higher levels for solutions (Kelly, 1965). For example, a cell (team) can be formed with personnel who would handle totally all aspects of the job — order booking, material procurement and financing (provided each cell has initial financing which can be rolled forward for meeting procurement needs to satisfy further orders). Thus each cell (team) is a profit center with opportunities for growth.

Team engineering can be defined as an amalgamation of dissimilar activities which are grouped together with a certain degree of autonomy with regard to control over the administration and way of working.

Teams & Business Functions

Team engineering deals with the development of a well integrated manufacturing and business system with dedicated teams of personnel. The procedure is to identify at first the work element structure of sub-systems and groups using GT. The leaders of the various groups are then identified to form teams with definite objectives. These teams are formed using functional attributes called DOCUMENTS in a systematic fashion as follows:

1.0 Represent the whole business function as a system.

2.0 Develop a work-breakdown-structure for each sub-system.

3.0 Form teams using Group technology techniques.

3.1 Identify the interdependent functional attributes i.e. a DOCUMENT.

3.2 Construct Department-Document data matrix.

3.3 Compute Department similarity matrix.

3.4 Solve the assignment problem.

3.5 Identify the closed loops.

3.6 Rearrange the rows according to the closed loops.

3.7 Assign binary numbers to each row and find the rank order of each column.

3.8 Rearrange the rows according to rank order and cluster the documents.

3.9 Compute the interaction efficiency.

4 Draw the Human network diagram towards dynamic management.

5 Coordinate and control the teams.

1.0 Represent the whole business function as a system which comprises various sub-systems like Marketing, Personnel, etc.

2.0 Develop a work-breakdown-structure for each sub-system to the lowest level of work package sub division which represents an identifiable work effort in relation to a given process or service.

3.0 Form teams using Group technology techniques (Waghodekar, 1986).

3.1 Identify the functional attributes like interdependency, precedence relation, etc. The process equivalent of group technology is the process like Marketing, Finance, etc.; analogous to Turning, Milling, etc. The component equivalent is the document which passes through all different processes; analogous to a Bush or a shaft. The interdependency of the component equivalent between various process equivalents is to be identified.

Here an attempt is made to formulate teams based on the component equivalent, that is, a document.

3.2 Construct a Department-Document data (D-D) binary matrix by assigning the value for ' a_{ij} ' = 1 when i^{th} department is processing j^{th} document, otherwise ' a_{ij} ' = 0. Here the D-D matrix is a $D_i \times d_j$ matrix where;

D_i = total number of departments and

d_j = total number of documents.

3.3 From step 3.2 construct the Department similarity matrix which is a square matrix of the order of total number of departments. In the Department similarity matrix,

For diagonal elements (d.e.)

$$S_{ij} = 0$$

For other elements (o.e)

$$S_{ij} = \sum_{\substack{k=1 \\ k \neq j}}^n d_k$$

where $d_k = 1$ if $a_{ik} = a_{jk}$

$d_k = 0$ if $a_{ik} \neq a_{jk}$

3.4 The department similarity matrix formed from step 3.3 is taken as input to an assignment problem (Srinivasan & Narendran, 1991, 1992) and solved for maximization of the similarities. Since it is maximizing the diagonal elements are forced to zero.

3.5 Identify all closed loops that are formed in the solution of the assignment problem. A closed loop can be explained as follows.

If $X_{ij} = X_{jk} = X_{kl} = \dots = X_{pq} = X_{qi} = 1$, a closed loop comprising $[i, j, k, \dots, p, q]$ exists.

Results

The interaction efficiencies of the different clusters are found to be consistent. The human network diagram of the above example is drawn as shown in Figure 11.

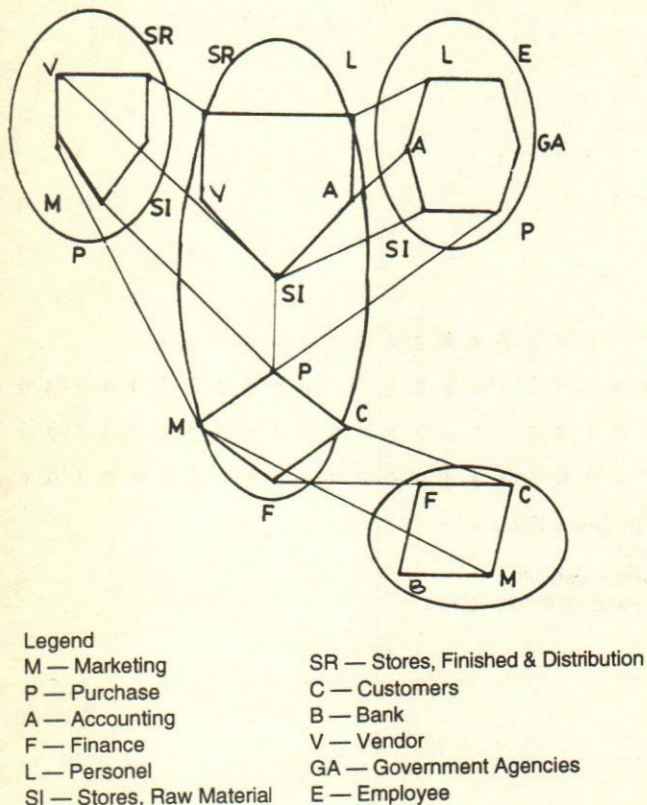


Fig. 11. Human Networking Diagram

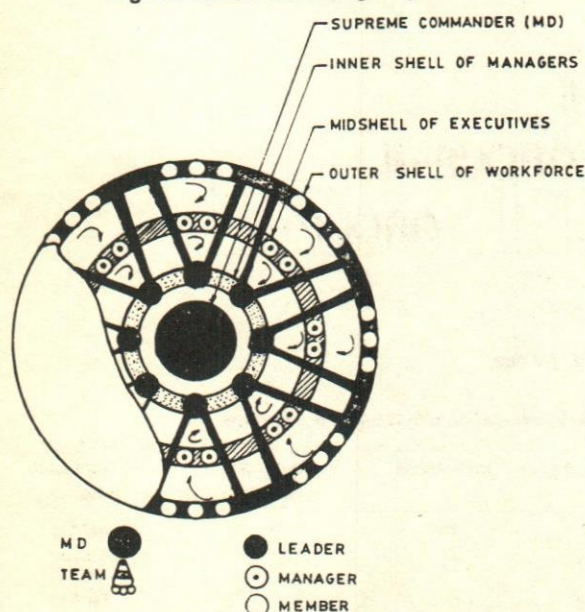


Fig. 12. Shell Structure of Teams

Coordination & Control of Teams

The most important attribute of any organization is the way it organizes the effort of the people and motivates them. This paper proposes a shell structure for control and co-ordination of teams (Figure 12) (Gudaihs, 1975).

The most important attribute of any organization is the way it organizes the effort of the people and motivates them.

The structure comprises three concentric shells. The innermost shell is represented as Level-1, the middle as Level-2 and the outermost as Level-3. For better control and co-ordination it is proposed that each team will have middle and outer shell members and inner shell members will act as an integrating team.

The outer shell

The group of activities in the outer shell is performed by means of continuous and frequent interactions. This will be responsible for the operation of the activities. The team of persons in the outer shell has mutual interactions and immediate feedback will facilitate correction. This type of interdependence is called 'reciprocal interdependence'. The situations are such that the output of each part will be the input for others. Here the operational members of different teams will exchange inputs and outputs and each part of the team is penetrated by the other. Co-ordination in the outer shell is achieved by Mutual Adjustment of co-ordination by feedback.

The middle shell

The group of activities that require planning to face the dynamic changes are placed in the middle shell. Here the team is responsible for coping with the dynamic situations. The teams in the middle shell will have 'sequential interdependence'. The interdependence will take a serial form such that the output of one team will be the input to other. One team depends on another for its input but the dependency is only in one direction. Direct interdependence can be pinpointed between them and the order of interdependence can be specified. Co-ordination in the middle shell can be achieved by planning. This involves the schedules of interdependent parts by which their actions may be governed. This does not require a high degree of stability and therefore this is more appropriate for dynamic situations.

The inner shell

The group of activities responsible for planning and fixing the procedure to enhance the overall productivity is placed in the inner shell. This is called the 'integrating team'. It consists of team leaders of each team and has 'Pooled interdependence. The organization is composed of interdependent teams and it is not necessary that each part is dependent and supports each other in any direct way. Each part renders a discrete contribution to the whole. But the combined output contributes to the organizational overall goals/objectives. Co-ordination in the inner shell can be achieved by standardization. They establish the rules which constrain the action of each part into the path consistent with those taken by others in the interdependent relationship.

Benefits

As each member of the team is responsible for a distinct part of the document, all team members have to communicate and negotiate with one other to select the most appropriate alternative and to harmonize the processing of the document. Each member in the team has the opportunity for inter-disciplinary collaboration. Teamwork enables every member to participate in a cooperative and decentralized manner and permit greater flexibility in the organization and use of time and facilities. Apart from economical and technological benefits, claims made suggest that social benefits will be more significant in future. TE enables a high quality of service and consumer (internal/external) satisfaction, reduction in frustration, and high morale among the personnel due to clarity of objectives, responsibilities and authority, in a team (Fazakarley & Hyer, 1986). The groups so formed offer an excellent vehicle for performing many of the steps in the decision making. By aggregating the resources of several team members, more input to the decision

TE enables a high quality of service and consumer (internal/external) satisfaction, reduction in frustration, and high morale among the personnel due to clarity of objectives, responsibilities and authority, in a team.

process can be obtained. Group working tends to be more accurate. The informal communication network be-

tween the groups (grapevine) is free to move in any direction, skip authority levels and hence facilitates task accomplishment (Robbins, 1991). As all members work as a team a well integrated and co-operative method of working takes root. There is a blossoming of confidence, trust, good relations and attitudes. The tendency of fault finding is replaced with path finding, thereby creating a conducive working environment leading to the fulfillment of the overall corporate goals.

References

- Aravindan, P., Hiregoudar, N.L., (1994). 'Team technology — A system approach of human and computer integration for effective management', Proceedings of ICC & IE-94, Japan, March 6-9.
- Edwards, W., & Fazakerley, G.M., (1973). Cell system of production embraces group technology, and also concerns management, technology, and social change, 14th MTDR Conference, U.K., Paper No. 1009.
- Fazakerley, M.G. & Hyer, N.L., (1986). 'A research report on the human aspects of group technology', Int. J. Prod. Res., 14, No. 1.
- Lippit, G.L., 'Organization Renewal', Appleton Century Crafts.
- Griffin A. & Hauser J.R., (1992). 'Patterns of communication among marketing, engineering and manufacturing', Management Science, Vol. 38, No. 3.
- Hiregoudar, N.L., et al., (1993). 'Development of human & computer integrated manufacturing through group technology', Proceedings of INCARF, Tata McGraw Hill, Vol. II.
- Jadhavrao, T.S., (1986). Group Technology: A solution to problems of multi-product engineering industry', Summer school on computer aided group technology & plant layout, Pune.
- Kelley, E.J., (1965). 'Marketing strategies & functions', Prentice Hall Inc. New Jersey.
- MaBerg, W., & Kath, H., (1993). The structural changes of manufacturing enterprises as an answer on changing market conditions', Proceedings of 15th AIMTDR Con.
- Robbins, S.O. (1991). 'Organization Behavior: Concepts, Controversies and Applications', PHI, 5th Ed.
- Savage, C.M., (1992). 'Fifth Generation Management-Integrating Management through Human Networking', Prentice Hall of India.
- Srinivas, G., Narendran, T.T., (1991). 'GRAFICS — a non-hierarchical clustering algorithm for group technology', Int. J. Prod. Res., Vol. 29, No. 3.
- Srinivasan, et al., (1992). 'An assignment model for the part-families problem in group technology', Int. J. Prod. Res., Vol. 28, No. 1.
- Sigvard Rubenowitz, (1992). 'The role of management in production units with autonomous work group' Int. J. Oper & Prod. Mgmt. No. 718.
- Wemmerlov, U. & Hyer, N.L., (1987). 'Research issues in cellular manufacturing', Int. Prod. Res., Vol. 25, No. 3.
- Weaghodekar, P.H. & Sahu, S.A. (1986). A critique of some current GT techniques', I.E. Journal, 15(8).
- Gudaihs, W.V., (1975). 'Modeling a hospital organisation', IEE transactions on System, Man & Cybernetics, Vol. 5, No. 4, July. □

Total Quality Management: Application of Galilean Concept

Y.K. Sehgal

The paper is a presentation of Total Quality Management in a logical, systematic and simple manner. Many myths have been created about TQM by blowing one or the other aspect of it out of proportion. Is it a culture or a way of life? A revolution or epidemic? Is it relevant to India? The article places TQM in the right perspective by integrating its evolution with management theories.

Management is defined as "the art of getting things done through people". The requirement of this fundamental need can be traced back to the pre-historic period. The pre-historic man generally recognised and obeyed a leader or group decision maker, while hunting in bands. Simultaneously, man reacted upon the environment in his natural quest of winning over the nature. This reaction gave birth to science and management.

Initially, science and management were left to the individual's observations and perceptions and existed without any systematic approach and standard method. Actually man's achievement was dependent upon the knowledge he chanced upon. But in none of the achievements he was able to establish a coherent system of knowledge. Initially management and science/technology were basically shaped through chance and intuition bereft of the power of logical analysis with experimental verification.

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The systematic and logical approach was initiated in the sixteenth century by Galileo, who established that the earth revolves round the sun and not the other way, as per the prevalent concept. Logical understanding of nature's behaviour was further strengthened by the discoveries of Newton and Desecrates. These discoveries set forth a scientific revolution in the sixteenth century and ultimately led to the industrial revolution during eighteenth and nineteenth century. This set the stage for

the evolution of several management schools of thought, logical approaches.

The development of technology and growth of industrialisation concentrated on:

Resources — raw materials, manpower, machinery for manufacturing of various goods in the factories on a large scale and

The distribution of goods for the use of mankind.

This required co-ordination among various functions and created problems of management. To overcome the problems faced by industry, many attempts were made by experts in various fields and a number of management theories were established, sometimes in unison and sometimes parallel with scientific theories.

Galilean Science

Though *observation of environment* yields knowledge, Galilean Science insisted that it must always be subjected to *experimental confirmation* and must aim at establishing a relationship described in mathematical language. The Galilean Science created a breakthrough from all the past traditions towards acquisition of knowledge with the following distinct demarcations: Knowledge was not to be accepted as revealed, but only as observed and experimentally verified by an informed mind. Unlike Aristotelian Science, it refused to answer the totality of observation through a totality of cause. On the other hand, it broke down the observation into manageable parts; isolated these parts and searched for a cause, part by part. This is called reductionism. This method enabled the observer to analyse the observation more intimately and systematically, and to carry out experiments in a manageable manner and with a meaningful purpose. This, in modern science, is known as **economy of effort**.

Reductionism and analysis do not automatically lead towards the utility of knowledge. In the practical realm, man has to always look for the overall purpose of an endeavour and practical benefits derived from the same. Integration of the broken parts is a must for a greater unification of knowledge. In other words, the rudimentary mathematical relations should be generalised to arrive at a new but complex relationship, which offers a holistic view and a greater insight into reality.

Scientific Management & Classical Organization Theory

No homogeneous theory evolved in the initial period, however the following forerunners have a permanent place in the history of Management:

Robert Owen (1771-1858): A manager of several cotton mills at New Lanark, Scotland, during early 1800s, Owen conceived the role of manager as that of a reformer, who should always think for the welfare of his workers. He never claimed that his reforms were on humanitarian grounds, but argued that improving the condition of workers (the vital machine) will inevitably lead to increased production and profits.

Improving the condition of workers will inevitably lead to increased production and profits.

Charles Babbage (1792-1871): A British Professor of Mathematics, Babbage professed that the application of scientific principles to work processes would increase productivity and lower expenses. Babbage's idea of division of labour has given birth to modern assembly lines.

Fredric W Taylor (1856-1915): Taylor's principles of differential rate and first class worker constitute the essence of scientific management; His principles were evolved through his experiences in three steel companies: Midvale Steel, Simond Rolling Machine and Bethalam Steel.

Henry Fayol (1841-1925): Founder of classical management, Fayol divided the management function into planning, organising, commanding, coordinating and controlling. The famous fourteen basic commandants of classical management given by him are:

Division of Labour, Authority, Discipline, Unity of Command, Unity of direction, Remuneration, Subordination of Individual Interest to Common Good, Centralisation, The Hierarchy, Order, Equity, Stability of Staff, Initiative, Esprit de corps.

These theories were limited to the knowledge that was available and the conditions that existed during that time. Although criticised by the other schools of management, their perspective has been better appreciated by the practising managers. However, with the turbulent organizational environment and increasing employee education, the classical organization theories are becoming obsolete. Division of labour and unity of command have become almost non-practicable, e.g. today Maintenance Engineer is taking orders from both Chief Engineer and Head of Production.

very modest in the areas of organising, staffing and leading the organization. Some managers complain that the concepts and language of management science are too complicated for ready understanding and implementation. Others feel they are not involved with management scientists in developing decision making techniques, with the result that the ongoing implementation of the technique is often unsuccessful. Management Scientists, for their part, feel that they have not achieved their potential for solving management problems, because of their remoteness from and lack of awareness of the problems and constraints actually faced by managers.

The System Approach

The System approach to management attempts to view the organization as a unified, purposeful system, composed of inter-related parts. Rather than dealing separately with the various parts of an organization, the system approach gives the manager a way of looking at the parts of an organization as a whole and a part of the larger external environment. The system oriented manager can not function wholly within the confines of the traditional organization chart. To mesh the department with the whole enterprise, the manager must communicate with other employees and departments, and frequently with representatives of other organizations as well.

The Contingency Approach

Charles Kendal Berger, the well known International Economist was found telling his students at MIT that the answer to any real engrossing question in economics is "It depends". "It depends" is an appropriate response to the important question in management as well. Management theory attempts to determine the predictable relationship between situations, actions and outcomes. The contingency approach was developed by managers, consultants and researchers, who tried to apply the concepts of major schools to real life situations. They often found that methods that were highly effective in one situation would not work in another situation. Why, for example, did an organizational development programme work brilliantly in one situation and fail miserably in another? Advocates of contingency approach have a single and logical answer to such questions. Results differ, because situations differ. A technique that works in one case will not necessarily work in all cases. According to contingency, then, the task of the manager is to identify which technique will, in a particular circumstance, and at

a particular time, best contribute to the attainment of managerial goals.

Definition of Total Quality Management

Before we define TQM, to sum up the above detailed management approach, we would infer that the evolution of management has been through: Scientific Management and Classical Organization Theory, Behavioural School, Quantitative School, The System Approach and The contingency School.

To integrate all the schools in a scientific manner, we have to understand the elementary demarcation between engineering and management. Engineering is based on precise science like physics etc., in which narrow range of prediction is possible, whereas management is based on imprecise science, where such predictability is not guaranteed. An engineer always aims to attempt a quantitative measure of effectiveness, which he calls efficiency. Efficiency is circumscribed by the power of methods and clarity of scientific insights, that is available in the context, in which the engineer is operating. It is not always true that his science or methods are fully in his grasp or even science and mathematics have risen to the stature suitable for the purpose. In such a contingency he falls back upon the concept of more effectiveness or less effectiveness. He substitutes the quantitative approach with qualitative approach. Nevertheless, he has a perception of the degree of effectiveness.

Total Quality Management tries to integrate all the schools and can be defined as "a continuous iterative process of meeting the goal, where the search is for better effectiveness. Effectiveness may be measurable by a quantitative parameter, called efficiency or a qualitative ability to distinguish between more effectiveness and less effectiveness."

Total Quality Management can be defined as "a continuous iterative process of meeting the goal, where the search is for better effectiveness."

Special Features of Total Quality Management

Customer Orientation: As per the definition, TQM is a process of changing. The direction of this change is towards the market. So, the goal of business will be directed by the market. The father of TQM, Deming has named the "suitable for the market" as Quality. Quality is

Stress & Coping: A Challenge for The Executive

B. Pattanayak, J.K. Mohapatra & P.K. Nanda

Stress is an oft-encountered syndrome in today's world. The authors trace the various sources and stages of stress and present a few reactive as well as proactive strategies for stress prevention and reduction/elimination.

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What is Stress?

The concept of stress was first introduced in the life sciences by Hans Selye in 1936. It is a concept borrowed from the natural sciences. In common parlance, however the term 'stress' and 'strain' are used synonymously. Stress is considered either as an external force acting on the organism, a change in the physiological function due to an external stimulus or an interaction between external forces and internal resistance. Hans Selye's General Adaptation Syndrome (GAS) has been widely held as a comprehensive model to explain the stress phenomenon. This three stage model states that when an organism is confronted with a threat, the general physiological response occurs in three stages. (Fig.1).

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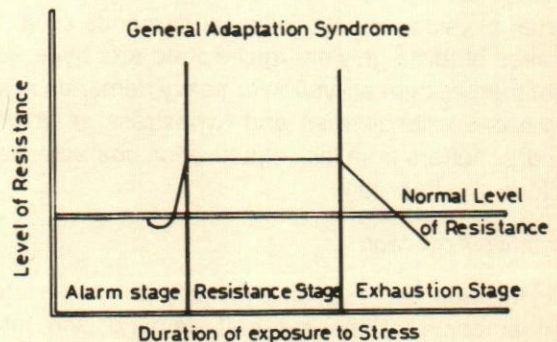


Fig. 1

Alarm Reaction

The first stage includes an initial shock phase in which resistance is lowered, and a 'Counter-shock phase' in which defence mechanisms become active. Alarm reaction is characterised by autonomous excitability, adrenalin discharge, increased heart rate, muscle tone and blood content and gastrointestinal ulceration. Depending on the nature and intensity of the threat and the condition of the organism the periods of resistance vary and the severity of symptoms may differ from mild invigoration to diseases of adaptation.

Stage of Resistance

Maximum adaptation occurs during this stage. The bodily signs characteristic of the alarm reaction disappear. Resistance increases to levels above normal. If the stressor persists or, the defensive reaction improves ineffective, the organism deteriorates to the next stage.

Stage of Exhaustion

Adaptation energy is exhausted. Signs of the alarm reaction reappear and the resistance level begins to decline irreversibly. The organism collapses. The first major shortcoming of this theory is that it has evolved out of the researches carried out on infrahuman subjects. In such experiments the stressors are usually physical or environmental whereas the human organism is not always afflicted by such stressors. Secondly, Selye's work on stress depends on the existence of a non-specific physiological response. But there are certain stimuli which do not produce non-specific response and hence General Adaptation Syndrome does not occur. Thirdly, intra-psychic or social factors emerge as major stressors in human beings.

In a variation of this approach, stress is used to the highly energized psycho-physiological state when an organism is faced with a situation that threatens or places unusual physical or psychological demands on it. The extremes of this highly energized state are: hyperstress, where there is over activation or heavy demands in terms of time or responsibilities and hypostress in which the individual suffers from lack of activation characterized by lassitude and boredom.

Interactive Approach

In this approach, stress is looked upon as an interactional outcome of the external demand and internal resources. Lazarus (1966) maintains that stress occurs when there are demands on the person which tax or exceed his adjustment resources. According to MC

Grath (1976) stress involves an interaction of person and environment, something happens out there which presents a person with a demand or, a constraint or, an opportunity for behaviour.

Stress occurs when there are demands on the person which tax or exceed his adjustment resources.

Comprehensive Approach

This approach views stress not only in interactive terms but also as an individual phenomenon, peculiar to the individual and his environment. It is seen as the situational outcome. Here, in the present context, stress is taken to mean a fairly predictable arousal of psycho-physiological (mind, body) system which, if prolonged can fatigue or damage the system to the point of malfunction and disease.

Is Stress Bad for Health?

The fatalist's view of stress dates from the 1950s, when many researchers began to look for links between it and illness. For two decades they explored the pessimistic notion that the more frequent and serious the stress in your life, the greater your chances of falling sick.

Present day researchers and practitioners visualise the phenomenon of stress in a new perspective and state that each individual needs a moderate amount of stress to be alert and capable of functioning effectively in an organization. Pestonjee (1987) and Mathew (1985) in their conceptual papers agree with this contention. Mathew has gone to the extent of advocating that particular type of stresses are essential for being a creative manager. Pestonjee and Singh (1987) reveal that managers of private organizations generate greater stress in turn leading to higher job satisfaction in comparison to their counterparts in the public sector.

Each individual needs a moderate amount of stress to be alert and capable of functioning effectively.

Stress is not necessarily always bad. But stress beyond the Stress Tolerance Limit (STL) is bad for health. In a typical study, researchers interviewed a group of

hospital patients being treated for everything from depression to heart attack about their stressful experiences in the past three years. These hospitalized people had it turned out been under more stress than a comparable group of healthy people. Different researchers like Srivastava & Broota (1987), Varkey (1988), Mandal, Ghosh and Nair (1991), Pattanayak (1993), are of the view that Hyperstressed life styles and negative life events are manifestations of psychosomatic illness.

Burn out Stress Syndrome

All gainful activities classified as work or job are fraught with some risk of stress. Paine (1982) observed that Burn Out Stress Syndrome (BOSS), the consequences of a high level of job stress, personal frustration and inadequate coping skills have major personal, organizational and social costs, and these costs, are probably increasing. BOSS can lead to at least four types of Stress related consequences such as depletion of energy reserves, lowered resistance to illness, increased dissatisfaction and pessimism and increased absenteeism and inefficiency at work. Veningle and Spradley (1981) have identified five distinct stages of BOSS.

The consequences of a high level of job stress, personal frustration and inadequate coping skills have major personal, organizational and social costs.

- Honey-moon
- Fuel shortage
- Chronic Symptoms
- Crisis and
- Hitting the wall

Honey-Moon Stage: In this stage, there is a euphoric feeling of encounter with the new job. There is excitement, enthusiasm, pride and challenge.

Fuel Shortage stage: In an attempt to deal with the job related crisis, some individuals overdraw on the reserves of adaptation energy and realize too late that the energy reserves are limited. In this stage there is a vague feeling of loss, fatigue and confusion. The symptoms are job dissatisfaction, inefficiency, fatigue and sleep disturbance leading to escape activities, such as increased eating, drinking and smoking.

Chronic Symptom Stage: The physiological symptoms became more pronounced and demand attention and help at this stage. Symptoms are chronic exhaustion, physical illness, anger and depression. A sense of fatigue and exhaustion overtakes the individual.

Crisis Stage: There is a feeling of oppressed, heightened pessimism, and self doubting tendency. One develops an escape mentality, peptic ulcers, tension, head aches, chronic backache, high blood pressure and difficulty in sleeping are some of the symptoms.

Hitting the Wall Stage: This phrase has been taken from athletics. It is an experience so devastating that it completely knocks a man out. The individuals glycogen reserves are used up, the body becomes dehydrated and the body temperature shoots up to 106°F — 107°F with an accompanying loss of blood volume. This leads to muscular paralysis, dizziness, fainting and even complete collapse. Similar experiences have been observed in the executive world at times. One may lose control over one's life, it may be the end of the professional career.

Rust Out Stress Syndrome (ROSS)

Researchers have observed a phenomenon which is the opposite of BOSS — ROSS indicative of stress underload. It occurs when there is a gap between what the executive is capable of doing what he is required to do. Stress underload can arise due to both qualitative and quantitative aspects of work. A situational appraisal is a pre-requisite for countering stress.

Vulnerability to Stress

The notion that all stress makes you sick assumes we are all vulnerable and passive in the face of adversity. But what about human resistance, initiative and creativity? Many people come through periods of stress with more physical and mental vigour than they had before. We also know that a long time without change or challenge can lead to boredom and physical and mental strain. In 1979 Dr. Kobassa became interested in people who stay healthy in stress. She and her colleague decided to look first at high powered business executives — widely viewed as the walking wounded of the stress war. They

Many people come through periods of stress with more physical and mental vigour than they had before.

found a group of telephone executives whose life experiences on the standard scale would have put them at high risk for illness but who were still in good health. So they asked the question; what was special about these executives?

Kobassa thought some people might be able to handle stress without becoming anxious and aroused in the first place and without starting the spiral that leads to illness. So she checked out three major personality traits that seemed most likely to help.

- Commitment to self, work, family and other important values
- Personal control over one's life.
- The ability to see change in one's life as a challenge to master.

The researchers saw these "C_s" — commitment, control and challenge — as the ingredients of what we called Psychological hardness. Hardy people should be able to face change with confidence and self-determination and the eagerness of seeing change as opportunity. In contrast, a less hardy person could feel alienated, threatened or helpless in the face of any major challenge to the status-quo. Kobassa carried out one study taking 700 executives of AT & T Corporation. The finding shows that the healthy executives were not younger, wealthier, higher on the career ladder or better-educated than the colleagues who became sick under stress. But one difference clearly counted: they were hardier. The stressed but healthy executives were more committed, felt more in control and had bigger appetites for challenge. These personality traits were the most potent protection against stress. A recent study of 480 employees of Rourkela Steel Plant made by Pattnayak, Nanda and Mohapatra (1994) supports this view.

Commitment, control and challenge the ingredients of Psychological hardness. Hardy people face change with confidence.

High job satisfaction and high autonomy and power can reduce the effects of stress on the job. Another factor that effects vulnerability to stress on the job is social support — one's network of social and family ties. The person who is alone physically or psychologically is more vulnerable to stress than someone who has strong social relationships.

High job satisfaction and high autonomy and power can reduce the effects of stress on the job.

Personality seems to be related to one's ability to tolerate stress. This is particularly apparent with the Type-A and Type-B personalities and their differential susceptibility to heart diseases (Friedman & Rosenmen, 1974). The two primary characteristics of type-A personality are a very high competitive drive and a constant sense of urgency about time. These persons are intensely ambitious and aggressive, always working to achieve something racing against the clock, always in a hurry. When they set out to accomplish something it must be done immediately, tomorrow is too late. They express their hostility and aggressiveness primarily by competing with others, particularly on the job and also in other spheres of life. They are impatient with other people and quick to anger if, they think others are working too slowly. These people are always in a state of tension and stress. Hence they are more susceptible to heart attacks.

Sources of Stress

There are two types of social systems to which we all belong: the family and religious, ethnic, regional and linguistic groups are examples of the primary social system. Membership of these systems is involuntary and strong. For instance, the family ties are strong because one acquires one's basic identity as a member of the family. The secondary system to which we relate are the social technical institutional clubs. Membership of these systems is optional. The functional requirements and role based expectations from the primary and the secondary systems differ. The demands made on the individual in one system have their effects on his performance in the other and often prove to be a source of stress.

On a broad spectrum there are three sources of stress — Psychological, Bio-ecological and personality Pattern.

Psychological Source

These stressors are a function of the complex interaction between social behaviour and the way our minds interpret those behaviours. In other words, our societal stress is determined by the meanings that are assigned to the events in our lives.

Bio-ecological Source

These stressors basically are biologically related and may arise out of our relationship with our environment.

Personality Source

This reflects the dynamics of an individual's self perception and characteristic attitude and behaviour which may somehow contribute to excessive stress.

Source of Executive Stress

Organized membership is a dominant source of executive stress. Organizational role stress covers a wide variety of stress arising from one's membership in work organization. The term role refers to the demands communicated by significant others, either in the organization or outside. Pareek's (1981) signal contribution to the Organizational role research lies in identifying as many as ten different types of organised role stresses. They are as follows:

Inter-Role Distance Stress is experienced when there is a conflict between Organizational and non-Organizational roles. For example, the role of an executive versus the role of a husband.

Role Stagnation Stress arises out of conflicting demands originating from colleagues i.e. superiors, subordinates and peers in the organization.

Role Erosion Stress arises when a role has become less important than it used to be or, when somebody else gets the credit for doing what needs to be done in one's own role.

Role Overload Stress is the feeling that one is required to do too much or doing things of considerable importance.

Role Isolation Stress is characterised by the feeling that others do not reach out easily; indicative of the absence of strong linkages of one's role and other roles.

Personal Inadequacy stress is depicted by the absence of adequate skills, competence and training to meet the demands of one's role.

Self Role Distance Stress arises from a gap experienced between one's concept of self and the demands of the role.

Role Ambiguity Stress is experienced when there is lack of clarity about the demands of the role.

Resource Inadequacy Stress arises when the human or material resources allocated are inadequate to meet the demands of the role.

Dealing with Stress at Organizational Level

The techniques for dealing with stress involve both the prevention of stress and its reduction or elimination. Some pro-active interventions are as follows:

Emotional Climate Control: Providing a climate for esteem and regard for employees and by allowing them to participate in all discussions involving change in their work and in the structure of the organization.

Provision of Social Support: Social support can reduce one's vulnerability to stress. The Organization can enhance social support by facilitating the cohesiveness of groups and by training supervisors to be empathetic to and supportive of subordinates.

Social support can reduce one's vulnerability to Stress.

Redefinition of Employee Roles: Managers must clearly state to their subordinates what is expected by them and what the precise scope and responsibilities of their jobs are. The management can reduce role conflict by making sure that the demands of a job are not in conflict and by not expecting the employees to behave in ways contrary to their values and standards.

Elimination of work overload and underload: Proper selection and training, equitable promotion decisions and fair distribution of work can do much to eliminate these causes of stress. The management must ensure that job requirements and employee abilities are matched.

Provision of Assistance to Stressed Employees: Management should provide in-house counselling programmes that teach individual stress-control techniques and supply facilities for physical exercise.

Dealing with Stress at Individual Level

Schultz and Schultz (1990) suggest the following strategies to overcome Stress affliction.

Relaxation Training: Individuals should be taught to concentrate systematically on one part of the body after another; tensing and then relaxing the muscles. By focusing on the sensations produced by the relaxed stage, progressively greater relaxation could be achieved.

Biofeedback: Biofeedback a popular technique for dealing with the effects of stress, involves the electronic

measurement of internal bodily processes such as heart rate or, muscle tension. People can learn to control not only heart rate but also muscle tension body temperature, brain waves, stomach acid and blood pressure which ultimately prevent stress related diseases.

Behaviour Modification: The technique involves learning how to relax, then conditioning positive emotional reaction to stressful events. By this technique type-A behaviour can be modified.

People attempt to cope with stress in different ways and not all approaches are equally effective. But in general the coping strategies are of two types. It may either take the form of avoiding the situation (reactive strategy) i.e. functional style or, confronting and approaching the problem (proactive strategy) i.e. functional style.

Less formal individual techniques of dealing with stress include developing stronger social support networks off the job, developing more interests outside work, taking vacations and leaving a stressful job for a less stressful one. These are common sense solutions that many people institute on their own and can be quite effective.

How to deal with stress

- Do confront the problem. It may not be as bad as you thought.
- Do change your attitude. Take things less seriously or, change the situation.
- Do take control. People who feel on top of things suffer less from stress than passive people.

Stress Prevention Tips

- Be aware of what is too stressful for you.
- Don't make too many changes at once.
- Take a break every day.
- Ignore the clock at times.
- Teach yourself how to relax.
- Get help from friends.
- Get regular exercise.

Concluding Remarks

The complete absence of stress is not beneficial. A certain level of stress is stimulating, invigorating and desirable. The problem for each individual is to find his

optimum stress level (stress tolerance limit) under which he can function and remain in good health by developing his own unique coping style.

References

- Friedman, M. & Rosenman, R.H.** (1974). Type A — Behaviour and your heart, New Haven, Conn, Fawcett Publications.
- Kobassa, S.C.** (1979). Stressful Life Events, Personality and Health: An enquiry into hardiness. *Journal of Personality and Social Psychology*, 37.
- Lazarus, R.S.** (1966). *Psychological stress and coping Process*. New York : McGrawhill.
- Mandal, J.M : Ghosh R, & Nair, L.** (1991). Early childhood experience and Life Events of male cancer patients; Psychosomatic Patients and normal persons: A comparative study. Paper presented at National Conference of Indian Academy of Health Psychology, Cuttack 1991.
- Mathew, V.J.** (1985). Job Stress of a creative managers. FPM written comprehensive Examination Paper, O.B. Area, Indian Institute of Management, Ahmadabad.
- M.C. Grath, J.E.** (1976). Stress and Behaviour in Organization in M.Dunnetti (Ed) *Hand book of Industrial and Organizational Psychology*. Chicago. Rand M.C. Nally.
- Paine, W.S.** (1982). *Job Stress and Burwout : Research Theory and Intervention*. London : Sage Publication.
- Pareek, U** (1981). *Making Organizational Roles Effective*. New Delhi, Tata MC Graw-Hill Publishing Company Limited.
- Pattanayak, B.** (1993). Role of Life Events, Type-A Behaviour and Mental health. A study on Public Sector Executives. *management and Labour Studies*, 18 (4).
- Pattanayak B; Nanda, P.K. & Mohapatra, J.K.** (1994). Does Job Stress Affects Organizational Commitment? Unpublished Paper, Jawaharlal Nehru Centre for Occupational Health Services, Rourkela Steel Plant, India.
- Pestonjee, D.M.** (1987). Executive Stress; Should it always be avoided? *Vikalpa*, 12(1), 23-30.
- Pestonjee, D.M. and Singh, G.P.** (1987). Organizational Behaviour issues for Managers and system Analysts. Working Paper No. 660, Indian Institute of Management, Ahmedabad.
- Pestonjee, D.M.** (1992.) *Stress and Coping*. New Delhi, Sage Publications.
- Schultz, D.P. and Schultz, S.E.** (1990). *Psychology and Industry Today*, New York : Mac-Millian Company.
- Selye, H.** (1956). *The Stress of Life*, New York. MacGraw Hill.
- Srivastav, S and Broota, K.D.** (1987). Stress and Cancer. *Journal of Personality and Clinical Studies*, 3(2), 89-94.
- Varkey, L** (1988). A study of Personality, Stress and Coping in Individuals with Coronary Heart Diseases (Unpublished paper) Bangalore University, Bangalore.
- Veningle, R.L. and Spradley, J.P.** (1981). *The work connection: How to cope with the Bum out*. Boslon. Little Brown and Company. □

Strategic Planning of Technology in Electronics Industry

V. Nanda Mohan & G. Manoj

The development of the electronics industry in India, so far, has been peripheral. The adoption, adaptation and diffusion of technology in a competitive industry like electronics should become highly strategic. Here an empirical analysis is made to establish that our current electronics industrial development/policy is lopsided. The analysis is based on the concept of technology figure of merit of electronics industry in India.

The electronics industry in India had its origin in the early 1950's but its growth has not been significant compared to other Newly Industrialising Countries (NIC's) like Korea, Singapore, Taiwan, Hong Kong etc.

Taking a cue from the NIC's India as a developing economy can try to make its presence felt on the world economy scene by developing the fast growing sector of electronics. The significant stagnation in electronics industry in India prompted an attempt to analyse the important factors causing the recessionary trends. As the development of electronics mostly depends on technology, an indepth analysis of technologies used in electronics has been attempted in terms of technology figure of merit.

Technology Figure of Merit

Technology figure of merit is a systematic attempt to value each of the technologies used in electronics production by using the value of production as a weighting factor. Simple weightings are insufficient when interaction effects are significant. For instance, a complementary product that increases the production of another product should be more heavily weighted than the simple value of its own production would indicate. To accomplish this, more complex weighting, a judgement of the level of product — product complementarity is determined and a weighting matrix created. Similar linkages

A Complementary product that increases the production of another product should be more heavily weighted than the simple value of its own production would indicate.

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should also be established between products, processes and technologies. These weightings, leading to a priority listing of important technologies can be assessed by the careful construction of a series of matrix relationships.

Conceptual Model

The model used for developing the technology figure of merit has been adapted from Goodman et al (1984) who developed a figure of merit for the technological development of Spanish industry in eighties.

The successive steps in the figure of merit calculation involve the construction of six matrices to find out the interrelationship between the different products, technologies and the processes involved in the infrastructure of the products. The entire set of computations are done by using the forecasted production values and the matrices which lead to the computation of the technological figure of merit. From this, the dominance of technology or technologies over different time periods can be found out enabling the identification of the technology with the higher payoff levels. Technological figure of merit can thus be used as a practical tool for interactive policy making. It is also a technique for evaluating various action projects aimed at improving the technological development of a nation's industrial base. Thus the figure of merit is highly useful for strategic planning of technology.

Estimation

For developing the technology figure of merit, the electronics industry was divided into three sub sectors namely Professional electronics, Consumer electronics and Components. As Professional electronics (in India) leads in production terms, it has been taken as the area of focus and the following seven areas (products) are distinguished:

Industrial electronics, Test and Measuring Instruments, Medical Electronics, Computer/Information Systems, Telecommunication Equipments, Broadcast Equipment and Strategic/Military Electronics. The Processes that are used in the manufacture of Professional electronic equipment are: Coatings, Metal work, Assembly, Control, Inspect, Clean room and Quality.

The different Technologies taken into account for the manufacture of Professional electronic equipment are: Analog, Digital, Signal transmission and detection, Computer Information Systems, Control Systems and Complementary (which includes many of the non electric technologies such as optics, fluids and mechanics).

In the first stage of the development of technology figure of merit, the production in the seven sectors of Professional electronics has been forecast at five year intervals up to 2001 by time series analysis. The production figure is used here as a weighting factor to find the technological figure of merit. The weighting factor could have been value added, employment or some other basic variable that could be associated with the products.

The second stage of the technology figure of merit calculation involves the construction of six matrices: the Product-Product matrix, the Product-Process matrix, the Process-Process matrix, the Product-Technology matrix, the Process-Technology matrix and the Technology-Technology matrix.

The Product-Product matrix indicates how strongly one product contributes to the production of another. Then the technology needed to develop and manufacture one product can also be credited with a portion of the production of related products.

The Product-Process matrix is developed to determine which processes are necessary to produce each of the products considered. Thus the Product-Process matrix indicates the processes critical to the manufacture of specific products. This matrix is in the zero one form. The result indicates an important dependence of the process for the technology category.

The Process-Process matrix is developed to describe the relationships between processes. This indicates how the processes contribute to the development of other processes.

The Product-Technology matrix is developed to indicate the technologies necessary for the success of a specific product. This matrix is in the zero one form. It indicates the technologies needed for various manufacturing processes.

Finally the Technology-Technology matrix is developed to find the advantage of one technology arising from the development of another technology. It indicates the value that one technology has on the development of another technology. In our development of technology figure of merit in Indian electronics, we have taken the above matrices from the work of Goodman and Lawless (1984). Using the different matrices and the professional electronics production figures in India as weights the technology figure of merit has been developed (Nanda Mohan and Manoj 1993).

The rank order of different technologies, corresponding to different years, developed from the technology figure of merit are presented in table 1.

Table 1: Rank Order of technologies

Technology	1981	1986	1991	1996	2001
Digital	1196.3	4194.3	12594.7	17904.9	24071.5
Signal Transmission and detection	844.8*	3176.4	9956.3	14099.5	18957.2
Control systems	856.4	3147.3	9359.4	13427.1	18055.4
Analog	383.4	1610.7	4693.4	6947.1	9348.7
Computer/Information systems	351.1	1425.1	4223.7	6191.2	8331.8
Complimentary	30.3	145.2	367.4	544.9	732.4

* — Only in 1981 control systems superseded signal transmission and detection.

Interpretation of Results

Comparing the rank order of different technologies, Digital, Control systems and signal transmission and detection dominate in the time period from 1981 to 2001. It is also seen that computer/information systems which is the most important electronic technology occupies a bottom ranking below the analog system technology in the Indian context.

Computer/information systems which is the most important electronic technology occupies a bottom ranking in the Indian context.

Again in India, Control systems is ranked only next to Signal transmission and detection except in 1981. In countries like Japan where the electronics industry has flourished highly significantly, control systems occupies prominence. The complementary technology which is ranked last includes optics, fluidics, mechanics etc which are advancing fast elsewhere. India lags behind much in the advancing technologies of electronics industry.

The calculation of the technological figure of merit indicates that three technologies i.e., digital, control systems and signal transmission and detection dominate in the five time periods that we have analysed. Investments in these technologies will have higher payoffs than investment in lower ranked technologies. Moreover, this dominance remains stable over a 20 year period. But it is highly discouraging to see that India lags in production

based on the digital technology (like production of digital ICs) which comes first in our technology figure of merit.

Policy Implications

In India the market for consumer electronics is developing/expanding. But our electronics industry has been in a state of stagnation; in fact we have been assemblers of semi-conductors imported from the competitors in electronics. As we import IC's (mainly digital) from the world market excepting for production of some application specific IC's (ASIC), more foreign exchange flows out and we remain net losers in the electronics trade. Paradoxically, the installed capacity in the production of limited ASIC has been under utilised as its production is limited to few applications of specific domestic users. Based on the facts (installed capacity and production of different firms) published in Indian Electronics Directory 1991, the capacity utilisation of IC's in 1990 is found to be around 10 percent.

The history of the electronics industries of Korea and Taiwan points to the importance of specialisation in the manufacture of semi conductors. Both Korea and Taiwan started out in the late 1960's as low cost assembly bases for export-oriented semi-conductor multinationals. At the time, assembly was a highly labour-intensive process. The more skilled and capital intensive design and wafer fabrication stages of the production process were performed exclusively in OECD countries. With the development of export oriented consumer electronics and computer peripheral industries in Korea and Taiwan, domestic demand for semi-conductor devices, including sophisticated memory chips and microprocessors, grew as well. In part to serve that market, a number of firms made large investments in design and fabrication facilities, in Korea in the early 1980's and in Taiwan during the second half of the decade. As the semi-conductor production field has become more competitive, newly industrialising countries like India can survive only by developing/expanding the domestic market on the one hand and making the industry competitive on the other so that the scale economies which are extremely important in IC production can be attained.

The history of the electronic industries of Korea and Taiwan points to the importance of specialisation in the manufacture of semi conductors.

Education & Entrepreneurship Development

N. Manimekalai & C. Thangamuthu

Entrepreneurship in India has been encouraged by various measures in order to boost industrial growth as well as to promote employment opportunities. Industrial Estate Programmes have been introduced with the objective of promoting entrepreneurship among the various sections of population and in industrially backward areas. This Study to finds out the relationship between education and entrepreneurship and it is concluded that education alone is not the determining factor for the growth of entrepreneurship.

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Harris [1971] hypothesized that the deficiencies for developing entrepreneurship in LDC are superficial and can be remedied over a relatively short period by providing conventional education and training inputs. He held that the supply schedule of efficient entrepreneurial services can be shifted or flattened by an appropriate investment in training facilities. India, assigned greater significance to industrial development by improving the quality of entrepreneurs through imparting training and other facilities. Both the state and central governments cater to the requirements of infrastructure, incentives, technology, marketing and inter-institutional tie-ups through various departments and institutions. Entrepreneurship Development Programmes have been initiated to provide training for the educated unemployed, providing self-employment opportunities. But the results of EDPs have not been very encouraging with the national average, in terms of participants who have set up industrial units, placed around just 10-15 per cent of the total number of people trained. Thomas et.al [1993] say that this could be indicative of the inadequacies in the present system. Focusing on the human resource input to the present system they remark that a large number of individuals attending EDPs are not genuinely interested in becoming industrialists. They have suggested that the government should frame a scheme and earmark funds, under Human Resource Development (HRD) efforts, so that 'students' trainer' training programme takes off as an on going process.

The supply schedule of efficient entrepreneurial services can be shifted by an appropriate investment in training facilities.

Table 1: Product line of the Sample Units

Product line	IE Units		OIE Units	
	No. of Units	%	No. of Units	%
Steel Fabrication & General Engineering	70	64.81	23	65.71
Ferrous and Non-ferrous castings	5	4.63	—	—
Metal and Metal based castings	6	5.55	4	11.43
Electric and Electronic products	7	6.48	—	—
Food processing	2	1.86	1	2.86
Plastic & Rubber products	9	8.33	4	11.43
Chemical products	5	4.64	2	5.71
Mineral products	3	2.77	—	—
Knitting	1	0.93	1	2.86
Total	108	100.00	35	100.00

ly in Industrial Estate. Factors for choosing this particular industry were ranked and found that previous experience is the foremost factor and education ranked second in both the sample groups. An analysis of parental education and occupation was made and revealed that education of parents did not have any impact on the education of the entrepreneurs. Similarly with the occupation of the fathers, as most of the parents were from agricultural background.

Previous experience of the entrepreneurs is an important factor for success.

thereby that Industrial Estate Programme has invited more non-local entrepreneurs. Previous experience of the entrepreneurs is an important factor for success and in both the sample groups nearly 75 per cent of the entrepreneurs have nearly 1-15 years of experience; this percentage is slightly higher for IE group thereby proving that experienced entrepreneurs got accommodation easi-

There is dominance of educated entrepreneurs particularly in IE group. Among the OIE group, more than 40 per cent have not crossed school final. The educational qualification of the sample entrepreneurs is given in table 2. More entrepreneurs in the industrial estate have higher and professional education; as high as 50 per cent were either engineering graduates or technical diploma holders. Table 3 which shows the relationship between education and product line, exhibits that most of the

Table 2: Educational qualification of the Entrepreneurs

Educational Qualification	IE Units		OIE Units	
	No. of entrepreneurs	%	No. of entrepreneurs	%
Primary	4	3.70	3	8.57
Secondary	25	23.15	12	34.29
Intermediate	7	6.48	2	5.71
Graduates [Arts & Sci.]	14	12.96	4	11.42
Post Graduates [Arts & Sci.]	2	1.85	—	—
Engineering Graduates	28	25.94	3	8.57
Technical Dip. Holders	19	17.59	9	25.71
Professional Education [other than Engg.]	9	8.33	2	5.71
Total	108	100.00	35	100.00

Table 3: Educational qualifications by product line

Product line Education	IE Units										OIE Units								
	1	2	3	4	5	6	7	8	9	Total	p.c.	1	3	5	6	7	9	Total	p.c.
Primary	2	—	—	—	2	—	—	—	—	4	3.70	2	1	—	—	—	—	3	8.57
Secondary	18	1	1	—	—	2	—	2	1	25	23.14	6	—	1	3	1	1	12	34.29
Intermediate	3	1	—	1	—	1	—	1	—	7	6.48	1	—	—	1	—	—	2	5.71
Graduates	6	1	2	1	—	1	3	—	—	14	12.96	2	—	—	—	—	—	2	5.71
Post Graduates	—	—	—	—	—	—	2	—	—	2	1.85	—	2	—	—	—	—	2	5.71
Engineering Graduates	23	1	2	1	—	1	—	—	—	28	25.93	3	—	—	—	—	—	3	8.57
Engineering Dip. Holders	13	1	1	3	—	1	—	—	—	19	17.59	8	1	—	—	—	—	9	25.71
Professional education [MBA]	5	—	—	1	—	3	—	—	—	9	8.33	1	—	—	—	1	—	2	5.71
Total	70	5	6	7	2	9	5	3	1	108	100.00	23	4	1	4	2	1	35	100.00

technology qualified entrepreneurs are engaged in steel fabrication and general engineering. Another study also found that entrepreneurs with higher professional education were concentrated in engineering units. [C. Than-gamuthu & S. Iyyampillai, 1991]. It may be inferred that technically educated persons are able to avail the opportunity to set their units in industrial estates as evident by their dominance in the latter group than in the OIE group.

The dominance of technically qualified persons in the engineering industries may be partly because of the higher technical skill requirement in the engineering group and partly because of the expectation that BHEL's job orders may be better forthcoming if one of the partners of these concerns is an engineering graduate.

The dominance of technically qualified persons in the engineering industries may be because of the higher technical skill requirement.

Performance of the Entrepreneurs

An analysis of entrepreneurial performance on the basis of the educational attainment of entrepreneurs [table 3] reveals that in both IE and OIE groups, the technically qualified entrepreneurs dominate, as they constitute nearly 45 and 35 per cent in IE and OIE groups respectively. This is however not corroborated by some other studies. Balamohandas [1982] found that though the ancillary units require some technical skill, eight out of his sample of 35 entrepreneurs did not have any formal education and only 10 had technical education.

Table 4: Performance by Education for the year 1988-89

Education	IE Units						OIE Units					
	No. of Units	Mean Invest. [in lakhs]	Mean Capacity Utilisation [in p.c.]	Mean Profit [in lakhs]	Mean Turn over	Mean Age of Units [in yrs]	No. of Units	Mean Invest. [in lakhs]	Mean Capacity Utilisation [in p.c.]	Mean Profit [in lakhs]	Mean Turn over	Mean Age of the units [in yrs]
Primary	4	6.3	55.00	0.30	5.50	9.40	3	4.33	56.66	0.50	3.06	12.00
Secondary	25	9.00	62.00	0.73	12.13	8.78	12	8.50	83.00	0.90	17.11	11.86
Intermediate	7	7.08	60.86	0.65	10.07	9.83	2	3.75	75.00	0.65	10.50	8.00
Graduates [arts & sci.]	16	15.00	60.00	1.71	21.73	10.50	4	4.06	60.00	0.70	3.88	12.50
Technically Qualified	47	10.00	61.00	0.9	15.96	9.98	12	9.12	73.00	1.30	7.00	13.00
Professional education [other than Engg.]	9	14.00	62.00	1.49	18.26	8.00	2	7.50	70.45	1.00	8.50	11.00
Average	108	10.60	60.73	1.01	14.82	9.82	35	7.56	73.06	1.09	10.06	12.09

Taking the performance indicators and education it is observed that those who have the lowest education namely primary, show a very poor performance in terms of all indicators (table 4), in both the IE and OIE groups. Further, it is found that as the education of the entrepreneurs increases, their performance in general also increases. Strikingly enough, however, in terms of capacity utilisation, a key indicator of performance, the entrepreneurs with secondary-level school education have consistently shown better performance [than the graduates] in both IE and OIE categories. As Fothergrill and Gudgin [1979] in a study of new manufacturing firms in the East midlands of England show, the firms founded and managed by those with degrees or equivalent qualifications perform significantly better than non-graduates. Bhanusali's [1987] study also shows that higher the level of technical education, better the performance; such a relationship however does not exist in the case of non-technical [general] education. The present study also goes with this finding as far as the first point is concerned, but the second assertion is not supported by the current study. The performances of technically qualified entrepreneurs as well as that of other graduates seem to be similar and impressive.

The performances of technically qualified entrepreneurs as well as that of other graduates seem to be similar and impressive.

In contrast to the IE units, where the graduates show better profit performance, among the OIE group, non-

graduates also perform equally well. This may be attributed to the fact that some of them have started their units as self-employment ventures after their practical experience/training [though with lesser education]. Relatively, the average level of education among IE entrepreneurs is higher than that of the OIE group, Entrepreneurs with other professional qualifications such as MBA, BL, LLB, etc., also show a moderate performance in terms of profit and turn over.

The correlation coefficients for growth of turnover, investment, capacity utilisation etc. are found to be negative and significant thereby proving that education does not contribute to better entrepreneurial ability. On regression analysis of the growth of turnover of the unit, education has been found to be positively contributing and it is statistically significant also. For other dependent variables like growth of profit, capacity utilisation, investment, profit reinvested etc, the regression co-efficients were negative and also significant, indicating that education is not a determinant of these variables, This is true for both the sample groups.

It is revealed that 75 percent of the highly educated entrepreneurs [graduates & above] were able to avail credit from banks and other promotional agencies. The amount availed by the highly educated entrepreneurs was higher than that by the less educated. Perhaps it is due to the heightened awareness and ability to overcome the difficulties by the better educated persons. This is true in both the groups of samples.

Entrepreneurial Economic Success Index (EESI)

An attempt was made by P. Akhouri [1978] and Rahaman [1979] to evolve a comprehensive methodology known as Entrepreneurial Economic Success Index

Table 5: EESI by Education

Success Index Education	IE Units						OIE Units					
	Very Successful	Suc-cessful	Less Suc-cessful	Unsuc-cessful	Total	p.c	Very Successful	Suc-cessful	Less Suc-cessful	Unsuc-cessful	Total	p.c
Primary	1	1	1	1	4	3.70	—	—	1	2	3	8.57
Secondary	3	5	6	18	32	29.63	2	4	5	3	14	40.00
Graduates	2	3	3	8	16	14.81	—	2	—	2	4	11.43
Engineering Graduates	1	3	8	16	28	25.94	1	1	—	1	3	8.57
Technical Diploma Holders	1	5	6	7	19	17.59	2	4	2	1	9	25.71
Professionals [other than B.E.]	1	1	2	5	9	8.33	1	—	1	—	2	5.71
Total	9	18	26	55	108	100.00	6	11	9	9	35	100.00

[EESI]. Taking the risk taking ability measured by the extent of capital to his own capacity, resource mobilisation ability measured by borrowed and raised capital, entrepreneurial efficiency by net profit and quality to progress by the reinvestment of profit, EESI has been calculated. Depending on the index value, they have been classified as very successful, successful less successful and unsuccessful. The formula for EESI is as follows:

$$EESI = \frac{WTI}{TI} \frac{NP}{TI} + \frac{PR}{NP}$$

where WTI = The weighted total investment

$$WTI = \frac{OC}{OCTY} \text{ of } OC + \frac{BC}{OC} \text{ of } BC + \frac{RC}{OC} \text{ of } RC$$

$$= \frac{OC^2}{OCTY} + \frac{BC^2}{OC} + \frac{RC^2}{OC}$$

OCTY = Own Capacity to Invest

OC = Own Capital

BC = Borrowed Capital

RC = Raised Capital

TI = Total Investment [OC + BC + RC]

NP = Net Profit [after tax and interest deduction]

PR = Profit Reinvested

The results of EESI showed that the incidence of failures [proportion of unsuccessful entrepreneurs] does not seem to reduce as the level of education increases. For instance, among engineering graduates in IE group, the proportions of less successful and unsuccessful and successful entrepreneurs are even slightly higher than those among the less educated. The technical diploma holders have however fared relatively better in both the categories of IE and OIE entrepreneurs. In the latter group, the percentage shares of very successful and

successful entrepreneurs accounted for by the diploma holders are quite impressive. The general belief that engineering graduates, with their relevant qualifications, would emerge and develop as successful entrepreneurs has been largely belied. Only one out of 28 engineering graduates in the IE group could qualify for the very successful grade.

The general belief that engineering graduates, would emerge and develop as successful entrepreneurs has been largely belied.

The proportion of successful entrepreneurs to total entrepreneurs in each category on the basis of EESI can be used for their merit rating. The percentage share of very successful and unsuccessful [both put together] are used for giving merit rating/ranking. The points are given bottom up, the last in order getting one point and higher up getting successively higher points. The merit rating by education is given in table 6.

Table 6: Merit Rating by Education

Education	Merit Points	
	IE Units	OIE Units
Primary	5	1
Secondary	3	2
Graduates	6	3
Engineering Graduates	1	5
Technical Diploma holders	4	5
Professional [other than B.E]	2	3

The graduates in the IE units and engineering graduates and diploma holders in OIE group get higher points. From this no perceptible assertion could be made, as in IE group even those who have primary education did better than engineering graduates, whereas the performance moves positively with education i.e., higher the level of education, better is the performance for OIE group.

Conclusion

Education does not necessarily enhance entrepreneurial performance. The correlation co-efficient calculated exhibits negative relationship implying that the highly educated entrepreneurs perform poorly than less educated entrepreneurs. Moreover, in the engineering group, education should have positively contributed for better performance but did not do so in the sample group.

Nevertheless, it may not be altogether surmised that the education does not contribute for entrepreneurship development. It of course contributes for the emergence of entrepreneurs in the engineering field and the performance difference might be attributed to inherent factors like social and economic variables other than education. In both the groups, considerable percentage of engineering degree and diploma holders have started industries indicating that the educated population has directed its resources to self-employment and industrial activities rather than white collar government jobs. Also education has created better awareness about the existing opportunities and supportive facilities with promotional agencies, as most of the highly educated entrepreneurs have availed more loan from various institutions. Therefore, education is an important factor which promotes entrepreneurship. It is a basic factor which is necessary for the emergence and creation of entrepreneurship. However success and better performance cannot be attributed to education alone but also to several other factors such as previous experience, community, nativity, nature of the unit, the industrial background and the like.

References

- Akhouri, M.M.P.** (1978), "Entrepreneurial Economic Success Index for assessing Entrepreneurial Success" SEDME, 1[1].
- Bale Mohandass,** (1982), "Ancillary Industrial Development" Andhra University Press.
- Bhanusali S.G.** (1987), "Entrepreneurship Development", Himalaya Publishing House, New Delhi.
- Boswell J.** (1970), "The Rise and Decline of Small Firms", George Allen and Unwin, London.
- Fothergrill S. & Gudgin G** (1979), "The Job generation process in Britain", Centre for Environmental Studies, Research Series, No. 32.
- Harris J.A.** (1971), "The Development of Entrepreneurship" in Peter Kilby [1971, ed.], "Entrepreneurship and Economic Development", The Free Press, New York.
- Harris & Somers** (1971), "African Business — A study of Entrepreneurship and Development in Kenya", Routledge and Kegan Paul, London.
- Pathak H.N.** (1978), "Developing Entrepreneurship in Backward Regions", *Artha-Vikas*, Vol. 9
- Rahaman Habibur** (1979), "Entrepreneurship and Small Enterprise Development in Bangladesh," Bureau of Business Research, University of Dacca.
- Robert E.B., Wainer H.A.** (1967), "New Enterprise of Route 128", *Science Journal*, Dec.
- Tandon B.C.** (1975), "Environment and Entrepreneurship", Church Publications, Allahabad.
- Thangamuthu C. & Iyyampillai, S.** (1991), "Industrial Promotional Agencies and Entrepreneurship Development" submitted to ICSSR, Unpublished Research Project.
- Thomas T. Thomas & K. Padmakumar** (1993), "Developing Entrepreneurial Industrialists — an Alternate Approach", *Productivity*, 34[2], July-Sept. □

Human Resource Planning: The Case of Rourkela Steel Plant

Sujata Mangaraj

This article assesses the changing manpower planning policy decisions taken by Rourkela Steel Plant in favour of utilizing its human resources, identification of surplus manpower and redeployment by adjustment and training, elimination of overtime, checking of unauthorised and excessive absenteeism. The voluntary retirement scheme is helping the reduction of the less able employees. Cluster system of promotion is introduced for increasing work motivation, job satisfaction and promotion of workers morale. Thus, manpower planning has paved the way for better utilization of human resources.

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Human resource management is basically concerned with having the right number and type of people as and when required and improving the performance of the existing people to make them more effective on their present jobs and more competent for future opportunities. Human Resource Management starts with Human Resource Planning.

By maintaining human resource at an optimum level, by avoiding overstaffing and understaffing and by placing the right kind and number of persons at the right places, Human Resource Planning aims at effective utilization of human resources. To know how far Human Resource Planning activities help in better utilization of human resources, a study was undertaken in Rourkela Steel Plant which has recorded significant success in the last few years.

Rourkela Steel Plant is a Unit of SAIL, a monolith organization in the World of Indian Public Sector Undertakings. Its commissioning was started during 1958 and continued upto the end of 1962. The working area of the Steel Plant is 8540.84 acres and the area of the Steel City is 11244.38 acres including about 23,254 residential accommodations. The annual production capacity is 1.8 million tonnes of Ingot Steel and 1.225 million tonnes of saleable steel and 4.6 lakh tonnes of "SONA" Calcium Ammonium Nitrate (25% N) fertilizer. The capital investment is Rs. 1211.16 crores as on 31st March, 1988 and 27.37 million tonnes of saleable steel has been produced by 31st March 1992. The Plant has already made a profit of Rs. 259.02 crores till 31st March, 1991. It has a manpower strength of 33,941 as on 31st March, 1992.

Concern for people, excellence in every operation, continuous innovation, team work and high degree of personnel discipline are the core values of the organisation. Human resource management plays a vital role in organization's management and human resource plan-

ning activities are undertaken to achieve objectives such as fair assessment of optimum manpower recruitment, assessment of training needs of the employees to cope with new technologies, efficient manpower utilization, avoiding surpluses by redeployment and estimating future manpower requirement etc.

Concern for people, excellence in every operation, continuous innovation, team work and high degree of personnel discipline are the core values of the organisation.

Reduction in Manpower & Labour Productivity

As a model employer, RSP was going on adding manpower since inception and thus identification of surplus manpower was a regular feature. Due to job rationalisation and closing down of certain units, manpower was rendered surplus. In this context, the concept of HRD practised in the organisation merits being highlighted.

The HRD concept considers the personnel working for an organisation as assets which are to be carefully acquired nurtured and developed. There is a subtle difference between material assets acquired and human resources. By careless handling or by natural wear and tear material assets tend to be less productive and may turn out to be a zero value asset (or a scrap) as a last consequence. Careless handling of human resource initially makes them less productive and at a stage makes them zero productive but the degeneration does not stop there. While an inanimate asset cannot damage itself beyond the point of being of a zero value, a non-productive asset, a non-motivated human resource might turn out to be not only a non-productive asset but also counter-productive being capable of instigating others also not to work or produce. Thus careless handling turns the performing human resource or asset into a non-performing asset first and a "Counter-Productive liability later" (Bhatta, 1989). The management of RSP decided to redeploy the surplus manpower after suitable retraining in the new and existing units.

As a massive organisation development exercise during the year 1986 "The Priorities for Action" were finalised with the objective of improving the working system of SAIL. In 1987-88 the memorandum of under-

standing (MOU) was signed in between the Government and SAIL. The result of the above two documents is the Annual Performance Plan (APP) which is the guideline or the basis on which the goal of the organisation as well as the role of every employee towards attainment of the said goal are finalised.

In the 'priorities of action' attempts are made to crystallise the management's thought by interacting with employees at all levels, conducting workshops and seminars. Improving the work culture is taken as priority and the objective behind this is to utilise the existing resources to the maximum possible extent. To improve the work culture, RSP has decided to give more emphasis on team work, open communication, decision making through participation, improved grievance handling system, job enrichment with delegation, role definition with defined authority, responsibility and accountability, discipline — both personal and organisational, elimination of overtime, reduction in absenteeism, better work practices, better house keeping, elimination of shift change delays, and operational consistency. Most of the above mentioned activities have been successfully implemented in RSP.

To improve the work culture, RSP has decided to give more emphasis on team work, open communication, decision making through participation, improved grievance handling system, job enrichments with delegation, role definition with defined authority, responsibility and accountability.

The year-wise manpower and labour productivity of Works Department as well as works and administration is given in table 1. There is an increasing trend in the total number of manpower till 1983-84. From 1984-85 onwards, RSP has been trying to bring down the total number of manpower. Similar trend is also found in the manpower in the works. At the same time the labour productivity in both the works and works plus administration shows a similar trend. Till 1986-87 a fluctuating trend is found in the rate of labour productivity whereas from 1987-88 onwards a straight upward trend in the rate of labour productivity is marked. In spite of the decrease in the total manpower there is an increase in the rate of labour productivity from 1987-88 onwards representing better utilization of manpower.

Table 1: Year wise manpower and labour productivity (in terms of Ingot tonnes per man-year)

Year	Total No. of manpower	Labour Productivity works and amn.	L.P. works	Manpower (Nos)
1981-82	38701	42	47	25957
1982-83	39676	39	44	26157
1983-84	40152	38	42	26218
1984-85	39827	39	43	26118
1985-86	39447	41	46	25973
1986-87	38932	39	44	24469
1987-88	37973	40	47	24202
1988-89	37045	44	51	23764
1989-90	36049	44	52	23364
1990-91	35213	48	58	22965
1991-92	34544	49	59	20618

Source: Manpower Cell RSP & Statistical year book

N.B.: Average yearly labour productivity

$$= \frac{\text{Total production of ingot steel(tonnes)}}{\text{Average manpower for the year being considered (man year)}}$$

Voluntary retirement scheme previously in practice in RSP. was modified in 1986. The objective of the past scheme was to help the workers in need, whereas the objective of the present scheme is to achieve optimum utilization of manpower and to improve the average age mix and skill mix of employees by separating idle, medically unfit, old surplus employees from the rest of the work force. A total number of 5329 separations were made between 1984-85 and 1991-92. Manpower reduction is made through an attractive voluntary retirement scheme. During 1992-93, there was a plan of separating 1422 employees out of which voluntary retirement constituted 430. Counselling programmes were conducted by management to motivate inefficient employees who come under the eligibility of the scheme to undergo voluntary retirement.

Redeployment after Retraining

Redeployment of surplus employees after successful retraining is adopted by RSP as method for better manpower utilisation. Redeployment started during 1971-72 in RSP. Within fifteen years since 1971-72 to 1986-87 about 1031 redeployment (an average of 67 per year) have taken place. Within five years since 1986-87 to 1991-92 about 1215 (an average of 202 in a year) redeployment has resulted. The changing attitude towards redeployment in RSP is helping better manpower utilization and increasing the labour productivity.

Overtime

Overtime is one of the factors for improper manpower utilization as it brings about a climate where higher

productivity is not the focus. It saps the employee's will to find better ways of doing the work. Overtime was one of the factors of inefficiency in utilization of manpower in RSP (table 2). Measures were taken by RSP Management, since 1985-86 to cut down overtime. After complete stoppage of overtime the labour productivity of the Company has not declined but shows an increasing trend. There is relative increase in the utilisation of manpower in relation to decrease in overtime.

Table 2: Average monthly overtime statement and labour cost on overtime in RSP

Year	Average overtime hours booked per month (in hours)	Labour cost on overtime (Rs. in lakhs)
1980-81	433574	530
1981-82	424457	584
1982-83	458234	668
1983-84	447135	720
1984-85	475907	884
1985-86	389379	767
1986-87	39092	88
1987-88	21186	45
1988-89	2843	11
1989-90	152	4
1990-91	—	—

Source: A report on quarterly statement on productivity, absenteeism, overtime in plant units April, 1989-June, 1989

Unauthorised Absenteeism

Frequent absenteeism in industrial establishments is a great handicap both to workers and industry. As "no work no pay" is usually the general rule, the loss to the workers due to absenteeism is quite distinct. The loss to the industry is still greater as both discipline and efficiency suffer. The yearwise unauthorised absenteeism record of RSP is presented in table 3.

Table 3: Absenteeism Record of RSP

Year	Authorised	Unauthorised	Total
1981-82	10.62	7.82	18.44
1982-83	10.45	7.55	18.00
1983-84	10.77	7.86	18.63
1984-85	10.71	8.75	19.46
1985-86	9.52	8.56	18.08
1986-87	9.18	7.75	16.93
1987-88	9.71	7.45	17.16
1988-89	9.13	5.5	14.63
1989-90	9.9	5.5	15.4

Source: Manpower Cell RSP

The rate of unauthorised absenteeism shows fluctuating trend uptill 1984-85. From 1985-86 onwards a declining trend is marked in the said rate. This declining trend is mainly due to the vigorous drive undertaken by RSP Management issuing comprehensive circulars on leave and holidays to facilitate leave planning, demanding prior approval of leave to avoid dislocation of work, conducting massive counselling campaigns through joint participative forums, and training programmes to create awareness among regular absentees and taking disciplinary action against habitual absentees. Besides, a scheme of attendance award was instituted in 1986-87. It motivates employees to achieve maximum attendance thereby contributing towards production enhancement as well as productivity improvement.

Non Executive Promotion Policy

To reward competent personnel having growth potential and to utilise their capacity to the maximum possible extent. RSP has adopted a system of non-executive promotion during 1988. It is known as the cluster system of promotion as it is a combination of a system of cluster of parts and jobs. The promotions within the cluster are vacancy based. Within this approach the job is understood in totality and in a composite manner so that the flexibility of the employees within the cluster becomes viable and the optimum utilization of human resource is achieved.

To reward competent personnel having growth potential and to utilise their capacity to the maximum possible extent. RSP has adopted a system of non-executive promotion.

The employees avail all opportunities of training for updating their skill. Within one cluster the employees are given different skill training so that idle manpower can be minimised and maximum utilisation and increased labour productivity can be realised.

Conclusion

Manpower utilisation is an important and vital aspect of any organisation. Some of the methods are more suitable to particular performance problems or particular personality types. As persons are individualistic it needs the judgement of the management, as an informed man on the spot to decide how to approach every case. The management has to analyse the problems and available resources and evolve appropriate manpower planning for meeting both the short term and long term manpower requirements; for introducing better clarity in the roles of workers; for evolving better schemes of appraising performance, training schemes; and for boosting morale of the employees.

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Rourkela Steel Plant has perused an active policy of manpower Planning by adopting a number of schemes for better utilisation of its human resources to raise its labour productivity. It reduced surplus manpower through identification and redeployment by adjustment and training. It achieved more or less absolute success in the elimination of overtime that breeds inefficiency in work performance. It checked successfully unauthorised and excessive absenteeism. The voluntary retirement scheme is helping reduction of the less able employees. Cluster system of promotion has been introduced for increasing work motivation; job satisfaction and promotion of worker's morale. Thus, manpower planning has paved the way for better utilization of human resources in RSP.

References

- Bhatta V. Prasanna**, "Training in Banks some aspects of Management", Economic time, mid week review, 2nd Nov. 1989.
- Report on "Human Resource Planning, Rourkela Steel Plant"** published by Industrial Engineering Department, Rourkela Steel Plant. □

Sustaining the Productivity of Natural Resources: Policy Alternatives

R.P.S. Malik

Agriculture depends almost entirely on the availability and health of natural resources. This also is the sector where natural resource abuse is enormous and the non consideration of the impact on the natural resource use, both by the planners in the formulation of policies and by the users in their pattern of usage, has often been responsible for the deterioration of resource base. An attempt has been made in the present paper to empirically demonstrate how the magnitude of natural resource depletion can be quantified, the cost of natural resources used up in the production process can be estimated and the cost so estimated can be accounted for using a modified accounting framework, the Natural Resource Accounting (NRA) framework, to work out more meaningful measures of profitability and more informed measures of sustainability.

The accounting frameworks used by the national governments at the macro level and those employed by a production firm or an individual farming household at the micro level, to appraise performance or to evaluate the rationality of decisions, often overlook or do not emphasise the productive role of natural resources. The framework employed to measure either the macro economic variables such as the Gross National Product (GNP) or the Gross Domestic Product (GDP) of an economy, or the profit and loss accounts of a producing firm or that of a farmer does not make provision for or take into account the cost of depletion and/or degradation of natural resources. While man made assets — such as buildings, machinery, equipment etc. are valued as productive capital and are written off against the value of production as they depreciate over time, the loss of natural resource base — such as soil, water, minerals, forests etc. are not so valued. As a result, the loss of natural resources entails no debit charge against current income that would account for decline in potential future production from use of these resources. Just as a machine depreciates with use over time and its productive capacity declines producing the same quantity at higher and higher cost, similarly soil also depreciates with use over time with decline in its productive capacity producing the same output at higher cost through application of larger quantities of nutrients. Failure to appreciate and extend this concept of depreciation to natural resources, which are a major source of income, employment and foreign exchange earnings in such resource dependent economies as that of India, is a major omission and inconsistency in the currently practised accounting frameworks. Underlying this anomaly is the implicit but inappropriate assumption that natural resources, being free gifts of the nature, are so abundant that they have no marginal cost and therefore there are no investment costs to be written off. This is however a misunderstanding —

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Just as a machine depreciates with use over time and its productive capacity declines soil also depreciates with use.

whether or not natural resources enter the market place, they do make an important contribution to the long run economic productivity and so are economic assets and must be treated accordingly (Repetto: 1989, Faeth: 1991). Failure to take into cognizance the possible effects on natural resources has been one of the important causative factors for the unsustainable patterns of development in a number of economies.

Failure to take into cognizance the possible effects on natural resources has been one of the important causative factors for the unsustainable patterns of development in a number of economies.

While a considerable and growing body of expert opinion has recognised the need to remove this anomaly the progress however has been rather tardy. One of the important obstacles in the way of accounting for depletion and degradation of natural resources has been the problem of precisely perceiving the nature of effect on natural resources, quantifying their magnitude, and valuing their cost. Further, since the resource depletion is often a slow process and its impact is generally not discernible immediately or even in the short run, accounting for natural resource use often requires consideration of a fairly long time horizon. This consideration further confounds the already complex quantification and valuation problems. The estimational intricacies deterred many a potential user from modifying their accounting frameworks to take account of natural resource depletion.

Hence a case study was undertaken in North-West India where overdevelopment of one of the most important natural resources — the groundwater — has evinced grave concern over threats to the sustainability of agricultural production.

Profile of the Study Region

The study region comprising the North-West Indian States of Punjab and Haryana, is agriculturally the most advanced region of the country. With less than 3 percent

of the geographical area of the country and less than 5 percent of the country's population the region is the largest producer of foodgrains in the country. The large scale shifts in cropped area towards rice and wheat has given this region the distinction of being referred to as the "food basket" of India. The combined area under rice and wheat as a proportion of gross cropped area has increased from 38 percent in 1970-71 to more than 59 percent now. Rice which occupied only 659 thousand hectares in 1970-71 now occupies more than 2700 hectares.

The climatic conditions in the region vary from arid to semi-arid. The region receives an annual average rainfall of about 600 mm of which almost 75 percent is received in the three months period from July-September. The cultivation of rice requires about 2500 mm of water while wheat requires about 480 mm. Since the available rainfall is grossly inadequate the cultivation of rice-wheat requires extensive supplementary irrigation.

To meet the time specific irrigation water requirements of the rice-wheat cropping system the farmers have resorted to intensive exploitation of groundwater through installation of private shallow tubewells¹. The availability of concessional credit from public sector financial institutions for installation of tubewells and highly subsidised electricity for irrigation pumping accentuated the process of groundwater development. As a result almost 85 percent of the cultivated area in the region is now irrigated with about 60 percent of the net area irrigated being by wells and tubewells.

The increase in the number of tubewells and the increased demand for water created by the water intensive cropping pattern, have put a great pressure on the groundwater resources. Due to low rainfall the recharge to the groundwater has been lower than the volume of withdrawals². This has adversely affected the groundwater balance in large parts of the region. Of the 118 development blocks³ in Punjab and 108 in Haryana, about 56 percent of the blocks in Punjab and 29 percent

1. The region has a fairly good network of surface water irrigation system. The available surface water is however sufficient to meet the protective irrigation needs of the agriculture in the region and is grossly inadequate to meet the irrigation requirement of the water intensive rice-wheat cropping system.
2. While the aquifer gets recharged from a number of sources such as seepage from surface irrigation systems, infiltration from irrigation water applied to the crops etc., rainfall nevertheless continues to be the most important source of recharge.
3. A block is an administrative unit. The number of blocks in a district can vary over a wide range from as low as 3 in some districts to as high as even 20 others.

in Haryana have been classified as "dark"⁴. Another 16 percent of the blocks in Punjab and 15 percent in Haryana have been classified as "grey". A more finer classification of the distribution of dark and grey blocks suggest that the proportion of dark and grey blocks is much higher in those districts where rice is a major crop. Thus as against 89 percent of the blocks classified as either dark or grey in rice growing districts, only 29 percent of the blocks fall in these categories in the non-rice growing districts of the region. The water table on large parts of the region is falling rapidly. Leading agricultural scientists and planners have expressed grave concern over the dwindling groundwater balance and the threat it is posing to the sustainability of agricultural production (Malik & Faeth: 1993; Prihar et al.: 1990; Randhawa: 1989; Johl: 1986).

The increase in the number of tubewells and the increased demand for water created by the water intensive cropping pattern, have put a great pressure on the ground water resources.

The Data Base

The study is based on a synthesis of data collected from official sources and that from a sample of 120 farms selected according to an appropriate sampling scheme from the predominantly rice-wheat growing region of Karnal and Kurukshetra districts in Haryana (Malik: 1994). The data collected relates to the crop year 1991-92. The study compares two competing farming systems rice-wheat and maize-wheat, the former due to large water requirements (about 2500 mm for rice and 480 mm for wheat) is mainly responsible for the decline in water tables while the latter due to low water requirements (about 320 mm for maize and 480 mm for wheat) does not cause any significant decline in water tables. To take into consideration the slow pace at which natural resources often deplete, the study envisages a twenty year time frame for estimating the magnitude of resource depletion and valuing its cost.

4. The classification blocks into different categories is done to denote the criticality of the stage of development of groundwater resources. According to the prevailing norms an area is classified as "dark" when its annual draft of groundwater exceeds 85 percent of its annual recharge; it is "grey" when the ratio of draft to recharge is between 65 and 85 percent; and "white" when this ratio is less than 65 percent.

Estimating Resource Cost of Groundwater

Groundwater being an open access resource without clearly defined property rights, any individual or a group of individuals who can either invest in or have access to a water pumping equipment can extract unobstructed as much water as required. Since the extractor does not have to pay for water per se, the cost to the extractor of the water so extracted can be equated to the cost of extraction as reflected by the capital and operating expenses of the pumping equipment. As the water table declines, the size of the pumping equipment and consequently the capital and operating cost of the pumping equipment required to extract a given amount of water also increases. The only implication of a decline in water table to the extractor of water is thus an increase in the capital and operating cost of pumping water from this increased depth. We therefore define the resource cost of groundwater as the likely increase in farmer's cost of pumping irrigation water consequent upon a decline in water table during the twenty year time frame of the present study.

Groundwater being an open access resource without clearly defined property rights, any individual who can either invest in or have access to a water pumping equipment can extract as much water as required.

The estimation of resource cost of groundwater thus requires information on two parameters:

- The prevailing depth to water table and its current and estimated rate of decline during the time frame of the study
- The changes in capital and operating costs as a result of decline in water table.

Current Depth to Water Table & its Rate of Decline

As the availability and distribution of underground water is controlled by complex hydrological and hydrogeological factors, authoritative knowledge about the dynamics of behaviour of underground water in India is rather meagre. In the absence of any assessment, argumentative assertions about the extent and rate of change in groundwater availability have often been made.

Estimation of current depth to water table and its rate of change can be ascertained directly either by maintaining a regular record of depth to water table over a long period of time for a selected number of observation wells spread fairly widely over the selected region/aquifer or from the decline actually observed and experienced by users of groundwater viz. the farmers. In the absence of availability of such a data set, the rate of change in the water table can also be estimated indirectly through estimation of changes in annual draft, recharge and groundwater balances for a given region/aquifer.

We have had access to the direct sets of data. The official data in respect of depth to water table for a sample of observation wells in the study region was available for a selected number of years between 1974 and 1991. We also collected data in respect of current depth to water table and that prevailing five and ten years ago and average annual rate of decline actually experienced from the sample of 120 farmer households. While both the data sources have their advantages and disadvantages, we estimated the information on both the parameters viz. current depth to water table and the average annual rate of decline using both sets of data and then attempted conciliation of the two sets of estimates keeping in view the strengths and weaknesses of the approaches used in deriving these data sets.

Following the above approach the average current depth to water table in the study region has been estimated at 15 meters below the ground surface and the average annual current rate of decline in water table to be 1 meter.

Future Rate of Decline in Water Table

On the basis of the available estimate on the current rate of decline in water table it is difficult to estimate the likely rate of decline in water table in future years. Much will depend on the scenario of changes that place on the agricultural scene: the number of additional tubewells installed; the changes in the relative prices of inputs and outputs; the changes in the nature of institutional constraints; the changes in the nature of crop — mix cultivated; the private profitability of extracting groundwater as depth to water table increases etc. However so long as the private marginal revenue from pumping an additional unit of water is more than the cost of its extraction, the farmer is likely to continue to extract groundwater from any depth. The response of the farmer to declining water table is likely to be in terms of installing higher capacity pumping equipment to cope with the decline in water table and continuing to extract the same amount of irrigation water. It is therefore fair to assume that the

water table will continue to decline at least at the present rate of 1 meter/year throughout the 20 year time frame of the present study.

Changes in Capital & Operating Cost

The most important financial implication of a decline in water table to a farmer is an increase in the capital and operating cost of pumping a given quantity of water from this increased depth. While the operating cost changes with every decline in water table the capital costs do not change as frequently. The sampled farmers reported that they do not generally change their pumping equipment with every minor change in water table. At a given level of water table the farmers generally invest in a somewhat higher capacity of pumping equipment⁵ than is otherwise warranted to pump water from this depth. In addition, to cope with the decline in water table the farmers so adjust the length of the delivery and suction pipes that they can use the same equipment over a range of variation in water table. In this way the farmers can continue to use the same equipment for a few years without having to incur any significant additional capital cost. However due to increase in total head and adjustment in the placement of pump and motor, the efficiency of the pumping equipment gets somewhat altered. In other words to pump the same amount of water the farmer will now need to run his tubewell for a longer number of hours and as a result incur higher operating cost.

The most important financial implication of a decline in water table to a farmer is an increase in the capital and operating cost of pumping.

On the basis of responses received from the sampled farmers it is estimated that farmers can continue to use the same equipment for water table declines by up to five meters. However with every five meter decline in the water table the farmer would need to install a higher capacity pumping equipment and as a result incur higher capital and operating costs. Thus on the basis of likely frequency of changes in pumping equipment consequent upon a decline in water table during the twenty year time frame, we work out the likely changes in the capital and

5. Another factor that contributes to decision about such a choice is the tendency on the part of the farmer to extract larger quantity of water in the shortest time because of uncertainty about/restriction on availability of electricity.

operating cost of pumping equipment for a representative 2 hectare farm. Table 1 presents the changes in capital and operating cost of pumping equipment with each change in the size of the equipment.

Table 1: Capital and Operating Cost of Different Sizes of Pumping Equipment

Motor BHP	Capital Cost of Equip.	Annual Operating Expenses		
		R & M	Elect.	Total
10	11730	1020	3480	4500
15	16790	1460	5220	6680
17.5	19260	1675	6090	7765
20	21735	1890	6960	8850
25	27025	2350	8700	11050

Notes:

The capital cost of equipment includes the cost of accessories. Repair and Maintenance cost has been taken as 10 percent of the capital cost of motor.

The cost of electricity has been computed at the rate of Rs. 29/BHP/Month

Resource Cost of Groundwater

The estimated resource cost of groundwater per hectare using three alternative values for the discount rate is given in table 2. At a discount rate of 8 percent the total per hectare resource cost of groundwater works out to Rs. 22643, of which about 56 percent is accounted for by capital cost, the remaining 44 percent by the operating cost.

Table 2: Per Hectare Resource Cost of Groundwater

Cost	Discount Rate (%)		
	6	8	10
Capital	15298	12524	10349
Operating	12781	10119	8082
Total	28079	22463	18431

Alternative Farming Systems

The relative economics of alternative farming systems rice-wheat and maize-wheat has been evaluated incorporating the resource cost of the groundwater so estimated using a Natural Resource Accounting (NRA) framework. The Net Financial Value (NFA) for a farming

Table 3: Net Financial Values — Reference Solution

	Farming System								
	Rice - Wheat			Maize-Wheat			% Difference		
	Discount Rate (%)								
	6	8	10	6	8	10	6	8	10
Returns Over Opert. Cost	158358	135549	117441	102647	87863	76125	54	54	54
Resource Cost of Groundwater	28079	22643	18431	0	0	0			
Net Financial Value	130279	112906	99010	102647	87863	76125	27	29	30

system has been estimated as the difference in the farm returns using the traditional concept of farm profitability (i.e. returns over operating costs) and the resource cost of groundwater. The estimated values of the farm returns, resource cost of groundwater and the net financial values for the two farming systems for the twenty year simulation period using three alternative values for the discount rate are given in table 3.

The results obtained bring out clearly the implications of including and excluding the resource cost in making a financial comparison. Thus if one were to compare the economics of the alternative farming systems based on the traditional concept of farm profitability by a simple comparison of farm returns, returns from cultivation of rice-wheat are 54 percent higher than those from maize-wheat. If one were however to take a more pragmatic view of farm profitability and take into account the cost of depleting natural resources as well, though cultivation of rice-wheat still continues to be more profitable, the difference in the net financial values between the two farming systems reduces to between 27 and 30 percent depending upon the choice of discount rate.

Planning for a Sustainable Pattern

The analysis demonstrates that even after accounting for the cost of depleting groundwater the cultivation of rice-wheat remains more profitable than that of maize-wheat. However due to the fast depleting groundwater, any large scale cultivation of rice-wheat cropping system is clearly unsustainable in the long run. Planning for a sustainable pattern of agricultural development requires efforts aimed at arresting or at least slowing down the rate of decline in water table.

Even after accounting for the cost of depleting groundwater the cultivation of rice-wheat remains more profitable than that of maize-wheat.

The two most important avenues for examining the possibility of a reduction in the amount of groundwater withdrawal essentially involve adopting more efficient irrigation management practices for rice without any shifts in cropping pattern and/or diverting at least a part of the area from rice to an alternative crop which is less water using. While some scope for conserving irrigation water through adoption of more efficient irrigation management practices for rice does exist, however such savings in water use have associated cost in terms of a reduction in rice yield. For example, some of the available evidence suggest that with a 9 percent reduction in water use on rice the paddy yields decline by about 12 percent (HAU, 1986). The farmer therefore is unlikely to switch to such efficient water management practices unless the savings in water use more than compensates for the loss in crop output. Even if farmers turn to such efficient irrigation management practices, this switching is, unlikely to make a reduction in the quantum of groundwater withdrawals of the magnitude required to make a significant reduction in the rate of decline in water table⁶.

Efforts aimed at slowing down the rate of decline in water table should thus primarily focus on diverting at least a part of the area from rice to other competing crops which are less water using. In a decentralised economy, the production decisions are taken individually by millions of farming households and there is no way through which such diversions in cropping pattern can be enforced. The planner however can to some extent influence this decision making environment through suitable changes in policy parameters. The two most important policy instruments available to influence the prevailing production and

Through suitable adjustments in the prices of inputs and/or crop outputs the planner can attempt to alter the relative profitability of alternative crop enterprises so as to encourage shifts in the cropping pattern in the desired direction.

decision making environment of the farmers are through adjustments in the prices of inputs and outputs. Through suitable adjustments in the prices of inputs and/or crop outputs the planner can attempt to alter the relative profitability of alternative crop enterprises so as to en-

6. This however should not be construed to imply that efforts should not be made to conserve water through adoption of such efficient irrigation management practices.

courage shifts in the cropping pattern in the desired direction.

The large scale shifts in cropping pattern towards such water intensive crops as rice and wheat in the study region and exploitation of groundwater in such massive scale have been facilitated by the availability of electricity at such subsidised rates.

Impact of Increasing the Price of Electricity

During the reference year of the study the farmers in the study region were getting electricity for irrigation pumping at a highly subsidised flat rate of Rs. 29/BHP month irrespective of the size of motor installed, the amount of water extracted or the cropping pattern practiced. It has often been argued that the large scale shifts in cropping pattern towards such water intensive crops as rice and wheat in the study region and exploitation of groundwater on such massive scale have been facilitated by the availability of electricity at such subsidised rates. While the prices of various inputs and outputs have varied substantially over the last few years, the price of electricity for irrigation pumping charged from the farmers has at best changed only marginally. Thus while the revenue realised from each KWH of electricity sold by the State Electricity Board (SEB) to the agricultural/irrigation sector has increased from Rs. 0.20 to Rs. 0.30 in between the period from 1985-86 to 1990-91, the real cost of supplying electricity to the agricultural sector during the same period has increased from Rs. 0.70 to Rs. 1.05 per KWH (Govt. of India; 1992). The continued widening gap between the market and social price of electricity while on the one hand has resulted in mounting losses to the SEB and increased the burden of subsidy at an alarming rate, has on the other hand encouraged inefficient use of energy and groundwater. Enough justification thus exists for increasing the tariff on electricity for irrigation pumping. While increase in the price of electricity for irrigation pumping would definitely enable the SEB to overcome part of the huge annual deficits and also possibly improve the regularity and quantity of electricity supply, however the extent to which increase in the price of electricity can help in arresting the rate of decline in water table and thereby promoting a more sustainable pattern of agricultural development in the region is debatable. The extent to which increases in the price of electricity can be suc-

cessful in slowing down the rate of decline in water table will depend mainly on the magnitude of shifts in crop pattern away from rice that such a measure can bring about. So long as the cultivation of rice is privately profitable for the farmer, he is unlikely to divert area from rice to alternative crops.

So long as the cultivation of rice is privately profitable for the farmer, he is unlikely to divert area from rice to alternative crops.

To estimate the magnitude of increase in electricity price required to make the two farming systems financially competitive, we parametrically varied the price of electricity in stages of Rs. 10/BHP/month. The results obtained suggest that all increases in the price of electricity are accompanied by a decline in both the farm returns as well as net financial values of both rice-wheat and maize-wheat (table 4). While the difference in the farm returns between the two farming systems increases with each increase in the price of electricity, the difference in the NFV narrows down. The cultivation of rice-wheat however continues to be more profitable than that of maize-wheat at all levels of increase in the price of electricity upto Rs. 99/BHP. The two farming systems become financially competitive at electricity price of Rs. 109/BHP/month.

Impact of Altering the Price Parity

Apart from the availability of electricity for irrigation pumping at highly subsidised price, the other important factors contributing to increased profitability of rice-wheat

farming system, and therefore to its large scale cultivation in the study region, are relatively higher crop yield and higher output price of rice. It thus follows that other things remaining the same any attempt to divert area away from rice should focus on increasing the total value productivity of the crop intended to be introduced by raising either its price and/or yield. While altering the relative profitability by increases in the crop yield through technological improvements is a long term alternative, in the short run the desired shifts in the cropping pattern can be achieved through a suitable package of output price policy coupled with efficient marketing.

Any attempt to divert area way from rice should focus on increasing the total value productivity of the crop intended to be introduced by raising either its price and/or yield.

The crop output prices in India are largely determined through government intervention in the output markets. The government announces minimum support/procurement prices of all important crops and this price generally sets the floor price of these commodities. Given such a price determining scenario, some scope for altering the relative profitability of alternative crop enterprises through suitable changes in the support/procurement prices therefore does exist.

While recognising that it will be too simplistic to expect that adjustments in output prices alone can bring about desired changes in the cropping pattern, we nevertheless attempt to estimate the likely increase in output

Table 4: Impact of Increasing the Price of Electricity — Discount Rate 8 percent

Electricity Price (Rs./BHP)	Rice-Wheat			Maize-Wheat			% Diff.	
	Return over opert. cost	Resource Cost	NFV	Return over opert. cost	Resource Cost	NFV	Return over opert. cost	NFV
29	135549	22643	112906	87863	0	87863	54	29
39	129658	25431	104227	81972	0	81972	58	27
49	123767	28219	95548	76081	0	76081	63	26
59	117877	31006	86871	70190	0	70190	68	24
69	111986	33794	78192	64299	0	64299	74	22
79	106095	36583	69512	58408	0	58408	82	19
89	100204	39370	60834	52517	0	52517	91	16
99	94313	42158	52155	46626	0	46626	102	12
109	88422	45142	43280	40735	0	40735	117	6

Note: The results are insensitive to choice of discount rate. The results with other two values of the discount rate viz. 6 percent and 10 percent are not given here for want of space.

price of maize that will be required to make the two farming systems rice-wheat and maize-wheat financially competitive on the margin. For doing so we increased the price of maize in successive stages of 10 percent each over the price prevailing in the reference solution, thereby altering the parity between the prices of paddy and maize from 1:1.09 used in the reference solution to 1:1.20, 1:1.33, 1:1.42, 1:1.53, and 1:1.64 with 10, 20, 30, 40 and 50 percent increase in the price of maize.

The results obtained suggest that with each successive increase in the price of maize the difference in the farm profits as well as in the NFV between the two

farming systems narrows down (table 5). The two farming systems become financially competitive with a 50 percent increase in the price of maize.

Impact of Simultaneous Increase in the Price of Electricity & Crop Output

In the foregoing analysis we attempted to ascertain the likely increase in the individual price of electricity and that of maize to make the two farming systems rice-wheat and maize-wheat financially competitive. The alternatives analysed however do not necessarily imply an either/or option. In fact a planner may prefer simul-

Table 5: Impact of Increasing the Output Price of Maize — Discount Rate 8 Percent

	Refer. Solution		Maize-Wheat				
	Rice-Wheat	Maize-Wheat	Maize Price Increased By (%)				
			10	20	30	40	50
Returns Over Opert. Cost	135549	87863	93321	99585	103807	109138	114293
Resource Cost of Groundwater	22643	0	0	0	0	0	0
Net Financial Value	112906	87863	93321	99585	103807	109138	114293

Table 6: Impact of Simultaneous Increase in the Price of Electricity and Maize-Discount Rate — 8 Percent

	Elect. Price Rs/BHP	Output Price at Ref. Sol. Level		Maize Price Increased By (%)				
		R-W	M-W					
				10	20	30	40	50
Return over opr. cost	29	135549	87863	93321	99585	103807	109138	114293
Resource Cost		22643	0	0	0	0	0	0
NFV		112906	87863	93321	99585	103807	109138	114293
Return over opr. cost	39	129658	91972	87431	93695	97916	103248	108402
Resource Cost		25431	0	0	0	0	0	0
NFV		104227	81972	87431	93695	97916	103248	108402
Return over opr. cost	49	123767	76081	81540	87804	92025	97357	102511
Resource Cost		28219	0	0	0	0	0	0
NFV		95548	76081	81540	87804	92025	97357	102511
Return over opr. cost	59	117877	70190	75649	81913	86135	91466	96620
Resource Cost		31006	0	0	0	0	0	0
NFV		86871	70190	75649	81913	86135	91466	96620
Return over opr. cost	69	111986	64299	69758	76022	80244	85575	90729
Resource Cost		33794	0	0	0	0	0	0
NFV		78192	64299	69758	76022	80244	85575	90729
Return over opr. cost	79	106095	58408	63867	70131	74353	79684	84839
Resource Cost		36583	0	0	0	0	0	0
NFV		69512	58408	63867	70131	74353	79684	84839
Return over opr. cost	89	100204	52517	57976	64240	68462	73793	78948
Resource Cost		39370	0	0	0	0	0	0
NFV		60834	52517	57976	64240	68462	73793	78948
Return over opr. cost	99	94313	46626	52085	58349	62571	67902	73057
Resource Cost		42158	0	0	0	0	0	0
NFV		52155	46626	52085	58349	62571	67902	73057
Return over opr. cost	109	88422	40735	46194	52458	56680	62011	67166
Resource Cost		45142	0	0	0	0	0	0
NFV		43280	40735	46194	52458	56680	62011	67166

taneous adjustments in the input and output prices rather than depending exclusively on either of them.

To analyse the level of simultaneous adjustment required in the price of electricity and in the output price of maize to make the two farming systems competitive, we worked out the relative economics of the two farming systems rice-wheat and maize-wheat at various combinations of electricity and maize prices.

The results obtained suggest that at all levels of increase in the price of electricity and maize the farm returns for rice-wheat are higher than those of maize-wheat (table 6). However a comparison of the vector of NFV's for rice-wheat and maize-wheat at different combinations of electricity price — maize price suggest alternative price combinations at which the cultivation of the two farming systems become competitive. Thus maize-wheat becomes competitive with rice-wheat with a 40 percent increase in price of maize and Rs 10/BHP increase in the electricity price; a 30 percent increase in the price of maize and a nearing doubling of the current electricity price; a 20 percent increase in the price of maize and Rs. 40/BHP in electricity price or a 10 percent increase in maize price and Rs. 60/BHP in electricity price.

Conclusions

The North-West rice growing region in India has drawn heavily on its natural resources to sustain the current level of agricultural production. In fact the current level of agricultural production has been achieved at the expense of potential future output.

The results obtained demonstrated how the relative economics of the two alternative farming systems rice-wheat and maize-wheat analysed in the study are distorted and overestimated because of adoption of faulty accounting framework which does not make allowance for depleting natural resources. If one were also to account for other possible effects of these farming practices such as on long term soil productivity and other environmental effects, probably the divergence in relative profitability may further narrow down.

The currently most popular farming system viz. rice-wheat is heavily dependent on the availability of groundwater. However, because of the fast rate at which the availability of groundwater is declining, such a farming system cannot provide a sustainable pattern of agricultural development in the region. The region must diversify to sustain long term growth. The results obtained clearly point to the possible fallacies on the part of the planner in not visualising and taking into consideration the long term effects of his policies on the use of natural resources and thereby encouraging a pattern of development which as demonstrated cannot be sustained. The results of the analysis obtained with variations in some of the policy parameters demonstrate how public policy intervention can help promote a more sustainable pattern of agricultural development in the region.

References

- Faeth, Paul (Ed.)** (1993), *Agricultural Policy and Sustainability: Case Studies from India, Chile, the Philippines and the United States*. World Resources Institute, Washington, D.C.
- Faeth, Paul et. al** (1991), *Paying the Farm Bill: Agricultural Policies and the Adoption of Sustainable Agricultural practices*. World Resources Institute, Washington, D.C.
- Govt. of India** (1992), *Annual Report on the Working of State Electricity Boards and Departments Planning Commission*, New Delhi.
- HAU** (1986), *Annual Report Department of Soils*. Haryana Agricultural University, Hissar.
- Johi, S.S.** (1986), *Diversification of Agriculture in Punjab: Report of the Expert Committee*, Government of Punjab.
- Malik, P.R. S. and Paul Faeth** (1993), *Rice-Wheat Production System in North-West India in Faeth Paul (ED.)*
- Malik, R.P.S.** (1994), *Land Use Planning for Sustainable Agricultural Development: A Study in North-West India* Agricultural Economics Research Centre, University of Delhi.
- Prihar, S. S et. al.** (1990), *Water Resources of Punjab — A Critical Concern for the future of its Agriculture Punjab Agricultural University, Ludhiana*.
- Randhawa, N.S.** (1989), as quoted in Dhawan, B.D. *Water Resource Management in India: Issues and Dimensions Indian Journal of Agricultural Economics*, 44, 3.
- Repetto, R. et. al.** (1989), *Wasting Assets: Natural Resources in the National Income Accounts* World Resources Institute, Washington, D.C. □

Land Degradation & Agricultural Productivity in Haryana

Jai Singh & D.S. Nandal

Land degradation in the form of soil salinity and waterlogging has become a serious threat to agriculture in Haryana. The present study based on an analysis of 248 respondents attempts to examine the effect of land degradation on agricultural productivity, its magnitude and remedial measures. It suggests that appropriate choice of technology like surface or sub-surface drainage, improved, irrigation system management, salt tolerant crop varieties etc., can reverse the process of land degradation and improve agricultural productivity.

Land degradation is a serious global problem. Nearly all forms of environmental degradation threaten agricultural productivity. The most pervasive damage stems from waterlogging and soil salinisation particularly in irrigated areas of arid and semi-arid regions. Ironically, reliable information related to the extent of soil salinity and waterlogging and its impact as an externality on agricultural production and productivity is limited.

The most pervasive damage stems from waterlogging and soil salinisation particularly in irrigated areas of arid and semi-arid regions.

Studies carried out in the past have shown that the losses are immense in terms of agricultural production as a result of land degradation. Uppal (1972) indicated that losses in the form of reduced agricultural production in Punjab as a result of waterlogging were as high as Rs. 500 million. Similarly in Haryana it has been estimated that between 0.3 and 0.5 million hectares of presently productive agricultural land will lose most of its productive capacity due to waterlogging and salinisation by the year 2000 (FAO, 1985). Joshi and Jha (1989) report that crop yields and income decline drastically on degraded soil, the yields of wheat and paddy on salt affected soils went down by 68 and 61 per cent, respectively in a span of 10 years. These results call for an immediate enquiry into the potential adverse impacts of these processes on agricultural production and productivity. The present study on Haryana is an attempt in this direction.

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Methodology

The study is based on the primary information collected from a sample of 248 farms (114 normal farms and 134 problematic farms) for the agricultural year 1989-90 from Hisar, Rohtak and Sonapat districts which were selected because of the higher intensity of soil salinity and waterlogging. One block with the highest intensity of land degradation and two villages having maximum area under soil salinity and waterlogging were again selected to draw on adequate sample of farmers for this study.

Cobb-Douglas form of production function for different soil types was estimated and decomposition exercise was carried out to estimate changes on farm production resulting from soil salinity and waterlogging and due to change in input levels.

The Cobb-Douglas Production Function in logarithmic form for different soils is represented by:

Normal soil

$$\log Y_1 = \log A_1 + b_1 \log X_1 + b_2 \log X_2 + \dots + b_n \log X_n \quad (1)$$

Salt affected soil

$$\log Y_2 = \log A_2 + b_1' \log X_1' + b_2' \log X_2' + \dots + b_n' \log X_n' \quad (2)$$

Waterlogged soil

$$\log Y_3 = \log A_3 + b_1'' \log X_1'' + b_2'' \log X_2'' + \dots + b_n'' \log X_n'' \quad (3)$$

where,

Y = Dependent variable

$X_i = (i = 1, \dots, n)$ explanatory variables

A = Scale parameter

$b_i = (i = 1, \dots, n)$ Output elasticities of i^{th} explanatory variables.

To decompose the equation, taking difference between equations (2) and (1) and adding some term and subtracting the same term:

$$\begin{aligned} \log Y_2 - \log Y_1 &= (\log A_2 - \log A_1) \\ &+ (b_1' \log x_1' - b_1 \log x_1) \\ &+ b_1' \log x_1 - b_1' \log x_1 + (b_2' \log x_2' - b_2 \log x_2) \\ &+ b_2' \log x_2 - b_2' \log x_2 + \dots + (b_n' \log x_n' - b_n \log x_n) \\ &+ b_n' \log x_n - b_n' \log x_n \end{aligned} \quad (4)$$

Rearranging terms in (4) we obtain:

$$\begin{aligned} \log Y_2 - \log Y_1 &= (\log A_2 - \log A_1) \\ &+ [(b_1' - b_1) \log x_1 + (b_2' - b_2) \log x_2 + \dots + (b_n' - b_n) \log x_n] \\ &+ b_2' (\log x_2' - \log x_2) + \dots \\ &+ [b_1' (\log x_1' - \log x_1) + (b_n' \log x_n' - \log X_n)] \end{aligned} \quad (5)$$

Equation (5) can be rewritten as:

$$\begin{aligned} \log \left(\frac{Y_2}{Y_1} \right) &= \log \left(\frac{A_2}{A_1} \right) + [(b_1' - b_1) \log X_1 \\ &+ (b_2' - b_2) \log X_2 + \dots + (b_n' - b_n) \log X_n] \\ &+ \left[b_1' \log \left(\frac{X_1'}{X_1} \right) + b_2' \log \left(\frac{X_2'}{X_2} \right) + \dots \right. \\ &\left. + b_n' \log \left(\frac{X_n'}{X_n} \right) \right] \end{aligned} \quad (6)$$

Similarly taking difference between equations (3) and (1) and adding some term and subtracting the same then re-arranging we get,

$$\begin{aligned} \log \left(\frac{Y_3}{Y_1} \right) &= \log \left(\frac{A_3}{A_1} \right) + [(b_1'' - b_1) \log X_1 \\ &+ (b_2'' - b_2) \log X_2 + \dots + (b_n'' - b_n) \log X_n] \\ &+ \left[b_1'' \log \left(\frac{X_1''}{X_1} \right) + b_2'' \log \left(\frac{X_2''}{X_2} \right) \right. \\ &\left. + \dots + b_n'' \log \left(\frac{X_n''}{X_n} \right) \right] \end{aligned} \quad (7)$$

These equations measure the approximate change in per hectare output. The terms in the first bracketed expression on the right hand side provide the percentage change in per hectare output due to shift in scale parameter (A). The next term expresses change in per hectare output due to shift in slope parameters. The third term explains the change in the output due to change in the level of inputs.

Factors Responsible for Land Degradation

According to one estimate (Status Report, Haryana 1990) about 0.180 million hectares of land is affected by the problem of salinity in Haryana which forms 4.03 per cent of the total geographical area. In another estimate (Sharma, 1989) an area of about 0.217 million hectares in the state is salt affected. Of this area, about 61 per cent is affected by soil salinity and waterlogging and the

remaining 30 per cent is subjected to alkalinity. In the selected districts the incidence of soil salinity and waterlogging was as high as 48 per cent in Rohtak district, 49 per cent in Hisar district and 28 per cent in Sonapat district in 1989-90 (table 1). Thus the problem of salt affected land is increasing with the passage of time.

Some of the major factors found responsible for causing soil salinity and waterlogging in the state are: the rise in water table after the introduction of irrigation due to naturally blocked drainage, the common practice of saline water irrigation, the presence of native saline ground water, limited rain water recharge in the salinity affected areas, low lying topography, climatic conditions, inefficient water management etc. These factors lead to soil salinity and waterlogging problems which reduce crop productivity and returns per unit of land and time.

Table 1: Extent of Land Degradation on Sample Farms during 1989-90.

	Hisar District		Rohtak District		Sonapat District	
	Normal farms	Problematic farms	Normal farms	Problematic farms	Normal farms	Problematic farms
Number of Farms	34	45	45	43	43	46
Average size of holding(ha)	4.06	3.41	2.97	3.83	3.49	5.10
Normal area (ha)	4.06 (100.00)	1.72 (50.44)	2.97 (100.00)	1.97 (51.43)	3.49 (100.00)	3.69 (72.35)
Salt affected and waterlogged area (ha)	—	1.69 (49.56)	—	1.86 (48.57)	—	1.41 (27.65)

Figures in parantheses are per cent of total farm area.

Table 2: Per Hectare Yield, Costs and Returns from Major Crops under Different Soil Conditions in 1989-90.

Crop/Soil type	Yield (qtl/ha)	Gross Income (Rs./ha)	Variable cost (Rs./ha)	Return over variable cost (Rs./ha)
Wheat				
Normal	33.59	8715.33	3702.32	5013.01
Salt affected	24.45	6348.66	3232.46	3116.20
Waterlogged	28.30	7284.67	2714.32	4570.35
Paddy				
Normal	57.37	13028.54	7560.56	5467.98
Salt affected	44.37	9921.33	5891.52	4029.81
Waterlogged	48.15	10558.61	5419.86	5138.75
Sugarcane				
Normal	385.55	12743.18	8510.32	4232.86
Salt affected	237.52	9761.05	6324.97	3436.08
Waterlogged	184.37	7536.05	5438.78	2097.27
Cotton				
Normal	11.21	8212.29	3265.24	4947.05
Salt affected	5.27	3877.18	2009.76	1867.42
Waterlogged	3.75	2766.49	1534.56	1231.93

Crop productivity & Net Return per Hectare

It can be observed from (table 2) that the productivity of all the crops shifts downward on both types of problem soils as compared to normal soils. The decline in average yield on problem soils was more sharp on saline soils in respect of wheat and paddy but the yield loss was more on waterlogged soils in case of cotton and sugarcane. Among the four major crops of the State, the downward shift in yield was more pronounced in cotton followed by sugarcane, wheat and paddy respectively. Almost similar results were confirmed in monetary terms or return over variable cost. In case of high concentration of salts and rise in water-table, sizeable fraction of land goes out of cultivation. Salt affected and waterlogged soils provide lower crop productivity resulting in heavy losses to the farm economy.

Table 3: Estimated Cobb-Douglas Production Function for Normal, Salt affected and waterlogged Lands

Crop and soil type	Constant	Seed	Nitrogen	Hired labour	Owned labour	Total labour	Machine	Tractor	Machine + Bullock + Tractor	R ²
Wheat										
Normal	5.2451	.1921*** (.0606)	.858 (.0228)	.0343** (.0138)	.1155** (.0232)	— —	.1022*** (.270)	—	—	.4573
Salt Affected	3.0916	.2682** (.1405)	—	.0331 (.0222)	.2145*** (.0628)	—	.1333*** (.0351)	—	—	.4527
Waterlogged	3.4903	—	.1100*** (.0191)	.0600*** (.0027)	—	—	—	—	.2500*** (.0421)	.5800
Paddy										
Normal	8.2527	—	.1834* (.1088)	—	—	.1430* (.0852)	—	—	.1318**	.4283
Salt Affected	6.9719	—	.3106* (.2181)	—	—	.3816*** (.1173)	—	—	—	.4283
Waterlogged	.5479	.7844*** (.1089)	—	—	—	.2227* (.1128)	—	—	—	.9666
Sugarcane										
Normal	21.4323	.1988** (.0865)	.0241 (.0469)	—	.2209*** (.0585)	—	—	.0093** (.0043)	—	.2393
Salt Affected	2.3291	—	.0705** (.0281)	—	.9742** (.3261)	—	—	.0523*** (.0169)	—	.7243
Waterlogged	.0650	—	1.7565*** (.4871)	.0739* (.0361)	—	—	—	—	—	.7477
Cotton										
Normal	2.0854	—	.1097 (.0893)	.0458*** (.0139)	.2986*** (.1022)	—	—	—	—	.3673
Salt Affected	1.4149	—	.1097 (.0893)	.0458* (.0139)	.2986*** (.1022)	—	—	—	—	.4967
Waterlogged	2.0354	—	.07537*** (.1241)	—	1.1936*** (.1455)	—	—	—	—	.5384

Figures in parenthesis are standard error of respective regression coefficients.

***, **, * indicate significance or regression coefficients at 1%, 5%, and 10% probability levels, respectively.

Table 4: Decomposition of total change in per hectare output of major crops between normal, salt affected and waterlogged soils.

	Percentage attributable						
	Wheat		Paddy		Sugarcane		Cotton
	Salt affected vs. Normal	Waterlogged vs. Normal	Salt affected vs. Normal	Waterlogged vs. Normal	Salt affected vs. Normal	Waterlogged vs. Normal	Salt affected vs. Normal
Sources of change							
1. Soil Salinity/Waterlogging	-22.94	-22	-48.83	-19.39	-2.86	-9.78	-39.00
2. Changes in inputs							
i) Seed	-3.17	—	—	—	—	—	—
ii) Nitrogen	—	-8.17	30.51	—	-1.38	-67.73	-7.00
iii) Hired labour	-1.91	-4.57	—	—	—	—	-4.00
iv) Owned labour	-0.61	—	—	—	-29.33	—	-12.00
v) Total labour	—	—	-11.58	-1.80	—	—	—
vi) Machine	-3.13	—	—	—	—	—	—
vii) Tractors	—	—	—	—	-4.28	—	—
Total change due to all source	-31.36	-12.96	-29.9	-21.19	-37.85	-77.54	-62.00

Determinants of Crop Productivity

The estimated production elasticities given in (table 3) show the relative contribution of various factors of production such as seed, nitrogen, hired labour, owned labour, total labour, machine hours, tractor hours and combined labour of machinery, tractor and bullocks on productivity of four selected crops under varying environments. In general, the number of significant regression coefficients comes down in case of problem soils showing thereby that land degradation nullifies the contribution of some inputs. In all regression equations the value of intercept also goes down which shows that productivity of crops without the use of these inputs on degraded land would be lower than their productivity on normal soils. The last column shows the explained part of crop productivity by all the explanatory variables in terms of the value of coefficient of multiple determination R^2 . Higher the value, higher will be the explained part and better the fit of the production function.

Decomposition of Crop Productivity

Table 4 presents the decomposition results of the total change in the productivity of four major crops. the total downfall in productivity of wheat, paddy, sugarcane and cotton on saline soils against normal soils was to the extent of 31.36, 29.9, 37.85 and 50 per cent respectively out of which 22.94 per cent, 48.83 per cent, 2.86 per cent and 39.0 per cent was attributed to soil salinity and the rest was due to reduction in the use of other inputs. In case of paddy, excessive use of nitrogen effected the downward pull of soil salinity by 30.51 per cent. Similarly water-logging conditions reduced the yield of wheat by only 0.22 per cent, of paddy by 19.39 per cent and of sugarcane by 9.78 per cent while the reduction of inputs pulled down the yield by 12.74 per cent in wheat by 1.8 per cent in paddy and by 67.76 per cent in sugarcane. Thus even moderate land degradation considerably brought down the yield of all crops and hence the urgency to arrest and reverse the land degradation process.

Strategies to Control Land Degradation

Land drainage facilities in irrigated areas in general and waterlogged saline land in particular are inadequate. Therefore, serious efforts need to be made to provide surface and sub-surface drainage to control land degradation. Horizontal sub-surface drainage is recommended in areas where ground water quality is poor and the drainage effluents can't be recycled for irrigation. Sound water management including lining of water cour-

ses and distributories to check seepage and rise in watertable, suitable irrigation methods, conjunctive water use etc., are of vital importance. Biological drainage or afforestation also contributes to watertable control for reclaiming waste lands and for the use of brackish or saline ground water. Breeding of salt tolerant crop varieties such as Kharchia-65, KRL 1-4 varieties of wheat, CSR 3 and CSR 10 varieties of paddy, CO453, CO6801, CO62422, CO1148 varieties of sugarcane, DL48, DL70, RD 137, Amber, Jyoti, IL3, K572, R56, R56 varieties of barley offers tremendous scope for areas where salinity remains a perpetual problem.

Breeding of salt tolerant crop varieties offers tremendous scope for areas where salinity remains a perpetual problem.

A large chunk of irrigated land has gone out of cultivation and cannot be put to any productive use unless reclamative measure are adopted. In addition to average loss, the decline in farm productivity, income and employment opportunities are matters of serious concern. A beginning has been made to provide land drainage, proper water management, afforestation and salt tolerant crop varieties to arrest and reverse the process of land degradation. But we have to go a long way to work out the potential social and economic benefits and costs of alternative solutions suited to different irrigated areas and put forward appropriate strategies for scientific management of degraded land and sustainability of vibrant agriculture on it.

References

- Food and Agriculture Organization** (1985). "Studies for the use of Saline water in Command Areas of Irrigation Projects, Haryana," FAO, Rome.
- Joshi, P.K. & Jha, Dayantha** (1989). "Farm level Effects of Soil Degradation in Sharda Saharak Irrigation Project, Uttar Pradesh, CSSRI, Karnal and IFPRI, Washington, D.C. (working paper).
- Sharma, R.C.** (1989). "Mapping and Characterisation of Salt affected Soils in Haryana Using Remote Sensing Techniques," Ph.D. Dissertation, Kurukshetra University, Kurukshetra.
- Status Report** (1990). Eastern Zone (NARP), Directorate of Research, HAU, Hisar.
- Uppal, H.C.** (1972). "Serious Waterlogging in Punjab and Haryana — How Caused and Measures to Prevent its Reoccurrence. Symposium on water logging — cause and measures for its Prevention, Vol. II, Publication No. 118. Central Board of Irrigation and Power, New Delhi. □

Poultry Farms in Punjab: An Economic Analysis

Balwinder Singh & Sukhwinder Singh

All organised commercial activities require sound management practices in order to be viable. Poultry farming is no exception. The authors made a study of the existing practices in the poultry farming enterprise in Punjab and make a few recommendations to turn it into a highly profitable venture.

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Before the era of planned economy poultry keeping was only for domestic purposes. The birds were of indigenous breed which had lower laying capacity of 60 eggs per year per layer. Not much attention was paid to breeding, feeding, disease control, and scientific management of poultry farms. Having realised the importance of poultry farming not only to cater to the consumption needs of population, but also to provide employment and subsidiary source of income to the farmers and livelihood to the educated unemployed, Govt. of India has launched an 'Intensive Poultry Production Programme' in 167 districts on the recommendation of National Commission on Agriculture. Poultry farming has developed through sustained financial and technological advances through the Five Year Plans. Considerable number of organisations and projects have been started in order to invent, extend and adapt efficient and remunerative poultry techniques.

No occupation can achieve success if the management is poor. As in agriculture and industry, management is the crucial aspect of poultry farming too. Three systems of poultry housing commonly used are deep litter system, cage system and wire and slatted floor system. In Punjab, only the first two are prevalent. Another factor to be considered is the pen size that results in different costs. Management in poultry farming also includes the rational use of poultry inputs and labour, concentrating on the devices for minimising costs thereby maximising net returns.

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Methodology

Poultry farming has been adopted as a subsidiary occupation, particularly by the farmers, in order to augment their farm incomes. Ludhiana is the leading district in agriculture and poultry farming in terms of adoption of modern technology due to the presence of Department of Animal Science, Punjab Agricultural University there. Keeping in view the influence of the Agricultural University, Ludhiana district was selected for a study. However, to get a large and logical sample, district Jullundhar was also included.

A list of all the poultry farms in the selected districts was obtained from the Punjab State Department of Animal Husbandry. These farms were differentiated into different management systems prevalent in these districts. The poultry farms in each system were categorised into three size groups on the basis of bird population by using cube-root method (table 1).

Table 1: Size Categorisation of Poultry Farms

Management system	Size Group	Size range (Layers)
Deep Litter System	Small	Up to 6200
	Medium	6201 to 12,600
	Large	12,601 and above.
Cage system	Small	Upto 5100
	Medium	5101 to 13000
	Large	13001 and above.

For each category proportional representation methodology was applied. The selected poultry farms under different management systems are presented in (table 2).

Table 2:

Management System	Size Group	Total No. of farms	No. of Selected farms	Average size of Poultry farms (Layers)
Deep Litter system	Small	14	10	4600
	Medium	21	15	10300
	Large	26	18	18400
	Total	61	43	12365
Cage system	Small	17	12	4500
	Medium	25	18	11100
	Large	37	26	20300
	Total	79	56	13957
Overall		140	99	13771

Thus, the total number of poultry farms selected were 99 out of which 43 relate to the category of deep litter system and 56 to cage system.

The primary data on costs and returns were collected through the personal interview method by frequently visiting the selected poultry farms. The schedules used for the purpose were pretested before actual data collection. Detailed information regarding establishment costs, variable costs and return structure was collected. In order to examine the costs and return structure of poultry farms under different management system, simple tabular tools like weighted averages and percentages were used. The study was conducted in 1991.

Results & Discussion

Cost Structure

The costs under different systems of different categories of poultry farms were worked out and are given in (table 3). On an average farm, the non-recurring expenditure in deep litter housing system was of the order of Rs. 116.60 per bird while there existed some variations among different categories. The non-recurring expenditure was Rs. 118.39, 117.42 and 116.01 per bird on small, medium and large farms respectively. In case of cage housing system, the average non-recurring expenditure came to be Rs. 113.44. The expenditure on small, medium and large farm worked at Rs. 115.71, 114.47 and 112.84 respectively.

The major part of the non-recurring expenditure (deep litter system) was incurred on building i.e. about 88 per cent on all the sizes of poultry farms. The expenditure on equipment like brooders, chick feeders, grower feeders, layer feeders, chick waterers, adult waterers and nest unit etc. worked out to be Rs. 14.34, 13.62 and 12.66 per bird on small, medium and large farms respectively and Rs. 13.06 on an average farm. The remaining non-recurring expenditure was incurred on miscellaneous items such as crates, egg, trays partitioners, electric connections, water tank, water pump and electric motor etc. Non-recurring expenditure per bird on each item showed a declining trend with increase in the farm size. In case of cage housing system, the major component of non-recurring expenditure was building followed by cages constituting about 67 and 24 per cent of the total non-recurring expenditure respectively. The non-recurring expenditure under this system did not include layer feeders and nest units as cages served the purpose.

In deep litter housing system, the cost of raising a pullet came out to be Rs. 37.23 per bird on an average poultry farm. This cost was Rs. 37.71, 37.37 and 37.10 on small, medium and large farms respectively. Feed was the major cost item constituting about 65 per cent of

Table 3: Existing Cost Structure on Different Sized Poultry (Layers) Farm under Different System, 1990-91

Cost items	Deep Litter Housing System				Cage Housing System			
	Small	Medium	Large	Average	Small	Medium	large	Average
A. Non-recurring Exp.								
1. Building	102.62	102.39	101.96	102.14	77.10	76.66	75.71	76.05
2. Equipment	14.34	13.62	12.66	13.06	27.27	27.18	27.08	27.12
3. Miscellaneous	1.43	1.41	1.39	1.40	9.64	8.97	8.47	8.66
4. Total	118.39	117.42	116.01	116.60	115.71	114.47	112.84	113.44
B. Recurring Exp.								
I. Cost of Rearing a Pullet								
1. Cost of day old pullet	10.21	10.19	10.18	10.19	10.28	10.23	10.18	10.22
2. Feed cost	24.36	24.24	24.15	24.19	23.02	22.93	22.71	22.79
3. Labour Cost	1.34	1.25	1.17	1.21	1.07	0.99	0.91	0.94
4. Miscellaneous	1.80	1.69	1.60	1.64	1.44	1.34	1.29	1.31
Total I	37.71	37.37	37.10	37.23	35.81	35.49	35.09	35.26
II. Cost upto one Year Age of Laying								
1. Feed cost	93.88	92.78	91.79	92.26	91.95	90.81	89.56	90.04
2. Labour cost	2.11	2.68	2.73	2.66	2.04	1.92	1.72	1.79
3. Miscellaneous	2.02	1.96	1.89	1.92	1.87	1.90	2.01	1.97
Total II	98.01	97.42	96.41	96.84	95.86	94.63	93.29	93.80
C. Depreciation on Building & Equipment	8.02	7.95	7.80	7.87	9.15	9.03	8.87	8.94
D. Interest of Recurring & Non-recurring Exp.	23.26	23.01	22.77	22.88	22.69	22.44	22.13	22.23
E. Total Recurring Exp.	167.0	165.75	164.08	164.82	163.51	161.59	159.38	160.23
t-value	(2.1264)*	(2.6284)*	(2.884)**		(2.2116)*	(2.4604)*	(2.9984)**	
	S-M	M-L	(S-L)		(S-M)	(M-L)	(S-L)	

**Significant at one per cent level.

*Significant at five per cent level

N.S: Non-significant

the cost of raising a pullet. In case of cage housing system, the cost of raising a pullet was Rs. 35.81, on small, Rs. 35.49 on medium and Rs. 35.09 on large farms whereas it was Rs. 35.46 on an average poultry farms. On this case also, the feed component formed about 65 per cent of the recurring expenditure. The cost of raising a pullet in cage system was Rs. 1.88 to Rs. 2.01 less than that under deep litter housing system. This was mainly due to the wastage of feed and higher labour cost under deep litter housing system.

The cost upto one year age of laying per bird in deep litter housing system also decreased with increase in farm size. However, a different trend can be seen of the labour cost. It was highest on large and least on small farms. The total expenditure incurred upto one year age of laying was Rs. 98.01, 97.42 and 96.41 per bird on small, medium and large farms respectively while it was Rs. 96.84 on an average farm. In case of cage housing system, recurring expenditure upto one year age of laying came to be Rs. 95.86, Rs. 94.63 and Rs. 93.29 on small, medium and large farms respectively which was less by Rs. 2.15 to Rs. 3.12 as compared to that under deep litter

housing system. Recurring expenditure upto one year of laying was Rs. 93.80 per bird on an average farm under cage system which was less than that under deep litter housing system. The difference in cost under the two systems was mainly due to the higher feed cost as there occurred a larger scope of wastage of feed and more labour was required under deep litter system than under cage system.

The total recurring expenditure in the case of deep litter housing system including depreciation on buildings, equipment and interest on recurring as well as non-recurring expenditure worked out at Rs. 164.82 per bird on an average poultry farm. This was Rs. 167.0 on small, Rs. 165.75 on medium and Rs. 164.08 on large farms. In this case feed cost was the major cost item and constituted more than 70 per cent of the total recurring expenditure. To test the difference between the total recurring expenditure per bird on different categories, 't' test was applied. The t values for small-medium, medium-large farms were significant at 5 per cent level while the same for small-large farm came out to be significant at one per cent level. The total recurring expenditure including depreciation

and interest was as high as Rs. 160.23 per bird on an average farm Rs. 4.59 less than that under deep litter system. Recurring expenditure per bird was Rs. 163.51, Rs. 161.59 and Rs. 159.38 on small, medium and large farms respectively, which were less by Rs. 3.49, Rs. 4.16 and Rs. 4.70 than the respective sizes under deep litter housing system. From this analysis it is concluded that the larger the size of poultry farm lower the cost per bird. The cage housing system involved less cost than the deep litter housing system.

The larger the size of poultry farm lower is the cost per bird.

Returns

The returns from poultry farming depend the cost structure, price of eggs, price of poultry meat, efficiency of production, mortality rate in the flock etc. The gross returns included the gross value of egg production (excluding breakage), sale of old hens, poultry manure and old gunny bags. Net returns were calculated by deducting the recurring expenditure from gross returns. Net returns were worked out on per cycle as well as per year basis (table 4).

The gross returns per bird in both the systems showed a direct relationship with the farm size. In case of deep litter system, the gross return was Rs. 180.99 per-

bird on an average farm whereas the same was Rs. 178.39, Rs. 180.36 and Rs. 181.48 on small, medium and large farms respectively. Gross value of egg production was the major source of gross returns constituting about 86 per cent in all the groups. The next major item was sale of old hens followed by sale of poultry manure and old gunny bags. The net returns per cycle was Rs. 16.17 on an average poultry farm. However, there existed some variations among different sizes. As such the returns per cycle were Rs. 11.39, Rs. 14.61 and Rs. 17.40 on small, medium and large farms respectively whereas the net returns per bird per year was Rs. 7.59 on small, Rs. 9.74 on medium and Rs. 11.60 on large farms. On an average the net returns per year worked out to be Rs. 10.78. This indicates that large poultry farms are more profitable compared to small farms.

The gross returns in case of cage system from all sources was Rs. 184.79 per bird on an average farm which was Rs. 3.80 more than that under deep litter system. The gross returns were found to be Rs. 182.42 on small, Rs. 184.53 on medium and Rs. 185.13 on large farms which were Rs. 4.03, Rs. 4.17 and Rs. 3.65 more than that under deep litter system. The variation in the gross returns under two systems was mainly due to the higher rate of mortality under deep litter system. The major component of gross returns in deep litter system was the gross value of egg production constituting more than 86 per cent. The second major contribution towards gross returns was made by sale of old hens i.e. about 12 per cent. Returns from sale of poultry manure and old gunny bags were slightly higher under deep litter system

Table 4: Returns (Rupees) on different sized poultry (layers) farms under different systems, 1990-91

Item	Deep Litter Housing System			Average	Cage Housing System			Average
	Small	Medium	Large		Small	Medium	Large	
Gross Returns:								
1. Value of eggs excluding breakage	153.92	155.94	156.97	156.90	157.66	159.77	160.46	160.09
2. Sale of old hens	21.22	21.27	21.44	21.38	21.72	21.79	21.82	21.80
3. Sale of poultry manures	1.71	1.66	1.62	1.64	1.66	1.61	1.57	1.59
4. Sale of old gunny bags	1.54	1.49	1.45	1.47	1.44	1.36	1.28	1.31
5. Total gross returns	178.39	180.36	181.48	180.99	182.42	184.54	185.13	184.79
't value	(2.0913)*	(1.2062) ^{NS}	(2.3221)*		(2.3268)*	(1.6056) ^{NS}	(2.6848)*	
	S-M	M-L	S-L		S-M	M-L	S-L	
Total recurring expenditure	167.00	165.75	164.08	164.82	163.51	161.59	159.38	160.23
Net Returns:								
1. Per cycle	11.39	14.61	17.40	16.17	18.91	22.95	25.75	24.56
't value	(2.8920)*	(2.1876)*	(2.2646)*		(2.8792)**	(2.2496)**	(3.2882)**	
	S-M	M-L	S-L		S-M	M-L	S-L	
2. Per year	7.59	9.74	11.66	10.78	12.60	15.29	17.16	16.37

**Significant at one per cent level; *Significant at five per cent level.

than that under cage system because a greater number of bags of feed was required under the former due to higher level of wastage of feed.

The net returns under cage system on per bird per cycle basis was Rs. 24.56 on an average farm which was Rs. 8.39 more than that under deep litter system. The same was Rs. 18.91, Rs. 22.95 and Rs. 25.75 on small, medium and large farms respectively which were Rs. 7.52, Rs 8.34 and Rs. 8.35 more than those on respective sizes under deep litter system. The net returns per bird per cycle showed a significant difference between different size groups in both the systems.

The net returns per bird per year came to be Rs. 12.60 on small, Rs. 15.29 on medium and Rs. 17.16 on large farms while the same was Rs. 16.37 on an average farm. Net returns as well as gross returns bore a positive relationship with the size of the farm. Thus larger the size of the farm, higher the profitability. Cage housing system of poultry farming is more profitable than deep litter housing system of poultry farming.

To sum up

While comparing the economics of different size of poultry farms under different systems, it is highlighted that larger the size of poultry farms, lower the cost per bird and the cage housing system of poultry farming involved less costs than that under deep litter housing system of poultry farming. The difference in the cost of raising a pullet was Rs. 1.88 to Rs. 2.00 per bird which was less than the cost on different sizes of poultry farm under deep litter housing system. This was mainly due to more wastage of feed and higher labour cost under the latter than those under

the former system. Recurring expenditure upto one year age of laying was less by Rs. 3.04 per bird on an average farm under cage system than under deep litter system. Feed came out to be the major cost of item. Recurring expenditure per bird had a negative relationship with farm size under both the housing systems.

Gross as well as net returns per bird were also higher on all the farm sizes under cage system than those on the corresponding farm sizes under deep litter system. Returns per bird were found to be positively related with the farm size. The gross returns on small, medium and large farms under cage system was Rs. 4.03, Rs. 4.17 and Rs. 3.65 more than on the corresponding farm sizes under deep litter system respectively. Net returns per bird per cycle on an average poultry farm under cage system was Rs. 24.56 which was Rs. 8.39 more than under deep litter system sizewise analysis also depicted the similar results. The variation in returns under the two systems was mainly due to the higher rate of mortality under deep litter system than that under the cage system.

On the basis of the results, the poultry farms should preferably be large where the farmers can reap the advantage of large scale economies. Among the different poultry systems, cage housing system may be adopted as it involves less recurring costs and higher profits compared to other housing systems of poultry. The farmers may grade the chicks carefully to avoid diseases and mortality, culling of male and unproductive layers should be done as early as possible to avoid non-productive burden on expenditure and balanced feed should be provided at lower costs to get higher rate of egg production resulting in higher profits. □

I learned more about my division in 2 days of the TQC review than in my total 9 months tenure as a General Manager.

A New Hewlett-Packard General Manager

Table 1: India vs World in Groundnut Productivity.

Source		Year						
		1985	1986	1987	1988	1989	1990	1991
Production (Ml. tones)	India:	5.6	6.4	5.0	7.3	8.0	6.9	7.0
	World:	20.5	21.7	20.4	22.9	22.8	22.2	23.4
Yield/hectare (kg.)	India:	800	821	746	973	988	862	847
	World:	1096	1100	1108	1170	1130	1111	1148
Rank of India in the World	Production:	2	1	2	1	1	1	1
	Yield:	35	36	37	32	39	34	73
% share of India in the World prod.		27.3	29.5	24.5	31.9	35.1	31.1	29.9

Source: Economic Intelligence Service, Published by Centre for Monitoring Indian Economy, Bombay.

like Andhra Pradesh (AP), Gujarat (GUJ.), Karnataka (KRT), Haryana (HR), Maharashtra (MS), Orissa (OR), Punjab (PU), Rajasthan (RJ), Tamil Nadu (TN), Uttar Pradesh (UP), Kerala (KRL), Madhya Pradesh (MP) and remaining other states (O.S.) was collected together, from different secondary sources on yearly basis,

The production variability has been measured for two time periods 1971-80 (period I) and 1981-90 (period II). The sources of instability were identified by using the Hazell (1982, 1984) method of variance decomposition. Goodman (1960), and Bohrnsted and Goldberger (1969) expressed the average production, $E(P)$, in terms of area and productivity as

$$E(P) = \bar{A} \bar{Y} + \text{Cov}(A, Y) \quad (1)$$

where A denotes the area shown, P denotes the production, and Y denotes the yield. Similarly, \bar{A} denotes the mean area and \bar{Y} denotes the mean yield. Change in any one of the area and yield component will lead to a change in average production between the periods of time. Similarly, the variance of production, $V(P)$ can be expressed as,

$$V(P) = (\bar{A})^2 V(Y) + (\bar{Y})^2 V(A) + 2\bar{A} \bar{Y} \text{Cov}(A, Y) - \text{Cov}^2(A, Y) + R. \quad (2)$$

where R is the residual term. For the purpose of analysing the data the partition in the changes in average production and variance of production between the first and second period is to be done. The method for the decomposition of analysis of variance of production is presented as follows. From equation (2) one can get

$$V(P_1) = (\bar{A})^2 V(Y_1) + (\bar{Y}_1)^2 V(A_1) + 2\bar{A}_1 \bar{Y}_1 \text{Cov}(A_1, Y_1) - \text{Cov}^2(A_1, Y_1) + R_1. \quad (3)$$

Similarly, for the second period

$$V(P_2) = (\bar{A}_2)^2 V(Y_2) + (\bar{Y}_2)^2 V(A_2) + 2\bar{A}_2 \bar{Y}_2 \text{Cov}(A_2, Y_2) - \text{Cov}^2(A_2, Y_2) + R_2. \quad (4)$$

Each variable in the second period can be expressed as the sum of the variable in the first period plus the change in the variable between the two periods. Like,

$$\bar{Y}_2 = \bar{Y}_1 + \Delta \bar{Y}$$

$$\bar{A}_2 = \bar{A}_1 + \Delta \bar{A}$$

and

$$R_2 = R_1 + \Delta R \quad (5)$$

The variance of production in the second period can be expressed in term of all values for the first period by substituting the values from eq. (5) to (4) as,

$$V(P_2) = (\bar{A}_1 + \Delta \bar{A})^2 V(Y_1 + \Delta Y) + (\bar{Y}_1 + \Delta \bar{Y})^2 V(A_1 + \Delta A) + 2(\bar{A}_1 + \Delta \bar{A})(\bar{Y}_1 + \Delta \bar{Y}) [\text{Cov}(A_1, Y_1) + \Delta \text{Cov}(A, Y)] - [\text{Cov}(A_1, Y_1) + \Delta \text{Cov}(A, Y)]^2 + [R_1 + \Delta R] \quad (6)$$

The change in variance of production, $\Delta V(P)$, is obtained by subtracting equation (3) from equation (6) as

$$\begin{aligned} \Delta V(P) &= V(P_2) - V(P_1) \\ &= [2\bar{A}_1 \Delta \bar{Y} \text{Cov}(Y_1, A_1) + (2\bar{Y}_1 \Delta \bar{Y} + (\Delta \bar{Y})^2 V(A_1))] + [2\bar{Y}_1 \Delta \bar{A} \text{Cov}(Y_1, A_1) + (2\bar{A}_1 \Delta \bar{A} + (\Delta \bar{A})^2) V(Y_1)] + [(\bar{A}_1^2 \Delta V(Y) + (\bar{Y}_1)^2 \Delta V(A))] + [2\Delta \bar{Y} \Delta \bar{A} \text{Cov}(Y_1, A_1)] + [(2\bar{A}_1 \Delta \bar{A} + (\Delta \bar{A})^2) \Delta V(Y)] + [(2\bar{Y}_1 \Delta \bar{Y} + (\Delta \bar{Y})^2) \Delta V(A)] + [(2\bar{A}_1 \bar{Y}_1 - 2 \text{Cov}(Y_1, A_1)) \Delta \text{Cov}(Y, A) - (\Delta \text{Cov}(Y, A))^2] + [(2\bar{Y}_1 \Delta \bar{A} + 2\bar{A}_1 \Delta \bar{Y} + 2\Delta \bar{A} \Delta \bar{Y}) \Delta \text{Cov}(Y, A)] + [\Delta R] \quad (7) \end{aligned}$$

where $\Delta R = \Delta V(A, Y) -$ sum of the other components. The changes in the variance of production can be ex-

plained now in a sequence from the first term to the right hand side of equation (7). These terms corresponding to the change in mean yield, change in mean area, change in yield variance, change in area variance, interaction between changes in mean yield and mean area, interaction between changes in mean area and yield variance, interaction between changes in mean yield and area variance, change in area-yield covariance, interaction between changes in mean area and yield and change in area-yield covariance and changes in residual. Similarly the components of change in average production can be

defined. The change in mean yield, mean area, interaction between changes in mean area and yield and change in area-yield covariance are $\bar{A}_1 \Delta \bar{Y}$, $\bar{Y}_1 \Delta \bar{A}$, $\Delta \bar{A} \Delta \bar{Y}$ and $\Delta \text{Cov} (A, Y)$ respectively.

Changes in Average Production, Areas & Yield

The production of groundnut in India increased on an average by 0.8100 million tons (i.e., 14.08%) in Period II as compared to Period I (Table 2). Andhra Pradesh (0.4100 million tons) and Orissa (0.2843 million tons)

Table 2: Average Production and Area of Groundnut in India over periods I and II.

State	Period		Change	
	I	II	Net	%
			(As compared to Period I)	
Average Production (million tons)				
Andhra Pradesh	1.1100	1.5200	0.4100	36.94
Gujarat	1.4700	1.4900	0.0200	1.36
Karnataka	0.5912	0.7599	0.1687	28.53
Haryana	0.0092	0.0056	-0.0036	-39.13
Maharashtra	0.5244	0.6901	0.1657	31.59
Orissa	0.1334	0.4177	0.2843	213.12
Punjab	0.1471	0.0488	-0.0983	-66.82
Rajasthan	0.1563	0.1539	-0.0024	-1.53
Tamil Nadu	1.0545	1.0166	-0.0379	-3.59
Uttar Pradesh	0.2396	0.1369	-0.1027	-42.86
Kerala	0.0169	0.0095	-0.0074	-43.79
Madhya Pradesh	0.2800	0.2213	-0.0587	-20.96
Other States	0.0099	0.0843	0.0744	751.51
All India	5.7500	6.5600	0.8100	14.08
Average Area (million hectare)				
Andhra Pradesh	1.3400	1.7300	0.3900	29.10
Gujarat	1.7900	1.9100	0.1200	6.70
Karnataka	0.8789	0.9511	0.0722	8.21
Haryana	0.0092	0.0061	-0.0031	-33.69
Maharashtra	0.8070	0.7665	-0.0405	-5.02
Orissa	0.1100	0.2946	0.1846	167.82
Punjab	0.1545	0.0510	-0.1035	-66.99
Rajasthan	0.2688	0.2179	-0.0509	-18.94
Tamil Nadu	1.0023	0.9684	-0.0339	-3.38
Uttar Pradesh	0.3466	0.1809	-0.1657	-47.81
Kerala	0.0156	0.0113	-0.0043	-27.56
Madhya Pradesh	0.4457	0.3010	-0.1447	-32.46
Other States	0.0089	0.0328	0.0239	268.54
All India	7.1800	7.4300	0.2500	3.48

Source: This table is based on data from various sources like Economic Intelligence Service, Agricultural Statistics at a Glance and Agricultural Situation in India.

together share, 0.6943 million tons (85.72%) of the increase in the average production of groundnut in our country. Next come Karnataka (0.1687 million tons), Maharashtra (0.1657 million tons), other (residual) states (0.0744 million tons) followed by Gujarat (0.02) million tons). On the other hand, Haryana, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Kerala and Madhya Pradesh observed decline in their average production. In terms of percentage changes, other (residual) states observed the highest increase by 751.51% of average production. It was followed by Orissa (213.12%), Andhra Pradesh (36.94%), Maharashtra (31.59%), Karnataka (28.53%) and Gujarat (1.36%).

The area under groundnut crop in India increased on an average by 0.2500 million hectare (i.e., 3.48%) in Period II as compared to Period I. Andhra Pradesh (0.3900 million hectare) and Orissa (0.1846 million hectare) together contributed the maximum (0.5746 million hectare) of this increase. It was followed by Karnataka (0.0722 million hectare, other (residual) states (0.0239 million hectare) and Gujarat (0.1200 million hectare). On the other hand Haryana, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Kerala and Madhya Pradesh observed decline in their average area sown. Other (residual) states observed the highest increase in terms of percentage changes in average area sown by 268.54% between the two periods. It was followed by Orissa (167.82%), Andhra Pradesh (29.10%), Karnataka

(8.21%) and Gujarat (6.70%). Due to increase in area under irrigation groundnut crop become more profitable in Maharashtra and Karnataka.

The average productivity of groundnut in India also increased by 9.51% in Period II as compared to Period I. Average yield of other (residual) states showed an outstanding increase of 329.65% between these two periods, thereby indicating the popularity of the crop in non-traditional areas. Maharashtra (36.88%), Karnataka (22.54%), Rajasthan (19.72%), Madhya Pradesh (18.36%), Orissa (13.6%) Uttar Pradesh (13.59%) and Andhra Pradesh (4.88%) also observed increases in their respective average yields. The increase in average yields of Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Madhya Pradesh was enough to compensate for the loss in average area sown. Interestingly, one of the major states, i.e., Gujarat observed a decline in average yield by 0.06 tons/hectare (i.e., 7.41%) (Table 3). The average production of groundnut increased by 14.08% whereas the standard deviation of yield and area increased by 34.73% and 257.82%, respectively resulting in more instability (table 4).

The values of coefficient of variation for total groundnut production and yield increased by 73.04% and 22.19% in period II as compared to period I. Similar trends were observed in the values of coefficient of variation of production for all states. The variability which is

Table 3: Average Yield (tons/hectare) of Groundnut in India during periods I and II.

State	Period		Change	
	I	II	Net	%
			(As compared to Period I)	
Andhra Pradesh	0.8200	0.8600	0.0400	4.88
Gujarat	0.8100	0.7500	-0.0600	-7.41
Karnataka	0.6694	0.8203	0.1509	22.54
Haryana	0.9999	0.9033	-0.0966	-9.66
Maharashtra	0.6493	0.8888	0.2395	36.88
Orissa	1.2510	1.4212	0.1702	13.60
Punjab	0.9477	0.9562	0.0085	0.89
Rajasthan	0.5872	0.7030	0.1158	19.72
Tamil Nadu	1.0505	1.0425	-0.0080	-0.76
Uttar Pradesh	0.6800	0.7724	0.0924	13.59
Kerala	1.0769	0.8362	-0.2407	-22.35
Madhya Pradesh	0.6220	0.7362	0.1142	18.36
Other States	0.8833	3.7951	2.9118	329.65
All India	0.7990	0.8750	0.0760	9.51

measured in terms of the coefficient of variation (CV) for different states indicated relatively high risk and instability in production (table 5). From it we observe the following:

Table 4: Change in standard deviation of Yield and Area.

	State	% Change in S.D.	
		Yield	Area
1.	Andhra Pradesh	-5.93	113.45
2.	Gujarat	23.39	76.73
3.	Karnataka	174.52	175.21
4.	Haryana	21.28	20.00
5.	Maharashtra	13.48	8.93
6.	Orissa	-39.81	136.71
7.	Punjab	165.56	5.18
8.	Rajasthan	45.98	-27.15
9.	Tamil Nadu	113.26	16.73
10.	Uttar Pradesh	8.24	22.04
11.	Kerala	158.16	44.44
12.	Madhya Pradesh	72.64	-32.12
13.	Other States	1694.88	665.22
14.	All India	34.73	257.82

Other states, Punjab and Kerala experienced an increase of 291.22%, 191.11% and 112.24%, in the value of coefficient of variation respectively thus reflecting the maximum instability in groundnut production in these states. Uttar Pradesh, Rajasthan, Gujarat, Karnataka, Andhra Pradesh, Haryana and Tamil Nadu, showed 21.69%, 26.70%, 28.11%, 28.75%, 38.26%, 50.28% and 96.86% increase in the coefficient of variation. These states are thus neither too risky nor too safe. Madhya Pradesh, Maharashtra and Orissa observed an increase of 13.53%, 14.49% and 19.11%, respectively proving themselves to be the safest states in groundnut production.

The relative risk in yield as measured by the coefficient of variation for different states as shown in (table 5) indicates that other (residual) states, Kerala, Punjab, Karnataka and Tamil Nadu experienced an increase of 317.70%, 232.61%, 163.17%, 129.07% and 114.93% in the values of coefficient of variation, thus, reflecting high instability in productivity. Rajasthan, Gujarat, Haryana and Madhya Pradesh showed 21.96%, 33.27%, 34.18% and 45.88% increase. These states are thus neither too risky nor too safe. Orissa, Maharashtra, Andhra Pradesh and Uttar Pradesh observed a decrease of 47.01%, 17.09%, 10.31% and 4.70%, respectively proving themselves to be more stable in groundnut productivity. We

conclude that the changes (in %) in relative yield risk are more important variables than relative production risk variables since in the former there is an increase as well as decrease whereas in the latter there is only increase in the coefficient of variation.

Table 5: Coefficient of variation of Production and Yield

	State	Period		Change %
		I	II	
Production				
1.	Andhra Pradesh	19.47	26.92	38.26
2.	Gujarat	38.84	49.76	28.11
3.	Karnataka	17.84	22.97	28.75
4.	Haryana	23.13	34.76	50.28
5.	Maharashtra	23.45	26.85	14.49
6.	Orissa	18.84	22.44	19.11
7.	Punjab	19.47	56.68	191.11
8.	Rajasthan	25.88	32.79	26.70
9.	Tamil Nadu	14.01	27.58	96.86
10.	Uttar Pradesh	29.46	35.85	21.69
11.	Kerala	17.64	37.44	112.24
12.	Madhya Pradesh	23.57	26.76	13.53
13.	Other States	54.32	212.51	291.22
14.	All India	12.39	21.44	73.04
Yield				
1.	Andhra Pradesh	15.42	13.83	-10.31
2.	Gujarat	37.48	49.95	33.27
3.	Karnataka	13.25	29.69	129.07
4.	Haryana	14.95	20.06	34.18
5.	Maharashtra	21.82	18.09	-17.09
6.	Orissa	16.55	8.77	-47.01
7.	Punjab	6.68	17.58	163.17
8.	Rajasthan	22.04	26.88	21.96
9.	Tamil Nadu	11.05	23.75	114.93
10.	Uttar Pradesh	22.12	21.08	-4.70
11.	Kerala	7.39	24.58	232.61
12.	Madhya Pradesh	15.69	22.89	45.88
13.	Other States	54.18	226.31	317.70
14.	All India	11.49	14.04	22.19

Changes in relative yield risk are more important variables than relative production risk variables.

Table 6: Area-Yield correlations

	State	Period	
		I	II
1.	Andhra Pradesh	0.23	0.45
2.	Gujarat	0.34	0.52
3.	Karnataka	0.19	-0.43
4.	Haryana	0.09	0.07
5.	Maharashtra	0.02	0.60
6.	Orissa	-0.70	-0.12
7.	Punjab	0.43	0.01
8.	Rajasthan	-0.11	0.11
9.	Tamil Nadu	0.14	0.31
10.	Uttar Pradesh	0.52	-0.29
11.	Kerala	0.71	0.09
12.	Madhya Pradesh	0.53	-0.05
13.	Other States	0.88	-0.13
14.	All India	0.39	0.72

Components of Change in Average Production

The components of change in average production of groundnut in India are shown in (table 7). Changes in mean yield and mean area accounted for 68.31% and 23.49% of the variation in average production of all India. Changes in mean yields were more prominent than changes in mean areas for Karnataka, Maharashtra, other (residual) states and at the country level. On the other hand changes in mean areas were more important than changes in mean yields for the states of Andhra Pradesh, Gujarat, Haryana, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Kerala and Madhya Pradesh. Changes in covariances between areas and yields were negative for Karnataka, Rajasthan, Tamil Nadu and other states whereas these were positive and considerably lower for Haryana, Punjab, Kerala, Orissa, Andhra Pradesh, Madhya Pradesh, Maharashtra, Uttar Pradesh and at the country level. The variation for Gujarat was very high. Except Punjab, Andhra Pradesh, Karnataka, Haryana and All India the interaction effects between changes in mean yields and mean areas were considerably high for Orissa, Uttar Pradesh, Madhya Pradesh, and other (residual) states. They accounted for 11.05%, 14.56%, 28.21%, 93.19%, respectively of the increase in average production, For Rajasthan, they were very high in comparison to the other states. However, these interactions were negative for Gujarat, Maharashtra, Tamil Nadu and Kerala.

Components of Change in Production Variability

The components of change in the variance of production of groundnut in India are presented in (table 8).

Changes in mean yields accounted for a small share of the changes in the variance of production for most states except Maharashtra, Rajasthan and Haryana, which accounted for 0.74% of the increase in the variance of India production.

Changes in mean area were more important than changes in mean yields for all states except Karnataka, Maharashtra, Rajasthan, Tamil Nadu and other (residual) states, where the changes in mean yield were more important than changes in mean areas. They accounted for 385.66%, the largest, of the increase in the variance of Punjab production, followed by 183.33%, 177.82%, 110.00%, 42.86% and 2.16% of the increase in the variance of Haryana, Madhya Pradesh, Gujarat, Uttar Pradesh and All India production, respectively. Changes in mean area had a stabilizing effect on the variance of Maharashtra, Rajasthan, Tamil Nadu and Kerala production, but had little effect in reducing increasing the variability of Karnataka and other (residual) states production.

Changes in yield variances accounted for large shares of the changes in the variance of production for most states except Maharashtra, other (residual) states, Punjab\Uttar Pradesh and Madhya Pradesh. They accounted for 400.00% of the increase in the variance of Gujarat production, followed by 231.74%, 203.49%, 151.36%, 133.33% and 85.87% of the increase in the variance of production of Kerala, Karnataka, Rajasthan, Haryana and Tamil Nadu, respectively. Change in the yield variance accounted for 21.95% of increase in the variance of All India production. The large shares of the increase in the variance of production due to changes in yield variances of Gujarat, Kerala, Karnataka, Rajasthan, Haryana, Tamil Nadu and All India were consistent with the large increases in the standard deviation (table 4) of yields of these states. A decline of 5.93% and 39.81% in the standard deviation of Andhra Pradesh and Orissa, respectively explained the negative effect of changes in yield variance on the variance of Andhra Pradesh and Orissa production.

Changes in the variances of areas sown were of lesser importance in comparison to the changes in yield variances for all states except Andhra Pradesh, Orissa, Punjab, Uttar Pradesh and Madhya Pradesh. Change in the area variance of Gujarat had the largest contribution, 115.00% in destabilization of the Gujarat production, and was consistent with an increase of 76.73% in the standard deviation of Gujarat area. Change in area variance contributed only 15.61% in the production variance of All India.

Table 7: Components of change in average production (%).

	State	Source			
		Change in mean yield	Change in mean area	Interaction between changes in mean area and mean yield	Change in area-yield covariance
1.	Andhra Pradesh	13.33	79.57	3.89	3.21
2.	Gujarat	-475.22	430.09	-31.86	176.99
3.	Karnataka	77.83	28.39	6.39	-12.58
4.	Haryana	24.35	83.76	8.09	0.02
5.	Maharashtra	117.00	-16.11	-5.94	5.05
6.	Orissa	6.59	81.24	11.05	1.12
7.	Punjab	-1.33	99.79	0.89	0.65
8.	Rajasthan	-958.22	919.96	181.44	-43.18
9.	Tamil Nadu	21.24	94.31	-0.72	-14.83
10.	Uttar Pradesh	-31.07	109.71	14.56	6.80
11.	Kerala	50.74	62.57	-13.98	0.67
12.	Madhya Pradesh	-86.89	153.66	28.21	5.02
13.	Other States	35.09	28.27	93.19	-56.55
14.	All India	68.31	23.49	2.38	5.82

Table 8: Components of change in the variance of production (%)

Source	State													
	Change in mean yield													
	AP	GUJ	KRT	HR	MS	OR	PU	RJ	TN	UP	KRL	MP	OS	AI
	1.67	-17.50	7.38	66.66	13.98	2.75	-20.88	31.57	-0.23	-8.57	-57.19	-82.02	1.21	0.74
	Change in mean area													
	19.21	110.00	6.00	183.33	-6.78	15.46	385.66	-41.19	-1.88	42.86	-42.15	177.82	0.96	2.16
	Change in yield variance													
	-3.34	400.00	203.49	133.33	20.31	-4.01	-1013.8	151.36	85.87	-12.00	231.74	-444.63	18.4	21.95
	Change in area variance													
	45.11	115.00	74.61	-150.01	2.19	72.65	7.79	-38.01	3.57	-7.28	106.81	69.09	2.96	15.61
	Interaction between changes in mean yield and mean area.													
	0.11	-0.75	0.14	-2.12	-0.03	-3.26	1.95	0.89	0.01	1.77	0.05	10.44	0.83	0.02
	Change in area-yield covariance													
	23.39	282.50	-132.15	-2.44	45.11	10.95	331.50	48.40	21.47	47.14	-42.16	193.42	-7.09	37.36
	Interaction between changes in mean area and yield variance													
	-2.51	55.50	34.80	66.66	-2.01	-24.75	903.36	-51.88	-5.72	8.57	110.20	241.84	228.13	1.55
	Interaction between changes in mean yield and area variance													
	4.17	-15.00	37.43	16.66	1.92	21.11	0.17	-16.47	-0.05	-2.14	-42.41	27.69	51.76	3.31
	Interaction between changes in mean area & yield and change in area-yield covariance													
	8.35	-3.50	-42.41	0.97	13.62	21.94	-221.59	-1.39	-0.89	-19.31	21.95	-38.98	-30.59	5.27
	Change in residual													
	3.84	-826.25	-89.29	-213.05	11.69	-12.84	-274.16	16.72	-2.15	48.96	-186.84	-54.67	-166.61	12.03

Changes in the covariances between areas and yields had destabilizing effects on the production of all states except Karnataka, Haryana, Kerala and other (residual) states, where these changes largely contributed toward the stability of production. Change in the

area — yield covariance was the largest component of change in the variance of production of Punjab (331.50%) and second-largest component of change in the variance of production of Gujarat (282.50%) as compared to 37.36% at the country level. These changes are largely

in accordance with the change in the area-yield correlations (table 6).

As shown in (table 8) the interaction terms were important sources of the changes in the variance of production. If added together, interaction terms accounted for about 684.00%, 250.00%, 241.00%, 90.00%, 82.00%, 36.00%, 30.00%, and 10.00%, of the increases in the variance of production of Punjab, other (residual) states, Madhya Pradesh, Kerala, Haryana, Gujarat, Karnataka and All India, respectively.

Finally, changes in the residual term contributed substantially to changes in the production variances for Uttar Pradesh, Rajasthan, Maharashtra and All India and had stabilizing effects on the production of Gujarat, Karnataka, Haryana, Orissa, Punjab, Tamil Nadu, Kerala, Madhya Pradesh and other (residual) states.

Policy Implications

The variations in average production were more due to variation in average productivity than in average area under groundnut cultivation. Also changes in yield variance, area-yield covariance and interactions, were of greater consequence for the variability of the production for all states. The contribution of interaction terms indicated that the simultaneous changes in area and yield further enhanced the production instability. This could have been due to increased sensitivity to weather and diseases and erratic supply of water and inputs at the time of their requirement.

To achieve stability and sustainable growth all factors like fertilizers, high yielding seed varieties, credit, plant production measures and optimum agronomic practices are to be taken up together.

To achieve stability and sustainable growth in groundnut production, all factors like fertilizers, high yield-

ing seed varieties, credit, plant production measures and optimum agronomic practices affecting the production, are to be taken up together at the right time. To achieve the goal of maximum production with stability there is a need coordination among different bodies working for enhancing agriculture production such as planning Commission, Agriculture research institutions, funding institutions water commission and the farmers themselves.

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References

- Bohrsted, G.W. & Goldberger, A.S. (1969). "On the Exact Covariance of Products of Random Variables," *Journal of Amer. Statist. Assoc.* 64.
- Cauvery, R. (1991). "Groundnut Production in Tamilnadu — A Decomposition Analysis," *Journal of agricultural Situation in India*, Vol. XLVI, August, No. 5.
- Goodman, L.A. (1960). "On the Exact Variance of Products," *Journal of Amer. Statist. Assoc.* 55.
- Hazell, P.B.R. (1982). "Instability in Indian Foodgrain Production," *Research Report 30, International Food Policy Research Institute Washington, DC.*
- Hazell, P.B.R. (1984). "Sources of Increased Instability in Indian and U.S. Cereal Production," *American Journal of Agricultural Economics*, 66.
- Mehra, S. (1981). "Instability in Indian Agriculture in the Context of New Technology," *Research Report 25, International Food Policy Research Institute Washington, DC.*
- Ray, S.K. (1991). "Instability in Indian Agriculture Revisited," in *Recent Advances in Agricultural Statistics Research*, P. Narain, O.P. Kathuria, V.K. Sharma, and Prajneshu, Eds, Wiley Eastern Limited, New Delhi.
- Singh, J.P. (1993). "Green Revolution Versus Instability in Food grain Production in India," *Agribusiness*, Vol. 9, No. 5.
- Singh, J.P. & Gangwar, J.C. (1991). "Instability in Cereal Production in Haryana: A Decomposition Analysis," in *Recent Advances in Agricultural Statistics Research*, P. Narain, O.P. Kathuria, V.K. Sharma, and Prajneshu, Eds., Wiley Eastern Limited, New Delhi.
- Walker, T.S. (1984). "HYVs and Instability in Sorghum and Pearl Millet Production in India," *International Crops Research Institute for the Semi-Arid Topics (mimeograph)*, Hyderabad. □

Pollution Audit & Waste Minimisation Studies in Small Electroplating Units

NPC Pollution Control Division

The Indian Electroplating sector is dominated by small and medium enterprises, mostly working on job orders. These units cater to the requirements of different kinds of large scale industries mainly automobile industries. A demonstration project was conducted by the Ministry of Environment and Forests in electroplating sector considering following points.

- Electroplating is one of the 18 priority polluting sectors.
- Possibility of the effluent to cause ground water pollution and affect the water quality of the surrounding industries/area.
- Sludge from the treatment plant falls under the Hazardous waste category.

Under the Ministry of Environment & Forests Waste Minimisation Demonstration, studies in a representative mix of large, medium and small electroplating units in and around Madras were conducted.

There are more than 100 electroplating units in and around Madras. Electroplating industries are among the prime contributors to heavy metal pollution. These generate a low quantity/high strength waste containing a diverse range of heavy metals. The specific discharge of heavy metal pollutants (kg of heavy metal discharged per unit area plated) is high in small scale units due to the following inherent limitations:

- Frequent variation in daily production schedule

- Insufficient working space resulting in inadequate operational facilities and poor housekeeping
- Unskilled and untrained manpower

Pollution Status

During the plating process, the toxic heavy metal bearing waste water is generated from rinse and other streams, which impair the water quality of receiving bodies. Both Nickel and Chromium plating processes are widely used. At present the heavy metal problem is being tackled only by "End of Pipe" approach (treatment systems) with little emphasis on pollution prevention and resource recovery aspects.

It is reported by the Industrial Association and State Pollution Control Board that 90% of the units use Ni-Cr, hard Cr and/or Zn plating process. On the basis of scale and economy of operation they can be classified into three segments:

Large scale units having captive plating shop (Category-A).

Small and Medium scale units catering to selected business groups as feeder units (Category-B).

Small and Medium scale job platers (Category-C).

Table 1 indicates the findings of the study and heavy metal losses in these units prior to implementation of waste minimisation measures, the modifications/equipments and capital investment required to implement them. The expected monthly savings were computed and are shown in the following table No. 2.

Table 1: Summary of Heavy Metal Losses in Various Units Before Waste Minimisation

Category	Area plated (m ² /d)	Effluent 1/d	Qty. 1/m ²	Ni/Zn loss in Effluent (g/d)	Ni/Zn loss in (g/m ²)	Total Ni/Zn loss# (g/m ²)	Ni/Zn bath Drag out rate (1/m ²)	Total Cr. loss (g/m ²)	Cr. Loss in Effluent (g/m ²)
A	575	105000	182.6	12017.5	20.9	30.3	0.31	14.6	12.0
B*	350	3900	11	2060	5.7	6.2	0.19	—	—
B	67.5	4425	65.5	3500	51.9	59.3	0.74	25.0	20.0
C	25	1500	60	1000	70	172	0.66	25.7	19.2
C*	150	4100	27.3	1672	11.1	11.7	0.31	—	—
C	90	8000	88.9	7200	80	106.7	1.31	30.6	25.0

*These units have zinc plating process.

#Includes losses in wastewater and other losses such as spillages, coating on fixtures etc.

Table 2: Waste Minimisation Measures, Investment Costs & Monthly Savings

Waste Minimisation Measures		Modification required	Costs (Rs.)	Monthly Savings (Rs.)
a)	Drag out reduction			
—	Conversion of Ni rinse I to drag out	Change in piping	10-15,000	15-40,000
—	Lower Ni Conc. in Ni bath	Change in practice	—	5-10,000
—	Improved PVC coating of Jigs & fixtures	Better control over coating preparation	Nominal	3-8,000
—	Lower Cr Concentration in bath use of catalyst	Change in Practice	-do-	3-5,000
—	Better Jerking after component removal for improved drainage	-do-	-do-	6-8,000
b)	Rinse System			
—	Use of DM Water for topping Cr & successive topping Cr dragout	-do-	-do-	5-7,500
—	Introduction of spray rinse after dragout	Installation of tank & a spray system	8-10,000	4-8,000
—	Water conservation through partial rinse water	Change in Piping	50,000	15-25,000
c)	Good Housekeeping			
—	Preventive maintenance of various equipments	Change in Practice	Nominal	
—	Weekly thorough cleaning of joints & bus bar connections, bus bar rerouting	-do-	-do-	3-6,000

A combination of waste minimisation options were implemented in the units and Table 3 indicates the summary of heavy metal losses before and after waste minimisation.

Table 3: Summary of Heavy Metal Losses in Various Units Before and After Waste Minimisation

Unit No.	Area plated (m ² /d)	Effluent (before)		Ni/Zn Loss before (g/d)		Ni/Zn loss in Effluent g/m ²		Total Ni loss (g/m ²)		Drag out rate (1/m ²)		Total Cr. loss (g/m ²)		Cr. Loss in Effluent (g/m ²)	
		1/d	1/m ²	Eff.	Total	B	A	B	A	B	A	B	A	B	A
1	575	50000	86.9	12017	17422	20.9	10.4	30.3	17.7	0.31	0.31	14.6	12.0	12.0	9.4
2*	350	3900	11	2060	2200	5.7	3.2	6.2	3.77	0.19	0.10	—	—	—	—
3	67.5	4425	65.5	3500	4000	51.9	28.1	59.3	35.6	0.74	0.53	25.0	19.8	20.0	14.8
4	25	1500	60	1000	1800	70	28.8	172	33.6	0.66	0.53	25.7	18.8	19.2	14.4
5*	150	4100	27.3	1672	1772	11.1	8.3	11.7	8.96	0.31	0.23	—	—	—	—
6	90	8000	88.9	7200	9600	80	34.7	106.7	54.8	1.31	1.07	30.6	24.3	25.0	18.7

*These units have zinc plating processes.

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International Comparisons in Labour Productivity Growth

NPC Research Division

In an earlier issue [Productivity, 34(2)] we made a comparison of labour productivity levels among select Asian countries during 1980-90 based on gross domestic product valued at current international dollar. The corresponding labour input data in the case of India was estimated by extrapolating the employment in 1981 by its compound rate of growth during 1971-1981. With the availability of labour data from the latest Census of India, 1991, a more reliable estimation of employment became possible. Thus the revised estimates of labour productivity for the aggregate economy and its various sectors in domestic currency was published in our last issue [Productivity, 35(3)].

Using the revised employment data estimates, an international comparison of labour productivity growth for select countries is attempted here. India's gross domestic product at current international dollar¹ is allocated to its various sectors based on their respective shares in GDP in domestic currency at current prices². Productivity data for other countries are obtained from 'International Productivity Journal, 1994 (III), arrived at by the International Productivity Service, Washington.

Table 1 gives the index (1985=100) of GDP per capita at current international dollar. The rest of the tables show labour productivity indexes (1985=100) for aggregate economy and various sectors in terms of current international dollar.

Table 1: Index of GDP Per Capita in International Dollar

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	101.9	101.9	102.3	102.0	104.1	102.7	101.3	102.1	102.8	102.5	101.0	111.4	102.5
1987	105.6	104.1	103.8	103.7	108.8	105.8	103.3	104.9	108.5	105.6	104.5	123.6	104.9
1988	111.7	107.2	107.0	107.6	113.8	109.8	108.0	106.8	113.8	109.6	107.9	136.4	112.9
1989	116.5	108.8	109.8	110.6	116.0	112.9	111.8	108.6	119.0	110.9	109.1	143.5	119.0
1990	121.7	109.6	113.9	112.7	116.1	115.1	115.3	109.3	123.0	109.2	107.2	154.8	127.0
1991	113.5	107.6	117.4	112.9	113.0	117.6	117.1	107.3	125.5	105.8	106.4	166.4	139.7
1992	127.5	109.4	117.6	113.9	112.1	119.4	117.8	104.5	126.3	104.8	107.5	172.8	147.0

1. Computed based on per capita GDP at current international dollar, from various issues of World Development Report of the World Bank.
2. Data for gross domestic product in national currency is from the National Accounts Statistics.

Table 2: Labour Productivity Index-GDP Per Person Employed

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	101.8	100.6	100.9	102.2	104.2	102.3	100.8	103.0	101.0	100.5	98.8	108.5	102.8
1987	105.0	101.0	101.6	104.1	106.9	105.8	102.4	104.5	101.9	101.7	101.3	115.3	105.5
1988	109.6	102.7	104.7	107.6	108.5	108.8	105.9	105.5	103.6	103.5	102.4	124.6	113.8
1989	112.6	103.2	106.8	110.3	107.6	111.9	108.1	106.4	104.2	103.9	100.3	127.4	122.5
1990	115.8	104.0	109.8	109.7	107.0	112.2	110.2	106.7	105.3	102.9	98.6	135.0	144.0
1991	118.4	104.1	112.7	110.3	108.2	112.6	111.9	107.5	107.3	103.1	100.9	142.2	143.3
1992	118.5	106.1	113.8	112.6	110.1	114.4	—	109.8	110.4	104.7	103.8	146.3	150.2

Table 3: Labour Productivity Index-Agriculture, Forestry and Fishery

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	100.7	102.8	112.3	103.9	102.3	104.4	106.8	115.4	100.9	115.1	103.8	106.6	98.8
1987	105.2	106.1	107.0	109.2	102.3	111.9	100.7	114.3	114.8	109.0	102.6	101.7	100.5
1988	105.1	104.3	120.0	112.9	102.6	114.5	109.9	115.2	120.5	107.7	96.9	112.8	112.1
1989	111.1	106.2	128.1	121.8	110.4	122.1	112.0	138.9	119.3	118.0	110.6	113.7	116.2
1990	114.7	116.4	143.5	128.2	115.2	121.7	106.1	151.5	131.4	126.8	111.4	112.1	137.0
1991	112.0	117.1	135.9	133.0	118.4	133.4	—	145.3	141.9	118.8	108.4 ^e	117.7	140.1

e = estimated

Table 4: Labour Productivity Index-Mining and Quarrying

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1986	116.93	106.34	87.97	101.74	120.30	—	87.73	106.60	—	96.54	100.41	89.60	100.5
1987	110.03	114.30	90.09	110.37	140.12	—	98.62	125.17	—	104.45	109.97	88.89	94.2
1988	128.85	140.92	86.45	114.12	142.54	—	87.96	125.26	—	112.61	107.76	117.49	109.7
1989	119.44	130.60	97.67	119.41	131.54	—	78.67	135.42	—	111.50	114.71	164.07	113.5
1990	174.91	141.67	95.85	125.77	111.96	—	61.81	132.55	—	110.63	128.27	168.09	129.6
1991	171.78	140.67	105.46	127.98	123.81	—	—	141.15	—	115.45	130.72 ^e	202.36	119.5

Note: This sector of Italy and Spain are included in Manufacturing.

e = estimated

Table 5: Labour Productivity Index-Manufacturing

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	97.9	100.7	100.1	102.1	103.7	103.4	101.5	100.2	—	99.3	99.5	108.4	103.2
1987	106.5	108.0	98.2	103.5	109.3	109.2	106.6	104.4	—	102.6	102.3	111.5	108.3
1988	114.0	111.6	101.6	111.4	115.3	115.7	113.8	106.3	—	103.4	104.4	119.7	117.4
1989	120.6	110.9	103.4	116.7	119.8	119.3	118.0	106.8	—	102.5	104.4	119.7	135.3
1990	128.0	112.9	105.1	117.7	123.3	120.5	122.3	107.4	—	103.4	102.0	130.3	159.5
1991	132.1	114.4	107.2	117.4	124.2	120.6	—	109.0	—	103.6	106.7 ^e	139.3	150.3

Note: Mining and Quarrying of Italy and Spain are included in Manufacturing.

e = estimated

Table 6: Labour Productivity Index-Electricity, Gas and Water

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	104.4	101.2	101.7	104.7	112.9	104.1	101.3	105.3	111.7	105.1	103.6	128.5	103.5
1987	110.3	106.6	106.6	111.3	118.3	105.1	107.4	111.2	126.1	108.6	124.3	131.1	104.9
1988	118.1	109.7	106.4	113.9	118.4	107.6	114.3	111.3	129.2	103.5	137.1	121.9	109.9
1989	127.5	119.0	109.8	113.2	118.4	111.3	122.2	119.5	120.7	98.4	144.4	118.9	120.1
1990	135.9	114.5	110.6	116.7	127.9	114.7	126.6	118.4	118.0	93.0	158.9	115.0	144.3
1991	132.3	116.0	116.3	123.9	136.4	113.4	—	119.3	129.3	98.2	162.4 ^e	130.9	143.4

e = estimated

Table 7: Labour Productivity Index-Construction

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	102.9	95.9	102.8	103.6	105.2	102.7	102.8	105.4	98.9	97.6	93.1	107.5	107.1
1987	114.1	95.6	101.9	103.6	111.2	106.0	105.3	101.2	96.2	94.8	98.5	117.1	110.5
1988	119.6	93.1	103.6	110.4	115.4	110.3	112.8	101.5	96.3	91.2	99.3	115.2	115.2
1989	121.6	92.7	106.5	110.3	112.0	115.6	112.8	103.3	98.7	90.4	89.3	120.1	120.3
1990	126.6	91.4	106.4	111.5	110.4	115.2	113.8	95.8	101.2	89.3	86.1	126.5	138.5
1991	126.2	91.7	108.7	114.9	112.9	110.7	—	92.9	100.4	95.6	88.3 ^e	118.9	134.5

e = estimated

Table 8: Labour Productivity Index-Wholesale and Retail Trade

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	101.6	106.6	100.6	102.0	105.6	101.0	102.0	103.8	98.3	100.2	93.3	113.2	101.0
1987	105.6	102.0	101.7	101.1	111.6	103.7	100.5	107.2	94.9	103.7	100.0	125.3	100.1
1988	109.4	105.3	103.4	101.1	114.8	107.2	101.0	107.5	94.7	104.9	100.3	137.8	104.4
1989	112.7	106.7	105.6	103.2	116.2	110.2	97.8	105.9	95.5	106.2	94.1	137.8	111.5
1990	119.6	104.7	108.8	104.3	114.8	110.5	99.0	104.5	101.6 ^e	101.0	89.2	142.3	129.6
1991	122.6	106.0	112.8	105.0	114.2	110.1	—	106.3	102.7 ^e	100.4	91.7 ^e	147.3	124.0

Note: This sector includes hotels and restaurants except Japan and Australia, which are included in sector community, social and personal service.

e = estimated

Table 9: Labour Productivity Index-Transportation, Storage and Communication

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	98.4	100.8	98.8	103.6	105.8	102.2	96.0	103.2	99.2	101.2	100.0	104.9	108.1
1987	102.6	106.4	101.9	109.3	110.8	103.3	102.1	108.6	101.4	107.4	113.7	113.9	117.7
1988	107.2	107.4	108.3	119.1	114.7	109.7	110.3	116.3	104.6	115.1	121.5	118.0	126.6
1989	108.9	107.8	112.2	126.3	116.3	115.7	118.9	120.5	101.3	110.6	118.9	124.3	136.3
1990	110.0	113.0	117.8	130.9	115.5	121.0	124.2	130.8	109.2 ^e	115.2	121.9	130.3	168.0
1991	113.0	116.7	118.6	134.2	116.5	123.0	—	168.8	113.1 ^e	121.1	128.5 ^e	137.7	175.2

e = estimated

Table 10: Labour Productivity Index-Finance, Insurance, Real Estate and Business Service

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	101.8	94.9	102.7	103.8	99.6	—	103.0	100.8	91.8	101.8	100.0	102.4	102.7
1987	103.2	93.4	103.4	105.6	99.5	—	102.6	103.9	87.3	100.2	96.7	107.2	102.4
1988	107.6	94.3	106.1	102.8	98.2	—	105.1	101.1	84.6	99.1	97.4	113.5	104.6
1989	110.5	94.8	108.0	101.1	91.9	—	107.6	98.2	82.2	100.1	94.2	109.8	114.2
1990	108.2	95.5	107.3	96.2	91.1	—	110.6	96.6	85.7	97.0	90.8	114.3	129.4
1991	106.3	97.2	110.9	93.8	92.6	—	—	94.7	82.4	98.5	90.8	117.5	133.1

Note: Data on Italy is included in the sector community, social and personal service. Real estate of Germany and Business Services of Germany and Spain are excluded from this sector but included in the last sector.

e = estimated

Table 11: Labour Productivity Index-Community, Social and Personal Service

Year	Japan	US	Germany	France	UK	Italy	Belgium	Sweeden	Spain	Canada	Australia	Korea	India
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1986	99.1	100.3	100.8	100.2	99.7	100.6	99.0	102.7	97.9	99.8	100.1	102.0	108.4
1987	96.0	99.5	101.8	100.7	98.2	101.8	99.2	100.8	99.7	99.1	96.3	103.6	113.3
1988	95.8	99.1	104.2	102.7	96.5	99.9	98.0	100.5	100.3	100.1	99.3	104.6	117.4
1989	94.8	98.9	104.7	103.8	94.7	100.6	99.4	101.7	101.0	100.7	98.4	103.7	125.1
1990	92.8	99.1	107.7	105.7	102.6	99.5	95.8	101.3	104.5 ^e	101.3	94.7	104.5	144.6
1991	90.9	97.9	108.3	107.2	102.7	100.8	—	101.1	105.4 ^e	100.0	95.2 ^e	105.0	146.2

Note: Government Services and Other Producers' products are included in this sector for all countries. Real estate of Germany and Business Services of Germany and spains are included in this sector, as well as hotels and restaurants of Japan and Australia.

e = estimated

Compiled by
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News & Notes

CONFLICTS IN AGRICULTURE, URBAN AND INDUSTRIAL USES

Integrated land use planning could be an answer to conflicts arising from competition among agriculture, urban and industrial users for finite land resources.

However, only very few developing countries in Asia and the Pacific region have acquired the capabilities for proper land use planning.

Dr. F.J. Dent, a FAO expert on soil management, said at an APO seminar held recently in Japan that unless this basic deficiency is corrected, prime agricultural land in the region will be swallowed by urban and industrial expansion which would endanger national food security.

The APO Seminar on **Agricultural Land Use Management** was organized from November 8 to 18 to examine the role of agricultural land management, especially its relation with sustainable agricultural production. The seminar was attended by 15 participants from 10 member countries.

"The ultimate objective of land use planning is to meet the needs of today and safeguard the land for tomorrow. It is a means of resolving conflicts over land use by systematic appraisal of land resources as well as social and economic imperatives of the country," said Dr. Dent.

The planning would involve such steps as the establishment of goals, the identification of problems and opportunities, the evaluation of land, the assessment of viable options in terms of social, economic, and environmental impacts, selection of the most optimal option and the preparation of land use plan.

"Intensive farming through the heavy use of fertilizers and pesticides could bring increases in agricultural production, but probably at a lower rate than in the past. Furthermore intensive farming has also resulted in over-

exploitation of natural resources and consequent degradation in soil health and fertility," stressed Dr. Dent.

Another resource person Mr. Masao Tsuji of the Kyushu National Agriculture Experiment Station said misuse of land could also arise from the competition of land use between agriculture and forestry. Proper allocation of land for forestry, he stressed, is important for the prevention of soil erosion and landslide as well as for the preservation of environment.

In addition to the presentation of resource and country papers, the participants visited Shizuoka Prefectural Office and held discussions with its officials on land use planning. Prefectural government, being the apex bodies in the Japanese local government system, enjoy high degree of autonomy in land use determination.

Source: APO News: Dec., 1994

POOR HOUSEHOLDS AS ENTERPRISES?

One important concern of international development agencies is the alleviation of poverty. In the case of the Entrepreneurship and Management Development Branch of the ILO many of its technical cooperation projects target urban and/or rural poor and assume that these groups are more likely to surmount their poverty if they receive help in starting a small business. In using enterprise development as a strategy for poverty alleviation a number of questions arise. For example,

- What is poverty alleviation? Does it mean helping the target group to satisfy certain needs (adequate food, education, shelter clothing, health services, etc.) and, if so, is increasing cash income an appropriate strategy?
- If it is, whose cash income should be increased—the household's or the individual's?
- What would be the best way of increasing cash income in each case? If enterprise development is

the means chosen, what/whose enterprise must be developed? In the case of a poor household should its income generating activities be considered separately from the household's activities, or, for the purposes of analysis, should the household be considered as an enterprise?

There are other issues that need to be addressed when considering enterprise development as a tool for poverty alleviation. For example, what approach should be used in promoting enterprise development for poverty alleviation? Will it be different from the one used when simply promoting viable and profitable enterprises?

One difference is that given its economic operations it is more useful to consider the poor household as an "enterprise" so that in order to alleviate its poverty, it can be helped to improve its productivity.

As an enterprise, the poor household comprises many production units and subsistence activities: farm work, seasonal employment, petty trading, home-based non-farm income-generating activities, and so forth. In order to increase income from these activities, the productivity of the inputs must be improved, particularly those of the labour input. Many studies have shown that the poor already work long hours to eke out a subsistence living. It is therefore necessary to help them to work "smarter" and not "harder". This holds particularly true for the women members of poor households who are already overburdened with traditional housekeeping activities: fetching water; gathering cooking fuel. Promoting their undertaking of micro enterprise or other income generating activity without examining how to alleviate, or improve the productivity of their other tasks will just add to their already heavy burdens.

One face that emerges is that each poor household is different so that a generalized solution would not be appropriate. What is needed is a methodological guide that leads to situation specific solutions.

An opportunity to apply this type of analysis arose when the author led an ILO team on a multi-sectoral project formulation mission to rural China. The mission included several UN agencies (UNDP, ILO, FAO, WFP, UNICEF) and international NGOs like CARE and the International Institute for Rural Reconstruction. It was organized in an effort to do something about the growing economic disparity between the booming coastal areas and the hinterland and after the Government and the UNDP had identified rural poverty alleviation as one area to be pursued under China's third country programme.

In coordination with the other teams, the ILO was called upon to formulate components for township and village enterprise (TVE) promotion (TVEs are non-farm business enterprises owned either privately, by a collective, a township or a county government); income generating activities including those for women; finance mechanisms (savings and credit schemes); functional literacy and skills training.

A pilot programme on participatory approaches to poverty alleviation was drawn up for implementation in three provinces within the framework of the Government's "five ones" under which each household received: (1) 1 Mu (1/15th of a hectare) of land for food production; (2) 1 Mu for cash crops; (3) 1 Mu for fruit growing; (4) sufficient livestock to permit the sale of at least one animal per year; and (5) continuous training to enhance the income generating skills of each household.

The pilot programme focused on

- improving agricultural productivity using the LEISA approach (the use of low external inputs sustainable agriculture), soil conservation and community forestry;
- delivering social services (primary health care, basic education, water, sanitation);
- employment creation through TVEs and income generating activities.

Interviews with some of the poorest households indicated that if their poverty was to be alleviated they needed help to increase their cash income since, under the new reforms, they now had to pay for most of their basic needs. However, although they were not able to produce enough food for their needs, the market economy did offer them an opportunity to sell their produce.

It was evident that the most viable option for raising their cash income was to build on the resources available in the poor households — their land and labour. This could be done through:

- producing higher value crops (spices, fruit, etc.);
- choosing high value, space-efficient livestock such as pigs and chickens, and a system of integrated agriculture for the home lot and farm production; and developing communal forestry;
- planting new cash crops in community forests and on marginal farmland (i.e. prickly ash, chinese alpine rush, eucomia trees, etc.).

These measures called for:

- technical extension services to teach beneficiaries better farming practices;
- market studies to determine the size of potential markets for the produce;
- veterinary services to upgrade their skills in animal husbandry;
- agricultural extension services to provide advice on the new crops.

In addition, micro credit schemes should be set up, produce collection and marketing schemes should be considered and, when cash incomes improved, savings schemes would be developed to help in the accumulation of capital. Labour saving methods and techniques (i.e. for collecting water, firewood, and fodder) also needed to be introduced to make more time for productive work.

When a household is viewed as an enterprise it is possible to apply to it the analytical framework used to improve the productivity of small businesses. The poor household is then seen as a collection of production units with a product mix and a set of production activities. Resources can be shifted among the different activities, depending on market opportunities and the availability of inputs. Income from this mix of activities is pooled under one household account.

To improve the household's "business", its resource and market opportunities may be analysed as well as its various production activities. A better product mix can be identified and production methods and total productivity improved. Opportunities for diversification can be examined and analysed relative to present constraints. A cash flow analysis can be made of the household/enterprise to determine its credit worthiness and repayment capacity. Human resource development approaches and strategies can be identified.

A sectoral approach to poverty alleviation through enterprise development then becomes relevant and meaningful. Enterprise development efforts should focus on enterprises that have the closest market links to the production activities of poor households. Enterprises that buy the produce of the households or supply them with essential inputs should be promoted and strengthened. In the case of the poverty alleviation project in China these would be the agri-business TVEs. Care must be taken at this level, however, not to lose sight of the poverty alleviation purpose of the project in the interest of improving the profitability of the TVE by paying unfair prices for poor household produce.

Of course there are limits to the extent to which poor households' productivity can be improved. Human resources must be combined with other production factors and these are in short supply in poor households. However, development efforts should aim at enabling the human resources in poor households to engage in organized micro or small enterprise activities or to obtain employment in larger enterprises — in the long run.

Indeed, when enterprise development is looked at not as an end in itself, but rather more as a means of achieving other development objectives, it is necessary to examine the appropriateness of applying traditional enterprise development premises and methodologies.

Source: ILO Entrepreneurship and Management Development News Oct., 1994.

HUMAN PROBLEMS IN NEW PRODUCT DEVELOPMENT

It is a known fact that some companies do highly successful R & D, while others possessing many researchers produce results that still leave much to be desired. It is important for companies to think about what gives rise to these differences. What is it that puts some companies ahead of others in developing new products? One of the most important elements in this is the human question.

The first requirement in developing new products is ideas. There are many theories about how to obtain good ideas, and various derivations of the brainstorming technique such as the Gordon method and the K J method, have been devised over the years. However, cerebral physiology tells us that a person's ideas cannot transcend what he or she has personally experienced or become consciously aware of. New ideas are generated by selecting fresh combinations from among those that can be formed from the limited store of memories and thoughts held in the brain. In research, these combinations are constrained by the development objective and other limitations.

However, a new product cannot be developed on the basis of just any idea that happens to pop into one's head. Generating good ideas requires the following qualities:

- Great receptivity, giving one a high degree of sensitivity to the problem.
- Intuition, enabling one to grasp the essence of the problem.
- Wide-ranging knowledge.
- The ability to combine and optimize all of these.

A prerequisite for effective problem-solving is the ability to pinpoint the crux of a problem. Human perception originates in the physical senses, and sense impressions are reflections of the various aspects of what is being examined. The first thing needed in identifying a problem is a high degree of receptivity, since this allows one to responsively register the various aspects of the phenomenon being investigated. This is the starting-point. However, even though there may be a rich supply of sense impressions, it constitutes a motley collection of different stimuli, some relating to the problem and some not. This kind of fragmented information does not represent a grasp of the problem, just as having a dictionary does not mean that we understand everything.

Our understanding of a problem is deepened by organizing the sense impressions in terms of the strength of their relationship to the problem and presenting our findings in structured form. Our grasp of the problem is completed by taking this a step further and clarifying the overall form of the problem, the internal relationships among its elements, and its connections with other matters. In this way, our perception of the problem progresses from the merely sensory to the insightful. However, this process has no stereotypes. It is followed intuitively, so different people will do it differently. Nevertheless, trying to sort out a problem overlooking its essence is likely to be of little use however carefully it is done.

Once a problem is understood, the methods and means of solving it are selected if such methods and means already exist or are to be searched for if none is yet known. This is the stage at which knowledge is needed. The more knowledge available, the easier the search. A wider range of choice makes it possible to select suitable methods with fewer trials.

Although we can expect education and training to increase people's ability to analyze and piece together problems, there are limits to what can be achieved through these. Problem-solving ability is ultimately an individual talent. However, this certainly does not mean that management has no role to play in research. Differences in product-development capabilities between companies with equivalent research facilities are not infrequently a result of their different management styles.

The issue for management is whether or not the people employed in R & D are exercising their inherent abilities to the full. Human capabilities can be improved more dramatically by learning directly from each other than merely by studying books and articles. This is one reason why some companies achieve better R & D results than others.

As discussed above, the results achieved by research departments owe much to the abilities of individual researchers, and whether or not those abilities are utilized effectively in achieving the company's objectives depends greatly on the attitudes of those researchers.

There are two main types of research: scientific research, which aims to elucidate scientific laws and principles, and engineering research, which aims to develop new products. As well as being an important form of research from the standpoint of the advancement of science, scientific research also spawns the "seeds" of engineering research. From the long-term perspective, its importance is undeniable. However, from the business management standpoint, no major results contributing directly to a company's profitability can generally be expected from this kind of research. This is because business is generated by "needs," not by "seeds."

To develop a product that performs excellently from the technical standpoint but has no clearly-defined purpose into a commercially-viable item of merchandise, it is first necessary to create a need for that product. It is hard to commercialize a new technology just as it is when no recognized need for it exists, because of the difficulty of recovering the investment made. It is therefore difficult to find a place for such a technology in a company's business plans.

Technologies that cannot be commercialized when they are developed should be temporarily stockpiled as a form of intellectual property for use in satisfying possible future needs. But storing knowledge away without using it like this is equivalent in management terms to idling an asset; it is a major form of waste and impairs business efficiency. From the management standpoint, operating a research department efficiently thus means selecting research topics that are directly related to demand and ensuring that they are completed within strict time limits.

The first computer for use by the private sector was produced in 1946. After this, a large number of companies tried to commercialize the product. However, until 1970, few companies except IBM were able to make a profitable business out of it. This was because no suitable applications apart from performing complex scientific calculations had been devised. Many people were of course aware of the latent possibilities of the computer as a commercial product, but they were not very active in developing significant needs that would produce a direct requirement for the machines. Despite this, many companies poured development resources into improving

their computers' calculation speeds. In contrast, IBM devoted its resources to developing the market for computers by investigating how they could be used in general administrative work.

Source: Hitoshi Kume in KENSHU, Autumn, 1994.

LEFT-HANDERS

A 1991 investigation of death records revealed that left-handers died seven to eight years younger than right-handers, and their deaths were five times more often related to accidental injuries. "Our environment eats left-handers; it is set up for the safety and convenience of right-handers," Dr. Stanley Coran, a professor of psychology at the University of British Columbia said in a recent interview. The technological and physical environment we have created is unsafe for left-handers.

Everyday difficulties for left-handers include using power tools with safety features to protect the right side of the body, driving with the main controls on the right and operating household appliances with hands and arms crossing hazardous areas. Even in the workplace, right-access controls and safety switches on industrial machinery, for example, force left-handed operators to assume uncomfortable positions to accommodate the awkwardness of using their right hands.

Can anything be done to make it safer for the left-hander? The answer is yes! However, attempting to change the left-hander into a right-hander is not the right way to go about it. Forcing a left-hander to work with the right hand is both fatiguing and less accurate for the individual. Left-handedness is not a simple movement preference that has been developed into a habit. It probably reflects differences in the pattern of neural circuitry in the brain

The first step toward solving many of the left-handers problems and discomforts is for society to become aware that they exist. Left-handers are a larger minority than you might think. More than 33 million North Americans are left-handed, which is the equivalent of about 13 per cent of our population.

There needs to be recognition that at times the lives of left-handers are jeopardised by an environment and technological design that makes the workplace unsafe for them. It has even been suggested that left-handers may be subtly denied employment by making it impossible for them to perform in workplaces specifically designed for right-handers. At times their performance may appear

imprecise because the equipment is designed for right-handed use.

Consequently, it is necessary to specify, design and purchase tools that can be used by either hand. Furthermore, job requirements need to be adaptable so they can accommodate the needs and abilities of either hand.

There are a number of benefits of designing tools and workstations so they can be used by either hand. Left-handers are not excluded. The tools can be used by the non-preferred hand in special work situations where the preferred hand is not available. And, during repetitive operations, it is possible to switch hands to reduce local muscle fatigue.

One way to reduce the right-handedness of a tool or workstation is to locate switches or controls near the centre, rather than to one side. Provide some redundancy. For example, the mouse on a keyboard can be plugged in on either side. Products and hand tools should be evaluated by asking such questions as:

- Can either hand hold and operate the tool?
- Can the tool be moved in the direction of force equally well by either hand?
- Is the workpiece equally visible when operating with the right and left hands?
- Can both hands exert the controlling force with equal ease?
- Are emergency shut-offs equally accessible to both left and right hands?

As Coran concludes in his book *Left-Handers Syndrome*: "Right-handers and left-handers can coexist in the same environment, but their mutual rights to dignity, opportunity and safety must be respected. Both have needs which can be jointly met if we set our minds to it."

Source: Loss Prevention News: April-June 1994.

NEW ULTRAVIOLET WATER PURIFICATION SYSTEM

The Energy Efficiency Project is collaborating with Lawrence Berkeley Laboratory (LBL) on a demonstration of how ultraviolet (UV) light disinfects drinking water effectively and inexpensively. Researchers expect the technology, which disrupts the DNA in bacteria cells and destroys their ability to reproduce, to have a dramatic effect in countering cholera, typhoid, dysentery, hepatitis, and other common waterborne diseases. In addition to human health benefits, using energyefficient UV light for water purification offers an environmentally sound alter-

native to the traditional practice of boiling water, which contributes to greenhouse gas emissions and deforestation (for fuelwood). Boiling water is presently the most commonly used method of purifying water in Latin American, Asian, and African countries.

The UV purification option promises to be extremely cost effective. Research into the process began in 1993 when Derek Yegian, a mechanical engineering graduate student at the University of California Berkeley, and Ashok Gadgil and Arthur Rosenfeld of LBL began investigating the possibility that UV light might be an economically attractive method of disinfecting drinking water in developing countries. The team's analysis showed that a UVbased disinfection unit can purify drinking water for as little as half to one U.S. cent per metric tonne. Thus, it would cost between twoandahalf and five U.S. cents per capita annually to disinfect the drinking water for a typical village resident. The team also found that UV disinfection will be effective against the new "Bengal" strain of cholera that is sweeping South Asia, against which there is still no vaccine.

Because UV purification is very energy-efficient (it is 40,000 times more efficient than boiling water over a cookstove), the Energy Efficiency Project and the U.S. Department of Energy's ADEPT program provided funding to support research into its application. Mr. Yegian used this and other funding to improve the physical design of the disinfection unit. The newly designed unit uses 254 nanometer wavelength rays produced from a lowpressure mercury arc. Hydraulic testing demonstrated that this unit, which uses a single 40watt UV lamp (similar to a fluorescent lamp), is capable of treating 30 liters (approximately 8 gallons) of water per minute even under worstcase scenarios of poor water quality and decreased UV output.

The impacts of the UV purification technology are so pivotal that leading multinational corporations offered to support LBL's project. U.S. companies PhilipsHolland

and General Electric donated germicidal lamps for the project, while Singapore's G&U Marketing donated electronic ballasts for testing.

Applying the Technology to RealLife Settings

LBL approached several Indian government agencies and a few international aid organizations late last year to discuss using UV disinfection technology in Indian villages. Every region in India has a problem with drinking water quality, so in May of this year Dr. Gadgil and Mr. Yegian traveled to India to lead an ultraviolet drinkingwater purification workshop. The workshop was organized by the Orissa Renewable Energy Development Agency (OREDA) in Bhubaneswar, which planned to define and organize field tests of the units in the monsoon season. The workshop, which was attended by over 50 representatives from India's national and state governments, international aid agencies, and nongovernmental organizations, was successful: OREDA was able to organize financial and technical support for testing 41 purification units throughout the country. In early June 1994, UNICEF India granted funds for the units to be built and tested in India this summer. Data from the first field tests should be available from the local Indian organizations in November.

Future work on the UV purification technology will expand the field testing in India and extend the project to other countries. Both Mexico and Brazil have expressed interest in the system. Technical issues currently being addressed are the testing and availability of suitable electronic ballasts and UV reflectors for use in the purification units. The project's ultimate goal is to make inexpensive (under U.S. \$100), locally built, easytouse UV water purification units available in developing countries.

Source: Global Efficiency Monitor, Oct., 1994. □

Book Review

Total Quality Management for Engineers by Mohamed Ziari. Aditya Books, New Delhi - 110002, 1992, 254p, Rs. 400.

Mr. Mohamed Ziari's book on Total Quality Management is a timely addition to the ever increasing literature emerging on this topic in recent times, when industries the world over and more particularly in India striving hard to integrate with the newly emerging global economic order and in meeting the imperatives thereof, namely the "Quality, Cost and Delivery" triangle.

Mr. Ziari has done well to mention at the very beginning of the book about the different philosophies of approach adopted by quality Gurus like Edward Deming, Philip Crosby, Ishikawa and Taguchi, to perceive the same truth namely the "Gospel of Quality". Mr. Ziari should also be congratulated on having succeeded admirably in putting across what can turn out to be a highly mathematical topic, in very simple and lucid language easily understood by practising engineers, thus making the book a highly readable one. In fact, he has used an optimum combination of theory and practice in this book to convey the philosophy, precepts and practices underlying TQM.

A well established Total Productive Maintenance System, is the bed rock on which all the efforts of TQM are built. Therefore, devoting substantial space and attention to this topic is indeed praise worthy and speaks of the broad vision and wisdom of the author.

Another important feature of this book is the excellent treatment given to the topic of "Statistical Process & Control" which is the heart and soul of TQM Management. Whatever be the philosophy of approach or concept, ultimately all of them have to be reduced to simple steps to be taken on the shop floor, either to improve the process or hold the process in control. Otherwise, most of the concepts lose their relevance. Ultimately it is the value added process which holds the key to Quality Cost and Delivery. One reason for poor quality of goods produced is the lack of attention paid to Process En-

gineering and Process Control by most of the organizations. The concept of simultaneous or concurrent engineering is to be commended for implementation by industries. Many defects can not only be eliminated at the design stage itself most cost effectively, but also superior quality can be built into the design of a product. There is no point in designing a product, if it cannot be manufactured with highest quality of lowest cost and lowest delivery times. It is in this context, that the preventive approach of Dr. Taguchi, referred to in this book is to be, recommended. A case in point is that of video recorders, which was essentially a Philips invention, but then it was the Japanese who introduced to the whole World Video recorders of high quality at an affordable cost with least possible delivery times. That was because the Japanese had mastered and perfected the process of manufacture of high quality video recorders, by paying meticulous attention to the intricate details of process engineering and process control.

In fact Statistical Quality Control (SQC) techniques, which are reactive in nature, should give way to SPC techniques which are proactive. It is the opinion of many experts in recent times that all the employees should be familiar with SPC techniques in order for that company to have a competitive edge in the newly emerging global market place. It is in this connection that the treatment of the SPC topic assumes importance. Had this treatment been a little more extensive and elaborate with possibly a few case studies from industries of Japan, USA etc. thrown in, the usefulness of this book would have increased manifold.

This book is well written and in a sense shatters the so called 'language barrier' which exists between technical, managerial and academic persons. For precisely the same reason, this book is recommended equally for the top management of the companies who ultimately have the power to "make things happen", as well as engineers and technicians on the shop floor. In fact, all the companies, wanting to integrate with the global trade and

commerce should read this book and implement the ideas put forward in it.

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Marketing of Perishable Products by K.C. Talukdar and B.C. Bhowmick. B.R. Publishing Corporation, New Delhi 110007, 1993, 285p, Rs. 250.

'Marketing of Perishable Products' is an edited collection of papers from those contributed for a two-day National Seminar held in November 1988 at Assam Agricultural University in Jorhat. 26 papers spread over ten parts attempt to focus on both the macro and micro issues of the marketing of perishable products. The introduction by the editors summarises the main findings and recommendations. The last part and the last chapter again bring out the policy recommendations of the national seminar separately. Although a wide spectrum of issues arising from different states of the country are covered, maximum emphasis has been laid on the issues confronting the north-eastern states.

The paper by P.N. Pandey provides an overview of the problems and prospects of marketing fruits and vegetables in the North-Eastern states and highlights the need for establishment and full implementation of the provisions of regulated market yards, the need for special attention by the North-Eastern Council (NEC) in promoting the NERAMAC as well as the need for having a separate Directorate of Agricultural Marketing with appropriate technical personnel for each state. Some of the North-Eastern states have these facilities and therefore, the reader wonders why the requisite quantity and quality of services are not forthcoming from these existing organizations. The author has remained silent on how to bring about the necessary changes in the existing units.

The study of marketing of perishables in the Mysore city by Gopala Rao et. al. has brought out the role of the traders lobby, the enormous viability and flexibility of the informal sector, the services of women hawkers as well as the need for effective coordination across various stages and sub-sectors within the system. The need for an integrated approach seems obvious from this paper, although the authors have not made this point explicit nor taken any pains to indicate the strategies for developing such a system using inter-disciplinary perspective.

'A Study of Vegetable Marketing in Uttar Pradesh Hill' by Arora et al points out the plight of the producers, as they cannot do effective marketing of their own produce. There is least doubt about the need for what they have suggested — grading and standardization of vegetables, cold storage facilities, implementation of provisions of the Market Regulation Act and effective regulation of retail trade. But they have failed to enlighten the reader about how to achieve these while taking care of the interests of the producers. Beset with the problem of marketing of tomato, Mrithunjaya has come up with a similar, if not identical, set of conclusions. While his analysis and estimation of the demand-supply gap under alternative assumptions makes his study an interesting one, one fails to understand his rationale for placing so much optimism on the functioning of the Karnataka Agro Industries Corporation, or of the village panchayats. One is yet to find a government corporation in the country which is undertaking the functions of transportation, grading, financing, input supply, processing, marketing, etc. in a satisfactory manner, keeping the interest of the producers in mind and without running into huge losses. This is all the more difficult for a perishable commodity like vegetables. It is also not clear why and how a political body like village panchayat could play an active role in vegetable marketing.

'A Study into the Marketing Aspect of Vegetable Growing Economy of Himachal Pradesh,' by Sharma et. al is a good descriptive paper based on a properly drawn sample of 60 farmers. The authors have not drawn any conclusion about whether the present setup constitutes the best configuration of circumstances or whether it can be improved upon in one way or the other. The next chapter 'Marketing of Vegetables in Andhra Pradesh: A Case Study of Hyderabad Markets,' by Parthasarathy has not only described the situation but also brought out a number of features like more difficult credit linkage, distress sale, monopoly commission rates, unsatisfactory weighing, lack of grading, storage and appropriate storing facilities, inadequate staff and amenities at market committee level etc. But as in most chapters of this edited volume, the author is silent on how to achieve the necessary improvements.

Talukdar and Singh explain in the 'Marketing of Pineapple in Manipur State' and derive a number of interesting conclusions. But the policy implications they have derived — namely, encouraging adoption of technology to increase per hectare productivity, establishment of various infrastructural facilities including roads, transportation, storage, processing and retail selling facilities through growers' cooperatives, market regulation and exploration of foreign markets are all too well known in the

profession. It appears the authors have silently passed on the responsibility of designing an appropriate organization and logistics to take care of these problems, to the government. In contrast, the paper by Arote *et al.* 'Role of Producers' Association in the Marketing of Bananas and Grapes' has highlighted an encouraging example, which is worth emulating in other commodities and in the rest of the country. However, the very fact that the replication has not taken place on any significant scale probably indicates some inherent difficulties. It would have been better if the authors could bring out those features of their model which are replicable or not replicable.

Chapter 10, 'Variability and Relationship between Prices and Market Arrivals for Flowers and Fruits: A Case Study of Hyderabad Market' by Krishnaiah *et al* has concentrated merely on applying regression techniques to bring out the producers' response in terms of market arrivals to prices and vice versa. They have come to the conclusion that sweet orange is more price responsive than Chrysanthemum, and that only a part of the variation in supply can be explained by price variation. They have not probed it further, nor derived any policy conclusion out of their own exercises.

The paper by Patil and Kumar 'Factors Influencing the Prices of Alphonso Mango' brings out the relation between price/profit realisation, on the one hand, and the timing of sale, size and grade of the crop, and sources of funds, on the other. They have not probed why higher prices could not be realized through appropriate technological and institutional interventions, even though they seem to have recommended the same. That cooperatives can best serve the interests of farmers is too well known a conclusion, but why there is such a big gap between theory and practice remains unexplained.

Venkata Rao in his paper 'Price Spread, Price Fluctuations and Supply Response of Ginger in Meghalaya' has described well the sorry state of affairs confronting the producers of ginger in Meghalaya. However, the very fact that the existence of MECOFED, NERAMAC and primary level cooperatives have hardly made much dent casts serious doubt about the author's old-fashioned conclusion about putting further emphasis on such types of organizations. What precisely went wrong about the working of such costly organizations and whether and how to correct them are important matters on which no clue has been provided.

'A Study into the Marketing of Onion in Rohtak District of Haryana' by Gupte *et al* is a totally descriptive

paper. It appears the authors as well as the editors decided not to extract any policy lesson out of this descriptive exercise. The editors have completed their responsibility by adding a single sentence. However, it is an exception for semi-perishable products like onion as shown by D.D. Gupte and others in Haryana in Chapter One.

'Role of Milk Marketing Cooperatives in Western Maharashtra' by Inamke *et al* brings out the various advantages of milk cooperative societies, and has come to the obvious conclusion that larger societies are capable of providing more benefits than the smaller ones. However, the problems confronting the cooperative milk societies regarding high costs of production and low price realization on liquid milk, which seems to be leading to some decline in the role of milk cooperatives in the country, have been totally ignored in this paper. Another paper 'An Economic Analysis of Milk Marketing in Tarai Region of Nainital Region of Uttar Pradesh' by Bhogal and Chaturvedi highlights the role of cooperatives in milk marketing. They have recommended a strong coordination between the dairy cooperatives and cooperative credit societies without explaining how this could be achieved or how this is being achieved by more successful cases in some other parts of the country.

Chapters 16 and 17 deal with the development of inland fisheries. While the former paper describes the present scenario and the policy frame, the latter deals with the Andhra Pradesh situation. The conclusions again are too well known — suitable legislation and infrastructural facilities including formation of cooperatives and corporations, and development of an efficient marketing system. Unfortunately, the authors have remained satisfied with these conclusions rather than probing into the reality of loss-making and inefficiently-run fishery cooperatives and corporations. The fish farmers being the most backward community from the most backward regions can hardly claim or manage the right kind of legislation and infrastructural facilities. The authors have not provided any clue about how to overcome the implications of this fundamental problem.

Chapters 18 and 19 deal with the sericulture sector. Chaudhury describes the different components of sericulture in Assam and cites the absence of an integrated system as the major lacuna for development of this sector. But he has failed to take cognizance of and also to explain the fact that even a sericulturally developed state like Karnataka has failed to achieve such an integrated system. In the next chapter dealing with the cocoon markets in Karnataka, Chengappa has raised hopes by

describing the well-working features of the regulated market in Karnataka. His exercise would have been much more fruitful and convincing if he could provide analytical answers to why such regulated markets don't work in other commodities in the same state or even in the same commodity elsewhere in the country. Only when the distinctive features of a well-functioning system are brought out together with the ingredients necessary for success, such a system becomes replicable elsewhere.

Chapters 20 and 23 are devoted exclusively to the marketing of agricultural produce, in general, and for the north-east region and the state of Assam, in particular. All these papers have supplemented each other in bringing out the various lacunae in the present marketing arrangements and highlight the need for strengthening the management of the regulated market system by bringing in professional manpower, by closely monitoring the implementation of various provisions of the regulation and by having a master plan for perspective development of regulated markets in a region. This is an interesting reading in order to know about the present state of affairs, especially in a backward region. But how to get rid of the constraints, who will provide the necessary funds and who will manage the developments? Since neither the authors nor the editors have pursued the matter, the answers remain wide open for the reader to guess.

The lone paper on 'Grading and Standardisation of Fruits and Vegetables' by Bhavani provides extremely useful information about the existing provisions and regulations. It has also made a strong case for bringing quite a few of the promising horticultural products under the provisions of standardisation. In the same spirit the next chapter describes the various credit facilities currently available from NABARD, but without providing any analysis as to what extent NABARD has been successful and what are the major limitations the NABARD is facing with regard to distribution and utilization of such credit facilities in these sector vis-a-vis the other agricultural activities.

The editors have summarized the major recommendations arising out of the National Seminar in the last chapter. These recommendations pertain to transportation, storage and processing, production, technology, prices and procurement policy, facilitative functions and marketing development and government marketing programmes. Clearly, these recommendations cover financing, organizational development and logistics development with respect to procurement, processing and marketing. Attention has been drawn of various

government departments and funding agencies for implementing these recommendations. This book tends to give an impression that without the active and effective support of governmental agencies, nothing is possible. However, the hard reality is that most of these agencies have been there for quite some time and have been spending a large amount of resources in promoting various products. There is no dearth of workshops, seminars and planning documents which are being directly or indirectly sponsored by one agency or the other. Still there has been hardly any significant improvement, as this book has rightly pointed out. This raises two fundamental questions: Did we entrust certain responsibility to agencies which are not at all suitable for carrying out those tasks? Or, is it simply by accident that these agencies failed to fulfil their tasks? Unfortunately, the editors have not given enough thought nor done enough home work to provide any satisfactory answer to these questions. For a person who wants to know about the present state of affairs with respect to marketing of perishable agriculture products, this book provides a wealth of information regarding a large number of products and regions of the country. But then the reader must be prepared to apply his own mind and seek answers to the various questions confronting him at the present stage of development of the country. The editors should have provided a much more lucid presentation of the issues as well as some clues towards resolving such issues in the very first chapter. Even as construction of sentences are loose and defective on a number of occasions in this chapter.

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***"Managing Innovation — Concepts and Tasks"* by N.S. Srinivasan and V. Narayana, Concept Publishing Company, New Delhi - 110059, 1992, 159 p, Rs. 200.**

'Innovation' is the key for progress in any field — be agriculture, industry, health, games etc. An understanding of the process of innovation development in a particular field is very crucial to appreciate or criticise the various innovations that pour into the market daily from every field of science. But, literature regarding how innovation is developed, and managed in a specific science is scanty.

This book entitled "Managing Innovation — Concepts and Tasks" will serve as a source of information for

knowing the ins and outs of how innovations should be handled till they reaches the market.

The analysis of how innovation is being managed in the present day industry is alarming and indicates the need for attitudinal and conceptual changes by all concerned. However, the concept of innovation has not been dealt with in depth. No definition has been quoted anywhere in the book. An analysis of the various definitions of the term 'innovation' available in literature and finally arriving at a logical definition of 'innovation' by the authors would have enhanced the utility value of this book from the point of view of management students and research scholars concerned with innovation or technology management.

The process of innovation has been described as a path of four stations viz., idea generation, research, developing research output into innovation and establishment of the innovation in the market. Had a discussion of the various models of innovation process, including the steps of innovation process, been added, it would have been a boon for the younger generation to follow. But, the nine characteristics of innovation process explained in the book will definitely help innovation managers of any field in judicious allocation of the various resources for the different innovation projects in the organization.

The authors have rightly added a chapter on 'time element in innovation activity' and discussed the various concepts and tasks related to time dimension. Indication of the reasonable time to be spent on the various activities to be carried out in the innovation process, based on the analysis of cases of successful innovation projects, could have been of much help for the innovations personnel and managers in time budgeting of future innovation projects.

The dimensions of quality concepts mentioned in the book are worth remembering for orienting the innovation projects to the needs of the consumers. The need for a conducive innovation environment has been aptly described in the chapters on 'Promoting innovation' and 'organizing' for innovation. The instrument given in the book for measuring the innovation environment of an organization is one which could be used by managers at periodic intervals to take corrective measures, if any.

The qualitative skills needed to be innovative have been lucidly described and can be developed and acquired by practice in any enterprise. In the same way, the quantitative tools given in the book would help in sharpening one's analytical and logical abilities.

The authors have given many tools and instruments for measuring the various managerial qualities, skills and variables. However, a brief description of the methodology used in developing these tools and instruments and also a mention of the reliability and validity values of each of these tools or instruments would have increased their authenticity and future utility value.

The authors have repeatedly emphasized the importance of taking the innovation to the market. But, surprisingly, there is no indepth discussion on the techniques, issues and problems involved in successful marketing of innovations anywhere in the book. A separate chapter on marketing of innovation could have been added which is an important aspect of 'innovation management' in any enterprise. The first and last chapters are very small. They could have been dealt with in a more elaborate and convincing way.

In spite of the limitations the book will serve as a useful reference material for managers of organizations, management students, research scholars and others interested in innovation management and technology development.

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Animal Quarantine in Asia and the Pacific — Report of an APO Seminar. Asian Productivity Organisation, Tokyo, 1994, 309 p.

The recent change in food consumption patterns in Asia and the Pacific, resulting from the rapid economic growth and increased awareness on balanced nutrition, has led to a greater demand for non-cereals like livestock products. For the sustained development of livestock sector in any country, effective implementation of regulatory mechanism through animal quarantine becomes essential to prevent the entry of exotic livestock diseases from other countries. In view of the present trend in liberalizing the import and export policies related to livestock products by different countries, it becomes all the more necessary to observe strict animal quarantine measures to prevent the spread of diseases from one country to another. The Office International des Epizooties (OIE), the international body responsible for keeping a watch on livestock diseases, has classified the diseases prevalent in different parts of the world into three broad spectra through its International Zoo Sanitary Code. Every country tries to prevent the entry of OIE

listed diseases from other countries through proper quarantine measures.

Recognizing the importance of efficient animal quarantine services, the Asian Productivity Organization (APO) organized an Asia-Pacific Regional Seminar in November 1992 in Tokyo, Japan. This report contains the salient features of that seminar including the resource papers and several country papers presented by invited speakers. The document is organized into four parts. Part I presents the summary of findings that emerged from the deliberations in the seminar. In this part, one can have a broad overview of the importance of animal quarantine service as a regulatory tool, the methods and procedures followed, and the various constraints and implementation problems encountered by different countries in Asia and the Pacific.

Seven resource papers presented by the animal quarantine experts are given in part II of the report. Broad areas such as the role of animal quarantine in livestock development, economic loss due to livestock diseases, animal health and disease control programmes, animal quarantine regulations and treatment methods, quality control and monitoring in animal quarantine, and current problems and measures in animal quarantine are covered in this part. While the authors of most resource papers cover the Asia-Pacific region in general, some papers specifically deal with individual countries (two on Japan and one on Taiwan). These papers, both content-wise and organization-wise, are presented in an excellent manner.

Part III contains the country papers presented by experts from 14 different countries in the region, viz. Bangladesh, the Republic of China, Fiji, Hong Kong, India, Indonesia, the Republic of Korea, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Sri Lanka, and Thailand. These papers essentially focus on the existing livestock situation, animal disease control programmes and measures implemented, animal quarantine services available, animal quarantine methods and procedures followed through legislation, and implementation problems and constraints encountered in their respective countries. Going through these papers, one can visualize the existing variability in the structure and functioning of animal quarantine services among the countries in the region. While animal quarantine system is well established in countries such as India, Japan and the Republic of Korea, it is still in the process of development in Bangladesh and Nepal. It is interesting to note that in countries like Japan, private parties also participate in enforcing animal quarantine measures along with the

Government machinery. One can also learn as to how countries such as the Republic of China, Fiji and Malaysia are able to maintain an almost disease-free status through rigid quarantine measures.

This is an excellent document on animal quarantine from which anyone in the livestock sector. Apart from getting an overview of the current status of animal quarantine services in terms of structure, functions and operations, the readers can get a lot of information on the issues encountered and the measures taken for their effective implementation. The book will be a very useful source of information for the animal science students and researchers, livestock development planners and policy makers.

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***Essays on Kerala Economy* by M.A. Oommen, Oxford & IBH Publishing Co., New Delhi - 110 001, 1993, 226p, Rs. 175.**

The twelve chapters of this book are the papers written by the author from time to time and published earlier in various journals. With a refreshing candour, the author deals with the various ramifications of economic development in the State of Kerala. Much labour has been put into the descriptive and analytical attempt in respect of certain critical parameters of development.

One important aspect of Kerala's economic development that is well known is that during the last twenty years, remittances from the Gulf, with their multiplier effect have significantly raised the per capita income in Kerala. Earlier, Kerala was a relatively poor state of the Indian Union. However, as observed by Jean Dreze in his foreword to the book, the incidence of poverty in Kerala now is more or less at par with the all-India incidence. And yet, the standards of literacy, health and related aspects of the quality of life were already very high before the expansion of remittance-related incomes. According to Dreze, this particular feature gives special significance to Kerala's development experience.

On the issue of land reforms, the author seems to be quite satisfied when he says that with all their limitations, these have been more equitable than elsewhere in the country. However, there have been two disquieting aspects — one, alienation of the tribals for whom land was the major source of livelihood and two the growing trend in the transformation of land as an exchange com-

modity rather than a simple means of production. This phenomenon has adversely affected the distribution of land in favour of the poor and the actual tillers of soil as they have been priced out of the market. Like in most parts of India, though feudal landlordism stands abolished in Kerala, it is also not true that land has passed on to a class of sturdy self-cultivating peasantry. There are a large number of absentee landlords in the State's agricultural sector. This phenomenon has been unhelpful for raising productivity of the soil.

There is a chapter on agriculture in the Third Five Year plan followed by one agricultural income distribution. One wishes that these had been updated as many changes have taken place since these were written. Surely, the flourishing agricultural economy with all constraints of land deserves a special mention of the contemporary situation.

There is an attempt made to trace the evolution and expansion of commercial banking with a historical retrospect. The author says that modern commercial banks in Kerala emerged along with the capitalist form of business organisation and production. Banks in Kerala evolved due to a variety of socio-economic factors and found a natural place in the economy of the region. The Syrian Christians emerged as an important trading and financial class by the nineteenth century. There was no Vaisya or trading community as such. Again, this reviewer would like to submit that developments in banking in the post-nationalisation period in Kerala should have been included in this chapter to complete the chain of historical perspective.

On the question of unemployment in Kerala, the author points out that it is much more acute here than in any other part of India. There is a high rate of casual workforce in Kerala which, according to the author, is due to the high incidence of unemployment and high wage rates combined with low productivity, unionisation and the like. Nevertheless, the preference for 'soft' jobs has made manual work less attractive and respectable. Amongst the educated class, there is higher unemployment among females than among males.

The author has made interesting observations, on the impact of gulf money. About 50 per cent of the foreign remittances are spent on the construction of residential buildings. "As the inputs for modern building industry such as cement, iron rods, paints, mosaic tiles, electrical goods, sanitary wares, etc., come mostly from outside the State, forward linkage effects have been registered in other parts of the country." Priorities like higher proportion of rural investment, land reforms, primary health care, family planning and so on were not necessarily the

development priorities of this State, the author comments. They all needed qualitative improvements. Kerala faces a fiscal problem which poses a development dilemma. The author has raised some issues to be discussed so that the financial position of the State Government gets consolidated.

The last chapter of the book is on the development challenges of Kerala during the Nineties. The focus here again is on raising resources to finance future development. After delineating the various sources of finance and analysing the data, the author strikes a plaintive note when he says that "Given this precarious situation, neither effective maintenance nor proper development can occur in Kerala during the next decade." In his view, effective decentralised planning and decentralised government offer a better way out of the resource crunch, the unemployment problem and the ecological overkill that stare us in the face.

The book gives enough information about Kerala's economic development in certain crucial sectors. The author should update most of the chapters in the next edition of the book to make it more relevant to the current scenario.

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Promoting Information Technology on Small and Medium Industries by Assam Productivity Organization, Tokyo, 1994, 159p.

The present publication is based on seminar on a Information Technology led Applications in Small and Medium Industries (SMLs) conducted in Seoul from 9th to 13th November 1992. The salient findings provided in Part I are useful in understanding the factors hindering IT induction in Small and Medium Industries in Asia. These are Limited Financial Capacity, Unrealistic expectations of Top Management from investment in computerization, Lack of skilled IT manpower, Inadequate protection of software property, and Low labour costs as compared to capital investment.

To overcome these drawbacks and use IT successfully in Small and Medium Industries the publication provides a few recommendations which are worth noting.

Resource papers from Japan, Taiwan and Singapore show that IT induction in SMLs in these Asian countries are almost at the international level of developed countries in the West. Strengthening Small and Medium Enterprises (SMEs) is a matter of national consensus in

Japan and it is reflected in many Government policies. The Japanese Government has offered support to SMEs for quite a long time under the belief that SMEs are the backbone of Japanese economic strength.

Facing global competition, Taiwan is speeding up the process of industrial automation and improving the industrial infrastructure to regain competitive advantage. In its tax deduction programme, the government offers a 5% tax deduction on sales revenue for companies that develop automation technology and conduct education and training programme. The Industry Computerization Task force has been formed and is sponsored by Government for promotional activities to encourage and expand the use of IT for improving productivity, the quality standards of products and the services of SMIs. There are programmes for the software industry to complement the efforts of SMEs. Huge infrastructure and investment is provided for a Software Science Park to support such strategies.

Singapore is envisaged as one of the world leaders in the adoption of IT for competitive advantage and a better quality of life. Singapore's industrialization programme began with the "10-year economic development plan for the eighties." Short-term and long-term measures were initiated in all directions by the Government to adopt IT in the industrial sector — both large and small. The Economic Committee of Government in 1985 recommended the adoption of a high-technology and R & D policy. Subsequently, National IT plan gave a seven-point strategy to implement the National IT plan. These resource papers provide the other Asian countries how IT strategies meaningfully be formulated and use IT for improvement of productivity and competitiveness of SMIs.

Part III of the book gives the present status of the use of IT in SMIs, Government policies, issues confronted in promoting IT in SMIs and prospects of IT in SMIs in the following ten countries: China, Hongkong, India, Indonesia, Iran, Malaysia, Nepal, Phillipines, Singapore and Sri Lanka. The book, in sum, provides a very useful monograph for policy formulation and serves as a status document for National Productivity Organization for future plan of action. It is also an eye-opener for individual SMIs to show how IT is a potential tool for future competitiveness and quality and productivity improvement.

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Agricultural Extension Systems in Asia and the Pacific — Report of an APO Study Meeting Asian Productivity Organisation, Tokyo, 1994, 381p.

The book is based on the papers presented in the study meeting on Agricultural Extension Systems organised in Japan from 15th to 25th June, 1993.

The first part of the book gives a brief idea about the objectives of the study meeting; the present status of the agricultural extension system; the major problems and issues that affect its effectiveness and the government policies concerning the agricultural extension in the participating countries. Besides, this part of the book describes the current status of Agricultural Extension Systems in Asia and the Pacific; a typological analysis; effective agricultural information flow through extension service in the republic of China; reevaluation of effective traditional technologies, low-cost farming practices in traditional farming, practical approach to agricultural extension services, cooperative agricultural extension service in Japan and the experiences of field studies carried out by the participants during the study meeting.

Out of 7 resource papers, 4 are from Japan, one each from Thailand, Republic of China and Philippines. The major issues which are covered in these papers are clientele and approaches; organisation, human resources, extension-research linkages; clientele participation; financing, monitoring and evaluation; components of the agricultural extension systems and influencing factors; typological analysis basic communication processes; the decision-making environment of farmers, merits and demerits of technological duality approach; characteristics of traditional agriculture; the functions of extension service etc. Out of 20 country papers, each of the four countries namely, India, Indonesia, Malaysia and Philippines has contributed two papers. Each of the twelve countries: Bhutan, Brunei, Darussalam, Republic of China, Cook Island, Iran, Republic of Korea; Mangolia, Nepal, Pakistan, Sri Lanka, Thailand and West Samoa has contributed one paper. Almost all the papers are country specific. The objectives, functions involved; approaches, problems and issues; financing, government policies and some suggestions are the common aspects covered in these papers.

Since, the papers presented in the study meeting constitute the subject matter of the report, there has not been much scope for the editor to given analysis related to the agricultural extension system. In fact, the subject matter has been presented in the form of a report rather than in the form of a book. However, the papers provide information about almost all the elements of the agricultural exten-

sion system and that too in respect of 16 countries of Asia and the Pacific. Therefore, the report is very useful for all those directly involved in extension activities and the formulation of extension related policies and programmes and for those engaged in research for evolving an efficient and effective agricultural extension system.

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The Political Economy of Industrialisation — From Self Reliance to Globalisation by Dalip S. Swamy, Sage Publications, New Delhi, 1994, Rs. 275.

Swamy's book can be construed as a powerful critique of the argument of supply-side economics. Contrary to the prevailing view, he argues that the liberal invitation to international capital in the 1980s in India has created a marshy situation for the country and the consequent dependency on it of the Indian economy. Aggravation of the situation, he maintains, is explained by the hackneyed socialism pursued by the Indian state through the Mahalanobis model without effecting land reforms and without shaping instruments of generating purchasing power for the masses. The book thus focuses on the major problems and policies of India. By adopting the analytical-historical — and not a thematic or chronological — approach Swamy has studied "this perplexing economic and social chaos" which he views not as a "minor systemic disorder" but as a structural crisis.

The history of this structural crisis and of economic policies since Independence has been written in fourteen chapters divided into three broad sections, which cover the phases of self-reliance (1950-65), systematic crisis (1965-74), and industrial globalisation (1974-88). This analysis is preceded by an introductory chapter: economy in retrospect; and is followed by a chapter consisting of conclusion and perspective. In his analysis of the first phase (1950-65), Swamy highlights the accelerated industrial growth, reduced regional disparities, planning, industrial licensing, price control and price stability. His analysis of the second phase reveals deceleration of industrial growth, increased regional disparities, diluted planning, bureaucratisation of industrial licensing, and tense Central-state relations. Though Phase three (1974-88), according to him showed accelerated industrial growth it was marked by regional disparities and very tense Central-state relations, increased political in-

stability and increasing role to market mechanism rather than planning. His analysis has attempted to identify the major factors that militated against the process of growth. While elaborating his formulations the author has focused on changes in economic activities, policies, institutional and political forces so as to locate their causal roots.

What is strikingly impressive buttressed by the concern of the author for the common masses, is the extent of scholarship that underwent in this book to further this concern. One of the many strengths of Swamy's erudite argument — which advocates a Maoist people's power model — is his lucidity of style and narrative coherence. His argument is not addressed to the economist alone; he has tried to — and surely will, through this book — reach out to a much wider and even the die-hard advocates of globalisation cannot disregard his counter-viewpoint, which provides important sociological insights into the contemporary state of the Indian political economy.

The book should also help the reader develop a holistic perspective of the rationale and magnitude of liberalisation in India. The statistics cited by Swamy in support of his arguments provide considerable respectability to his formulations and to his "new economic order", which he envisions to be a plural, democratic, decentralised and transparent state without the disadvantages of statism (p. 280). For this vision of national reconstruction he advocates "a people's (new) social democratic revolution" so as to secure to our masses the constitutional promise of "right to work" and "living wages". In effect, his model of development envisages "full participation" of people in the democratic process. Such a model will expectedly guard both against unemployment and the limitations of oligopolistic market.

Swamy has handled the historical perspective of his politico-economic analysis with impressive panache. He has produced insights that are not already too conspicuous in the literature. All in all, he has produced a scholarly and intellectually stimulating study of the Indian political economy, written in accessible, conversational style and striped of hard economic jargons. He has demonstrated considerable sophistication in advocating his "people's power" model of development. Surely, he needs to be congratulated for this excellent book, which highlights fresh socialist perspectives relating to the problems of Indian economy.

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