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Vol. 40 July–September 1999 No. 2

Focus : Competitiveness/Competition Policy-II

Competitiveness & the WTO

Financial Sector Reforms

Public Sector Competitiveness

Revitalizing the State

Competitive Labour Market Policy

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Competition Policy and the WTO – Implications for Developing Countries

S. Chakravarthy

In the era of globalization and economic liberalization, evolving a legal framework in India for an efficient and purposeful competition policy in relation to market forces has assured topical importance. The present paper discusses the role of competition policy in economic development in relation to the legal provisions in India. The implications of the policy measures to developing countries in general are also stated. Stressing the linkage of competition policy with existing trade practices, the paper indicates how anti-competitive practices in certain sectors of the economy are to be curbed.

S. Chakravarthy had until recently served as Member of Monopolies and Restrictive Trade Practice Commission, New Delhi. He is consultant to the Department of Company Affairs, Government of India. Paper presented at NPC's Round Table meet on Economic Reforms & Competitiveness, New Delhi, October 26, 1999.

A dominant economic theme in the last quarter of this century has been the process of globalisation and a progressive international economic integration of the world economy. The movement is towards widening international flows of trade, finance and information in a single integrated global market. Globalisation has the fundamental attribute of increasing the degree of openness in most countries. The underlying rationale for globalisation is that free flows of trade, finance and information will produce best outcomes for growth and human welfare. However, it is inevitable that globalisation may initially, in an unequal world, throw up gainers and losers. It follows therefore that, if proper checks and balances are not laid down and complementary policies are not in place, the growth, welfare and income gaps across countries may widen.

In a globalising and liberalising world economy, the number of actual or potential entrants into foreign market increases, giving rise to greater potential for competition in markets regardless of their geographical scope. Many countries have taken to measures designed to open competition in strategic sectors such as tele-communications, airlines, electricity generation and distribution, etc.

Globalisation has the fundamental attribute of increasing the degree of openness in most countries.

The present paper in the context of the role of competition policy in economic development, deals with the Indian competition law and its implications for developing countries.

Competition Policy

All countries do not have a competition policy. If

they have, the objectives thereof differ from country to country depending upon the domestic circumstances and the historical past. Few countries have subjected competition policy to a clearly articulated coherent set of objectives. Basically governmental policy comprises measures that directly affect the behaviour of enterprises and the structure of industry. A coherent and pragmatic competition policy should be capable of enhancing competition in local and national markets. It is an instrument to achieve efficient allocation of resources, technical progress and consumer welfare and to regulate concentration of economic power detriment to competition with flexibility to adjust to the changing international economic milieu. On a broad note, a well-designed competition policy should govern globalisation, liberalisation and de-regulation. Of particular importance is the trade policy which impacts competition in the market significantly—whether positively or adversely—and thus has to be subservient to competition policy.

A well-designed competition policy should govern globalisation, liberalisation and de-regulation.

There are three points of view about competition policy. One view is that it fosters economic efficiency, economic growth and international competitiveness. Another view is that the policy promotes broad public interest and satisfies socio-political objectives like regional development and promotion of employment. The third view is that competition policy promotes welfare meaning thereby total economic welfare, which would take into account the actual and potential cost-benefits to consumers as well as to producers (Rao, 1998). While all these points of view can be harmonised, an underlying common thread in these views is that competition policy should have development dimension as its core objective.

Competition policy can be analysed from the perspective of five elements:

a) The need to curb, if not, eliminate anti-competitive practices;

b) Application of competition policy to Governmental policies and in particular, trade policies;

c) The need for creating an appropriate institution for adjudication of competition disputes and enforcement of competition law, the competition law authority should have punitive provisions for punishing offenders;

d) The need to subserve consumer welfare and public interest;

e) The need for competition advocacy and competition culture.

In the context of trade liberalisation and globalisation and increase in Foreign Direct Investment, anti-competitive practices are becoming not only more strident but also increasingly international in scope. A vigorous competition policy is therefore necessary to respond appropriately to these concerns and to establish a climate that is conducive to investment and economic growth. A well designed competition policy is imperative to maintain and encourage the process of market competition to promote economic efficiency in the interests of consumers.

A vigorous competition policy is therefore necessary to respond appropriately to these concerns and to establish a climate that is conducive to investment and economic growth.

The second aspect of the policy needs to be seen in the light of increased awareness and evidence of regulatory failure and the reversal of the tendency of regulation in many countries (OECD, 1992). Furthermore, there is increase in reliance on market mechanisms to promote economic progress as exemplified by the widespread trend towards privatisation, de-regulation, adoption and enforcement of competition law, reduction in the scope of industrial policy, etc. (Jenny, 1997). Governments in many countries use various means to monitor the shaping of industry structures and to protect their national firms from the rigours of domestic and international competition. With economic de- regulation, countries have taken to measures designed to eliminate public monopolies and to open competition in strategic sectors such as telecommunications, electricity generation and distribution, airlines, railway transport, etc. The competition policy therefore needs to envelop in its ambit all public enterprises, statutory corporations, financial institutions, banks, cooperatives, etc. so as to ensure that their behaviour and conduct do not pejorate consumer interests. Indeed, the competition policy should have the positive objective of promoting consumer welfare.

It is well known that many Governmental trade policies are executive in nature. Some of these policies

may protect the domestic industries and local producers, thereby injuring competition in the market. The trade and industrial policies in some countries are designed on the premise, that the State should lead the market and identify the industries that are strategically important. They want domestic competition but have strict control over the entry of outsiders. The World Economic Forum has listed areas which need to be tackled if competitiveness of enterprises are to improve (World Economic Forum, 1997). For instance, the Forum observes that price controls and dual pricing lead to severe distortions. In India, restrictions on sugarcane prices and procurement, production capacities, dual pricing of outputs, restraint of exports and imports and many others have enabled the inefficient producers of sugar to continue and prevent the rise of a competitive industry (Rao, 1998). Likewise, reservation of products for small scale and micro enterprises has led to poor quality of output. Since many of them are suppliers of ancillaries to organised producers, it leads to the overall poor quality of products to consumers. Efficiency of such suppliers is poor because of the lack of skills, low capital availability, poor quality of machinery, heavy labour orientation, poor cost control, low output and poor quality of outputs. A policy designed to provide subsidised interest rates to small scale units on agricultural exports may lead to higher interest costs for the remaining sectors of the economy rendering the latter's exports less competitive or non-competitive.

But yet such Governmental policies or trade policies may have a justification of their own for the countries concerned in order to subserve their goals, aspirations and needs. In the name of public interest, Governmental policies may be laid down to protect one specific interest group with no explanation of how or why the interest of such a group transcends all others. There is almost an unanimous view in India among the representatives of different Chambers of Commerce and Industry, Professional Institutes. Bar Associations and Consumer Associations and Groups that competition in the market is a desirable objective, but that competition policy of a country should have flexibility to cater to its needs, aspirations and goals. The caveat of flexibility has been suggested on the apprehension that if competition policy were to be given an unbridled run, it is possible that some of the multi-national companies and firms may oust or exit the domestic industries because of the former's financial and marketing clout.

Competition in the market is a desirable objective, but competition policy of a country should have flexibility to cater to its needs, aspirations and goals.

While competition policy is a desirable objective and instrument for subserving consumer interest and consumer welfare, there is a need to bring about the competition environment gradually than in one stroke. In other words, till the domestic producers and suppliers get educated and exposed to competition and thereby address themselves towards enhanced efficiency, economies of scale and subserving of consumer interest (in the broadest sense of the term), the competition policy/law should be gradually strengthened and implemented. A transition period of say 7-10 years may be provided to the domestic producers and suppliers to enable them to get ready to face competition particularly at the global level, during which period, the implementation of the competition law and competition policy needs to be gradually strengthened, in a step by step manner in its application to the market. Competition should inform all trade and market policies. In order to prevent abuse of the expression "public interest" by the Government, competition law should have provisions to test the Governmental policies on the touch stone of competition.

The third element is the creation of an institution for implementation and enforcement of competition policy/law. An important dimension of any competition policy or law is a set of provisions for its administration and enforcement. A poor law or a poorly enforced law is worse than no law at all.

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The element pertaining to consumer welfare and public interest—has important overtones for competition policy/law. Both are not synonymous and need to be distinguished. Consumers are affected by pricing policies, financing practices, quality of goods and services and various trade practices. Public interest, on the other hand, is something in which the public or the community at large has some pecuniary interest or some interest by which their legal rights or liabilities are affected. It does not mean anything so narrow as the interests of a particular locality or of a small section of citizens.

The final element is the need for competition advocacy and competition culture. Education/advocacy is an important dimension of competition policy. It will ensure public awareness of competition principles and will

keep competition and regulatory laws and policies upto date with the latest understanding of competition in the market place. Only a National Competition Agency or Council could serve as a focal point for advocacy efforts to promote market oriented economic reforms, competition policies and a national competition culture. The Competition Law Authority can itself be such an Agency. The Competition Law Authority, in addition to its implementation and enforcement role, can be made to serve as an advocate for competition policy and for regulatory reforms and also for promoting a national competition culture.

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Linkage Between Competition Policy and Trade Policy

This aspect has been studied only recently and that too not in a structured manner. A detailed study of the linkage vital in the context of liberalization of the economy is yet to be made, though the process is now on. Wu and Chu in their paper prepared for the second conference on the Pacific and Basin Business have underscored the importance of the linkage (Wu and Chu, 1994). It has been argued that international trade and competition policy measures complement and buttress each other in promoting trade, market access, global economic efficiency and consumer welfare and that the promoting of objectives of a liberal trade policy supports the objectives of competition policy and vice versa (Khemani, 1997).

Trade and competition policy measures promoting trade, market access, global economic efficiency and consumer welfare.

One can, after scanning the literature available, perceive the formulations of an intellectual rationale for globalisation. The phenomenon of globalisation is perceived as a means to ensure not only efficiency and equity but also growth and development in the world economy (Nayyar, 1997). The neo-liberal model suggests certain analytical foundations for the intellectual rationale. It argues that Government is incapable of intervening efficiently. Government needs to be rolled back, wherever possible so that the target is a minimalist State. The market is the preferred alternative as it is seen to generally perform better. The model further suggests that market prices conforming to international prices (as far as possible) should govern policies on resource allocation and resource utilisation. Finally, it suggests that national boundaries, national ideologies and domestic economic concerns should not act as constraints. The ideologues believe that such globalisation promises economic prosperity for countries that join the system and economic deprivation for countries that do not (Sachs and Warner, 1995).

This rationale has drawn support and reinforcement from changes in technology and a better understanding of organisational structure and behaviour which have changed competitive conditions in the market questioning the hitherto believed policies of direct regulation.

The general trend towards decrease in Government interference in market mechanism and towards liberalisation and deregulation in many countries can be attributed to three reasons. The first reason is linked to the fact that there is a certain measure of cavil developed over the years, on the ability of the Government to promote the long run competitiveness of the economy through direct intervention. Industrial policy in many countries is no longer considered to be a powerful tool to promote economic development that it once was considered to be. The second one is that Government regulation often implies protection from competition and a higher degree of concentration of market than what would result from free market forces. It is no secret that interest groups lobby to secure protection and are ready to pay for protection from competition. The third reason is that Government interference in market mechanism through a policy of protection from competition leads to a reduction in the real income of the citizens compared to the level they would enjoy, if competition prevailed. Regulated economies are often considered by the public to be unfair to the consumers. To quote Jenny (1997):

> "The widely held perception that regulated economies in which competition is restrained through Government regulation are inefficient, undemocratic or unfair explains to a large extent why we have witnessed a pattern of changes in many countries over the last decade including deregulation of economies, privatisation and increasing reliance on competition in the market place."

Competition – A Dynamic Concept

Clark (1940) in his paper on "Workable Competition" conceived competition as an amalgam of factors that stimulates economic rivalry. He referred to competition as a dynamic concept, as it attempts to judge forms of industrial organisation and the policies of firms by reference to the extent to which they promote or hamper this rivalry. Competition according to him, describes the kind of market pressure which must be exerted to penalise laggards and to reward the enterprising, and in this way to promote economic progress.

Schumpeter (1942) on the other hand has noted that the ordinary forms of price competition favoured by economists and anti-trust bodies can at best only protect consumers against being charged excessive prices in relation to current levels of cost. He goes on to say that only the very large organisations which are protected from the full impact of competition, are capable of laying their hands on resources which permit them to bring innovations to fruition as well as to meet the risks of introducing them. Without the high profits, which their monopoly or dominance enables them to earn, the incentives and the means to innovate would be lacking.

Often trade policies and competition may not be in tandem. It is imperative for every country that both trade and competition policies are directed towards its economic growth and development while subserving consumer interest. Trade laws and policies are primarily used for balancing the trade/export policies of other countries vis-à-vis both the national interest and demands of the domestic industry. On the other hand the basic tenet of the competition policies is the inherent interest and welfare of the consumers and the efficient allocation of scarce resources. While it is necessary to ensure that trade liberalisation, deregulation and globalisation lead to enhancement of competition, it is equally necessary to establish a mechanism that ensures a healthy competition in a globalised economy.

It is imperative for every country that both trade and competition policies are directed towards its economic growth and development while subserving consumer interest.

Efficiency and Equity Facets

There are many facets to the concept of public interest rendering any consensual definition difficult. However, many of the facets can be grouped under two principal headings namely efficiency and equity. The former concerns the technical and allocative efficiencies, which are basically economic in nature. Such efficiencies relate to cost minimisation, profit maximization, optimal muse of resources etc. The latter, namely equity, on the other hand, is a multi-dimensional social objective and very simplistically speaking, it can be linked to free competition in the market in the interest of consumers. But these two facets, efficiency and equity, are not necessarily mutually exclusive social goals. A crude theory can be that the efficiency facet can be fastened to public interest and equity facet fastened to consumer interest. This theory suggests that there is subserving of public interest in efficient use of resources or in obtaining economic or technical efficiencies and subserving of consumer interest in the equitable supply of goods and services.

Strengthening and promotion of competition need to be a key goal of economic policies, of not only developed countries but also developing countries, least developed countries and countries in transition, while leaving room for its flexible application to take into account the specific characteristics and needs of individual countries. For the developing countries, in particular, flexibility in applying competition law and policy may be necessary in order not to impede efficiency, growth and development goals and coherence needs to be ensured between competition policy and other policies aimed at promoting development. Competition policy should have a strong undercurrent of the development dimension but should have some flexibility to take care of the needs of individual countries particularly developing ones.

Strengthening and promotion of competition need to be a key goal of economic policies, of not only developed countries but also developing countries.

In view of abovesaid remarks, following approach ensures whenever there is the inevitability of a conflict between trade and competition policies.

a) Competition should be a factor to be reckoned in the trade and market policies of a country.

b) There should be a competition policy and of course a competition law, which should be so structured that they subserve by and large the consumers, consumer interest and consumer

welfare. There should be a Competition Law Authority to implement the competition law and also to facilitate and shape the competition policy, from time to time.

c) The trade policy of a country should at all times reckon the contours of the competition policy and law. There should be enough flexibility in the competition and trade policies to deal with the specific needs and requirements of a country.

d) Public interest dimension can have primary over consumer interest dimension, in exceptions and exemptions should be few and far between and should not be allowed to dilute competition as far as possible. Care should be taken not to allow public interest to be abused to circumvent competition.

e) Competition policy should inhere the development dimension in its approach and implementation.

Competition Policy and Competition Law

Competition policy can be regarded as a genus, of which competition law is a species. The former covers a whole array of executive policies and even approaches, whereas the latter is a piece of legislative enactment having the character of enforceability in a court of law. Government made decisions by way of executive policies and executive guidelines are pronounced in trade policy areas, in terms of which trade is regulated or even liberalised without the promulgation of a law or without the requirements of having to secure the approval of the legislature before applying the same.

In policies which are not having the cover of law, there is always the danger of discrimination, abuse of discretion and non-rule based decisions. While one can easily appreciate the difficulties involved in covering and supporting every executive made competition policy by a legislative enactment, it is desirable that there is a codification of the principles in the competition law which should act as an umbrella framework for making executive policies. Furthermore, such a competition law should have necessary provisions and teeth, to review any executive policy on the touchstone of competition and also have the power to require the executive to amend its policies, as may be necessary. This will ensure the spirit of competition in the executive policies relating to trade and market.

The above mentioned observations have an important dimension, namely non-discriminatory application of the law. Usually and in most countries, competition law has surveillance over anti-competitive activities and conduct indulged in by private parties including companies, firms, producers and suppliers of goods and services. Government enterprises and departments are generally excluded from such surveillance, but should be treated like any private enterprise for the purposes of the application of competition law. Where a Government department is manufacturing and supplying goods and/or rendering services, they should be treated alike their counter-parts and competitors in the private sector and be subjected to competition law enforcement without any favour. The only restriction, that may be built into this principle is that Government enterprises and departments engaged in any sovereign function (like defence, law and order, currency functions) may not be subjected to the rigours of competition law.

Swaminathan S. Aiyar, has made a pointed reference to the plethora of law and rules in India that explicitly protect favoured players, reduce competition and give discretion in decision making to politicians and bureaucrats in the name of public interest (Aiyar, 1998). He has observed that "public interest is frequently and unabashedly invoked to protect one specific interest group (unionised labour, small scale industries, handloom weavers) with no explanation of how or why the interest of this group transcends all others". He has provided the illustration of restrictive policies which impede competition like reservation of industries for the public sector (Coal, Railways, Postal services, Insurance, Petroleum etc.), canalisation of exports and imports through the public sector (Petroleum and some agricultural products), the jute packaging order (compelling fertilizer and cement producers to use jute rather than plastic sacks resulting in leakage of material), reservation of items for the small scale sector and reservation of items for the handloom sector in support of his contention that many Governmental policies are anti-competitive in character. He has also referred to the Industrial Disputes Act which makes it impossible to retrench labour or close units without Government permission, even if the units are unviable and to the Urban Land Ceiling Act which inhibits competition in using urban land. In the name of public interest, runs his further argument, protecting job leads to sacrifice of efficiency, raises potential costs and risks and

All Governmental policies will have to be viewed through the competition lens to ensure that consumer interest and welfare and economic efficiencies and development dimensions are not pejorated.

discourages new investment. All Governmental policies will have to be viewed through the competition lens to ensure that consumer interest and welfare and economic efficiencies and development dimensions are not pejorated.

In many countries, procurement is reserved for domestic bidders in tenders. The Kennedy round of GATT has created a plurilateral procurement system applicable to those GATT members who voluntarily opt to join it, but it is not mandatory for other GATT members.

Even though in certain specified areas, protection to domestic industry may be needed, it can be achieved through tarrification and appropriate import duties and through fiscal methods. There is no need to dilute the competition policy to protect domestic producers and suppliers. Tendering should not be tailored to protect domestic producers and suppliers.

Yet another area which is a cause of concern is the practice of transfer pricing. When trade takes place between two branches or subsidiaries of a multi-national corporation, the price of the transaction is so fixed as to shift the bulk of profits to the firm with the lowest tax liabilities. A company that under-invoices or over-invoices exports and imports is indulging in transfer pricing. Many industries appoint fully owned firms of their own to act as suppliers to or sales agents of a larger joint stock company with a large number of share holders and here, both the inputs and sale prices are manipulated to siphon off profits from the widely held company into the fully owned ones. There are some multi-nationals which impose sales or export restrictions on their branches in the importing countries to whom they supply technology.

The conclusion that follows is that competition law should envelop executive policies of the Government besides a host of anti-competitive practices on the part of the market players so as to ensure the beneficial consequences of competition for the consumers in general and the public at large.

Exemptions and Exceptions

Every country should have the flexibility and freedom to provide for certain exemptions and exceptions to competition law or even competition policy having regard to its specific needs and circumstances particularly relating to its trade and economy. For instance, there is a large body of small scale sector enterprises operating in developing countries like India which provide considerable local employment, use of local resources and raw materials and supplies to local and sectoral markets. Some of the products of such enterprises may be found eminently suitable for the local population, which does not set very high quality standards because of their impercunious conditions and even affordability qua very rigorous and high quality products. In the name of competition, the interests of such enterprises should not be injured, as all that will happen by the competition law holding its field, is to extinguish them and throw many people out of employment without any corresponding gain to the local population who will not be able to afford the high quality products and therefore will have to go without the products at all. This is not to say that high quality products need not be given to such consumers, but the emphasis is that in a given situation, there should be enough room for flexibility for a country to provide for exemptions and exceptions in its larger public interest.

Extra-Territorial Reach and Relevant Market

Some anti-competitive practices may have extra-territorial origin or extra-territorial impact. For instance, some mergers and acquisitions may have significant effects beyond the borders of the country in which the merging parties are based or have production facilities. A recent example is the merger of Boeing-McDonnell Douglas in which the parties' production facilities were located in the USA but their customers were located all over the world. The merger was cleared after review by the Federal Trade Commission of USA and the European Union, after the parties undertook certain commitments to the European Union (Federal Trade Commission, 1997). In such matters the concept of a "relevant market" for competition law purposes comes into play. "Relevant market" has both a product and geographic dimension. Regarding the product dimension, the basic question to be answered is with what other products and services does a particular product compete? Answering this question involves consideration of past evidence of consumer substitution patterns, the relationship between price movements and the demand for other substitutable products, econometric evidence etc.

The applicability of domestic competition law to arrangements entered into outside a country's borders, so long as such conduct has significant effects in the country, is important to the control of anti-competitive practices (See Scherer *et al*, 1994). However, it needs to be noted that extra-territorial application of national laws entails some potential for conflicts between jurisdictions. International co-operation and in particular agreements incorporating principles of "positive comity" can be useful in minimising the actual extent of such conflicts between countries participating in such arrange-

ments. A caveat which has jurisdiction is that if a country wants to have extra-territorial reach of its competition law, it should allow other countries to have extra-territorial reach of their competition laws in its soil.

As far as India is concerned, its Monopolies and Restrictive Trade Practices Act, has a provision that where any practice substantially falls within monopolistic, restrictive or unfair trade practices relating to production, storage, supply, distribution or control of goods of any description or the provision of any services and any party to such practice does not carry on business in India, the Monopolies and Restrictive Trade Practices Commission can make an order under the Act with respect to that part of the practice which is carried on in India.

Indian Competition Law

Anti-Trust legislation is now an integral part of the economic life all the world over. It is present not only in the developed countries but also in the developing countries. The Indian law on the subject known as the Monopolies and Restrictive Trade Practices Act (MRTP Act) was originally brought on the statute book in 1969 drawing its inspiration from the mandate enshrined in the Directive Principles of State Policy in the Indian Constitution. The said principles aim at 'securing social justice with economic growth'.

The purpose of the Directive Principles is to fix certain social and economic goals for immediate attainment by bringing about a non-violent social revolution (Supreme Court, 1973). Through such a social revolution, they seek to fulfil the basic needs of the common man and to change the structure of the Indian society.

The Indian law, Monopolies and Restrictive Trade Practices Act has drawn heavily upon the laws embodied in the Sherman Act and the Clayton Act of the United States of America, the Monopolies and Restrictive Practices (Inquiry and Control) Act, 1948, the Resale Prices Act, 1964 and the Restrictive Trade Practices Act, 1964 of the United Kingdom and also those enacted in Japan, Canada and Germany. The U.S. Federal Trade Commission Act, 1914 as amended in 1938 and the Combines Investigation Act, 1910 of Canada as amended in 1960 have also influenced the drafting of the Indian Act. Premises on which the Act rests are unrestrained interaction of competitive forces, maximum material progress through rational allocation of economic resources, availability of goods and services of quality at reasonable prices and finally a just and fair deal to the consumers. An interesting feature of the statute is that it envelops within its ambit fields of production and distribution of both goods and services.

Thrust Areas

Three areas are covered by the regulatory provisions of the statute – concentration of economic power, competition law and consumer protection. A criticism is often voiced that the Act prohibits it. Even in its regulatory capacity, it controls the growth only if it is detrimental to the common good. In terms of competition law and consumer protection, the objective of the Act is to curb monopolistic, restrictive and unfair trade practices which disturb competition in the trade and industry and which adversely affect the consumer interest. A parallel legislation known as the Consumer Protection Act, 1986 has also come into being which prevails in the realm of unfair trade practices. One could argue that the consumers need no special protection as they can be left to the market forces. But a perfectly competitive market is just a utopia and the consumer sovereignty a myth.

In many countries and in particular developing countries like India, a large number of consumers are illiterate and ill-informed and possess limited purchasing power in an environment where there is shortage of goods. Very often, one witnesses the spectacle of a large number of non-essential, sub-standard, adulterated, unsafe and less useful products being pushed through by unscrupulous traders by means of unfair trade practices and deceptive methods. Subtle deception, half truths and misleading omissions inundate the advertisement media and instead of the consumer being provided with correct, meaningful and useful information on the products, they often get exposed to fictitious information which tends to their making wrong buying decisions. Transparent information is missing and needs to be a goal to be chased.

The regulatory provisions in the MRTP Act apply to almost every area of business – production, distribution, pricing, investment, purchasing, packaging, advertising, sales promotion, mergers, amalgamations and take over of undertakings. They seek to afford protection and support to consuming public by reducing if not eliminating from the market monopolistic, restrictive and unfair trade practices. One of the main goals of the Act is to encourage fair play and fair deal in the market besides promoting healthy competition. Under the Act, a commission called the MRTP Commission has been set up to deal with offences falling under the statute.

Objectives

The principal objectives sought to be achieved through the MRTP Act are:

i) prevention of concentration of economic power to the common detriment;

ii) control of monopolies;

iii) prohibition of monopolistic trade practices;

iv) prohibition of restrictive trade practices

v) prohibition of unfair trade practices.

Out of these five, the first two have been de-emphasized, after the 1991 amendment to the Act. The emphasis has not only shifted to the three last mentioned objectives but they have been re-emphasised. Yet to the extent monopolies tend to bring about monopolistic trade practices, the Act continues to exercise surveillance which existed prior to the 1991 amendment. This is because a monopolistic trade practice is understood to be synonymous with anti-competitive practice. Anything which distorts competition can lead to a monopoly situation. Anything which is likely to prevent or distort competition is regulated by the statute. Tersely, the Act is designed against different aspects of market imperfections. For instance, a merger which can increase the dominance of the combine or has resulted in a large share in the market can be looked at in terms of the provisions of the Act and the objectives governing them.

Monopoly is a concept of power which manifests itself in one's power to:

i) control production, supply, etc.

ii) control prices

iii) prevent, reduce or eliminate competition

iv) limit technical development

v) retard capital investment

vi) impair the quality of goods.

The legislation seeks to curb such power arising out of a monopoly.

Prior to the 1991 amendment, the Act essentially was implemented in terms of regulating the growth of big size companies called the monopoly companies. In other words, there were pre-entry restrictions in the Act requiring undertakings and companies with assets of more than Rs. 100 crores (about 25 million US dollars) to seek approval of Government for setting up new undertakings, for expansion of existing undertakings, etc. but consequent on the 1991 amendment these pre-entry restrictions have been done away with essentially because of the need for achieving economies of scale, for ensuring higher productivity and for securing competitive advantage in the international market.

It was the perception and the experience of the Government that the pre-entry restrictions under the Act had outlived their utility and impeded the implementation of industrial projects. By eliminating the requirement of time-consuming procedure, it was felt that it would be possible for the productive sections of the society to participate in the maximisation of production and supply of goods and services.

The basic philosophy behind the Act was never to inhibit industrial growth in any manner but to ensure that such growth is channelised for the public good and is not instrumental in perpetuating concentration of economic power to the common detriment. This philosophy has been so refined by the 1991 amendment that the MRTP Act has been restructured with emphasis on measures to curb and regulate monopolistic, restrictive and unfair trade practices which are prejudicial to public interest.

Dominance

In the Indian law, the criterion for determining dominance is whether an undertaking has a share of ones fourth or more in the production, supply distribution or control of goods or services. When mergers or amalgamations come up for examination by the MRTP Commission, one of its important responsibilities is to evaluate the post merger/amalgamation dominance in the market with reference to the common good and public interest. If the merger/amalgamation leads to unilateral price fixation on the part of such dominant undertakings without any reference to the market and tends to extinguish smaller units and undertakings and douse competition, the Commission has the power to stop it.

Fostering Competition

Engendering competition is the touchstone on which both the MRTP Act and Consumer Protection Act have been drafted. The concept of public interest which includes consumer interest permeates the regulatory frame work provided for the prohibition of monopolistic, restrictive and unfair trade practices in the two statutes. By bringing the public enterprises under the vice of the MRTP Act, they have been put on notice that by virtue of Government backing and Government ownership, they cannot exploit the consumers and indulge in practices to their detriment.

The extant Indian Competition Law, the Monopolies and Restrictive Trade Practices Act, 1969 needs to be considerably refined and amended to make it a comprehensive competition law for the country. Perhaps a new Competition Law may be designed and drafted. The new Competition Law should declare the competi-

tion principles and should be an effective instrument for engendering and protecting competition in the market in the interests of the consumers and the general public. Deterrent punishment should be provided in the statute for those who trench its provisions.

Mergers and Amalgamations

Mergers, amalgamations and acquisitions may be benevolent or malevolent. That they reduce competition and consequently trench competition law can be justifiably presumed. But in a benevolent merger, there could be advantages like resultant economies of scale, reduction in the cost of production and sale and gains of horizontal integration. There could also be more convenient and reliable supply of input materials and reduction of overheads and inventories. In a malevolent merger, competition becomes very often a victim. It may lead to exercise of market power and dominance in the market by the merged entity to the detriment of consumers. A large unit may take into its fold an efficient and growing medium or small size undertaking and after the merger, may become complacent and suffer from deterioration over the years in its performance which may be prejudicial to public interest.

Instead of a mind set, that all mergers are prejudicial to consumer interest, what needs to be done by the Competition Law Authority is to carefully evaluate the trade-off between reduction in competition and potential gains in economic efficiency. It is suggested that a cost-benefit analysis be done by the said Authority to weigh the advantages and disadvantages of a merger and scrutinise efficiency arguments before adjudicating the question as to whether the merger is anti-competition in character. The Competition Law Authority should be provided with multi-disciplinary experts to help in their endeavours.

Intellectual Property Rights and Competition

All forms of Intellectual Property have the potential to raise competition law problems. Intellectual property provides exclusive rights to holders to perform productive or commercial activities but this does not automatically include the right to exert restrictive or monopoly power in a market or society. What is called for is a balance between unjustified monopolies and protection of the property holders' investments.

There is a growing recognition of the fact that a modern and well enforced Intellectual Property system is a strong imperative in the process of liberalising economic, industrial and trade policies. Industrial Property system needs to be used as a means for economic and technological development. In order to benefit from the new directions consequent upon the TRIPS Agreement developing countries need to improve their regulatory framework laws and service, which will help increase inventive activity. The provisions of TRIPS Agreement can open new horizons for a country's industry and can ensure success through competition.

In order to benefit from the new directions consequent upon the TRIPS Agreement, developing countries need to improve their regulatory framework laws and service, which will help increase inventive activity.

Developing countries need to study their IPR statutes in depth in order to identify the areas which need to be revised, updated or modified not only to conform to the TRIPS Agreement but also to subserve the national interest without detriment. They should also concentrate on using the flexibility in TRIPS Agreement to advantage. While making amendments to the IPR statutes, appropriate measures will have to be put in place by each country in its competition law to prevent the abuse of Intellectual Property Rights or to prevent practices which unreasonably restrain trade or the international transfer of technology. Abuse of dominance, collusive action and abuse of exclusive marketing rights should be under the surveillance of competition law.

Investment and Competition

Consideration relating to competition and competition policy have relevance for all countries, particularly the developing ones, as they seek to liberalise and get more closely integrated into the world economy. Developing countries look at assistance and investment from overseas as a source of capital, technology, managerial know-how and market access for sustained economic growth and development. Experience suggests that in many countries, the policies designed towards a more open Foreign Direct Investment (FDI) regime are supported by policies towards greater deregulation of economic activity, greater reliance on market forces in their domestic economies and increased dependence on international trade and factor movements like those relating to capital and skilled human resources (Low *et al*, 1995). Sometimes, as a consequence of FDI liberalisation, some developing countries are compelled to undergo the pain of adjust-

ment to competition, as the collective impact of FDI liberalisation, trade liberalisation and domestic economic reforms may give rise to competition concerns and conflicts. For instance, domestic industries which are intrinsically unviable face extinction, consequent on the said collective impact.

Trade policy, FDI policy and competition policy have a high degree of inter-dependence for ensuring efficient resource allocation and economic development and the three policy tools require to be appropriately configured so that they are in harmony and mutually reinforcing.

Foreign Investment Policy should essentially subserve the development dimensions of the beneficiary countries. For the developing countries in particular, an open investment regime should be a tool for enhancing economic growth and welfare. While exposure to competition in the long run, generates efficiency and a more rational allocation of resources, the concerns of short-term injury to domestic industry or of excess capacity or diseconomies of scale should not be under-estimated but should be studied by countries with a view to formulating their investment policy.

Competition policy and competition law should essentially govern investment policy. It is imperative that consequent on foreign investment, the enterprises involved in both the host and the home countries do not indulge in business practices to the detriment of the interests of the consumers. At the same time, the competition policy should be flexible in application that it does not impede growth or development goals of the investment receiving country. Special and differential needs of the developing countries in particular, will have to be kept in view along side their developmental objectives and national priorities. In other words, they should have the freedom to specify exemptions and exceptions in applying competition policy to investment policy. If mergers, amalgamations and acquisitions are chosen as the route for foreign investments, they should be placed under the surveillance of the competition law.

State Monopolies, Exclusive Rights, Regulatory Policies and Competition

State monopolies and public enterprises are the agents of the Government created to accomplish various socio-economic-political goals. They are designed to secure and subserve public policy objectives of the Government. Consequent on the process of liberalisation, privatisation and globalisation, there has been a trend recently towards de-monopolisation and privatisation of State monopolies and public enterprises. There is increasing recognition of the fact that competition is a key to improving the performance of State monopolies and public enterprises. In many developing countries, State monopolies, public enterprises and exclusive rights have played an important role in the core and strategic sectors. They are designed to providing effective and universal supply of goods and services to all citizens on specified terms and at affordable prices. Some of them are operated in the interests of the vulnerable and weaker sections of society. Nonetheless State monopolies and public enterprises need to be placed under the surveillance of competition law to prevent or minimise monopolistic, restrictive and unfair trade practices on their part. Furthermore, efforts should be made to strike a harmony between competition on the one hand and the existence of State monopolies, public enterprises and exclusive rights on the other. What needs to be underscored is an appropriate blend of competition principles and Government policies towards State monopolies, public enterprises and exclusive rights directed for the welfare and interests of the impecunious sections of the society, particularly in the developing countries.

State monopolies and public enterprises need to be placed under the surveillance of competition law to prevent or minimise monopolistic, restrictive and unfair trade practices on their part.

Finale

In conclusion, there is no panacea or magic formula for creating the desired harmony between the interests of competition (consumer interest) and the interests of the whole society (public interest). No one theory—economic theory—may fulfil the requirement for striking the harmony. Appropriate economic theories need to be reified to be suitable as a tool for working out the desired harmony.

This paper may conclude with the following quote from:

"One would like to avoid the danger of hollow purism that has made so much of modern economics unfit for actual use" (Sen, 1970).

*by **Mr. Amartya Sen**,*
Indian Nobel Laureate

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Financial Sector Reforms – Imperative for Competitiveness

S. Venkitaramanan

The present paper emphasises the need for broad-based financial sector reforms in India – an imperative to ensure competitiveness in the era of industrial globalization. In particular, the role of banking sector is dealt with, especially to strengthen the functioning of rural banking sector. The problems faced in the implementation of the financial reforms are examined.

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Undoubtedly an efficiently functioning financial sector, viz. the flow of credit, the profile of interest rates, – payment and settlement systems, monetary policy, external balance – is an important component of a competitive economy. The experience of the last decade or so around the world has brought to focus the strengths and weaknesses of financial sector reforms. No longer is there the cosy feeling that there is an one and only standard prescription. Indeed, the dominant theology – that of the Brettonwoods twins – is itself frayed and one twin attacks the other, to the irritation of those in India, who practise the earlier faith.

The experience of the last decade or so around the world has brought to focus the strengths and weaknesses of financial sector reforms.

The impression that financial sector reforms are a solvent of all problems is no longer unquestioned. Many studies, including those by IBRD, have confirmed that too rapid a liberalisation of the financial sector without adequate preparation and the right conditions can worsen the crisis.

Financial Sector Reforms

In this context the following aspects are important:

(a) They are particularly to be handled with care

(b) There is a widespread wrong impression that financial sector reforms are a solvent of all problems

(c) Too rapid a liberalisation of the financial sector without adequate preparation and the right

conditions can lead to a worse crisis than pre-reform

(d) Missionaries of the reform process sometimes slur over its problems

(e) India has so far escaped the adverse consequences of reforms

(f) While financial sector reforms do improve efficiency, they must take into account real sector links (Lawrence Summers, *op. cit.*).

(g) Officials in liberalising countries have often experienced high real rates and collapsing financial institutions, as a result of reforms

(h) The importance of managing the process of reform carefully instead of adopting a laissez-faire approach is reinforced by experience, which makes one wonder whether money is after all only just a veil

(i) One has to recognise that reform to financial sector is a process, not an event

(j) Abrupt changes can be disastrous, in this as in other areas of reform

(k) Financial reformers should move aggressively in good times and more slowly when borrowers' networth is being reduced by negative shocks, such as recession or losses due to adverse trends of trade

(l) Increasingly, analysis confirms the need—as a precondition for successful financial reforms—to develop the accounting, auditing and banking profession as well as pursuing judicial and legal reforms so that contracts can be enforced promptly

(m) Unless Governments take prior action on these sectors, reform may be useless.

Indian Scenario

Several aspects emerge concerning weakness of reforms done in India of which only a few are focused:

(i) The financial sector reform process, although essentially homegrown, was pushed through mainly by external pressure in the midst of the forex crisis of 1991; (ii) A number of changes have been made, some of which did not then—and may not even now—suit India and (iii) At that time, during last legs on the forex front, the views of the protagonists of reform in India and that of donors coincided—partly or mainly because of the pressure of the crisis on the BoP front.

There were inevitably many parts of the reforms, which were relevant to other countries with different legal and financial systems and at a different level of economic development. Much has indeed been accomplished in the right direction and it would be churlish to deny credit to the substantive achievements made. Given the fact that the reform covered many aspects of India's financial working, it was difficult to anticipate every possible error and risk of failure. It is creditable that those who pushed through the financial sector reforms did try to systematically gauge various problems in their complexity, although not always with success. It is often forgotten that the reforms of 1991 followed on the earlier episode of liberalisation initiated in the previous period 1980-90.

Reforms of 1991

(a) Introduction of provisioning and prudential norms, capital adequacy as a concept—NPA definition—Reduction of statutory preemptions—End of financial repression—all these marked a watershed

(b) Most of the changes made have, however, more or less "arithmetical" (to quote Mr. M. Narasimham)

(c) "The form of India Banking changed, but not its content"

(d) The institutional and legal context of India continues to be relatively unchanged

(e) Reforms so far have ignored this problem to some extent

(f) One must recognise that to transport the procedures and norms of a developed economy, like USA, to India—two countries with such different contexts—is inexpedient, if not harmful.

It is an undeniable fact that law's delays help and comfort the defaulter. Priority must be given to speeding up legal reforms, papers regarding which are pending for too long with GoI! The "transport" of unsuitable paradigms is illustrated by suggestions regarding merger of strong and weak banks, which ignore the ground reality of difficulties in downsizing staff or closing branches, in the context of Indian labour legislation. Merger is a solution for weak banks only in those countries, like USA/UK, where closure and retrenchment are condoned by society and recognised by the legal systems.

Yet another question concerns inadequacy of capital adequacy norms. Capital adequacy norms are today being overstressed, which is not fully relevant in a situa-

tion where the investors do not enthusiastically subscribe to bank shares. A peculiar situation has arisen, in that capital of one bank has been subscribed by another – No genuine additional capital!

A recent review shows that ingenious devices have been used to add to Tier 1, not only in India but elsewhere. For instance, United States permits the use of holding companies to issue debt-type securities and then draw on them to fund additional capital. In Germany, the German State Bank, known as the Landesbank has no publicly listed shares because they are owned by the State Government. They issue dated debt securities called "Stille einlagen" or silent participation. Basle norms are thus treated with scant respect even by the stronger nations. A strict enforcement of capital norms has meant yet another alibi for lending only to good risks. Capital adequacy, important as it is, should not become an excuse for banks to shy away lending.

The institutional context—the human resources dimension

(a) The managements of Indian banks, particularly of the public sector, are relatively helpless, in that they do not have the requisite flexibility to retrain, refocus, redeploy and retrench their employees.

The managements of Indian banks, particularly of the public sector, are relatively helpless, in that they do not have the requisite flexibility to retrain, refocus, redeploy and retrench their employees.

(b) This is a continuing deterrent to managerial efficiency. Managers today very much in the hands of Trade Union leaders Importantly, the informatics revolution has passed by the Indian banking sector, except in the case of certain major showpieces

(c) Institutional paralysis due to the role of external vigilance yet another aspect

(d) Banking reform incomplete so long as the procedures of banks are swathed in the vigilance-oriented supervision, – vigilance officials who have comparatively little awareness of complexity of banking

(e) RBI supervision is today overlaid by CVC/CBI's intervention

(f) CVC Mr. Vittal's latest guidelines, good as they are, do not go far enough to alleviate the fear complex

(g) Nor is it valid to adopt for this reason the solution suggested by Narasimham Committee (II) to escape these controls by converting the Government holding in PSU banks to a minority

(h) It may not solve the basic problem, which is that the largest shareholder, GoI, who still is on the board, can continue to be negative and is risk-averse

Treatment of Industrial Sickness

Another aspect of banking reforms, which causes concern, is the continued weakness of the treatment of "sick" industries. Industrial sickness can be either self-imposed or externally caused. Many industries are sick, although industrialists themselves are not. In this connection pursuit of defaulters is legally crippled in our system. BIFR itself is sick – its structure is afflicted by a number of weaknesses, not the least being an imminent sentence of termination. In order to handle the sickness of our financial system, – it is necessary to adopt, among other things, procedures similar to those in vogue in USA in regard to bankruptcy and now being introduced in countries, like Thailand.

Lending to Sick Firms

- Banks may need to be liberal while lending to companies in distress, provided they have analysed that they can be nursed over the difficulties – The use of Chapter XI in USA
- Fear of subsequent enquiries, however, a disincentive to such action in India
- Loans to sick companies with good prospects of revival should not be considered a crime
- "Debtor-in-possession" procedure in vogue in USA should be introduced
- The IMF itself offers a classic instance of such lending, – when it gives loans to countries in default, but keeping them in command under controlled condition
- Indeed, of late, pundits of IMF have gone to town advising banks to lend more money to businesses even in countries, which may be affected by crisis, albeit subject to conditions.

NPAs – Treatment and Impact

(a) "Non-performing Assets" (NPA) and their defini-

tion in India have been a subject matter of much controversy. It is stated to be intractable

(b) Reformers who breathe fire and brimstone against our bankers for their high "NPAs" compared to the low NPAs in countries, like USA should be careful to not the different accounting treatment of assets in USA.

Two aspects of this is mentioned.

- Firstly, in banks and FIIs abroad, collateral is netted out in calculating the size of the NPAs. Here it is not—The ostensible argument being that given our legal procedures, collateral cannot be liquefied easily
- While this reasoning may appear to be generally, it cannot be held against FIs, for instance, who have lent against large projects with proper security

Secondly, where settlements/compromises are made, they are frowned on as evergreening and unlike in other countries, once the loans are treated as impaired, they are counted as NPAs even after restructuring

- In USA, once a settlement or compromise is made with a likely defaulter, the impaired loan is no longer treated as a NPPA. Bail-outs are not to be treated as wrong when they can convert potential disaster into a prospect of survival and growth. Bankers abroad do not hesitate to engage in "work-outs" of loans—an euphemistic expression for evergreening. IMF itself has been lending to countries in distress
- Even consider the case of LTCM, where the Federal Reserve itself organised a rescue operation for their hedge fund.

Directed Credit

A mistaken prejudice against "directed"/priority sector credit as such informs our financial sector reformers. Note, however, that in most mature economies, including USA, Government have taken a leading role in allocation of credit. Even today in USA, the Government requires banks to lend specific proportion of the total loans to special community areas. Further, nearly 24 per cent of all loans in US economy are at present advanced by Government, be it to students, small businesses and so on.

Rural lending untouched by reforms

Rural lending in India has been relatively untouched by financial sector reforms. Here is the suggestions made in Narasimham Committees (I) and (II) do not go to the roots of the problem

The cooperatives, who are a prime source of credit for agriculture, are still afflicted by age-old maladies. A sharp reversal of the current attitude of benign neglect towards rural lending is under. This is because the total amount of credit to agricultural sector even today not more than 10 per cent of the output, whereas in industry it is nearly 30 per cent. As a result, the Indian farmer depends more on money lender and trading channels than banks for credit

If credit flow is to become an engine of growth, institutional bottlenecks to debt recoveries and the lack of credit channels, like cooperatives, have to be removed. Reforms have not touched on the major problem of rural credit

This can be handled effectively only if the linkage of credit and marketing is recognised, as is happening in NDDB cooperatives. While Kurien's success to a large extent was, indeed, due to his own personality and the vision that he had successfully transmitted down the line, equally important was the institutional arrangement by which he linked credit to market.

This turned out to be an important key to the growth of milk cooperative.

Importance of Informal Finance

(a) Financial sector reform has up till recently concentrated mainly on formal sources of finance, such as banks and FIs

(b) Over the last 2 or 3 years, specific attention of reformers has been focussed on formalising the structure of non-bank finance, with rather serious adverse consequences to many NBFCs

(c) Admittedly, much of this had become necessary in the context of abuse of public fuel by some of the NBFC deposit takers

(d) Granted, there is need for strengthening the supervision of formal NBFCs

(c) But, the RBI is, as it is, ill-equipped to handle this problem

(f) The current regulations in respect of NBFCs impose a super-human task on RBI's inspectorate

(g) It would be necessary to share the responsibility for supervision of NBFCs with the State Governments, who are closer to the ground

(h) Apart from NBFCs, there are a number of informal channels of finance, such as Chit Funds, available in rural area, which perform a very important role

(i) In the zeal for reform, there is a danger that all these institutions, which have been surviving for many years and giving a basic financial support to our agricultural and small industries, are snuffed out

(j) It is unfortunate that the attitude about the NBFCs, both in RBI and GoI, has been relatively adversarial, ignoring their potential useful role.

Neglected Sectors

- Bankers mostly focussing attention on big corporates
- Where is the source for funds for small businesses, craftsman and traders?
- They cannot access any equity sources
- Bankers are also afraid of touching them
- Financial sector reforms have mostly skirted the problems of those at or below the poverty line, but those who can become effective members of the community with adequate credit.

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Export Credit

- Exporters are at the receiving end of Government's attentions only at times of trade policy or when BoP shows a dip
- Unlike in mature economies, exporters seem to be the Cinderalla's finance
- Access to credit for exports is difficult which costs are high
- Reliefs given seem to have been temporary

Convertibility

- On the external front, financial reform should first focus on completing the move towards fuller current account convertibility

On the external front, financial reform should first focus on completing the move towards fuller current account convertibility.

- There are still many problems faced before our business community and NRIs, who try to either bring in remittances or wish to pay for goods and services abroad
- The guiding principle of reform should be, "Those who deal with the external world should be made to feel that their funds are welcome"
- At present, they are treated with suspicion

Payment and Settlement Systems

These systems in India have improved considerably, with the advent of computerisation. But, they still leave a lot to be desired. There are, of course, the perennial subjects of discourse, which are raised, whenever and wherever financial reform is discussed. For instance, take the questions of independence of the central bank and monetary policy, which have increasingly been recognised to be limited in their impact, compared to the euphoria of earlier days. Central bank independence is no longer seen as so closely correlated with management of inflation, as was imagined in earlier discussions. In fact, the need for a political interface between central bankers and the people has been recognised in much recent debate. In a perceptive book, the academic turned central banker, Prof. Alan Blinder had recently addressed the issue and pointed out the false correlations sought between total independence and economic management. At best, central bankers can be given instrument independence, not "goal" independence, but even there central bankers have to recognise, says Blinder, where they draw authority from.

Over-emphasis on monetary aggregates has been corrected in recent times. As Blinder himself says, the very vagueness of what constitutes a "money measure" has led to monetary aggregates abandoning central bankers even before central bankers abandoned them.

High interest rates are another part of the earlier reform package, which has fed current recession. But, it is not known how to get out of it. Prescriptions of high interest rates and tighter credit have been identified as among the principal contributors to the continuing malaise in the Asian economies, in crisis. But, the IMF and its proponents, – both in India and elsewhere, – are unreformed reformers. High fiscal deficit, which are in

High interest rates are another part of the earlier reform package, which has fed current recession. But, it is not known how to get out of it.

turn the cause of high interest rates in a situation where liberal monetisation is frowned upon. While it is of course the duty of politicians to solve the problem of revenue deficit, financial sector reformers have not helped them by their continued insistence on keeping rates of Government borrowing high and thus increasing the deficit itself. They do not recognise that one of the causes of success of USA in recent times is the manner in which they have brought down interest rates for Government borrowing, such as it is and such as is refinanced. Nearly 20 to 25 per cent of its gilts are subscribed to by external savers—which help keep rates low—a prospect which India's reformers, for rather obtuse reasons, denied.

Lastly, there s the highly charged issue of financial institutions and their future. There are other better qualified experts here who are to speak on it. Suffice it to say that DFIs have performed a useful role in India's development and growth. They have still a role to play. Whether they should become commercial banks of the type that SBI or Bank of Baroda is, is a matter of dispute. The question is rather how to enable DFIs to enlarge the range of their products and services, while increasing their access to resources. DFIs will suffer grievously if they are promoted to the dubious honour of being treated as NBFCs—which is one of the recommendations of the discussion paper of RBI on the subject. The should rather graduate into wholesale banks. Their access to the capital market should be encouraged by suitable credit enhancement wherever they are undertaking special purpose lending as for infrastructure.

Conclusions

The agenda of reformers for the future can be stated:

- Glamorous issues, like universal banking, stock market reform and the like are likely to be in sharp focus sooner rather than later, because these are part of the vocabulary of the powerful
- Some solution or other will inevitably be found for them

It is those who are outside the mainstream, who will not too early feel the touch of reform. It is to them one should now turn the focus of our attention. □

Public Sector Competitiveness

Arvind Pande

Economic liberalisation since 1991 with scope for greater private sector investment has forced restructuring of the functioning of public sector undertakings (PSU) which constitute a major segment of the economy. Policy measures are urgently needed to ensure competitiveness of PSUs. The author critically examines the suggested measures and in particular discusses the situation in a major undertaking, viz. SAIL. An important aspect of the reforms concerns labour demand and performance to ensure better competitiveness.

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Any corporate entity—whether in the public or private sector—will have to be competitive, if it is to face successfully the winds of liberalisation and globalisation. In India not only has the image of the PSU changed but expectations from it have undergone a radical transformation in the last 50 years. Today, the public sector has come a long way from the post-independence era in which it was expected to provide the platform for sustained and rapid economic development, besides meeting social obligations of being the largest employment generator for the state. After the post-liberalisation period which began in the early 90s, the public sector is now expected to be financially viable, by performing profitably.

The liberalisation of economic policies since 1991 and greater room provided for private investment (both domestic and foreign), notwithstanding that the public sector constitutes a major segment of the Indian economy even today. It is estimated that over 60 per cent investment is in the public sector is primarily in heavy industries and infrastructural sector. Hence, the issue of competitiveness of this large constitute of the economy, is of paramount importance.

The liberalisation of economic policies provided greater room for private investment (both domestic and foreign), notwithstanding that the public sector constitutes a major segment of the Indian economy.

With the opening up of the economy and increasing globalization, the performance of this sector has been mixed with only few individual brilliant performance. There is tremendous potential in the public sector which can be harnessed if the units are allowed to be run as corporates, making their own decisions for forging joint ventures, hiving-off non-core units, close unviable assets, reorganising manpower etc.

Acknowledging the importance of the public sector, Government had a few years ago, accorded wide-ranging financial and managerial autonomy to the Navratna PSU. It is time now to translate this autonomy into freedom to break the shackles of structural inconsistencies. While the public sector has the potential to surpass the private sector, it can not do so largely because of the way it is structured.

Public Sector Performance

The financial rate of return of public sector enterprises has been most disturbing. The low rate of return on the capital invested had important implication both for short-term macro management, as well as for accelerating industrial growth. A summary of the performance of the central PSEs is given in Table 1.

Table 1: Performance of Central Public Enterprises

	1970-71	1980-81	1990-91	1996-97
Number of Units	87	168	236	236
Capital Employed (C.E.) in Rs. billion	36.5	182.3	1020.8	2020.2
Profit after Tax (PAT) in Rs. billion	0.0	−1.8	22.7	102.6
% PAT to C.E.	(-)	(-)	2.22	5.08

Source: Economic Survey 1998-99.

The more widely attributed reasons for this lack of performance is the multiplicity of objectives often working at cross purposes, such as—promotion of self reliance, industrialisation of backward areas, employment generation, profit generation etc.

However, amongst the various problems faced by the public sector, those related to labour, and skilled personnel and management have had special significance. The political environment led to over-staffing and payment of higher average wages to unskilled labour compared to private sector. At the same time many skilled personnel have left public sector owing to:

(i) relative low scale of pay in relation to private sector

(ii) reliance on promotion predominantly by seniority.

The economic liberalisation has brought about sea changes in the corporate sector, with private companies initiating structural and managerial changes to make themselves more productive. The public sector, by and large, is still in the process of responding to the market realities. This is because structurally, PSUs were established to fulfil the objectives which are no longer relevant. Hence, it would be important to restructure and liberalise the public sector so as to allow both public and private enterprises to compete freely. While it is relatively easier to liberalise the private sector by diluting the licencing and trade regimes, the harder task, no doubt, is to liberalise, restructure and revitalise the public sector.

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Globalization and the advent of the liberalisation has affected the public sector performance and hence, its performance needs to be judged in the backdrop of such competition winds of change. This is more true of the steel sector today. Steel is a global industry and the post-liberalization Indian market is far more exposed to global supply and demand trends and increased international competitions. Irrespective of the sector we operate in whether public sector or private sector, what is needed is a level-playing field for domestic industry. Even in advanced countries like US which propagate free trade, their domestic industries are not left to a totally unprotected environment. In such an environment, SAIL is quite confident of facing the winds of competition provided we operate on a level playing field and are not discriminated against, for being a PSU.

Global Competitiveness

It is interesting to note that despite indifferent financial performance in the recent years, for instance SAIL remains a low cost producer and has the potential to be in the league of the lowest cost producers internationally. However the intense and some times unfair competition, demands strong performance in the areas of cost, quality and delivery. While SAIL is competitive internationally in terms of cost of production, it needs to improve its product, quality and delivery. The current cost advantage also faces the danger of getting eroded as the opportunity set changes in the global context and environmental constraints inhibit quick adjustments in the domestic economy. The critical success factor hence, is the policy regime within which SAIL operates which alone can allow SAIL to emerge as a cost competitive, quality conscious player in the global market.

A view of the trends in the international steel market, shows, that, competitive global players, will increasingly, have access to new technologies, in hot strip rolling, such as thin-slab casting which can reduce per ton capital cost, by as much as 75 per cent. In the case of SAIL, such advantages in new cost-effective technology, can be accessed, only through the formation of new companies, in the joint sector. Major international steel companies, such as Nippon Steel Corporation, POSCO, British Steel, (to name a few), are setting up units in other countries, through joint ventures, with steel companies from third countries. In other cases, as with Thyssen, and Krupp, in Germany, mergers are being proposed, to mutually supplement the strength of each unit. In the case of SAIL, such alliances, with other steel companies, could provide a way of combining mutual strengths, within the domestic market as well.

It may be noted, that, two successful Asian steel companies, namely POSCO in South Korea, and China Steel Corporation in Taiwan, were established by the respective governments, in 1968, and 1971, respectively. In each case, privatisation has been introduced progressively, so that, government shareholding, has come down below 50 per cent. In the case of China Steel Corporation, the company is combining with Taiwan's Kuie Yu Industrial Co., to build Taiwan's second largest integrated steel mill. Other recent cases of privatisation of government-owned steel companies, include USINOR of France, and ILVA of Italy, both being companies with a global presence. USINOR shut down or divested its loss-making units, (as British Steel had done earlier, in the process of privatising in the late eighties).

Policy Measures

To retain its competitiveness and have a long term viability SAIL needs to take certain tough decisions in its business, for which it needs the support of the Government, the trade unions and the polity at large. While it would be imperative to maintain the thrust on internal improvements for getting the operational benefits and cost reduction, it is equally essential to target for business restructuring in a time bound way.

The sluggish market and heavy burden of interest and depression on account of huge investment in modernisation have placed severe stress on the bottomline of SAIL. It is necessary to point out some of the reasons for this. SAIL is burdened with a number of assets that are unviable or incompatible with its core mild steel business. Besides, SAIL employs far too many people, 4-5 times more than it needs. The indirect managerial and social cost of maintaining such a large workforce are debelitating.

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Despite the unfavourable market conditions and other disadvantages, SAIL has performed relatively better. Sales have been at its highest level, saving on cost reduction had exceeded Rs. 1600 cr. in last two years and Manpower reduction of 6000 nos. has been achieved. These performance improvement efforts need to be supplemented by restructuring exercise which would eventually increase shareholder value considerably. The proposed Competitiveness Plan, therefore, would provide for not only a viable but also a profitable and thriving future for SAIL. This plan can make SAIL as one of the world's lowest cost producers of flat and long products in the near future by tackling the following critical areas:

- Restore the financial foundation
- Refocus on the viable and core areas
- Restructuring the organisation into SBUs and implement performance management systems besides, right-sizing manpower substantially.
- Rejuvenate marketing by quality improvement, key account management and distribution channel optimization
- Reduce operational, social purchasing and inventory expenses
- Repriortise capital expenses

All this would result in value-creation for the government and its other shareholders.

SAIL needs to concentrate on its core business and unbundle activities which are ancillary to the main business. Further, it has to gradually withdraw from financing social infrastructure which has to become self sustaining. Divesting of special steel businesses and going in for joint ventures in key product lines where investments for essential technological interventions are beyond SAIL's independent agencies to raise resources, would be some of the steps in this direction. It also has to plan for closure all uneconomic units/shops and selling off all idle assets. Finally, SAIL has to take immediate corrective steps to right size its manpower.

Furthermore, the above measures for business restructuring need to be preceded by financial restruc-

turing. IDBI who have carried out a detailed study on SAIL's financial position have recommended that SAIL should target a debt equity ratio approaching 1:1 through a one time capital restructuring and recasting.

At a more generic level the competitiveness policy for PSUs should target reforms in certain critical area as enunciated below.

Enhancing Competitiveness of PSUs

The focus of any systemic reforms for the PSUs should be to speed up the decision making process and encourage appropriate risk taking behaviour. These however are contingent on reforms in the following areas:

a) There is a need to provide a continuity in the management of the PSUs for a longer tenure, with due representation to shareholders other than Government share-holders.

b) The decision making process in the PSUs are subject to a plethora of controls, which considerably slows down the entire process of project formulation, selection and implementation. The business decisions are also influenced by presence of a number of controlling agencies such as the Ministry, Parliamentary committees, CAG, CVC etc. The result of this is recourse to risk averse approach of business. A significant outcome of this is non-consideration of purchase of second hand equipment where on the spot decisions need to be taken and the transparent processes such as global bids are not available. As the PSUs have their own internal vigilance, investigation from CBI need not be necessary. An agency similar to the Banking Board for commercial Banks can oversee the affairs of PSUs.

c) The PSUs—which have become non-distinct from the state, are expected to carry out activities which may be adverse to its commercial interests. For example, take-over of some sick/potentially sick units, or investment in some newer units based on socio/political considerations are a few examples normally witnessed by PSUs. This results in non-flexibility to the company in re-organising its own business. Over time there are units or areas of operation which lose their commercial/economic viability. However, it is not possible to reorganise business of the PSUs in the current set up. The PSUs therefore should be given freedom to close down/dispose-off non-profitable or low return operations/assets to release capital which could be more optimally utilised. Operationally this may in certain situations imply spinning off loss making subsidiaries into independent public sector companies directly under the control of Government of India, so as to make SAIL attractive from the investment point of view.

d) The other area of business which is impeded in the current structure is that of forming strategic alliances, joint ventures and acquisitions. Steel being a mature industry offers many good opportunities of expanding business through the route of acquisitions and joint ventures, as the steel sectors in different parts of the globe get restructured. However, there are numerous constraints on the PSUs for getting approvals for formation of Joint Ventures and alliances. There are also restrictions in terms of the area of business in which it can set up a Joint venture. The PSU Boards therefore should be empowered to take decisions with regard to strategic alliances, acquisitions and mergers and no Government clearance should be required for joint ventures, including those set up abroad.

e) In the Post-liberalisation era, compared to the other companies operating in India as well as abroad, SAIL has maintained a larger than required work force. Steel being a capital intensive industry, labour has to be treated as a variable input and will call for re-examination of labour laws. SAIL is at significant competitive disadvantage in terms of manpower productivity and it is a potential cost dis-advantage in future. In the short term, certain off-setting concessions from the State need to be provided for the excess labour till an optimal balance takes place through Voluntary Retirement Schemes [VRS], redeployment and judicious recruitment. Apart from this, there could be a national policy of skill enhancement for the excess manpower for rehabilitation in future. There should also be legislative changes to avoid forced absorption of contractual manpower.

It is inevitable that the public sector is throwing a challenge of privatization and restructuring. In the intervening period, however, we have to devise ways of imparting it the requisite financial and functional autonomy. The Government's avowed objective of disinvestment from PSU is a step in the right direction. Far reaching changes will have to be made first to derive maximum benefits from the disinvestment process. What is needed, therefore, is fresh thinking on the whole gamut of issues concerning the public sector particularly its relevance and desired directions of change.

Public Sector Competitiveness

This presents the following scenario:

1) The expectations from PSUs have changed from an economic and social responsibility to purely financial profitability.

2) Globalization and liberalization affected the performance of not only PSUs but private sector also.

3) Autonomy granted in the form of Navratana – what is required is to give freedom to implement M&A and exit non-core areas, close unviable assets, reduce manpower etc.

4) To perform, a level-playing field desired and not a totally unprotected environment.

5) Performance of public sector is to be judged in an environment of competition and liberalization. SAIL has been facing the full brunt of a market forces with increased capacities facing declining demand. Unlike PSUs in the oil and power sector, SAIL has yet to face competitive pressures.

6) PSU has the potential to compete the private sector (as in steel). However, their structure impedes their performance.

7) SAIL has a competitive plan which includes wide-ranging financial and business restructuring, tackling issues of hiving-off non-core areas, power and oxygen plants etc. Divesting/closing unviable units like ASP, SSP, ICO, VISL etc. and reducing manpower substantially. Support required from the shareholders i.e. Government, labour unions and polity towards the success of this Plan.

8) Mature sectors like steel, require structural changes – therefore mergers and acquisitions to be freely allowed.

9) With privatisation inevitable, it is important to restructure the PSUs to derive maximum benefits in terms of increased value-creation.

□

Revitalizing the State: Options for India

Pradip N. Khandwalla

Successful experiments in governance the world over suggest a number of options for revitalizing the Indian state. These include options for achieving fairer representation in the legislature, for selecting in good and selecting out bad candidates for election, for professionalizing politics, for stabilizing fragile governments, and for professionalizing political executives. Based on the lessons of successful efforts in several Commonwealth and East Asian countries, options are discussed concerning the revitalization of the Indian bureaucracy. These include creative fragmentation of the monolithic bureaucracy, options for strengthening the responsiveness of public agencies to the public, options for revamping justice, options for energizing the management of social development, selective privatization, and selective deregulation.

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As assessment of the performance of the Indian state after Independence suggests an above-average performance marred, however, by several ominous dark spots. The strengths appear to be the institutionalization of democracy; a federal structure with governance at several levels; an independent judiciary; a mixed economy; economic planning that funnels increasing resources to poverty alleviation, human resource development, and infrastructure development; and a highly effective, phased liberalization of the economy that has removed some of the shackles on India's collective creativity. The main weaknesses appear to be political instability; a soft state; corruption and criminalization of politics; an inefficient, corrupt and slow-footed bureaucracy; a lethargic judiciary, and excessive regulation, especially by the various Indian states. But successful experiments in governance the world over do suggest a number of options for public deliberation and possible adaptation for revitalizing the Indian state.

Options in Revamping the Political System

At the minimum, a democratic political system must ensure that those who are elected reflect, as far as practicable, the preferences of the voters.Beyond this minimum, a good polity should select in capable, honest, and committed candidates with a strong sense of public purpose for election, and select out incompetent, corrupt, and mercenary candidates. One more upward step is that the legislators create a stable government that runs the course of the people's mandate. A still further step towards excellence is that those who become political executives are highly qualified to be so,

At the minimum, a democratic political system must ensure that those who are elected reflect, the preferences of the voters.

are accountable for doing their jobs, and are enabled to do their jobs well. A priori there are no perfect solutions for these requirements, but a number of options can be thought of for consideration.

Fairer Representation

In a pluralistic society like India, important interests and segments get to be grossly under-represented in the legislature because of this winner-take-all system. When a party getting less than 50 per cent plurality of the votes polled gets a nearly two-thirds majority in the parliament, as it interprets this as a massive mandate for far reaching changes, including changes in the constitution, then the letter of democracy is respected but not its spirit.

In a pluralistic society like India, important interests and segments get to be grossly under-represented in the legislature because of this winner-take-all system.

A viable option is to reduce the size of the present constituencies, say to a third, have elections by proportional representation so that around 500 members of an "electoral college" are elected, and have these 5000 in turn elect from amongst themselves through some such device as a number of regional constituencies, 550-odd members of the Lok Sabha, again through proportional representation. Proportional representation at both stages of the election process would ensure that those elected reflect the choice of the people more faithfully than at present. Some functions could be earmarked for the electoral college, such as it being convened by ratify constitutional amendments made by the parliament, and for an annual review of the union government's performance in terms of the directive principles of state policy contained in the constitution. Such a proportional representation option as the foregoing could also be considered for election to the state assemblies and to the district and village panchayats. The fairer representation—a proportional representation system tends to ensure also tends to obviate the demand for minority representation through separate electorates and reserved constituencies.

An interesting option has been tried out in Germany to ensure fair representation (Reddi and Sunder Ram, 1991). Every voter has two votes: one for the candidate and one for the party of his/her choice. Each party's votes in a region are aggregated and the various parties get representation in the legislature in proportion to the votes they poll in the region. Each party's representation consists of those of its candidates that win directly, and others out of a list provided by it to the election authorities prior to the election. But the party gets proportional representation only if it wins at least 5 per cent of the vote or win in at least 3 constituencies.

Choice of candidates

One possibility is for the country's Election Commission, to gather basic information on each candidate that would be useful to the electorate, and disseminate it through the media to the electorate. The information sought and disseminated could relate to the person's age, educational qualifications, occupation, work experience, record of any public or social service, platform, record of any criminal or civil suits/convictions, income and wealth, tax status, connections of the candidate and his/her immediate family members with any firms or companies or other organisations, etc. Alternately, a special Professional body could be set up to do the job. Selecting in "good" candidates is tougher than selecting out "bad" ones. Some of the biggest barriers to "good" citizens contesting elections are financial. Capable persons are often successfully employed. Fighting elections imposes heavy costs-not only the costs of electioneering, but also if elected, the costs of foregoing earnings while serving as a legislator, costs of keeping in touch with one's constituency, costs of fighting elections to get re-elected, etc.

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Political Professionalism

Creating an effective political system is as much a priority of a young democratic state as strengthening the economy or ensuring social justice or creating an effective administrative system. A malfunctioning political system inevitably affects negatively the other three enterprises. The political system is a powerful interest articulation and conflict resolution mechanism. It also oversees administration, and makes an often insensitive bureaucracy responsive to local needs or special needs of specific groups. It is also a powerful social policy making instrumentality, one with a monopoly of legislative enactment. Very large resources of the state are allocated by the political system to national priorities. These functions require a high degree of profes-

sionalism. As of now there are virtually no mechanisms or institutions for training politicians to perform these functions effectively.

Creating an effective political system is as much a priority of a young democratic state as strengthening the economy or ensuring social justice.

Professionalization in the management of political parties is necessary to improve the political services they provide to society. An important step can be to provide state funding to significant political parties in return for greater financial transparency and greater intra-party democracy (Sridharan, 1997). For instance, parties that are able to get at least 5 per cent of the vote in national, state, or local elections may become eligible to receive partial state funding for operations at the respective levels. The latter could be in the form of an annual maintenance grant to cover (partially) such costs as establishment costs, costs of grassroots work, training of cadre, media costs, costs of organizing meetings and rallies, etc. But in return the party receiving funding should get its accounts audited, file accounts for public scrutiny, elect office bearers, keep a register of members, be transparent in disclosing the contributions and donations it receives, have a transparent and democratic process for selecting candidates to fight elections, pledge its allegiance to the Indian constitution, etc.

Stability in Government

In India, keeping an elected government in power for the course of the people's mandate is becoming a serious problem at the local, state and national levels. After 1996, for instance, there have been several changes of government at the centre, none lasting more than a few months. Coalition government in a pluralistic society is perhaps inescapable, but with shifting, opportunistic alliances that frequently fall apart, the stability a government must have to carry out the people's mandate is in jeopardy.

Where the executive branch of the government is seen as an agent of the legislature, and the society is pluralistic, with multiple parties and factions, the problem of instability becomes acute. One option is to make the fall of government contingent on, not a simple majority of legislators voting against it, but a higher percentage, say two-thirds. Thus, even if the government suffers defeat in the legislature, it can remain in power unless the margin of defeat exceeds the specified percentage.

Another option in a pluralistic society with a Westminster style government is to have a consociational state (Lijphart, 1982) in which two or more major parties, representing major segments of the population agree formally to share power on a contractual or even constitutional basis. There is a formal sharing of major posts like president, prime minister, speaker, ministers, even judges and senior bureaucratic posts. The system has been tried in variants in Lebanon, Israel, Bolivia, etc. (Lijphart, 1982).

An even more daring option is for the legislature to appoint a ministry on a contractual basis. Such a ministry, like the top management team of a corporation appointed by the corporate board which is elected by the shareholders, may hold office for a fixed period, say 3 years, with a formal mandate from the legislature to implement the policies and programmes decided upon by the legislature. The difference from a Westminster-style system would be that the ministers need not be members of the legislature, need not be elected to the legislature, and need not hold office at the pleasure of the legislature.

These options are not perfect, but they do tackle the problem of governmental instability. A wider discussion of these options may lead to such changes in the present system that facilitate both executive stability and accountability to the legislature.

Professionalism of Political Executives

Politicians are not necessarily good political executives. The Indian political executives-ministers-tend to have backgrounds that enable them to be successful in politics, not backgrounds that enable them to take managerial and strategic decisions. A study of some 15 union (central) government cabinets between 1947 and 1989 revealed that the average cabinet member was reasonably well-educated (over 85 per cent were at least graduates, and about 8 per cent had Ph. Ds). Most (66 per cent) were from an urban area; upper caste (63 per cent); likely to be social and political workers (62 per cent); and more likely to be lawyers (41 per cent) than any other profession (Pai Panandikar and Mehra, 1996). Few cabinet ministers had backgrounds in such occupations as business management or management of trade unions, cooperative societies, voluntary organizations, or institutions. Any attempts to provide managerial training pertinent to political executives could improve the quality of political management. The US political executives—the president, governors, members of the cabinet-have each fairly sizeable publicly funded staffs of experts, like economists, statisticians, pollsters, scientists, technologists, etc. Modern political management is quite complex, involving as it does a

consideration of short, medium, and long term implications of decisions, and impact on a very large range of social and economic groups along a variety of dimensions. The decision support system that has evolved in Egypt to aid cabinet level decision making is the kind of aid that could be very useful in India also (El Sherif and El Sawy, 1988). Such a system identifies the goals of individual ministers or even the cabinet as a whole, seeks out the relevant data, constraints, and other information, develops computer-based system simulations, and provides answers to a range of questions such as what would be the consequences of alternative power tariffs, or tight versus loose monetary policy, or alternative foreign exchange rates. Although the Indian cabinet system is one of collective accountability, each minister individually also has accountability to the head of government for the proper conduct of his/her ministry. There is, as of now, no formal mechanism for ensuring this accountability.

One possibility is that the minister's performance would be assessed at the end of the year. Some such system was institutionalized by President Park of the Republic of Korea in the sixties and seventies (Campos and Root, 1996). A formal performance assessment by the political chief executive can provide a powerful incentive for the ministers to perform well, and in the process enable them to pick up important political management competencies.

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Revitalizing the Indian Bureaucracy

Attempts to reform bureaucracy have commonly not met with success (Caiden Gerald E, 1991). In India, too, over the years, several consultants, committees and commissions have been set up to revamp bureaucratic administration (Dave P.K., 1973). These include the consultation with Paul Appleby and A.D. Gorwala in the fifties, the monumental Administrative Reforms Commission in the sixties, and the Sarkaria Commission in the eighties. There also have been numerous studies by the Staff Inspection Unit, the Organisation and Methods Directorate, the Department of Administrative Reforms, the work study units in various ministries, and studies at the level of the states. The feeling persists, however, that only cosmetic changes have been achieved, and that the bureaucracy still retains its diffuse responsibility, excessive scrutiny and excessive blocks to taking action, too little systemic review of actions taken.

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Bureaucratic Performance

This has been depressing in India and elsewhere, and bureaucracy has widely been resistant to reform attempts. However, the striking and on the whole successful attempts at transforming bureaucracy in several countries like Malaysia, Britain, Singapore, Canada, Australia, and New Zealand (Kaul and Collins, 1995), like India all Commonwealth countries sharing many bureaucratic traditions, gives hope that the Indian bureaucracy too can be transformed. There is also the example of several East Asian countries, notably Japan, Korea, and Taiwan, in which bureaucracy seemed to develop commitment to economic growth, transcended its short term, narrow interests, and helped these countries achieve very high growth rates (Campos and Root, 1996). The cumulative lessons for India seem to be the following:

1. It is vitally important to institutionalize meritocracy in the bureaucracy. Recruitment on the basis of tough civil service examinations and a good academic record is one option. However, the abilities tested for must be relevant to the developmental and other roles the bureaucrats are expected to perform. Remuneration needs to be merit-based, as in the U.K., Malaysia, etc. (Commonwealth Secretariat, 1995).
2. Differentials for similar work in the public and the private sectors need to be kept fairly narrow. These differentials (Business Today, 1996) have increased hugely in India after liberalization, especially at middle, senior, and top management levels. It is worth remembering that in Singapore, the governmental pay scales are fully comparable to those in the private sector, and are indeed higher than in the US (Campos and Root, 1996, ch. 6). Singapore also happens to have one of the most efficient and honest public service systems in the world.
3. There has been a very determined effort 23, 24 in the countries like UK and Singapore with ef-

fective bureaucracies to (a) decenetralize authority (b) insulate administration from political influence and (c) strengthen accountability and personnel policies for performance. Meritocracy, decentralization, and accountability cannot work without appropriate monitoring of bureaucratic performance.

4. A culture of providing high quality services to the public and of being responsive to their requirements needs to be inculcated in the Indian bureaucracy. In Malaysia and in UK the government sought to do this through its Excellent Work Culture Movement launched in 1989 (Commonwealth Secretariat Study: Malaysia, 1995). A monitoring agency 28, 29 as consultative panels have been established.

5. As several Commonwealth states have demonstrated, especially Malaysia, there is huge scope for increasing public sector productivity and innovativeness. At the same time the simplest strategies for increasing productivity—that of laying off "surplus" staff-cannot be resorted to freely in India in the absence of a welfare state and unemployment compensation. Yet a lot can be done through training, office automation and computerization, the development of productivity indicators, selective privatization of public services and activities, and handsome rewards linked to productivity. Innovation can be spurred, as in Malaysia and Singapore through quality circles and rewards for innovation (Commonwealth Secretariat Study: Malaysia, 1995a). Scrutiny exercises, as in the UK, can uncover very many opportunities for innovation and cost cutting (Commonwealth Secretariat: UK, 1995).

Bureaucratic Fragmentation

In India, as elsewhere bureaucracy is highly segmented and differentiated, yet it remains monolithic in terms of fairly standardized recruitment procedures, promotion norms, salary structure, rules for conducting business, procedures for responding to various contingencies, accounting and audit requirements and the like.

So long administration remains embedded in monolithic standardization, uniform personnel administration, routinization, hierarchy and so on, the kind of local adaptations, innovations, and responsiveness to citizens that are required may not materialize. Fragmentation of most of the stat bureaucracy into numerous relatively highly autonomous bodies that, however, remain accountable for pursuing the public purpose becomes necessary. The administrative technology for doing this has evolved in a number of countries, especially Britain, and a number of case studies indicate the quantum jump in innovativeness and responsiveness to "customers" when government departments and agencies are delinked from the monolithic state. While these agencies have a high degree of autonomy, public accountability is ensured through the device of the framework document signed by the professional head of the executive agency and the relevant government official to whom he/she reports. If the delivery of service falls short of agreed commitments, the job of the head of the agency could go on the block. It has been possible for the British and other governments to transfer out to executive agencies a very wide range of governmental functions. It has been made compulsory for these agencies to include performance-linked pay in all new pay agreements, and these agencies have the freedom to negotiate with unions the extent of the performance-related component of pay. Most agencies can also design their own salary structures, and can contract out some of their operations.

A striking example of how successfully authority and responsibility to an executive agency can be extensively devolved without loss of public accountability is provided by Britain's Employment Service. It is an agency with some 50000k employees. Earlier it was part of the British bureaucracy but was turned into an executive agency in 1993. It was set up with a framework document or charter which specified its basic function ("manage the delivery of services and programmes to help people into work") and conferred on it the authority to act for the government in relation to functions described in the framework document.

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The annual performance agreement of the Employment Service for 1995-96 spelt out the objectives and targets of the agency. For instance, for the object "To offer unemployed people, particularly the longer-term unemployed and others at a disadvantage in the labour market, help and advice in finding work or appropriate training". The performance agreement also specified the way the monitoring and reporting on progress vis-a- vis targets would be done, such as "At the end of each financial quarter the Chief Executive will provide infor-

mation on performance against each target in the quarter within 15 working days and report on progress in achieving the targets and variances from profiled performance and expenditure within 25 working days." The performance agreement also summarized the jobseekers' charter (citizen's charter), specifying what the Employment Service aimed to do and what its clients could expect the Employment Service to do.

The Employment Service is just one of a large number of executive agencies that have transformed the British state through fragmentation without loss of public accountability. If the administration is fragmented in this fashion, there may well be a leap in effectiveness. Once the Indian bureaucracy is fragmented in this fashion (that is, by setting up relatively autonomous agencies with specified public accountability), a good deal of management know-why and know-how can be applied to revitalize each unit. Selection of executives can be based on merit and on their potential for growth. Performance reward systems can be instituted that are custom-tailored to the needs of each unit.

A great advantage of the fragmentation of the bureaucracy into autonomous agencies is that it would create an opportunity for the abundant managerial talent in India to be harnessed for public purposes. So long as the central services occupy all the commanding heights in Indian public administration, the possibility of harnessing the vast managerial talent in the private sector for nation building tasks may remain largely unutilized. Fortunately, the union government corporate public sector was opened up at its top echelons to professional management from outside the governmental ranks on a contract appointment basis. This professionalization seems to have been beneficial, for the profitability of the central corporate public sector has been on the rise, from a negative return on capital employed in 1980 to 2.7 per cent in 1985, and 4.5 per cent in 1989 (Agrawal and Varma, 1997). However, the SOEs owned by the Indian states are still treated as a preserve of the Indian Administrative Service. There are about a thousand of them, and overall they remain loss making (Mishra and Nandgopal, 1990). They are plagued by political interference (their board chairpersons are almost invariably politicians) and short tenure of their IAS chief executives.

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Public responsiveness is weak in the Indian bureaucracy. Samuel Paul has provided examples of mechanisms employed in several countries to strengthen the responsiveness of agencies (Paul, 1995). For instance, the Government of Singapore set up a Division of Public Feedback to gather systematic feedback on various national policies and to invite interest groups to make representations in high level public hearings. These are beyond the normal legal and bureaucratic mechanisms of audit, parliamentary sanction for budgeted expenditure and scrutiny of actuals, etc.:

1. Value for money audits could be conducted to examine whether government money is spent economically, efficiently, and effectively in delivering services or in discharging functions.
2. Standards of service to be provided by public agencies could be publicized so that citizens could take legal or other recourse in case they are not satisfied. Also, grievance redressal procedures could be publicised so that disputes in most cases do not have to land up in courts.
3. Citizens could be given the right of suing individual civil servants and make them financially liable for violations of public interest or negligence.
4. "Voice" mechanisms could be developed, such as public hearings or deliberations, to get inputs from the public and users of public services about intended legislations or policy changes. Especially at the time of farming the budget, wide-ranging consultations with various stakeholders could be organized.
5. In designing various developmental projects or programmes, participation of intended beneficiaries could be especially elicited to ensure a better fit with their needs.
6. Public agencies and projects could be periodically reviewed and assessed by external non-governmental experts.
7. The autonomy of public agencies could be increased so as to increase their capacity to respond to the needs of the public; they cannot then plead lack of powers to respond to these needs.
8. "Exit" mechanisms could be created, that is, alternative suppliers of public goods/services, to break the monopoly power of public agencies.
9. Memorandum of understanding between the

public agency and the government department it reports to could be institutionalized for most agencies.

10. By public agencies charging for their services, greater resources would accrue to them. Also the users would exert greater pressure for getting appropriate services.

11. Special courts, such as courts for handling grievances of citizens with public agencies, could increase public accountability.

Having public agencies staffed by those with greater "customer" orientation should contribute to better service.

Revamping Justice

Justice is another area in which administration in India is poor. Millions of cases have accumulated and delays are endemic. One way of reducing the burden on the justice system is to reduce the number of allowable appeals to just one (Mitra, 1994). Another way to speed up justice is to grant stays of execution for only a limited period and only a limited number of times. Ombudsman has been tried out in India in several states though yet with limited success (Jha, 1996).

Perhaps the most effective way of reducing the burden on the court system of work-related disputes is to strengthen the grievance redressal machinery in corporate bodies. Many disputes at work-between employers and employees, between employees—can be resolved at the worksite itself with a fair grievance redressal machinery.

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Management of Social Development

The mismatch in India between the tasks of social development on one side and the personality of the administrators and the itinerant character of their postings on the other require action on several fronts. First of all, social developmental tasks require concentrated attention for a long period of time by administrators who are committed to these tasks. A "generalist" collector or district magistrate overseeing 30 different developmental tasks and projects during a year's tenure is no way such concentrated attention can be provided (Sohoni, 1988).

Development has to be owned by its beneficiaries to become sustainable. The various developmental projects in a district can be coordinated by the relevant local self-government, such as the district panchayat. In the state of Karnataka, for instance, meaningful decentralization has been achieved through law by the government (Raghavulu and Narayana, 1991). Village-level elected committees or gram sabhas have been set up to review development programmes for the village and select intended beneficiaries. Then there in the district-level elected body called the zilla parishad, with a per member constituency of around 30000, again with reservations and elected office bearers. Although a substantial devolution of development funds and authority may, in the short run, lead to more waste and corruption, democratic local control may in the long run lead to greater self-regulation and self-reliance, capability development, stronger institutional base, and more broad-based and participatory decision making, leading to sustained development and socio-economic transformation. Experience with developmental projects does indicate that people's participation contributes to the effective implementation of developmental projects (Jain, 1995).

Selective privatization

Many countries all over the world—the US and the UK being outstanding examples—have profitably contracted out many public services or inputs into public services (Clarkson, 1989). Not only substantial saving have frequently been made, the customers generally seem, as in Japan, to feel that service quality has gone up. A very wide range of public services can be contracted out in a country like India in which managerial and entrepreneurship capabilities in the private sector are so abundant. These can range from services related to utilities (e.g. lighting) to maintenance of public facilities, health services, educational services, cultural and recreational services, belling, inspection, transportation, security, etc. (Clarkson, 1989, pp. 182-183). Obviously, safeguards must be created against corruption, nepotism, and so forth, and the process of allocating contracts must be transparent. Contracts must be reasonably specific vis-a-vis price, quality, safety aspects, arbitration etc. Further safeguards may be customers' panels to assess periodically the quality of service provided by the contractor. It there are any job losses on account of contracting out services, these can be minimized by having the contractor absorb a certain percentage, say 80 per cent of those made redundant, and by giving first preference to the remaining in future additional recruitment, etc. Government pay scales of

those absorbed by the contractor may be protected. For the remaining, attractive and fair reparation terms can be offered, or some further public services can be contracted out to those made redundant.

Indeed a modest amount of privatization has been attempted in several Indian states, some resulting in substantial savings (Sundaram, 1997). Garbage collection is being partially managed in Chennai, Bangalore, Ahmedabad and Hyderabad by associations of local residents; balwadis and community halls have to an extent, been entrusted to community associations in Mumbai, Indore, Vijayawada, Vishakhapatnam, etc. Certain amount of contracting out of services has reportedly resulted in substantial savings. The potential for such savings throughout urban India is, of course, much vaster.

There are also large opportunities especially in cities for effectively privatizing certain governance functions in India such as registration of births, deaths, marriages, vehicles, etc. These relate especially to the areas of registration, certification, licensing, and justice. A wide range of certifications, now provided with much inefficiency, delays, and corruption, could be provided by appropriate institutions and associations. For example, the management of various industrial estates housing hundreds of industrial establishments could be entrusted, with certain safeguards, the task of certifying establishment could be entrusted, with certain safeguards, the task of certifying compliance with various safety and pollution control regulations. One safeguard could be that the registering or certifying mechanism should have representatives of the government, local labour, employers, and members of the local community. Another safeguard could be that the license to certify could be for a fixed period, and renewable on the basis of satisfactory performance. A third safeguard could be audit of the organisation on a statutory basis (like those of cooperatives, registered societies, and companies). Such attempts at involving private institutions into governance functions, selectively and with due safeguards, can not only reduce the administering burden on the state, reduce corruption, and improve service to the community, but also strengthen associational democracy, and disseminate public purpose in private institutions. Rural areas, too, offer opportunities for privatizing some government functions. In several rural areas there are healthy cooperative societies for credit, farm inputs, etc. These can take up some of the registering, certification, and licensing functions.

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Selective Deregulation

In the name of protecting the public interest and furthering it, the Indian state installed a massive number of regulations during 1955 to 1990. So much time and energy of government officials was taken up in implementing them, so badly many were implemented, such hardships these regulations imposed on citizens and enterprises, and so much corruption they bred, that many did not look worthwhile at all. Some of these regulations were eliminated or sharply curtailed in the wake of liberalization in the nineties. But a lot more deregulation is feasible. Competition and incentives are often (but not always) good substitutes for regulation, and even where there is need for regulation, the option of self-regulation by the targets of state regulation needs to be examined carefully.

Several countries like Japan, South Korea, Singapore, Malaysia, UK and Thailand have used the mechanism of deliberation councils of representatives of the government bureaucracy, industry, labour, and financial institutions (Campos and Root, 1996). These not only discuss policy issues, but also provide feedback to the government as to unnecessary or cost-ineffective regulations.

Vanquishing Corruption

Corruption is the subversion of the public interest for private gain. Corruption corrodes the public good in many different ways. Corruption erodes the legitimacy of public institutions and sharpens social conflict because the system is perceived to be unfair by the have nots and the victims of corruption. Social conflict in turn may lead to state repression and further social alienation. It diverts "easy money" to wasteful consumption or low priority investment such as in gold, real estate, and deposits in foreign bank accounts.

Otherwise it has silverlinings like the distribution of the spoils of corruption may dampen strife among the political and bureaucratic elites. On the whole, however, corruption is a cancer that weed and destroys order, equity, and development. As David Gould and Jose Amaro-Reyes put it: "There seems to be little doubt that under conditions of systematic or widespread corruption economic efficiency, together with political and administrative performance, declines below optimal levels

and thus lowers general welfare" (Gould and Amaro-Reyes, 1983; Rashid, 1981).

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Corruption in Developing Countries

Corruption in insidious like AIDS. It has been sapping the vitality of most developing countries. Several researchers, including particularly Gould and Amaro-Reyes, have documented the many forms of corruption in developing countries (Gould and Amaro-Reyes, 1983).

Gould and Amaro-Reyes have identified several conditions that breed corruption in Third World settings:

1. High government intervention in the economy, leading to a rapid growth of public bureaucracies, regulations, and monopoly power of officials and rise in opportunities for corruption.
2. Relative instability or precariousness of government which makes politicians and civil servants try to make hay while the sun shines. Also, a weak conception of nationhood and national interest, rise of the soft state marked by social indiscipline, and unscrupulous private sector.
3. Poverty, high unemployment, widening disparities in living standards; rise of parasitism.
4. Strength of kinship loyalty, nepotism, and other social norms and practices and affiliative orientation that conflict with rational bureaucratic norms in hiring, contract awards, location of projects, etc.
5. Rigid and slow-footed government structure, decision-making processes, personnel management practices, and administrative control and accountability systems, giving rise to the prevalence of speed money.
6. Lack of effective modes of monitoring transactions at lower levels.
7. Large salary differentials within the government and vis-a-vis the private sector also breed corruption. In 1969, reportedly salary levels were so low in Ghana that public sector employees could not afford a balanced diet even if they spent their entire income on food!

Dolly Arora had identified some further facilitators of corruption that hit hardest the poor and the disadvantaged, such as mystification of the extent of authority of officials, discretionary authority vested in civil servants, absence of information to citizens about their rights or erosion of these rights by arbitrary practices, secrecy in the actions of officials, deliberate creation of obstacles to the access citizens have to powerful officials so that middlemen can collect bribes on behalf of these officials in return for access (Arora, 1993). Paul has identified some additional general factors fueling the pandemic of corruption in India (Paul, 1997). One is the monopoly power of most government regulatory and service agencies, often in combination with discretionary authority of officials that can be misused. The second is lack of effective accountability of government officials, especially when their own superiors are colluding with them to fleece the public. Accountability is often weak also because of inadequate measurement of agency performance or because the performance reporting system is weak. The relative weakness of a public service orientation in officials is another factor that fans corruption. Often the citizen is only weakly motivated to fight corruption because he/she encounters corruption only episodically rather than regularly. In the absence of reliable information as to who the other victims are, organized bodies to fight corrupt systems seldom arise.

Control Corruption

Deregulation is one way of reducing corruption because regulation sharpens the conflict between public and private interests and creates incentives for bribing to waive or ease the force of regulations. But deregulation, too, can sharpen a conflict of interest-between groups of citizens or institutions or citizens and institutions—and create an incentive for the strong to exploit the weak. Cutting back on development expenditure has negative consequences for the economy's growth rate. Similarly, there are usually many leakages in poverty alleviation expenditures of the state and according to a former Indian prime minister, only 15 per cent of the funds spent by the state on poverty alleviation reach the targetted poor. But cutting back poverty alleviation expenditures may deny the poor the meeting of even their

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minimum needs. Nonetheless, corruption can be controlled as achieved by Hong Kong (Campos and Root, 1996, Ch. 6). Hong Kong offers an interesting example of the setting up of elitistic Independent Commision Against Corruption in Hong Kong helped in this process. Whole the staff of ICAC. On the had high salaries get they did not have the kind of job security associated with government service. They could be dismissed on suspicion of wrong doing.

The Commission had extensive powers of investigation. It could examine bank accounts of those suspected of corruption and their safe deposit vaults. It could examine their acquisition of property and other expenditures, liabilities, and repatriation of funds outside Hong Kong. It could question them on oath. It could restrain them from disposing off their property. It could arrest suspects without a warrant.

Indian Scenario

An impressive range of mechanisms has been employed in India for fighting corruption (Chakravarthy N.S., 1990). In particular, a Vigilance Commission has been set up with constitutional authority and considerable independence, with a Chief Vigilance Commissioner and state-leveel officials. The function of these is to investigate instances of wrongdoing and bring them to the notice of approriate authorities. Vigilance officers are appointed in every government body. The Central Bureau of investigation has been set up to investigate and prosecute wrongdoing by public officials, including politicians. In recent years, as the dimensions of corruption in India have become frighteningly clear, the courts have become more aggressive in combatting corruption, to the point of permitting or even directing the prosecution of very powerful politicians. Some Indian states have set up the institution of Ombudsman, though the results so far not very promising. The press, of course, quite frequently and persistently exposes corruption. The government has been appointing from time to time commissions to enquire into scams or specific instances of the misuse of authority for private gain (Maheshwari, 1990). Election laws outlaw corrupt election practices and one Indian prime minister lost her seat in parliament (temporarily) while she was convicted of the charge of unfair election practices. Handsome rewards for officials who catch evasion of customs and excise duty, in the form of a percentage of the amount recovered, has also yielded some positive results. Perhaps the most effective blow to-date against corruption has been dealt by deregulation and liberalization. The central government began dismantling controls in the eighties and speeded up the process under IMF- World Bank pressure in the nineties. Taxes were also brought down.

Several additional approaches are worth considering. First, there is a great deal of pointless regulation at the level of the state governments that can be dismantled. Dozens of permits and annual certifications are needed for businesses to operate. Some simple steps like extending the duration of the permit and reducing the frequency of required certifications, as in Malaysia, would significantly bring down corruption (Commonwealth Secretariat Study: Malaysia, 1995). Transferring the issue of some of these permits and certifications to non-governmental bodies with high social credibility, too, could help. Second, the machineries of the state like the Vigilance Commission and the Central Bureau of Investigation, need to be more pro-active in identifying on a systematic basis the levels of corruption in different parts of the state. One way this can be done is to set up panels of users of public services, and to poll them periodically on the extent of perceived corruption in each such service.

The third approach is for each public body to create a watchdog agency from among its employees and the users of its services for "whistle-blowing". Such a watchdog agency would alert the management of the public body about likely cases of corruption, weaknesses in the system that promote corruption, etc.

The fourth approach is for citizens to form users associations (encouraged by the state) for each public service in each local area to exert pressure for fair practice and against malpractice. Once individual users know that a body will take up cudgels on its behalf, they are more likely to resist pressures for bribes.

Case for a Corporate State

Corporatism amounts to private and public governments participating in one another's decision making (Gill 1981). Corporatism usually involves representation of interest groups in the state's decision making structures. The corporate state is decline in the states of the West, which are turning increasingly towards laissez faire, but it originated in the West and was considered quite legitimate in its various forms in Europe in the 19th century and even in the early part of the 20th century.

The key aspects of corporatism are that it favours collaboration between the state and the private sector, collaboration within the private sector, the participation of the state in the affairs of private sector associations, and the participation of the latter in the state's decision making systems, especially strategic decision making systems. In theory at least, such corporatism makes sense when a country has overriding priorities such as rapid socio-economic transformation and underdeveloped institutional capacity. In such circumstances

it makes sense for all the major institutions of society—the state and its organs, and major trade, industry, and labour associations—to underplay adversarial relations and work instead towards cooperation for achieving national priorities. Post-war Japan's deliberation councils illustrate the mechanisms involved.

Japan's extremely rapid economic growth from 1954 to the seventies was in no small measure due to the collaboration between the Japanese state and business, in Japan's drive to catch up with the West economically, through growth paced by growth of non-traditional exports. The Japanese deliberation councils, consisting of representatives of industry, and in some cases labour and consumers, and with the participation of government officials, operationalized this relationship. Typically, one or more councils were established by each government economic ministry to coordinate the functioning of some of its bureaus with business. There were two kinds of deliberation councils: the first related to functions like industrial rationalization or finance or pollution; the second related to specific industries or sectors such as chemicals, automobiles, or steel.

Many of these deliberation councils closely worked with the Ministry of Trade and Industry (MITI), which played an extremely important coordination role in promoting. Japan's industrial growth. For forming a new policy or changing an old policy, typically MITI would convene hearings and get the views of various parties. An integrative draft would be prepared, which after vetting by an appropriate research group in MITI, would be submitted as a report to the appropriate deliberation council(s). Various views expressed in the council(s) by representatives of industry, labour, financial institutions, academics, consumers, etc. would be incorporated into a modified report prepared by the appropriate research group. Finally, MITI would announce the new policy to the public, explaining its objectives and justifications. Although the deliberation councils were advisory rather than decision making bodies there were several occasions when MITI abandoned a proposed policy change when there was serious opposition in the relevant deliberation council.

There is a strong case for the Indian state to tilt towards corporatism. Such corporatism as in Japan, involving participation, consultation and the use of incentives rather than state coercion, could enable India to reach high levels of investment in priority sectors, and pursue, like Japan, a vigorous exports-led growth strategy involving the rapid penetration of world markets through non-traditional products. Japan's success in this strategy is noteworthy. Japan's competitive advantage in the fifties was mainly in textiles, plastic products, and pottery.

For India to move towards greater corporatism should not be too difficult. Its Planning Commission played to some extent the role of corporatism in the fifties to eighties by allocating the shares of the private and the public sector in total investment. The state's policy of reserving certain sectors for SOEs, some for small scale industries, etc. also was a form of corporatism. But during the sixties and seventies there was an adversarial relationship between the state and big business, recourse to very high levels of taxation, and excessive regulation of industry, and so India did not reap the benefits from corporatism that Japan and several East Asian countries did.

It is not too late, however. Numerous deliberation councils can be set up in which government, industry, labour and other interests can be represented, not only to share information and views, but also to evolve national strategies for promoting rapid industrial and exports growth, and for tackling problems of transition to an industrial society.

In a corporatist state, comprehensive economic planning may not work well. While some planning for achieving specific long term targets may be very useful, rigid, centralized planning may breed, as in the Soviet Union and indeed in India during the sixties and seventies, a vast regulatory bureaucracy that extends the state beyond its governance capacity. Instead, planning could be indicative (Agarwal 1983), as in Japan and France, and focus on urgent priorities: poverty alleviation, rapid industrialization, exports-led growth, improvement in infrastructure, human resource development. Greater flexibility and opportunism should be useful in a rapidly charging world, and indicative short to medium term planning targets that emerge through extensive deliberations in deliberation councils would be much more feasible than targets that are based on unrealistic assumptions. Vast new opportunities are rapidly arising in terms of technological developments and emergence of large new markets. Corporatist rather than comprehensive planning can enable a rapid Indian corporate response to these with the state's backing. For instance, thermal power plants have been the primary means for increasing India's power generating capacity. This has expected a big toll in terms of CO_2 and other harmful emissions. But there has not been a vigorous enough response to technological developments that enable the economic tapping of a host of non-conventional, relatively more eco-friendly sources of power like wind, tidal, solar, geothermal, biogas, and nuclear energies in which India has huge potentials.

Concluding Comments

The performance of the Indian state after inde-

pendence has, on the whole, been satisfactory, and appears to be improving fairly rapidly in recent years. But there are dark spots that need cleansing. The Westminster-type winner-take-all system is not working either in terms of providing fair representation of the people's wishes in elections or in providing stability of political governance. Options in proportional representation, and in providing greater stability to elected governments, such as a stronger presidency and consociational democracy, need to be evolved. Options in direct, deliberative, and associational democracy are also worth evolving. Operational or mandatory training for candidates standing for elections, the scrutiny of their credentials by an independent body, partial state funding of elections and political parties, training of political executives and an accountability system for political executives are some other options for improving democratic functioning.

Corruption in another very dark spot. Although India is not alone is being an unclean state, corruption needs to be tackled much more aggressively. Apart from the presently institutionalized mechanisms—the vigilance and prosecution machinery, the courts, the press, Ombudsman, incentives for catching wrongdoing, and liberalization by the union government—much effort needs to be made to get rid off irksome controls and regulations, especially at the level of the states. An information system that involves the participation of the users of public services needs to be evolved to assess the level of corruption in the different parts and agencies of the state. Remedial actions are likely to be more effective with speedier and more reliable information related to the level and forms of corruption.

How does a vast system develop self-corrective mechanisms? One strategy is to decompose the vast system into numerous relatively autonomous sub-systems that are loosely coupled with one another and with the central authority. Thus the blending of decomposition, competition, public accountability, stakeholder participation in decision making, and professionalism may be an effective strategy to build into the autonomous components of the vast state strong self-corrective capability. In the context of India, substantial deregulation, privatization, fragmentation of the bureaucracy into semi-autonomous executive agencies with professional heads and charters that set out their accountability to the government and to service users or customers, demonopolization, and stakeholders councils for each semi-autonomous body may greatly aid the resilience of the sub-systems and the viability of the state. In the same vein, empowerment of local and regional self-governments with autonomy and expertise, with funding tied to their democratic functioning and public accountability, should also be beneficial. If global benchmarking by the bureaucratic sub-systems and the local and regional governments can be institutionalized for such areas of working as management systems, the use of information and communications technology, processes of decision making, training and empowerment, the results may well be truly magnificent.

Substantial but selective deregulation (as well as appropriate regulation needed to protect the public interest) can also improve the quality of governance, One interesting option that needs to be widely discussed is how regulation could be devolved on suitable private institutions without loss of public interest. Such a privatization could disseminate in the private sector higher levels of public interest awareness and also bring to the administration of regulation greater transparency and effectiveness.

Extensive but selective privatization of public services, and to a lesser extent selective privatization of state-owned enterprises offer further options for improving the quality and efficiency of governance.

Economic planning and a certain amount of state corporatism may be inescapable for a poor society like India in which cooperation between the public and the private sectors is as vital for long-term development as competition in the market place. But alternatives to comprehensive state planning and its rigidities need to be evolved, such as indicative planning and planning of the pursuit of a few strategic priorities like alleviation, literacy, population control, infrastructure development, human resource development, and exports-led growth. Deliberations councils, as in several East Asian countries, for bringing together government, industry, labour, consumers, and financial institutions for evolving priorities and strategies is also an option worth considering.

The model of the Indian state that has emerged in these pages is partly similar to the model of the World Bank enunciated in the World Development Report 1997. The points of similarity are vis-as-vis the importance of an efficient, more sharply focussed state, the wealth creating role of the private sector, healthier and freer markets and less regulation, more economic liberalization, more privatization, greater importance of NGOs and other private associations, more rule of law, greater priority to investment in infrastructure, human resource development and the provision of public goods, control of corruption, and so forth. But there are also significant differences: much greater attention to strengthening democracy; continuing importance of planning, but with suitable modifications; creative fragmentation of bureaucracy; much stronger corporatist role of the state; the importance of powerful integrators; the necessity of a strong but effective corporate public

sector; the importance of innovation and experimentation, and above all, the primary role of the people and their representatives rather than external agencies in designing and shaping the state.

The hub of a precarious federal state needs to be strong. As the Sarkaria Commission pointed out ".... under Indian conditions, a strong centre is necessary not only to protect and preserve the independence, integrity and unity of the country but also to coordinate a uniform integrated policy on basic issues of national concern (Markandan, 1991). If the centre does not hold, a blood-dimmed tide will down the ceremonies of the parts of the state and an anarchy will be let loose upon the Indian people. The hub must be strong, and the spokes that bind the outer parts to the hub must be strong too. A stable, democratic, truly representative government at the centre, overseen by professionalist political executives who are assisted by a professionalist bureaucracy, and both the political and bureaucratic elites being committed to rapid economic development and serving the public interest, are indispensable, for a firm, legitimate, and credible hub.

How extendable are the options and innovations considered for India to other states? All, or at least some, depending upon the circumstances. States resemble one another because of some reasons and differ from one another because of others, At the minimum all states share certain functions – law and order, justice, enactment of legislation, macroeconomic management, internal and external security, foreign relations, provision of minimum civic amenities, and so forth. Therefore, all states must develop the structures and systems that enable them to discharge these functions (Parsons 1949). The options and innovations one state considers in discharging these functions can be considered by all other states for appropriate adaptation. The expenditure for discharging all these functions comes from the finite financial resources of the state, so that every state has to develop mechanisms for establishing priorities, making budgetary allocations in terms of these priorities, and mechanisms of control, coordination, and accountability for spending public funds. These mechanisms are meant to knit together the diverse activities, systems and structures of the state (Lawrence and Lorsch, 1967). Here too, the mechanisms of integration and coordination used by any state can also be relevant to the other states.

Thus, participatory decision making that involves the major stakeholders, the induction of professional with the requisite expertise in the decision making process, the emphasis on teamwork, flexibility, free form interaction and so forth that represent an organic (as opposed to mechanistic) mode of management may significantly increase the quality of conception and implementation of strategic choices. Periodic review and evaluation, course correction, and organisational learning from the experience need to be designed into the implementation process (Khandwalla, 1978). The form of leadership also may matter a great deal. Research indicates that across several cultural settings a leadership style that emphasizes concern for task accomplishment as well as the satisfaction and well being of those involved in task accomplishment differentiates high from low performance units. (Rensis Likert 1961 and others, 1966 and 1980), it also indicates that transformational leadership that projects a bold vision, emphasizes core values, articulates a noble mission, empowers subordinates by inspiring and supporting them, and by giving them more autonomy and freedom of action differentiates high from low performance organisations (Bennis and Nanus, 1978).

Summary

There appears to be a layering in the extendibility of the options and innovations relevant to one state to others, Those that are worth considering for the core functions of the state are most widely applicable, and even the best states may have a thing or two to learn from the innovations in the other states. Those options and innovations that are relevant to functions central to the type of the state – developmental, welfare-interventionist, market friendly, businesslike – are more likely to be relevant to the states of the type than to those of other types. For true excellence, however, creative adaptation and innovation rather than mere replication may be essential, supplemented by careful planning, review and control of implementation, synergistic auxilliary choices, participative, professionalist, and organic modes of management and decision making, and task oriented but humane, visionary, and empowering sort of transformational leadership. The effective scanning of the relevant reference group of states and benchmarking with the best in this group, learning creative adaptation, and innovation are likely to be the principal keys to state excellence.

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Competitiveness of Public Sector in India

R.K. Mishra

This paper discusses the significance of competitiveness in public sector and its present orientation with regard to competitiveness. Public sector is an amorphous term. It includes in its scope, government departments, departmental enterprises and autonomous public enterprises. The present paper, takes into consideration only the last category of public sector. The competitiveness of public sector would determine in great measure the competitiveness of Indian economy in the globalization era. Needless to add that public sector suffers from low degree of competitive orientation.

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Introduction

India is in throes of a rapid economic transition. The past record of the country can only be of marginal support to help it write new economic equation, entitling it to march to a new millenium and realise the visualisation that its founding fathers had stated in the Directive Principles of the Indian Constitution. The country has to prepare itself for the fundamental economic transformation not only to join the group of economies leading the world, but also to develop a new self-adjusting framework providing continuous opportunity to its economy for organic growth. Competitiveness, is the litmus test in the present era of globalisation and internationalisation. All sectors of any economy have to qualify in this test. Public sector in India, cannot be an exception to this.

Further, public enterprises in India include both the Central public enterprises (CPEs) and the State level enterprises (SLPEs). According to some studies, even the enterprises owned and managed by the local bodies are included within the ambit of public enterprises. For the purpose of the present paper, we have mostly dealt with the CPEs. However, reference has been made to the SLPEs wherever necessary. Public enterprise is a vast economic aggregate. We have therefore referred to sectoral or individual cases to drive home our point.

Why Competitiveness?

Competitiveness is a basic element of the new economic paradigm endorsed by market economy framework and global institutions. Competitiveness optimises allocative efficiency and provides sinews for self-sustained growth. Competitiveness is taken to mean a higher growth in turnover and market share, value-addition, technology adoption on the one hand and relative efficiency on the cost and price fronts on the other.

Public enterprises in India, employ an investment of Rs. 5,00,000 crore composed of Rs. 2,00,000 crore in

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the CPEs, Rs. 2,00,000 crore in the SLPEs and Rs. 1,00,000 crore in the departmental and local level public enterprises. They contribute to about 45 per cent of the capital formation. There are 243 CPEs, 1100 SLPEs and about 100 departmental and local level enterprises. Much of the technological transformation that has taken place in the country has come through these enterprises. The wide and diversified range of goods manufactured and services provided by these enterprises include, bakery products, coal, steel, transport and power, automobiles, heavy electrical equipment, life and general insurance, banking, educational consultancy and trading. There is hardly any major sector of economic activity where public sector is not present. It is therefore necessary that public enterprise in India acquire competitive orientation to put the country on a new trajectory. Unless this happens, we cannot join the club of countries achieving self propelled growth.

Public enterprises in India have grown in a protectionist framework. They have devised creative financial strategies and technical efficiency parameters to ensure their survival. They justified their continuation in the name of import substitution. The concepts such as economic resource protection (ERP) and domestic resource saving (DRS) were used to support their operations. This could not stand valid for long as these could not substitute the price competitiveness. With the opening up of the economy, now they face an increased threat from the private sector and global economic forces. These enterprises have to devise perforce a new analytical framework to evaluate the effectiveness of their operations. Unless they opt for such a change their existence is wide exposed to the competitive forces. Their failure is likely to upset the national apple-carte resulting in a setback to dominant aggregates such as employment, demand, savings, exports, current account deficit and fiscal deficit to mention a few.

Competitive Orientation and Status

The present orientation of public enterprises towards competitiveness, takes into account parameters such as accounting and financial practices, operations management, labour, cost and research and development.

Table 1: International Comparison of Customer Orientation

	Product Quality[1]	Product Design[2]	On-Time Delivery[3]	After-Sales Service[4]	Managing Distribution[5]
India	41.08	34.05	30.27	41.08	52.43
Brazil	52.39	56.62	36.34	39.15	51.83
Thailand	63.00	58.50	57.00	54.00	66.50
South Korea	60.71	48.57	59.29	47.14	57.14
Canada	68.13	58.06	62.19	62.50	66.45
USA	59.67	69.84	62.62	57.70	74.43
Japan	92.68	81.46	93.17	89.76	72.20
Germany	92.50	71.39	88.06	78.61	75.83
France	55.94	66.96	44.64	45.56	66.09
Netherlands	72.89	63.11	69.78	68.44	74.76

Notes:

(1) Companies are rated 0 = poor, to 100 = excellent.

(2) Includes styling and packaging. Companies are rated 0 = poor, to 100 = excellent.

(3) Companies are rated 0 = poor, to 100 = excellent.

(4) Companies are rated 0 = poor, to 100 = excellent.

(5) Managing channels and distribution. Companies are rated 0 = poor, to 100 = excellent.

Source: Derived from tables in factor III, The World Competitiveness Report 1990, IMD and World Economic Forum, Lausanne, Switzerland.

Table 2: International Comparison of Human Resource Development

	Vocational Training[1]	Skilled Labour[2]	Worker Motivation[3]	Labour Flexibility[4]	Managerial Initiative[5]	Management Education[6]
India	35.68	64.86	42.16	24.86	60.54	66.49
Brazil	36,62	43.43	53.52	54.65	60.56	49.30
Thailand	45.00	47.00	70.00	63.50	70.00	58.50
South Korea	47.14	59.29	57.86	49.63	67.86	47.14
Canada	39.68	49.06	53.75	47.19	61.56	63.75
USA	48.20	53.44	56.39	64.26	73.67	68.85
Japan	78.50	61.94	84.39	67.80	72.20	59.51
Germany	68.89	50.00	68.06	39.72	72.78	56.94
France	51.18	42.90	51.01	28.99	64.64	59.71
Netherlands	53.33	52.44	64.00	36.44	67.11	53.78

Notes:

(1) Extent to which ongoing job training meets the requirements of a competitive economy: 0 = inadequate, to 100 = adequate

(2) Ready availability of quality skilled labour: 0 = not at all, to 100 = a great extent

(3) Willingness to identify with corporate objectives and priorities: 0 = low, to 100 = high

(4) Willingness of labour force to re-locate, retain and/or assume new work functions: 0 = not willing, to 100 = willing

(5) Managers' sense of drive, responsibility and entrepreneurship: 0 = low, to 100 = high

(6) Extent to which institutions adequately prepare executives for needs of business: 0 = not adequately, to 100 = adequately

Source: Derived from tables in factor V, The World Competitiveness Report 1990, IMD and World Economic Forum, Lausanne, Switzerland.

The accounting and financial practices adhered to by these enterprises are by and large based on the framework developed by nodal institutions such as the Institute of Chartered Accountants of India, Institute of Cost and Works Accountants of India, Institute of Chartered Secretaries, Ministry of Finance, Reserve Bank of India, Securities and Exchange Board of India etc. The content of accounting and financial policies is largely influenced by some legislations such as the Indian Companies Act, Banking Companies and Regulations Act and the Enabling Acts under which the statutory corporations were set up.

In the case of some SLPEs, wide discrepancies are found between the figures reported for an accounting period and the text connected to the financial statements. In the case of some SLPEs, though the accounts were duly certified by the internal Auditor, Commercial Auditor, Statutory Auditor and the Comptroller and Auditor General of India, the two sides of the Balance Sheet did not match when figures were computerised. Some CPEs follow inconsistent accounting policies. They twist the policies to present an exaggeratedly sound financial picture. The Oil and Natural Gas Commission Ltd. and the IPCL, and several other enterprises have been held accountable for this lapse. Most of the enterprises do not revalue their assets and provide for contingent liabilities. They resort to unfair practices of exaggerating turnover and profits.

In the case of SLPEs, the accounts are not prepared and finalised in time. They have been found to remain in arrears for a period of 1-17 years. The international audit virtually does not exist. In a study commissioned by the Power Finance Corporation at the behest of the World Bank, it was revealed that the internal and departments in the State Electricity Boards are either non- existent or dormant. They are staffed by unqualified and untrained personnel.

The cost norms have not been developed by many CPEs. Similarly, the cost audit is not effective. The variance analysis is not carried out periodically and there is an indifference towards analysing the causes of variance and initiating remedial action to rectify such cases. The materials cost and the associated wastages are found high. The energy costs exceed optimum levels. For instance, as against 7-8 per cent of energy costs, in the private sector, the CPEs have recorded energy costs of about 12 per cent. The energy audit in the case of Mishra Dhatu Nigam Ltd. revealed three times more the consumption of energy than warranted. Excessive stocks of stores and spares are maintained to prevent standstill. The labour costs are abnormally high in the range of 12-15 per cent on an average. High profit earning enterprises are associated with low labour costs, howering around 5 per cent and less of the turnover. Though the global insurance and banking industry incur less than three per cent as wage and salary costs, the Indian insurance and banking industry incur a high level of wage and service cost of about 15 per cent. There is a universal trend to adopt full cost pricing. The new technique such as incremental costing, activity based costing and strategic costing have still to find a wider acceptance. The costing decisions sometime overlook even the fundamental concept of contribution. If these were to be applied in time, a large chunk of enterprises would have made sound costing decisions and ensured the continuation of a large gamut of such activities which had a positive contribution over a period of time.

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Instances are galore where unhealthy financial practices are followed. There have been instances of using discretion to the ultimate disadvantage of the enterprise. To circumvent the payment of dividend and to show a high earnings per share (EPS), funds equity rate shown by an enterprise as advance made towards equity. The Debt-Equity ratios increased the financial risk so much so that some public enterprises lost all their gross margin to meet the interest charge and thereby turn into the red. As opposed to this, in some cases excessive equity was provided leaving the enterprise unable to make the balancing act to approach the capital market on account of abnormally high proportions of debt. The National Aluminium Company Limited is attempting an exercise for the reversal of such a pattern. The Steel Authority of India Limited (SAIL) has been engaged in such exercise for quite some time. In fact, the concept of one time debt-equity ratio stands discredited now and enterprises go on changing this in search of the optimum. Though some of the CPEs are corporate majors, they have not been listed on the Indian bourses to encourage trading in the shares of disinvested enterprises. The Government of India and the Securities and Exchange Board of India (SEBI) required them to get listed. However, many such enterprises pleaded their inability to comply with the exhaustive listing norms.

Public enterprises suffer from rampant over-manning. The total deposits of the commercial banking system in India is about Rs. 9,00,000 crore. This sector employs about three lakh personnel. The Bank of Belgium, headquartered at Brussels, manages a deposit of

10,00,000 crore with about 10,000 personnel. The quantity of steel produced by SAIL by 3 lakh employees, is produced by similar organisations globally by about 30,000 employees. The Indian enterprises in general have been found lower in the realm of Human Resource Development (HRD) on vocational training, skilled labour, productivity linked wages, worker motivation, labour flexibility, managerial initiative and management education. This holds true even with public enterprises. It has been found that in the case of lower levels of management, no worthwhile plans are formulated especially at the shop floor level and supervisory levels to train them. Even executives at the junior, middle and senior levels are not sent for training to the best enterprises in their respective fields. Very little time is spent on training top management and the money spent on training is not treated as worthwhile investment. Bharat Heavy Electrical's Limited's (BHEL) example of accounting of human resources needs to be emulated by the rest. The labour flexibility has not made inroads mainly because of indifference to multi-skilling and appropriate HRD administration. Flexi-tinings have not been introduced. Managerial empowerment has not received much attention. For instance, even in the case of corporate planning and the MOU, the bottom up or top down approaches have not received the due attention. The public sector wage committees including the Mohan Committee and the Ranganath Mishra Committee paid scant regard to productivity linked wages. In Japan, USA and several other countries, basic wages is a very small component of the overall wage structure. The performance linked wages are a crucial component of the total wages. The application of this system in the case of the Jaipur Metals and Electricals Ltd.—A Government of Rajasthan Cooperative Enterprise, transformed it from a sick to a financially healthy enterprise.

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The absence of hire and fire has also led to low productivity. Article 12 of the Indian Constitution, deprives a public enterprise to benefit from this system. The new developments such as issuance of stock options or performance based rewards and promotions, barring a few enterprises are yet to be introduced. Management education is considered a good investment proposal by reputed corporates. In Japan, the chief executive has to spend one-third of his total time in management education and development. Though there are about sixty in-house training institutions in the case of CPEs, their functioning does not qualify for much appreciation. Some of them are extinct and non-operational. The huge enterprises like BHEL, SAIL, COAL companies etc., could have collaborated with management institutions to launch suitable educational; programmes. Recently, the Indian Bankers Association, is collaborating with the Indira Gandhi National Open University, to launch a three-year post experience programme in banking for its fellow members.

Operations management provides a great leeway for developing competitiveness. First comes the question of technique. Instead of production by shifts public enterprises could plan their production through group technology and continuous production schemes. They may even like to outsource some of their operations or go in for global location of their production facility. The National Mineral Development Corporation (NMDC) is planning to buy mines in Zimbabwe. The designing and engineering aspects pull down public enterprises in terms of excellence and call for good deal of learning. The vendor selection, vendor development and supplier relationship are the parameters on which public enterprises are competitively very low. The importance of supply chain management is yet to be realised. The operationalisation of this concept can help public enterprises in both the project implementation stage and when the project is on stream. The maintenance is another neglected aspect. The public sector jute mills in Tripura have to wait for months to get stores and spares air-lifted from Calcutta for maintenance. The poor maintenance of aircrafts by the Indian Airlines and Air India cutting into effective operationalisation of flight schedules is a well known fact.

Public enterprises are found to be abysmally low on marketing. The growth of turnover is static. Normally their capital employed to turnover ratio is 1:1 as against 1:3 in the case of the private sector enterprises and 5:1 recorded globally. Their market shares are stagnant. Though 20 per cent of the foreign trade (exports) is through the public enterprises, most of it relates to the canalised items. The exports are of residual nature which deprives these enterprises to have a flavour of the developments in the international markets. The international comparison of customer orientation of enterprises in India shows that we are the among the lowest, in product quality, product design, on time delivery, after sales service and managing distribution. The Central and the State level public enterprises conform to these findings. Recently the Steel Authority of India Ltd. was charged with producing inferior quality steel. Several exporters have complained in the past about defective designs of the products of BHEL. A number of public enterprises have been held responsible for non delivery of goods in time. The poor after sales service was

responsible for the steep fall in the sales of consumer electronics and refrigerators produced by Electronics Corporation of India Ltd. and Hyderabad Allwyn Ltd. respectively. The poor customer orientation of the public sector banks is reflected in the increasing volumes of business of the private sector banks. The selling and distribution concepts adopted are not suited for market penetration and maximisation of revenues.

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Research and Development acts both as an engine of growth and stability. In any analysis of R&D efforts, the focus should be on developing the risk taking capacity on account of strategic changes in the market or the enterprise plans to deliberately influence the market. The analysis of the R&D scenario in public enterprises, points out that the R&D expenditure has shrunk over the years from 3 per cent of their aggregate turnover to about 1.5 per cent whereas it has been noted that during the nineties R&D spending has increased in private sector. There is a marked shift in the public sector spending in R&D from basic research to applied research. The case of the Indian Drugs and Pharmaceuticals Ltd. could be cited to show as to how over a period of time the company resigned its supremacy to the private sector companies by ignoring to develop patents and concentrate only on the distribution of bulk drugs.

Framework for Competitiveness

The orientation of public enterprises towards competitiveness and its status makes it evident that bold initiatives are required to be taken to permeate the competitiveness in its fullest measure. The measures to be taken could be classified as strategic, interface and internal measures.

Strategic Measures

Sankar and Mishra (1989, 1990), in their initial and modified matrix suggested the reorganisation of public sector businesses along core and non-core activities. They advocated that enterprises successful in financial terms and operating in competitive markets could be privatised, whereas enterprises unsuccessful in financial terms and operating in competitive markets could be wound up. Enterprises falling in other categories need to be restructured. The Rangarajan Committee suggested departure from the concept of 100 per cent ownership to zero per cent to debureaucratise and degovernmentalise public enterprises. It suggested 26 per cent share holdings for the State to ensure limited control over spatial resolutions brought in general body meetings of the enterprises and 51 per cent to have effective control It suggested 100 per cent for full ownership. The scheme has to be operationalised giving due weightage to importance of the various public enterprises at the present juncture. The reduction of the Government's share holdings to 49 per cent would free public enterprises from the control of 'saptarishi' and 'trishul'. However, the parliamentarians in India would do well to practice the right of self denial in tabling questions. The role of the Clerk in the U.K. parliamentary system, who is the counterpart of the Speaker in the Indian Parliament, is worth citing as he exercises a microscopic scrutiny in permitting the questions to be asked on the floor of the House. The U.K. has also abolished the Select Committee on the Nationalized Industries. Is not the time ripe that the Indian Parliament abolishes the Committee on Public Undertakings?

To implement the recommendations of the Rangarajan Committee on disinvestment, the Disinvestment Commission was setup in 1996. The Commission has examined the question of competitiveness in public sector. among other things, it has recommended improved systems of corporate governance and case by case modalities for disinvestments. The implementation of the recommendations of the Commission would have certainly improved their performance. The records of those CPEs having gone to market shows that they had the general tendency to outperform BSE-index. However, the indifference to the fullfledged implementation of the recommendations of the Commission coupled with the Government's decision of disinvestment by swapping and cross-holdings and its one-time thinking of warehousing of shares by the public sector financial institutions has depressed their share values and their prices are not moving in tandem with the BSE-index.

The question of reorganisation of public sector businesses calls for a study of further division of activity of each enterprise in to core and non-core, amalgamations and mergers of public enterprises, partnerships—alliances-linkages with national and international firms creat-

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ing a pool of common facilities for research, manpower selection and recruitment, sharing of costs and distribution facilities. The size of an enterprise is emerging as a dominant factor. The recent move to set up Petro-net is an excellent attempt to synergise the activities of the public sector petroleum industry and help the private sector firms in this arena. The recent moves to promote cross-holdings in the equities of the various public sector oil firms is being seen as an effective step to link the upstream and downstream businesses in the public sector oil industry. This is expected to benefit the Indian consumer and provide an alternative to many foreign countries to invite Indian expertise to collaborate with their indigenous industry. The Government of Mauritius is considering to invite Indian oil majors to collaborate in preference to some well established global giants. The partnerships, alliances and linkages are expected to lift the competitiveness of the Indian Industry to the global standards. HMT Ltd. could transform its businesses by such linkages via the joint venture route. This would pave the way not only for the equity or consultancy support, but also prepare the ground for uninterrupted flow of technology and access to international markets. In the case of BHEL and BHEL type firms or SAIL, such linkages with Seimens, Inland LTV and US Steel are likely to bring about a fundamental change in the technology governing their businesses and consequentially their customer orientation and bottom line.

The conversion of departmental enterprises and public corporations into companies would be a much sought after reform. This would put public enterprises on par with the private sector enterprises and ensure a level playing field and a healthy competition between the two. The conversion of the Indian Airlines, Air India, Industrial Development Bank of India, Industrial Finance Corporation Bank of India and Oil and Natural Gas Commission are some cases in point. The recent price-war between the Mahanagar Telephone Nigam Ltd. and the Videsh Sanchar Nigam Ltd. on providing Internet facility supports our contention.

Policy Changes

The Government policy shapes the contours of the success of a firm. Both the Central and State Governments in India have been excessively obsessed with factors constituting the term 'public' than creating a climate favourable for discharging the 'enterprise obligations'. The "Trishul", "Saptarishi", guidelines issued, existing provisions of public accountability and Article 12 of the Indian Constitution, seriously impair not only the policy autonomy but also the functional autonomy of these enterprises. These enterprises have to take the Government's permission to import technology, establish foreign collaborations, access Indian and international capital markets, determine the prices of their goods and services, recruitment and fixation of pay. They cannot even change their articles and Memorandum of Association. The appointment of the Chief Executive and the composition of the Board of Directors and all nominations on such boards are done by the Government. In sum, these are not board-led undertakings. This undermines their competitiveness a great deal vis-á-vis the private sector enterprises in India and the global giants abroad. Recently the Government of India's initiative of identifying some enterprises as Navaratnas and many more enterprises as Miniratnas has been a good departure form the earlier practice. The boards of the Navaratnas have been reconstituted. The first evidence of the functioning of the reconstituted boards reveals an initiation of the shift from procedures to results. However, even in the case of the reconstituted boards, there is a great scope for an enhanced and positive contribution from the Government Directors. Many disinvested companies failed to benefit from reforms because among other things their boards were not reformed. The Memorandum of understanding (MOU) was initiated in 1987-88 to bring about a cultural and interface change in public enterprises. The number of enterprises on MOU has shot up from a mere 4 in 1987-88 to 110 during 1996-97.

The system has undergone a drastic change from its initial orientation of 'contract de negotiation' to 'signalling' system. However, in the absence of accompanying reward and punishment features, the system has not delivered the results. There is a need to examine afresh its relevance as a tool to increase competitiveness.

The guidelines issued by the Government restrained severely the freedom of public enterprises. The N. Vittal Committee suggested the deletion of 762 of the 892 guidelines issued by the Government. It recommended modification of 25 guidelines and retention of only 105 guidelines. In the present context of the marketisation, there is a need to control the performance of public enterprises by results.

The policy changes cannot be a one-time measure. They have to be continuous and long term. The Government of Japan enhanced the competitiveness of their enterprises for all the times to come through a series of short, medium and long term measures. We suggest a matrix of measures for developing competitiveness in public enterprises (Table 3).

Internal Measures

A reform of the internal mechanisms may provide a gold mine to enhance the competitiveness. The optimal

Table 3: Policy Matrix for Developing Competitiveness in Indian Public Sector

Short Term	Medium Term	Long Term
Enterprises		
a) Environment scanning: niche determination technology monitoring.	a) Establish MITI type agency for promoting cooperation and competition in the domestic market.	a) Modernise national infrastructure for the next century.
b) Develop competitive incentives and instruments to guide public enterprises to new product domains.	b) Develop market–driven policy instruments rather than regulatory control to influence industry decisions.	b) Develop a national industrial focus.
c) Coordinate activities of organisations that monitor international trade, technology and competitiveness.	c) Update the status of Institutional environment: release bureaucratic control and facilitate/promote innovation.	c) Rethink strategies for the organisation of labour in future.
d) Train bureaucrats in specialised fields eg., manufacturing and services.	d) Enforce quality standards (eg., ISO 14000) for all domestic industrial transactions.	d) Develop new mandate for scientific institutions: emphasis on commercial spin-offs and diffusion of innovation to other sectors (eg., space, defence, etc.).
e) Develop instruments to train labour in advanced technology.	e) Develop social and environmental priorities based on domestic needs and concerns.	
	f) Promote infrastructural industries.	
	g) Emphasise development of efficient logistics.	
Institutions		
HRD		
a) Update technology and management programmes by developing courses in emerging areas.	a) Coordinate development of technology and practices across different industries, eg., machine tool and textiles.	a) Develop new products and process to strengthen existing and related industries.
b) Develop cooperation between technology and management programmes.	b) Monitor trade practices within domestic producers.	b) Play a proactive role in designing future of international trade and liaison with similar trade associations in other countries.
c) Update skills of trainers	c) Develop sectoral data banks on performance of industries.	c) Setup technological parks.
d) Introduce extensive use of computers in curriculum.	d) Develop sector-focussed programmes.	d) Create focussed research centres and develop horizontal linkages between such centres.
	e) Conduct joint research with industry and assist in technology transfer.	e) Provide services to other developing nations.
	f) Set up pilot projects on technology innovation in conjunction with trade associations.	f) Provide services to other developing nations.
	g) Design consulting and training programmes for small and medium manufacturers.	
	h) Set up vehicles for dissemination of knowledge in manufacturing management, eg., research journals, industry workshops etc.	
Industry		
a) Adopt dynamic practices based on world class services and manufacturing paradigm.	a) Develop expertise in strategic management of manufacturing at firm level.	a) Adopt a new strategy of continuous process.
b) Redesign organisational structures: integration of functions in the firm and emphasise inhouse innovation.	b) Invest in updating skills of workforce in technology and managerial effectiveness.	b) Invest in technology.
c) Become more responsive to domestic consumer's needs.	c) Develop linkage with educational and research institutions.	c) Participate in national infrastructure
d) Increase R and D activity in India.	d) Participate in the evolution of standards at ISI.	d) Development
	e) Develop environmentally viable products.	e) Setup focussed commercial research centres.
		f) Develop a strategy of joint development of technology (technology consortia).

performance through internal action could come through systemic changes such as commercial orientation, effective management information systems, computerisation, integration of work force with organisational mission, culture building, bench marking, adherence to environmental norms and value-addition. Among these myriad of measures, we propose to expand on bench marking and value-addition.

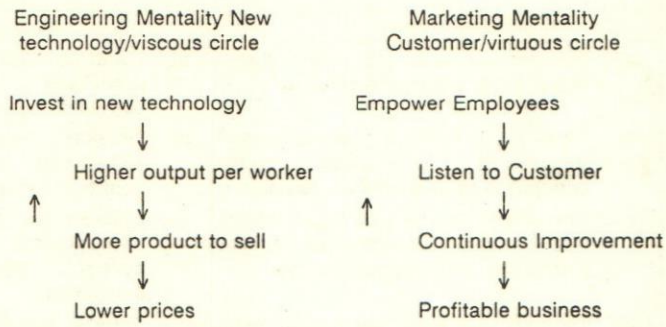
An intensive application of bench marking could act as a powerful tool to enhance competitiveness. A dissection of the financial and physical performance along some well established industry bench marks increases our understanding of the quantitative and qualitative gaps leading to rebuilding of physical and financial structures and germination of new cultural genes. For instance, any study in bench marking would reveal that energy consumption in integrated steel plants in India is far more than the Kawasaki Steel Plant, Japan. As compared to 0.8 per cent of the total energy consumption in integrated steel plants in Japan, the integrated steel plants consume 7.84 per cent in steel making in India. Energy accounts for about 40 per cent of the total cost of the steel production in India, while it is about 28 per cent in developed countries. 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.

An intensive application of bench marking could act as a powerful tool to enhance competitiveness.

To enhance competitiveness public enterprises have to replace their engineering mentality by substituting in its place the marketing mentality which will alter the focus from achieving the targets to continuous improvements:

The benefits that public enterprises can derive through value addition need to be driven home more intensively. Firstly, each activity should be taken up only in the case it adds to the value. It has been found that in the case of some public enterprises, the wage costs per employee exceed the turnover per employee. To increase competitiveness it is further necessary to study how the gains have been allocated among the different heads. What role has been played by different heads in the absolute or relative decline of value-added over a period of time. The various studies indicate a very dismal picture of creation and appropriation of value-added in public enterprise.

Types of Company Focus



Conclusions

The competitiveness of public sector would determine in great measure the competitiveness of the Indian economy in the present era of globalisation and internationalisation. There is no denying the fact that the public sector suffers from a low degree of competitive orientation. On the various parameters of competitiveness it is found to lag behind vis-á-vis the private sector in India and global giants. There is a need to initiate strategic, interface and internal reforms to make Indian public enterprises the front runners in the competitiveness race. This alone is likely to sustain the ongoing liberalisation process.

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Competitive & Humane Labour Market Policy for India

C.S. Venkata Ratnam

Indian labour policies have undergone radical transformation to meet the challenges of globalization and liberalization. This has a tell-tale effect on our economy afflicted with high levels of unemployment and poverty coupled with problems of rapid population growth. The author examines these issues critically in the present paper emphasizing competitiveness and elasticity of demand for labour in particular. He stresses the need for a national competition policy on labour aspects.

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Introduction

In 1950s the newly independent and industrialising India avowed its commitment to the welfare of the workers. It also recognised the need to protect the domestic industry through policies of self-reliance, import substitution and public sector "at the commanding heights of the economy." However, during the 1990s, due to domestic crisis and international pressures the policies of protection, self reliance and import substitution have given way to policies of competition with a view to integrating the national economy with the global economy and to boost foreign investment and exports. The private sector is now reckoned as an engine of growth even as the role of the public sector is being refocused.

Domestic crisis and international pressures, self reliance and import substitution have given way to competition to integrate the national economy with the global economy and also to boost foreign investment and exports.

Thus, till 1991 (or during post-independence, pre-liberalisation era) workers were protected in labour markets through job security and employers were protected in product markets through restrictions on competition, both domestic and foreign. In the post-liberalisation era (1991 to date), unskilled organised labour is feeling less/or un-protected and some employers feel that instead of being able to compete globally they are facing problem even in competing in their own domestic markets. The shift to market economy has resulted in less competition, instead of more competition, in some sectors where mega mergers and strategic alliances have created transna-

tional oligopolies with virtual monopoly in an uneven playing ground.

As Talcot Parson says human beings in every civilisation and at all times pursue both pattern maintenance and adaptation to change simultaneously. One cannot pursue one and leave the other. If the rate of change in the internal environment (national economy/ enterprises) is slower than the rate of change in the external environment, instead of catching up with the other countries, the country can and would lag behind.

The rate of growth in our economy—both during pre- and post- "reform" period—has neither been sustained or sufficient to reduce significantly the existing high levels of unemployment and poverty. The benefits of economic development in the post- independence era did not trickle down since it was only marginally higher than the rate at which our population grew. Trickle down can not be expected to occur unless the rate of growth in the economy is four to five times the growth in population. There is thus a need to boost investment and growth to create jobs and reduce poverty and social and economic inequities.

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Elasticity of Demand for Labour

Michael Porter (1980) who studied competitiveness of industries and nations asserts that there are five forces of competitiveness: entry/exit barriers, competitive rivalry, and power of substitutes, power of suppliers and power of buyers. When there is no competition, labour and management prospered at the cost of customers. When the Japanese and the Korean products entered the Television market, many of the domestic Television brands had suffered extinction. So did workers in those companies. When a substitute for jute was found, jute industry suffered. When the textile mills did not modernise or diversify, they suffered. While most other textile mills in Ahmedabad were either closed or are in the brink of liquidation, Arvind Mills in the same city continues to do well.

The well-known four laws of elasticity of demand for labour (Marshall, 1930) merit consideration here: (1) Technological possibility of substituting other inputs; (2) Elasticity of demand for the product of labour; (3) Proportion of cost spent on labour; and, (d) Elasticity of supply of other inputs. The combined impacts of the four determinants of labour make the demand for some categories of labour (such as airline pilots and others with rare skills) far less elastic than the demand for other categories of labour (such as unskilled workers in most industries). The latter category of workers suffers most due to structural changes. This is unavoidable to an extent in an economy with large pool of illiterate, trainable workforce, widespread poverty and pervasive unemployment/underemployment. Laws and labour administration would be weak in protecting labour. Minimum wage laws would be ineffective. Trade unions impact on wages would be marginal in such cases.

Global Competitiveness of Indian Labour

Table 1 presents the sorry situation with regard to human resources as a source of competitive advantage (IMD, 1998). India is second to none in terms of its skilled workforce. The problem, however, is that it is woefully inadequate to meet the country's needs. Technology increases the demand for skilled labour. ILO asserted, based on UNIDO industrial statistics data base for the year 1997, that in India the share of employment in high skilled manufacturing industry as a percentage of total manufacturing employment increased from 30 per cent in 1980 to 34.6 per cent in 1993. In future, the study noted, it is not always that "higher" skills are required, but different skills definitely are. Job losses may be more due to skill gaps than due to competitive pressure on costs.

Table 1: Global Competitiveness of Indian Labour

Item	Scale*	Rank**
Country has abundant labour force	6.77	1
Average workers are unproductive	2.94	51
Hiring and firing practices are severely restricted	2.16	53
Labour regulations impede adjustment of working hours to meet changes in demand	5.05	8

* All questions have scale from 1 (lowest) to 7 (highest)

** India's rank amongst 53 countries ranked in the 1998 Global competitiveness Report.

Source: 1998 Global Competitiveness Report.

Labour market interventions in India should therefore aim at skill development and generation of productive employment rather than protection of redundant and/or unproductive jobs.

There is evidence to suggest that legal restrictions

to adjust workforce so as to provide higher job protection have had adverse effect on job creation itself. Even the critics of this argument would agree that this is a factor, if not the factor. In Malaysia, legislation recognises recruitment, transfer, promotion, work assignment and work adjustment as the employer's rights. In India none of these are considered employers rights and are subject to collective bargaining and litigation. Yet, labour market in India is as flexible as in Malaysia. In a near full employment situation, before the recent crisis, employers in Malaysia were reluctant to freely use or abuse the rights given to them under the law for the fear that if they lose a qualified, trained and experienced worker, it would be difficult to get another.

In several cases it might that we could have created five times more jobs with the amount spent on protecting unproductive jobs. Given the unemployment situation, the efforts to protect the jobs of existing jobholders through retraining and redeployment would be at the cost of taking away the jobs from the new/fresh entrants into the market. Instead of creating credible systems of compensation and social security and other measures to mitigate/avert the adverse impact of macro economic job risks, artificial barriers are created at tremendous social and economic cost.

Balanced Perspective

Labour market policy should balance the interests of the social partners. If one were to merely look at labour market, one would be concerned more by considerations of illiteracy, poverty and unemployment. When one looks at the product markets, one would notice the trend towards increased competition, and the pressure to cut costs and/or adds value. Workers/ unions harp on labour markets and employers focus on product markets. The labour market impact is a function of the interaction between product market and labour market forces. In quite a few situations industry and product market characteristics strengthen the employers and weaken or make the unions vulnerable. In some others both will be left with limited choices/options and become defenseless, vulnerable or endangered. In the first set of industries employers can marginalise the power of trade unions through parallel production, outsourcing, etc. In the latter set of industries, input costs might be rising and output prices falling, squeezing both labour and management and leaving both with limited options. They are damned if they cooperate. They are damned if they do not. Labour management partnerships in some cases can become suicide pacts in do or die situations. Given the lack of labour market flexibility, such dilemmas lead to dithering behaviour and the preempted the potential for timely and proactive responses from both the labour and the management. It must, however, be said that labour market flexibility is a factor, not the factor. Poor physical and weak social infrastructure may have added to the problems in our labour market. Input and infrastructural bottlenecks reduce the job and income earning opportunities. Recent experience of India's export performance in the post-liberalisation period reveal that the industries which did well—software, gems and jewelry and clothing—were the ones which have competitive advantage in labour and skills. They were also—unlike the engineering industry, which is facing serious recession domestically—less dependent on inefficient domestic input producers and infrastructure providers.

Labour market policy should balance the interests of the social partners. Looking at labour market, one would be concerned more by considerations of illiteracy, poverty and unemployment.

At the minimum what the investors, particularly the foreign investors, expect is:

- A clear enunciation of the rights and responsibilities of employers and workers/unions;
- Unambiguous and easily understandable legal and institutional framework;
- Predictable arrangements concerning union recognition, collective bargaining, skills development, flexibility and workforce adjustment;
- Well-defined, clear-cut and time-bound procedures for grievance redressal; and
- Administrative and judicial system that can be trusted for its transparency, integrity, expedience, efficiency and accountability.

While different countries have different critical moments in history and pursue divergent industrialisation strategies, it is usually observed that "a less developed country begins the process of industrialisation by creating some initial conditions conducive to investment. In industrial relations terms, it may translate to low wages and low unionisation. This situation may attract initial investments by firms which can take advantage of such labour market conditions. However, with increased investment, the initial labour market conditions inevitably change and there are pressure for higher wages and possibly unionisation... This reduces the initial ad-

vantage which attracted the new investment in the first place so other inducements are needed in order to retain attraction investors. This creates a critical juncture in the development process and places pressure on the existing industrial relations systems (Lansbury, 1996). The State at this stage may introduce measures such as wage controls and union repression or, alternatively, take recourse to upgrading skills and linking wages to productivity and shift to high wage, high value industrialization where workers get higher wages but wage costs become competitive. Wage controls can not be prolonged and union suppression by itself can not guarantee economic success (Porter, 1988).

From the workers/unions point of view, labour policy and labour law should stress support for:

- the observance of a minimal number of core/basic labour standards;
- free trade unions and collective bargaining;
- workforce institutions capable of internalizing the enforcement of labour standards/government regulations and effecting changes at micro level smoothly;
- investment in education and training;
- bringing the entire labour force under the purview of minimal, but effective – rational and rationalised – regulatory/administrative framework;
- proactive labour market policies that provide for building skills/competencies reducing/eliminating the existing mismatch between acquired and required skills, facilitating information and counselling facilities for employment; and
- a culture of non-interference by one party in the affairs of the other party.

Cooperative relations between labour and management are necessary to align the interests of individual employees with that of the organisation through creative and innovative solutions to vexing human problems by integrated win-win approaches that take into account not only the sectional gains of labour and management, but also the other interest groups in the society. Firm's ability to adjust to new business pressures will be contingent on the quality of employment relations at the workplace.

Workplace industrial relations systems should facilitate change, promote flexibility and prepare the workforce to be able, adaptive and attuned to respond to the emerging challenges.

Role of The State

The State's role extends to regulation, guidance and correction of the market forces. The content and the purpose of labour policy and labour law should move away from regulation to facilitation, reaction to pro-action and dispute resolution to the creation of harmonious relations conducive to social and economic development.

Labour policy should focus more broadly on development of the entire labour force. Labour policy must be more closely aligned to changes in industrial and other policies. Labour policies should provide stimulus to, rather shun, job creation.

The scope of labour policy and labour legislation should be broad-based to cover the unorganised sector in a more substantive manner than what is currently being done. In India over 90 per cent of the labour is still unorganised and unprotected.

The State should shift away from the negative role of dispute resolution to the positive role of promotion of sound labour-management relations. Statistics on strikes and lockouts may not tell the whole story about the state of industrial relations either at the firm, industry, State or national level. The State should provide infrastructural and institutional support base for intermediary services of mediation and arbitration as discussed elsewhere in this paper. Academic experts and other independent persons could also be included in tripartite forums. While the Government has already taken the initiative to rationalise and restructure tripartite committees, there is a further need to reform the manner in which the tripartite meetings are conducted.

The State should shift away from the negative role of dispute resolution to the positive role of promotion of sound labour-management relations.

Sustaining growth and fostering competitive labour markets are critical to ensure job and income security. There is a need for a fundamental change in employment and income security measures. The concept of bankruptcy is not accepted in India, where jobs are treated as property with attendant hereditary rights in some employment contexts. Aspects like recruitment, transfer, promotion, work assignment, workforce adjustment and the debates on the whole range of employment flexibility need to be considered dispassionately with due regard to both employment and social stability as well as business imperatives. Job security at any

cost, regardless of the viability of the enterprise which provides the jobs in the first instance can lead to counterproductive work culture. The State should consider it as its obligation to eradicate poverty and end unemployment through creation of productive jobs which do not sacrifice the basics of quality of life. Here labour intensive industrialisation strategies become appropriate and the options should be different in existing business vis-á-vis new and emerging opportunities in the farm sector, bio-technology, software, etc. One should also take into consideration the vast indirect job potential those, developments in telecommunications, etc. has created instead of merely focusing on the job implications in a handful of organised sector industries. During the transition period, foreign/new investment may generate marginal job growth[1]. Therefore parallel domestic/public investments should target areas where job potential is high. Telecommunications revolution caused some anxiety to the concerned workers because new technologies are less labour intensive. Yet, in the past one decade STD/ISD booths may have created nearly five million jobs and during 1998-2008 teleworking – remote data processing itself – is expected to create over a million jobs.

Labour Law Reform

In a global economy labour law as an autonomous subject stands at cross roads. Some of our judges feel compelled to interpret law not by the content, but by the intent. It is possible for some judges to question the 'new economic policies' as inconsistent with our Constitution which is still wedded to the ideals of socialism. Elsewhere in the world, a view is gaining ground that "The social vision of labour law which went with the old-established institutions and practices had come under challenge to change or risk irrelevance." The time is ripe to strike a delicate balance between the two extreme viewpoints.

Rationalise the Labour Laws

The nature and extent of protection for labour has little to do with the number of laws. Have few laws and secure better enforcement. It is better to have one labour code in the place of a plethora of labour laws.

China and Vietnam, among others, have developed simple and less ambiguous labour codes in the 1990s in the wake of their transition to market economy. There is a scope to rationale our labour laws based on their experience and the experience of other Asian economies. The Labour Code developed by the National Labour Law Association in the 1990s reinforces protection to the workers and offers little to employers in terms of the flexibility they seek and making it attractive to employ more people. still it could form the basis for further discussion and simplification/rationalisation.

China and Vietnam, among others, have developed simple and less ambiguous labour codes in the 1990s in the wake of their transition to market economy.

Since 1991 to date, at some point or other, several state governments have made far reaching changes in their policies. Uttar Pradesh, for instance, required the labour inspector to obtain prior permission of the Labour Minister. Rajasthan granted exemption to several firms and simplified several forms in regard to labour inspection. Orissa and West Bengal have introduced secret ballot. Maharashtra Industrial Relations Act to replace the existing Bombay Industrial Relations Act and Prevention of Unfair Labour Practices Act. Kerala announced radical moves in the labour policies as part of its 1994 Industrial Policy.

The desirability, possibility and feasibility of competitive labour policies merit serious consideration. The industrial relations implications of Centre-State relations, particularly on the public sector undertakings, also needs careful review.

Clarity in Definitions

There is considerable ambiguity in the definitions of terms such "worker, workman and other worker", "wages", "appropriate government", "industry", etc. The same term is defined differently in different legislations. There is a need considering one single, uniform definition for all such terms.

The 1982 amendment to the Industrial Disputes Act, 1947 concerning the definition of "industry" (Section 2(J)) should be notified. Sovereign, administrative and philanthropic activities should not come within the scope of the definition of 'industry' for the purpose of Industrial Disputes Act.

The definition of industrial dispute in Section 2(k) of the Industrial Dispute Act, 1947 provide a vast canvas: "industrial dispute" means any dispute or difference between employers and employers, or between employers and workmen, or between workmen and workmen, which is connected with the employment or non-

1. During the post-reform period private sector employment grew at 1.5 per cent and public sector employment declined by 0.5 per cent.

employment or the terms of employment or with the condition of labour, of any person. Interest issues should be the subject of collective bargaining and rights issues the subject of adjudication. Where the dividing line between interest issues and rights issues is unclear, the decision of the proposed independent Industrial Relations Commission should be final.

Promote Labour Flexibility

A key question in labour market flexibility is workforce adjustment. As the following discussion reveals it have five elements:

1) *Notice:* The notice period ranges from one day to over one year in several countries depending upon (a) length of service of employee; and/or (b) number of persons affected. The longer the period of the service the longer the notice period. The larger the number of persons affected the longer the notice period.

2) *Information:* It is the duty of employers to provide information to the employees and their unions to provide information on what, why and how flexibility and/or workforce adjustment is needed.

3) *Consultation:* Communication and consultation with the affected groups of workers would help the parties to look at the issues from multiple perspectives. It helps them to examine whether there is more than one way of achieving the objective of flexibility and competitiveness. It provides the rationale of proposed actions to all concerned. It also can generate a sense of ownership over the proposed plan of action.

4) *Compensation:* Compensation to affected persons is an essential element of any programme which results in redundancy. The legal compensation is 15 days compensation for each year of service. The compensation under voluntary retirement is usually much higher. Employers are normally willing to pay higher compensation if they are able to do so. Terminally sick and cash starved companies may not be able to do so.

5) *Prior approval of appropriate government:* The law requires 90 days notice and prior approval of the appropriate government. The employers would not have difficulty if the government develops an objective criteria to determine the basis for approval or otherwise. In the absence of any criteria, the discretionary power of the government is arbitrary, dilatory and dysfunctional where such discretionary power is exercised only with concern for the affected persons, not enterprises. Most countries in the world, including the former socialist countries, have dispensed with the requirements of prior permission of the government and now allow employers' to adjust their workforce through layoff of or retrenchment. It is expected that employers exercise this right as a last resort.

Termination of employees for structural, technological and economic reasons was recognised as a last resort by ILO Convention No. 162. The resolution on "Automation without tears" adopted at the Indian Labour Conference in 1957 can not be sustained in the context of discontinuous changes.

Conciliation in individual disputes relating to termination/retrenchment/discharge/dismissal should be optional. Parties should have the option to approach labour courts directly without reference/interference by the government.

There is a perception that the existing laws give virtually veto power to unions in the organised sector to block changes like improvement in plant and machinery, rationalisation of manpower, and growth of productivity. Further there is a perception that labour legislation paved the way for multiplicity of unions, growth of inter and intra-union rivalry, exacerbation of industrial strife and excessive intervention by the State in industrial relations.

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There is an urgency to review the provisions of Industrial Disputes Act with a view to (a) provide clarity and consistency to terms used, (b) define more precisely the rights and obligations of workers/unions and managements/employers, (c) delineate aspects which can be the subject of consultation and collective bargaining, (d) identify issues which lend themselves for adjudication and which do not, (e) encourage collective bargaining and mediation, (f) streamline/revamp institutions to promote mediation and adjudication, (g) encourage adaptation to charges, (h) provide for continuity of existing benefits even if there is change in ownership; (i) provide for mandatory procedures for information sharing, communication and consultation; (j) acknowledge that jobs cannot be secure if the firms do

not remain viable and that firms can become bankrupt due to internal and external environmental factors; (k) concede the need for workforce adjustment to prevent sickness and closures; and, (l) make labour administration accountable for its role. Specific suggestions in regard to each of the above have been discussed in a note prepared by the author for a discussion meeting organised by the Confederation of Indian Industry in December 1998 (Annexure 1).

Linkages with the Parliament the Judiciary and the Executive

In recent years we witness many situations where judiciary comes face to face with legislative arbitrariness and executive apathy. Judgements are sometimes based on the intent than the content of law. Judicial activism is leading to judicial indiscipline also on occasions. Also there is a need for harmony within the central laws, between central and state laws on labour matters and between labour laws and other laws such as Companies Act and Consumer Protection Act. Several public interest litigations and cases brought before the consumer courts point to the potential trade off between the social rights of citizen/consumers and the labour rights of workers under various labour laws. There is a need for comprehensive review.

Conclusions

The labour policy in India is mainly obsessed with the eight per cent labour force in the organised sector. Even salaried employment constitutes a fraction (about 15%) of the total labour force in the country. Labour policy should concern itself with the entire labour force. In future it has to pay greater attention to the issues confronting the 92 per cent of the workforce in the unorganised sector.

National Competition Policy on labour aspects should reflect on the changes in work, worker and work technology and workplace (for example, teleworking when work becomes home and home becomes work) in the new millennium. It should have a visionary perspective. The contrast between the terms of reference of the first and the second National Commissions on Labour (see: Annex) highlight how drastically different the context is in today's terms. Of course, for this reason, the unions and as a corollary the employers have been seeking a say in reformulating the terms of reference of the proposed Second National Labour Commission. In any case labour market policy should aim at vastly improving India's record in terms of human development and international labour standards and yet not block the tremendous opportunities and potential that lie ahead in making India a major economic power in the next millennium which is only a few months away.

The urgent and important tasks are two-fold: (a) A credible mechanism for providing literacy and vocational skills training to all aspirants in the labour market together with a support mechanism for basic health and social security is a must. (b) Workplace industrial relations system should facilitate change, promote flexibility and prepare the workforce to be able, adaptive and attuned to respond to the challenges of change.

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Annexure 1

Terms of Reference of the First National Commission on Labour (1966)	Terms of Reference of the Second National Commission on Labour*
1. To review the changes in conditions of labour since Independence and to report on existing conditions of labour	(a) to suggest rationalisation of existing laws relating to labour in the organised sector, and
2. To review the existing legislative and other provisions intended to protect the interests of labour, to assess their working and to advise how far these provisions serve to implement the Directive Principles of State Policy in the Constitution on Labour matters and the national objective of establishing a socialist society and achieving planned economic development.	(b) to suggest an 'umbrella' legislation for ensuring a minimum level of protection to the workers in the unorganised sector.
3. To study and report in particular on:	While drafting the framework for the above, the Commission may take into account the following:
(i) the levels of workers earnings, the provisions relating to wages, the need for fixation of minimum wages including a national minimum wage, the means of increasing productivity, including the provision of incentives to workers;	(i) follow up implications of the recommendations made by the Commission set up in May, 1998 for review of various administrative laws governing the industry.
(ii) the standard of living and the health, efficiency, safety, welfare, housing, training and education of workers and the existing arrangements for administration of labour welfare, both at the Centre and in the States;	(ii) the emerging economic environment involving rapid technological changes, requiring response in terms of change in methods, timings and conditions of work in industry, trade and services, globalisation of economy, liberalisation of trade and industry and emphasis on international competitiveness and the need for bringing the existing laws in tune with the future labour market needs and demands.
(iii) the existing arrangements for social security;	(iii) the minimum level of labour protection and welfare measures and the basic institutional framework for ensuring the same, in the manner which is conducive to a flexible labour market and adjustments necessary for furthering technological change and economic growth.
(iv) the state of relations between employers and workers and the role of trade unions and employers' organisations in promoting healthy industrial relations and the interest of the nation;	(iv) Improving the effectiveness of measures relating to social security, occupational health and safety, minimum wages and linkages of wages with productivity and in particular the safeguards and facilities required for women and handicapped persons in employment.
(v) the labour laws and voluntary arrangements like the Code of Discipline, Joint Management Councils, Voluntary Arbitration and Wage Boards and the machinery at the Centre and in the States for their enforcement;	
(vi) measures for improving conditions of rural labour and other categories of unorganised labour; and	
(vii) existing arrangements for labour intelligence and research; and to make recommendations on the above matters.	

□

Infrastructural Development for Competitiveness

Arup Mitra

The role of public expenditure on infrastructure in the context of economic development had undergone significant changes in recent years. Recently this expenditure is seen as a factor improving productivity and private sector investment. The author discusses these aspects and presents empirical evidence to the positive association between infrastructure development and competitiveness. The role of infrastructure in total factor productivity growth and technical efficiency of industry are examined closely in the present study. Better infrastructure certainly enhances factor productivity and operational efficiency.

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Views on the role of public expenditure on infrastructure in the context of economic development have undergone a significant change over the years. From a typical Keynesian point of view it is considered as a factor contributing to aggregate demand. However, in the recent years public spending on infrastructure is seen as a factor improving productivity and private sector investment. Aschauer (1989) studied the contribution of non-military public capital as an additional input to the private sector production function in the United States, and showed that its contribution to improved productivity was even greater than that of private capital. These results influenced extensively the new growth models which began to take account of public spending as a factor for self-sustaining productivity gains and long-term growth (Barro, 1990).

Several studies using the time series data confirmed the positive contribution of public capital to private sector productivity (Munell, 1990; Lynde and Richmond, 1993 and Nadiri and Mamuneas, 1994). However, these studies were ctiticised mainly because of their use of aggregate public capital as a measure of productive infrastructure. Then shifted the scope of investigation to regional level as this is considered to be more appropriate for the measurement of externalities and growth-generating effects of infrastructure. Garcia-Mila *et. al.*, used disaggregated indicators for physical infrastructure (highways, water supply and sewerage systems) and showed that the effect of public capital is positive in estimations of regional production functions.

In the context of the East Asian success, infrastructure development has also played an important role although, as argued by Mody (1997). According to him, infrastructure in East Asia was guided by a strategic vision and propelled by a substantial and sustained drive—a predominantly public sector effort in this regard has been manifested both in terms of financing and regulation of infrastructure. A long-range vision to

maintain the region's competitiveness in export markets, to attract foreign investment to the region and to support more balanced social development, in fact, resulted in this sustained commitment to high quality infrastructure. While infrastructure investment was on an average around 4 per cent of gross domestic product in all developing countries, investment in East Asia hardly fell below 4 per cent of GDP and was often higher, reaching 7 or 8 per cent in several years.

The term competitiveness does not have a very clear cut definition: while to firms it means the ability to compete in world markets with a global strategy; to some of the economists it means a low unit cost of labour adjusted for exchange rates (Porter, 1990). And recommendations have been made for improving competitiveness through both company strategy and government policy. According to Porter (1990) the nature of competition in any industry is embodied in five competitive forces: (i) the threat of new entrants, (ii) the threat of substitute products or reviewers, (iii) the bargaining power of suppliers, (iv) the bargaining power of buyers and (v) the rivalry among the existing competitors. These five forces determine the profitability as they play a major role in price formation, costs incurred by the firms and their requirement to compete in the industry.

Competitiveness of firms which arrive from three major sources and are heavily dependent on infrastructure are as follows:

(i) cost advantages,

(ii) quality of the products and

(iii) reliability of delivery.

Cost advantages can be reaped by enhancing productivity growth and by developing access to external economies of scale emanating from locational characteristics. Total factor productivity growth has been shown to be identically equal to technological progress (regress) and the change in technical efficiency (Cornwell *et. al.,* 1990). While technological progress is defined as advances in knowledge relating to the art of production which may take the form of new goods, processes or new modes of organisation—technical efficiency is the efficiency with which factors of production are combined to generate output. In other words, technological change can be conceptualised in terms of shifts in the production function (Solow, 1957), whereas technical efficiency measures the distance between the actual and the frontier or maximum attainable levels of output (Bettegge, 1990). Both technological progress and change in the level of technical efficiency, given the technology are greatly influenced by the availability of infrastructure. Huge infrastructural investment create industrial complexes which result in certain advantages such as (a) substantial economies of investment expenditure, *i.e.,* the investment for the whole complex is less than the sum of investment for each enterprise planned and located in isolation, (b) efficient production due to advantages of specialisation, economies of large scale operation and organisation of common managerial and infrastructural facilities, (c) possibility of coordinated exploitation of the natural and raw material resources of the area of location, (d) opportunities for close contact, rapid diffusion of technological innovations, and rapid overall development of the economy (Hermansen, 1972). Agglomeration economics arising from interdependence of industries in terms of input-output linkages ancillarisation, marketing of products, and availability of infrastructure facilitate efficient utilisation of factor inputs. In other words, firms in areas with lumpy infrastructural investment are in a position to take advantage of certain existing facilities, which enable them to raise their production close to the frontier or maximum attainable output at a given level of inputs. Also, the information and communication network and social infrastructure complement the rapid diffusion and implementation of knowledge concerning efficient utilisation of the existing technology.

Cost advantages can be reaped by enhancing productivity growth and by developing access to external economies of scale emanating from locational characteristics.

Availability of infrastructure, particularly the social infrastructure, attracts highly skilled labour which in turn contributes greatly to the improvement in the quality of products manufactured by the firms. Reliability concerning delivery of products is also directly dependent on the transport and communication network. However, in the context of developing countries much of the studies argued in favour of trade and industrial policies, generally joining the debate on expert-oriented versus import-substitution strategies, for enhancing industrial competitiveness. Only in the context of OECD countries structural factors concerning skills, technological efforts, and institutions have been rated important for improving competitiveness (Lall 1990). But what is noteworthy is while export-orientation can provide healthy incentives for industrial development in the developing countries, the ability to respond to those incentives depends on the skill, and technological and infrastructural endowments of the countries concerned (Lall, 1990).

Availability of Infrastructure

The study by Das *et. al.*, (1996) shows that except for the primary products regional disparities among 23 Indian states (provinces and union territories) have increased during 1970-92 on almost all counts including infrastructure (construction, electricity, gas and water supply and transport, storage and communication). The inequality measure in terms of the Theil index rose at the rate of 1.85 per cent corresponding to infrastructure during the period mentioned above. According to the authors the double-U relationship of inter-regional inequalities in infrastructure suggests that federal policies of public investment have been acting against equalisation of infrastructural facilities across states. As far as the relationship between economic growth and regional inequality is concerned, the correlation coefficient between entropy measures of inequality for infrastructure and the corresponding annual growth rate is found to be negative, which refutes Kuznet's (1955) inverted-U shape hypothesis.

Another study done by Nagaraj, Varondakis and Veganzones (1998) takes up a more rigorous analysis of infrastructure, particularly in the context of long-run growth trends and convergence across Indian states. Table 1 (taken from their study) presents the average values during the 1970-94 period of some selected physical, social, and economic infrastructure indicators for Indian states. The states have been arranged according to their growth performance (*i.e.*, the average annual growth rate in real per capital SDP during the same period. The large regional disparities in the availability of infrastructure are quite evident. The principal component analysis carried out in this study suggests that the first principal component (P_1) opposes states with a comparatively low share of agriculture in the SDP, and a relatively adequate level of physical, economic and social infrastructure to states with a predominant agricultural sector, characterised by poor infrastructure, especially poor health conditions. The former group is also generally characterised by comparatively faster growth and a relatively higher level of per capita SDP, while the latter experienced slow growth and also registered a lower level of per capital SDP.

Two groups of states are also evident in the second principal component (P_2): on the one hand primarily

Table 1: Physical, Economic and Social Infrastructure Across States: 1970-94

State	Gr.	Agri	El	Ir	Rte	Rail	Lit	Mort	Bdep
Maharashtra	3.1	25.6	236.6	9.7	506.3	17.2	52.7	80.1	46.1
Punjab	2.9	52.1	303.9	80.4	809.3	42.5	46.0	87.8	39.6
Haryana	2.6	54.2	197.0	57.5	499.5	33.4	39.2	93.9	20.7
Tamilnadu	2.5	29.5	177.8	43.5	1068.8	29.5	50.0	93.7	29.1
Gujarat	2.5	36.1	231.5	19.0	293.3	28.7	46.8	121.4	37.2
Karnataka	2.3	44.3	152.8	14.1	599.0	15.3	43.9	78.5	29.8
Kerala	1.7	37.4	103.9	13.7	2786.3	23.3	76.9	41.8	36.7
Andhra Pradesh	1.7	47.4	111.3	31.6	373.8	17.5	32.2	98.3	23.7
West Bengal	1.7	32.0	122.8	29.4	930.2	42.0	45.8	73.1	42.1
Uttar Pradesh	1.4	51.1	88.8	50.3	526.5	30.0	31.5	154.7	24.0
Haryana Pradesh	1.4	48.3	78.2	16.5	303.9	4.7	45.6	96.4	29.0
Rajasthan	1.3	52.4	98.2	18.7	207.3	16.3	28.5	83.3	19.6
Assam	1.2	51.0	37.5	22.2	555.3	28.4	33.0	115.2	15.6
Madhya Pradesh	1.2	47.2	116.7	12.9	239.3	13.0	34.0	131.8	17.4
Orissa	1.2	53.0	120.0	20.6	721.0	12.6	38.2	129.9	11.6
Bihar	0.9	53.2	82.5	33.3	460.5	30.7	28.3	61.1	24.4
Jammu & Kashmir	0.8	50.2	82.9	42.2	55.1	0.2	30.9	54.1	33.2
India	1.9	45.0	162.0	28.1	466.6	18.6	41.9	106.6	27.0

Source: Nagaraj, Varondakis and Veganzones (1998).

Note: Gr is the average annual growth rate (%) in real per capital SDP and Agri, the share of agriculture in SDP, roughly reflecting the production structure of each state. El is per capital power consumption; Ir, net irrigated area as a percentage of net cultivated area; Rte, road length per 1000 square kms; Rail, length of railroad network per 1000 square kms; Lit, literacy rate of adult population; Mort, infant mortality rate; and Bdep, bank credit as percentage of the SDP. These are the average values observed during the period mentioned above.

agricultural oriented fast growing and rich states are found to have an adequate level of physical infrastructure in power, rail road and, especially irrigation and on the other hand primarily industrial oriented, slow growing states, with a relatively high educational level.

Based on these two principal components states which share common characteristics with respect to infrastructure and economic performance have been identified. Gujarat, Tamil Nadu, West Bengal and Karnataka form one group which experienced higher long-run growth and also had a satisfactory infrastructure endowment in comparison with the national average. The other group characterised by a low per capita SDP, poor economic and social infrastructure and sluggish growth comprises Andhra Pradesh, Uttar Pradesh, Bihar, Rajasthan, Jammu and Kashmir, Orissa, Madhya Pradesh and Assam.

The other four states, Haryana, Punjab, Maharashtra and Kerala which turn out to be outliers reveal three different categories. Haryana and Punjab which are mainly agricultural states with an exceptional growth performance show satisfactory endowments in physical infrastructure including power, railway net work and irrigation. Maharashtra with a far better growth performance than Gujarat, Tamil Nadu, West Bengal and Karnataka, seems also to be related to its above average endowment in physical infrastructure, well developed financial sector and satisfactory educational level. Kerala, on the other hand, with a slow SDP growth seems to have a high level of social infrastructure.

Infrastructure and Competitiveness: Macro-Level Evidence

In a recent study the role of infrastructure in total factor productivity (TFP) growth and technical efficiency of industries has been examined Mitra, Verondakis and Veganzones 1998). Using the state level data for 17 two digit level industries for the period 1976-77 through 1992-93 our study looks into the question of conditional convergence across states assessing the impact of infrastructure on TFP and technical efficiency (TE). By using an aggregate infrastructure indicator we hope to overcome the difficulties of estimating the impact of a large number of indicators which may be inter-related greatly.

The findings validate the positive impact of infrastructure on TFP in Indian manufacturing industries although at first sight the impact seems to be quite varied across industries. In industries wood and wood products (27), metal products (34), other manufacturing industries (38) and also in food products (20-21), textile products (26), and to a lesser extent though in chemicals (30), TFP seems to be more sensitive to the availability of infrastructure. These results complement the findings by Nagaraj, Varondakis and Veganzones (1998) which show, at a more aggregated level, that infrastructure is an important factor explaining long-run growth of Indian states.

The long-run elasticities of TFP with respect to different components of infrastructure have also been calculated. The social infrastructure approximated by education and health variables shows the greatest impact on industrial TFP growth. Primary education had a stronger impact compared to secondary education implying that improving access to primary education could be a source of big productivity improvements in manufacturing industries. Moreover, improvement in health conditions turns out to have a significant impact on productivity.

The social infrastructure approximated by education and health variables shows the greatest impact on industrial TFP growth.

Next to social infrastructure is financial development. The number of branch offices of banks per 1000 population shows the greatest impact on productivity growth, the ratio of deposits and loans to SDP shows an elasticity of the same order of magnitude, but lower than that for the number of branch offices.

A significant impact of core infrastructure on TFP has also been noted. The impact of power generation infrastructure, proxied by industrial power consumption, is highest. That for road transport captured by per capita number of vehicles and the density of the road network comes in the second place. The rail and postal networks seem to have a lower impact on TFP.

On the whole, the intermediate and capital goods industries seem to be highly sensitive to the availability of infrastructure (basic chemicals: 30, metal and metal products: 33-34, equipment: 35-36 and other manufacturing industries: 38). These are the industries which have also been identified as better performing both in terms of productivity and exports. Some consumption goods industries also show high sensitivity to infrastructure (wool: 24, and wood: 27). Improving infrastructure availability seems, therefore, to be important for productivity improvements in some of the dynamic industries, as well as an increased integration of the country into the world economy. In the case of technical efficiency also the

role of infrastructure has been found to be very significant. All this allows us to conclude that infrastructural development and competitiveness are closely related. In the next section we present some firm level evidence base don our work submitted elsewhere, to make this point stronger (Mitra, 1999 forthcoming).

Infrastructure and Competitiveness: Firm-Level Evidence

An important fact which is often missed attacking the urban population growth for its adverse impact on the existing physical infrastructure is the positive influence of urbanisation on economic growth. Although computable general equilibrium models tried in the context of urbanisation address themselves to quite a few complex problems, and aim at harnessing the empirical associations between economic development, structural change and urban dynamics, the impact of urbanisation on economic growth has not been discussed extensively therein (Becker, Mills and Williamson, 1992). However, the literature on city scale economies (or urbanisation economies) considered this aspect. Some industries are said to induce concentration of economic activity as they exhibit high economics of scale in operation, and some others benefit from concentration because of the operation of agglomeration economies. From concentration of activities a new firm not only benefits in terms of forward and backward linkages, but the existence of the complementary services also reduces its cost of operation. The effective price of infrastructure services like power, water supply, roads etc. is reduced if there is concentration of users of these services. Government action, however, has mostly failed to recognise the merits of concentration, and this has often led to sub-optimal utilisation of resources. Industrial location policies in India which aim at spreading industries under the following heads: (a) policies encouraging small scale enterprises, (b) the industrial estates programme, (c) the rural industries project programme, (d) metropolitan planning in the major states, and (e) incentives to promote industrial development in backward areas (Mohan, 1993). However, the impact of specific industrial location or regional policies on the actual location of industry has been quite limited not only in India but also in various countries in the world (Mohan, 1993). This is mainly because firms and workers both have a tendency to locate in large cities with the hope that they would be better matched there (Helsley and Strange, 1990). Besides, the rich infrastructure endowment in the large cities attracts firms by enhancing their expectation to experience possible reduction in the cost of operation. The reliability on firms concerning delivery of products also improves as large cities have better transport network and marketing facilities. All this, as mentioned in section 1, improves the competitiveness of firms.

Based on the firm level data, technical efficiency index of firms in two industries, namely electrical machinery and cotton and cotton textiles have been worked out (Mitra, 1999 forthcoming). It is noted that technical efficiency of firms located in large cities are generally higher as compared to their counterparts in small cities.

In Table 2, various size classes have been formed base don the efficiency index and the population level in the cities, and the firms are distributed across various categories. Around 55 per cent of the firms in electrical machinery group have an efficiency level of at least 0.9, and of all these highly efficient firms, if we define so, around 79 per cent are located in large cities, each with a population of 500,000 and above. On the whole, around 43 per cent of all firms in this industry group correspond to both a high level of efficiency and large city size. However in cotton and cotton textiles only 33 per cent of the firms seem to have an efficiency index of at least 0.9, and among these units 60 per cent are located in large cities (Table 3). On the whole, only 20 per cent of all firms are both highly efficient and located in large cities.

The average efficiency of firms calculated for each size class of cities/towns tends to increase with the rise in size class although in very large cities efficiency falls instead of rising monotonically. Firms in the electrical machinery group appear to be most efficient in cities in the size class 1.5 million and above but less than 2.5 million. Similarly, in cotton and cotton textiles firms located in cities with a population 2.5 million and above but less than 5 million are most efficient. This is possibly because diseconomies of scale tend to outweigh, the economies of scale after a certain threshold level. Nevertheless all this can be treated as indirect evidence in favour of the positive impact of infrastructure on technical efficiency and competitiveness of firms.

Conclusions

This paper highlights the positive impact of infrastructure on competitiveness. Using both macro level and firm level information it pieces together evidence in support of the productivity-and-efficiency-augmenting effects of infrastructure. Availability of infrastructure not only enables firms to utilise resources more efficiently, thus reducing the cost of operation, the reliability on firms as far as the delivery of products is concerned, is also heavily dependent on infrastructure. All this adds to

Table 2: Distribution of Firms by Efficiency and City Size in the Industry Group Electrical Machinery

City Population Size Class	Efficiency					Total	Average Efficiency
	Less than 0.6	0.6 and above but less than 0.7	0.7 and above but less than 0.8	0.8 and above but less than 0.9	0.9 and above		
Less than 100,000	–	1	–	–	1	2	0.80
10,000 and above but less than 300,000	–	–	2	16	19	37	0.85
300,000 and above but less than 500,000	–	–	–	2	4	6	0.88
500,000 and above but less than 700,000	–	–	1	4	3	8	0.89
700,000 and above but less than 1 million	–	–	1	4	3	8	0.89
1 million and above but less than 1.5 million	–	–	–	3	6	9	0.90
1.5 million and above but less than 2.5 million	–	1	–	12	11	24	0.91
2.5 million and above but less than 5 million	1	–	1	21	35	58	0.88
5 million and above	–	–	–	20	28	48	0.86
Total	1	2	4	88	117	212	0.874

Source: Author's calculation.

Table 3: Distribution of Firms by Efficiency and City Size in the Industry Group Cotton and Cotton Textiles

City Population Size Class	Efficiency						Total	Average Efficiency
	Less than 0.5	0.5 and above but less than 0.6	0.6 and above but less than 0.7	0.7 and above but less than 0.8	0.8 and above but less than 0.9	0.9 and above		
Less than 100,000	–	–	2	1	2	5	10	0.825
10,000 and above but less than 300,000	1	–	5	10	40	29	85	0.846
300,000 and above but less than 500,000	–	–	1	4	6	5	16	0.848
500,000 and above but less than 700,000	1	–	–	1	14	5	21	0.850
700,000 and above but less than 1 million	–	–	1	–	2	3	6	0.852
1 million and above but less than 1.5 million	–	–	1	9	32	17	59	0.855
1.5 million and above but less than 2.5 million	–	–	–	4	7	3	14	0.860
2.5 million and above but less than 5 million	–	–	–	2	18	14	34	0.892
5 million and above	–	–	2	6	24	16	49	0.840
Total	2	1	12	37	145	97	294	0.853

Source: Author's calculation.

the competitiveness of firms. However, economic policy in this context has not paid due recognition to the role of infrastructure, particularly its social components.

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Competitiveness of Indian Capital Goods Exports

Saikat Sinha Roy

International Competitiveness of goods exports has assured importance due to economy changing to a liberal trade regime. In spite of the liberalisation, manufacturing segments respond differently to changes in trade regime. This is particularly important for capital goods scenario and the present paper evaluates export performance during trade reforms. In particular, one finds that though aggregate exports have grown at high rates, the commodity composition of exports has not undergone any major change with the share of machinery and transport equipments remaining virtually unchanged. Furthermore, fiscal policy initiatives like rupee depreciation did not serve as panacea to improve international competitiveness of capital goods.

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The issue of international competitiveness[1] has assumed importance in India particularly when the economy is undergoing changes towards a liberal trade regime. Trade liberalisation, by attempting to augment production and volume of trade, (Rodrik, 1992) works in a way to improve competitiveness universally across sectors. Despite such an objective of trade liberalisation, it is often found that manufacturing segments respond differentially to changes in trade regime[2]. It is in this context that the present paper analyses international competitiveness of capital goods exports from India during trade reforms.

Competitiveness of capital goods has been at the centrestage of the import substituting strategy in India and has shown a changing growth path with respect to production and exports under protection and trade liberalisation. Though capital goods attained high scales of production and diversified during import substitution (Ramana, 1984; Bhagavan, 1985), and a World Bank (1984) study, focusing on selected non-electrical machinery industry in India, concluded that Indian firms were fully competitive through supplying complete plants for manufacturing cement, sugar and boilers, 80 per cent of the machinery for pulp and paper manufacturing. However, Mundle and Mukhopadhyay (1992)

1. The definition of international competitiveness is, however, imprecise. The concept, as Haque (1995) maintains, not only connotes such improvements in production and trade, but also indicates their sustenance over a period of time. Lal (1990) find the importance of structural factors like skills, technological efforts and related institutions in understanding industrial competitiveness of developing. This is however, as Lall (1990) asserts, not to deny the importance of right prices, which can only be necessary conditions for industrial success. The sufficient conditions are provided by the structural factors.

2. In case of India, Sinha Roy (1998) finds that though aggregate exports have grown at high rates during trade reforms, all sectors have not grown commensurately. More importantly, the commodity composition of exports has not undergone any major change with the share of machinery and transport equipments in total remaining virtually unchanged.

showed that the industry as a whole has failed to be internationally price competitive. The lack of competitiveness, as the study shows, is attributed to exogenous factors such as higher input prices or taxes. Even conversion cost differences are significant implying relative inefficiency of manufacturing various machinery items, thus making it evident that the scale economies and learning effects have been weak to establish international competitiveness in the industry. In fact World Bank (1990) also found that most capital goods have a positive nominal protection coefficient and effective rate of protection[3] indicating lack of competitiveness.

Though liberalisation was meant to do away with the distortions arising in a protected regime, Chakravarty (1987) doubted the positive impact of trade liberalisation on production of capital goods. Studies by Singh and Ghosh (1987) and Chandrasekhar (1987) proved Chakravarty's scepticism right on the competitive strength of capital goods in the home market. On the contrary, Rangarajan (1995) pointed out that capital goods production increased in the presence of rising imports of capital goods during the nineties. Narayana and Sinharoy (1996) have addressed to this aspect in a greater detail. These studies while analysing production have clearly helped to draw some tentative conclusions on competitiveness of capital goods in the domestic market during a liberal trade regime.

More importantly, capital goods have not performed well in the international market, where liberalisation did not translate into commensurate growth of exports from the sector, as indicated by various studies. For instance, while Marjit and RayChaudhuri (1997) have indicated poor performance in the machinery sector as against (past and emerging) competitors, Srinivasan (1998) shows that India's share of some machinery and equipments are low and has particularly lost out to China between 1979 and 1994, and Ganesh-Kumar *et al*, (1999) show that very few capital goods at a disaggregated level have shown tendencies of a changing RCA index[4] between pre- and post-1990 periods. It is instructive to note that capital goods exports from India have lost out especially during a period when growth of world trade in such goods is booming[5]. Given this background, the paper intends to draw some broad contours of competitiveness of capital goods exports and changes in its pattern during the post-1985 period[6].

In the present study empirical results on competitiveness of capital goods exports during liberalisation. This section would also highlight on some issues to price competitiveness of India's exports before highlighting certain policy implications based on the salient findings of the paper.

Measuring Competitiveness

The lack of a precise definition of competitiveness is reflected in the multiplicity of measures trying to quantify the notion. Firstly, as international competitiveness connotes the potentiality of tradeables in the international market, so ideally it is to be measured in the ex-ante sense. Secondly, a measure of competitiveness should also account for a host of non-price factors along with price ones. The latter dimension is especially important while considering competitiveness of capital goods.

Many approaches have been in use in the literature to measure international competitiveness of a country's production and exports. While some studies look at relative unit labour costs, others resort to relative prices as a measure. Though World Bank (1984, 1990) studies have used the measures like domestic resource cost or protection coefficients for quantifying competitiveness[7], Mundle and Mukhopadhyay (1992) show the inappropriateness of these ratios as measures of price competitiveness in terms of input costs, which are often distorted. The survey by Kathuria (1995), thus, stresses that even if analyses of domestic resource cost or effective rates of protection are relevant in understanding the pattern of comparative advantage, it is relative prices which is of importance. It is in this context that the method developed by Kravis and Lipsey (1971) assumes importance.

But in an imperfect market, where non-price factors (Balassa, 1965) play a significant role in determining competitiveness, the relevance of relative price as a

3. The positive ERP's for capital goods, as Kathuria (1995) points out, is due to high return on capital leading to high prices of capital goods in India.

4. A discussion on RCA index as a measure of competitiveness is dealt with in a later section.

5. Evidence to this fact are available from WTO (1995: 4-5). Even such machinery and equipments have accounted for a large proportion of aggregate exports from the East and South-east Asian countries (see UNCTAD, 1996: 112-121).

6. Trade reforms in India, though often identified with structural adjustment programme (SAP), were in place since the mid-eighties. The SAP only carried the reforms process forward. As trade reforms were initiated since the mid-eighties, so evaluation of post-reforms performance would be done for post-1985 period.

7. Panchamukhi (1997) has detailed about the method of calculating effective rate of protection and domestic resource cost and also arrives at the equivalence of these measures in case where market prices of primary factors are assumed to reflect their opportunity costs.

measure of competitiveness is often questioned, in addition, non-price factors assume greater meaning in assessing competitiveness of capital goods. It is in this context that market share measures, which subsume both price and non-price factors[8], are often used. One such market-share based measure is the Constant Market Share approach[9], which takes into account the actual value of exports to determine relative market share of economies and hence, their competitiveness in the world market. Though such market share based measures have a definite advantage over relative prices, they have an inherent drawback of not being indicators of competitiveness in the ex-ante sense. Moreover, market share can be an inappropriate measure in case of exports when exports are unprofitable or are not to their full potential (Kathuria, 1995, p. 149). Nonetheless, market share based measures are the most suitable measures of competitiveness of manufactures, especially capital goods, where non-price factors play a bigger role. Even recent studies[10] on capital goods exports from India used export growth and market shares to measure international competitiveness.

Nonetheless, market share based measures are the most suitable measures of competitiveness of manufactures, especially capital goods, where non-price factors play a bigger role.

One such market share based index is premised on the notion of "Revealed Comparative Advantage" (RCA) – indicated by manufactured trade in manufactures of countries – which has the inherent idea that the commodity configuration of trade brings forth not only competitive edge in terms of relative costs, but also non-price factors, thus revealing comparative advantage. Though the ratio of f.o.b. value of exports to that of imports could be taken to demonstrate an economy's static advantage in trade, Balassa (1965) gave more emphasis to exports alone rather than to the export-import ratio in coining RCA, as relative export behaviour would give a better picture than export-import ratios[11].

RCA is measured by comparing exports of countries at same levels of industrialisation. An RCA index shows a country's share in the world exports of a given commodity being "normalised"(Balassa (1965), p. 105) by its share in world exports. This is expressed as:

$$(X^0_{ij}/X^0_{nj})/(X^0_{it}/X^0_{nt}) = (X^0_{ij}/X^0_i) \quad (1)$$

$$(X^1_{ij}/X^1_{nj})/(X^1_{it}/X^1_{nt}) = (X^1_{ij}/X^1_i) \quad (2)$$

$$(X^1_{ij}/X^1_i)/(X^0_{ij}/X^0_i) \quad (3)$$

where X = exports, x = relative share of exports,

0 = average for the base years,

1 = average for the current period,

n = the total number of countries taken together,

i = country, j = product

While considering an RCA index, two factors the following are to be taken into consideration. Firstly, it is the question of number of countries to be considered. In this analysis, the RCA indices are calculated in the context of global trade, though Panchamukhi (1997) emphasises on the importance of the dynamics of comparative advantage on the basis of only selected countries. Secondly, is the question of advantage over time. In Balassa (1965), the equation (1) indicated the ratio for the period 0, 1953-55. The equation (2) showed the ratio for the "current year", 1960-62. Equation (3) emphasised relative export performance of the current year with respect to the base year indicating a somewhat crude measure of dynamic advantage. In such a measure of dynamic advantage, it is assumed that the commodity structure of manufactured exports in 1960-62 is same as that of 1953-55. Following Balassa (1977), revealed comparative advantage is denoted by the following equation (4) and not a ratio of the current period to that of the base year.

$$(X_{ij}/X_{nj})/(X_{it}/X_{nt}) = (X_{ij}/X_j) \quad (4)$$

The RCA index is often assumed to have only ordinal properties. The index exceeding unity implies that the share of the specific commodity in the particular country's exports outstrips its share in the world trade

8. Kathuria (1995). There could be certain 'non-price' factors such as technological leadership, design and quality of the product, speed of delivery, commercial and financial ties, credit terms and their flexibility along with various other services connected with trade affecting relative quantities. The product design would imply reliability and appearance.

9. For a detailed discussion on this approach to measuring competitiveness, see Leamer and Stern (1980).

10. Rath and Sahoo (1990) and Suvrathan (1991), which measure international competitiveness using this criterion.

11. Perhaps, these export-import ratios are distorted due to tariffs and other trade barriers, whose incidence on individual commodity groups vary across countries, thus making it incomparable between countries.

and is usually indicative of competitive strength, while that below unity is interpreted as a relative disadvantage. But, often views are expressed that an index with cardinal properties would give magnitude of the advantage of exports in addition, which an ordinal index fails to signify (Yeats, 1985). Given the cardinal properties, the index value can be compared over time and an increase in the RCA is suggestive of improving advantage thus revealed. For the purpose here, the index is calculated for points of time between 1980 and 1996 and a comparison over different time points would show dynamic advantage, where the concept of dynamic comparative advantage observes the change in a country's relative production efficiency and hence trade performance over a period of time rather than at a point of time (Bardhan, 1991). Though studies have pointed out certain inadequacies and suggested certain improvements in the index[12] (for instance, Kunimoto, 1977) the principal advantage of an RCA index is that it can evaluate relative export performance at the sectoral level, which may not be possible for relative price measures for the want of appropriate data. Moreover as a corollary of the analysis of the global competitiveness of capital goods exports, the degree of specialisation of such goods can be derived and draw conclusions on the diversification of capital goods exports from India.

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From the index, the advantage is interpreted by comparing economies at the same level of industrialisation and in this exercise, competitiveness is adjudged vis-a-vis other newly industrialising countries (NIC) as South Korea, Hong Kong, Singapore, Thailand, Malaysia, Indonesia, China, Brazil, Argentina and Mexico. It is necessary to mention here that though the East Asian and the Latin American countries have emerged as India's competitors in the world market in an earlier period, the South-east Asian NIC's and China emerged as competing economies only from the mid-eighties onwards. However, for China, trade data from UNCTAD source are available only for the period after the mid-eighties. Though the objective is to observe the extent and pattern of competitiveness of capital goods exports during the reforms period, 1980 is chosen as the benchmark year for the purpose of comparison between the pre- and post-reforms periods.

From the evidence available in Table 1, it is found that capital goods exports from India do not reveal comparative advantage as given by the low RCA index value across exportables. It is found in an earlier study (Sinharoy, 1991) that for a large number of products the RCA index improved till 1980 and declined since then. Thus, the phenomenon of low RCA index share was mostly in place since the early eighties and continued thereafter. The evidence in Table 1 also contrasts the findings in Sinharoy (1991), where it is found that India's revealed comparative advantage in capital goods exports greatly varied across commodities and witnessed a changing pattern over time.

Table 1: India's Revealed Comparative Advantage in Capital Goods Exports

Commodity groups*	Year					
	1980	1985	1990	1992	1994	1996
711	1.858 (1)	1.619 (1)	1.120 (2)	0.915 (1)	0.652 (2)	0.594 (2)
712	0.342 (1)	0.010 (7)	0.012 (8)	0.124 (4)	0.101 (6)	0.116 (7)
713	1.055 (4)	0.556 (5)	0.049 (11)	0.462 (6)	0.352 (4)	0.303 (5)
714	0.002 (8)	0.009 (7)	0.005 (8)	0.021 (9)	0.036 (5)	0.000 (–)
716	0.255 (7)	0.191 (8)	0.288 (10)	0.357 (8)	0.182 (10)	0.209 (10)
718	0.019 (4)	0.031 (7)	0.034 (8)	0.161 (5)	0.029 (9)	0.039 (9)
721	0.212 (5)	0.676 (3)	0.271 (4)	0.154 (3)	0.130 (4)	0.207 (4)
722	0.007 (8)	0.090 (4)	0.069 (4)	0.167 (3)	0.285 (3)	0.316 (3)
723	0.072 (7)	0.259 (5)	0.055 (8)	0.113 (8)	0.089 (7)	0.106 (9)
724	0.491 (2)	0.778 (3)	0.902 (2)	0.537 (4)	0.546 (4)	0.414 (4)

(Table 1 Contd.)

12. Kunimoto (1977) formulated an index to capture revealed comparative advantage in terms of a ratio of actual exports of commodity k by country i to the exports of commodity k by the country expected in a world in which world exports of commodity k are distributed among countries in proportion to their share of world exports. Bowen (1983), on the other hand, expresses the index in terms of net trade, which is based on the assumption of homothetic preferences across countries. Finally, the net trade intensity index can take positive or negative values indicating advantage or disadvantage, while greater than zero production intensity index would signify comparative advantage and the relationship between the two indices is expressed as $I^T_{ik} = (I^Q_{ik} - 1)$, where I^T_{ik} is the net trade index and I^Q_{ik} is the production intensity index.

(Table 1 Contd.)

725	0.290 (3)	0.040 (9)	0.110 (4)	0.178 (5)	0.190 (5)	0.096 (7)
726	0.168 (4)	0.376 (1)	0.382 (1)	0.201 (5)	0.190 (4)	0.175 (4)
727	1.689 (2)	0.929 (1)	0.734 (2)	0.494 (4)	0.637 (2)	0.000 (–)
728	0.279 (7)	0.311 (5)	0.354 (4)	0.240 (7)	0.217 (5)	0.133 (10)
736	0.614 (3)	1.136 (1)	0.422 (4)	0.338 (8)	0.309 (7)	0.137 (9)
737	0.163 (5)	0.438 (3)	0.155 (8)	0.264 (7)	0.236 (6)	0.248 (8)
741	0.329 (7)	0.212 (8)	0.162 (9)	0.118 (9)	0.144 (10)	0.166 (10)
742	0.947 (2)	0.637 (4)	0.439 (4)	0.447 (4)	0.324 (4)	0.550 (3)
743	0.183 (4)	0.436 (4)	0.278 (7)	0.221 (9)	0.185 (11)	0.243 (10)
744	0.139 (6)	0.236 (7)	0.176 (8)	0.154 (10)	0.103 (11)	0.066 (10)
751	0.073 (9)	0.348 (5)	0.156 (9)	0.104 (11)	0.068 (11)	0.075 (11)
764	0.229 (7)	0.035 (10)	0.050 (10)	0.048 (10)	0.058 (10)	0.104 (11)
71	0.523 (6)	0.218 (9)	0.111 (11)	0.207 (11)	0.312 (10)	0.465 (10)
772	0.387 (7)	0.199 (9)	0.173 (9)	0.223 (9)	0.195 (11)	0.277 (9)
773	0.870 (3)	0.889 (3)	0.756 (6)	0.320 (9)	0.364 (9)	0.204 (10)
774	0.053 (6)	0.279 (1)	0.128 (5)	0.134 (4)	0.101 (6)	0.269 (2)
776	0.066 (8)	0.087 (9)	0.123 (8)	0.054 (10)	0.043 (10)	0.082 (10)
782	0.126 (6)	0.067 (8)	0.055 (6)	0.128 (3)	0.151 (6)	0.163 (8)
784	0.531 (5)	0.266 (4)	0.277 (5)	0.311 (6)	0.380 (4)	0.208 (5)
786	0.048 (7)	0.611 (4)	1.117 (2)	0.735 (6)	0.140 (9)	0.110 (9)
791	2.876 (2)	1.069 (2)	0.285 (5)	0.199 (5)	0.401 (2)	0.383 (2)

Note: Figures in the parentheses represent relative position.

Source: Calculated from United Nations, International Trade Statistics Yearbook, Vol. I and II, various issues.

* The codes are given under Annexure I.

Further, it is important to note that certain capital goods exports from India as steam boilers and auxiliary plants, internal combustion and piston engine, non-domestic food machinery and railway vehicles, which revealed comparative advantage in 1980, witnessed a declining RCA index in the period since 1985. In addition there are large number of such other items for which the index has fallen throughout the period after 1980. Even if RCA indices of some tradeables are found to be increasing RCA in the earlier years of the 1980's, the index values has lowered during the nineties. Nonetheless, there are certain exceptions to this pattern of low or declining indices: while exports of non-road tractors from India are found to have an increasing index value throughout, the RCA indices of telecom equipments, etc. and electrical power machinery are found to be rising during the nineties. But for these later mentioned exportables, the index value remained low. Thus, it is striking to note that during trade reforms, revealed comparative advantage of capital goods exports are either low throughout or lowered during the period. On the whole, trade reforms have not led to improvements in international competitiveness of capital goods exports are either low throughout or lowered during the period. On the whole, trade reforms have not led to improvements in international competitiveness of capital goods exports from India, nor could the decline in index values be reversed.

The low RCA index values of capital goods exports from India get reflected in the degree of specialisation quantified by standard deviation of RCA indices at particular points in time.[13] It could be observed from the Table 2 that the standard deviation of RCA indices for India has been declining over time. This would indicate

Table 2: Standard Deviation of RCA Indices of NICs

Country/ Year	1980	1985	1990	1992	1994	1996
India	0.63	0.38	0.31	0.20	0.16	0.15
South Korea	0.88	0.97	1.29	1.29	0.78	0.70
Singapore	1.80	1.21	0.87	0.84	0.82	0.81
Hong Kong	0.33	0.63	0.62	0.55	0.58	0.62
Thailand	3.53	1.70	0.72	1.22	0.78	0.79
Malaysia	5.87	3.66	2.00	1.45	1.09	1.97
Indonesia	2.46	0.09	0.08	0.19	0.18	0.29
China	–	–	0.49	0.48	0.64	0.82
Brazil	2.05	0.86	0.77	0.83	0.74	0.81
Argentina	0.55	0.60	0.35	0.56	0.78	0.80
Mexico	9.26	2.64	1.43	4.19	1.64	1.81

Source: Same as Table 1.

13. This idea has been taken from Balassa (1977). Balassa explained the degree of specialisation with reference to the size of domestic market, the level of technological development, natural resource endowment and the effects of economic integration (as he dealt with the EEC). Yeats (1985) used variance to depict the degree of specialisation.

Table 3: Correlation of RCA Indices

Year	Correlation Coefficient between the indices of India &									
	Korea	Brazil	Indonesia	Singapore	Argentina	Hong Kong	Mexico	Thailand	Malaysia	China
1980	–0.203	0.024	–0.137	–0.244	0.419	–0.178	–0.080	–0.014	–0.128	–
1985	0.100	neg	–0.216	–0.267	0.256	–0.210	–0.018	–0.103	–0.187	–
1990	0.390	–0.159	0.302	–0.225	0.155	–0.097	–0.023	0.282	–0.166	0.206
1992	0.189	0.087	0.217	–0.317	0.177	–0.165	0.035	-0.018	–0.257	0.415
1994	–0.252	0.077	–0.207	–0.355	0.067	–0.087	.093	–0.204	–0.277	–0.080
1996	–0.136	0.312	–0.054	–0.135	–0.070	0.072	0.066	–0.068	–0.173	–0.029

Note: 'neg' indicates negligible

that over time there is a convergence in the degree of specialisation, which varied across products in the early eighties. However, this convergence does not necessarily mean that larger number of products are revealing comparative advantage in 1996, rather RCA indices have lowered universally across products leading to a lower standard deviation.

But the pattern over time has varied across developing countries. For South Korea, standard deviation increased till the early eighties and declined thereafter. For Singapore, Malaysia and Thailand it is almost a secular decline in the standard deviation except for in 1996. The decline in standard deviation is mostly due to larger number tradeables revealing comparative advantage, which is in sharp contrast to the Indian experience. For Indonesia, the standard deviation is significantly low for most years between 1985 and 1996, but the standard deviation increased during the nineties from the lower values prevailing during the eighties. In contrast, the standard deviation in RCA index increased in case of Hong Kong. The same is true for China during the nineties.

Even for Mexico and Brazil, the standard deviation lowered indicating increasing presence of commodities with high RCA index. But this proposition may not be true with Brazil, where the RCA index for most of the commodities lowered as in case of India. This pattern is against the pattern prevailing in Argentina with standard deviation increasing over time.

In contrast, Sinharoy (1991) observes that South Korea had the smallest standard deviation of RCA indices over the years between 1970-85, though it increased in the later years. The deviation in case of Singapore was also low, while the deviation indices for Argentina came down significantly. But the variation rose in case of Brazil and Mexico largely while the rise was not too much for Hong Kong. Though the standard deviation in case of Indian RCA indices was quite high, it fell sharply in the intermediate years but picked up again in the eighties. This showed that Singapore and, to some extent, South Korea had higher degrees of specialisation and diversification in capital goods exports, though the extent of export widening came down for Korea in the later years. Argentina's degree of specialisation went up over the years though it was not upto the Korean experience. The extent of specialisation and hence, diversification of capital goods exports was on a lesser scale for Brazil, Mexico and Hong Kong.

In order to provide an insight into the shifts in the patterns of revealed comparative advantage of India's capital goods exports vis-a-vis other competing economies correlation coefficients were calculated.[14] (Panchmukhi, 1997). It could be read from Table 3 that the correlation coefficient of India and South Korea's RCA indices, though found to be positive between 1985 and 1992, is negative in the following years. The pattern of relationship between the RCA indices of India and China underwent a change: the correlation coefficient was positive during 1990 and 1992, followed by years of negative correlation coefficients. With respect to most developing countries such as Singapore and Hong Kong and also the South-east Asian countries of Thailand, Malaysia and to a lesser extent Indonesia, the correlation coefficients are found to be negative. However, with respect to the Latin American countries as Brazil and Argentina, the correlation coefficients are mostly positive. Even in case of Mexico, though the correlation coefficient was negative till 1990, turned out to be positive thereafter.

The above pattern of correlation coefficients would indicate that the pattern of comparative advantage across India's capital goods resembled to that prevail-

14. Panchamukhi (1997) cites that rank correlation coefficients can be used give an indication about the similarity or dissimilarity in the patterns of revealed comparative advantage between the two countries. For example, Lee (1986) calculated Spearman's rank correlation coefficient to compare the whole manufactured export structure of Korea, Japan and Taiwan. However, this study resorts to simple correlation coefficient for the purpose.

ing in Brazil, Argentina and to some extent Mexico, but the pattern of revealed comparative advantage is at variance with most of the East and south-east Asian Countries. Even with China, during the mid-nineties, the pattern of revealed advantage differs as indicated by the negative correlation coefficient. As per the coefficients in 1985, India's commodity composition of capital goods exports was closer to those of Singapore, Brazil and Argentina than any other countries. But, form these correlation coefficients nothing definite could be inferred about the extent of industrialisation in these countries because the stages and nature of industrialisation which India went through was quite different from those of the East or the South-east Asian or even the Latin American countries.

Relative Prices and International Competitiveness

The decline in international competitiveness of capital goods exports from India has to be seen in the light of the attempts made to improve competitiveness during the period of trade reforms. The changes in trade policies have tried to address the issue of competitiveness in terms of depreciation in exchange rate and to that extent, the rupee was devalued against major currencies in 1991. But the issue of competitiveness of exports in terms of exchange rate does not rest on rupee depreciation against major currencies, but with respect to exchange rate of competing countries in the world market.[15]

Table 4: Depreciation in Bilateral Exchange Rate of Rupee with respect to Competitor Currency (in per cent)

Year	Rupiah	Won	Ringgit	Ph. Peso	Sing $	Baht	Yuan
1985	0.29	7.30	5.57	-8.20	8.60	15.51	11.86
1986	16.82	-2.94	-1.85	15.10	14.13	-7.85	16.87
1987	11.61	-7.31	-7.16	-4.69	-4.57	-6.59	3.67
1988	-3.31	5.33	07.98	-8.53	16.06	9.79	-8.40
1989	-9.04	1.37	-12.69	-13.69	0.42	1.81	-13.98
1990	-4.47	-0.54	-11.68	2.64	-9.77	-4.81	20.72
1991	-12.03	-2.03	-20.13	-12.93	-0.74	-5.07	-8.02
1992	-2.89	0.27	-16.35	-12.84	-0.39	-2.68	-3.23
1993	-9.50	-3.54	-15.77	-1.88	-2.96	-5.59	-16.95
1994	5.54	-1.35	-2.20	-3.25	-0.11	-2.43	28.82

Source: Calculated from IMF, International Financial Statistics Yearbook, various years

15. Such an approach to understanding export competitiveness and performance is in place. Refer Rajaraman (1991) for the purpose.

With respect to most of the competitor country currencies, the rupee depreciated during the nineties as against some mixed evidence for the quinquennium after 1985. As is evident from Table 4, the rupee appreciated with respect to currencies of most developing economies. The rates of depreciation lowered in 1994. Nonetheless, the rupee has depreciated on the average during the trade reforms period. It is striking to note that devaluation in 1991 led to major real rupee depreciation with respect to most competing currencies, but such high rates of depreciation did not carry over to other years till the mid-nineties. However, consequent upon a depreciating there has been no significant improvements in revealed comparative advantage of capital goods. The devaluation in 1991, at the most, would have led to one shot improvement in competitiveness, but the momentum was lost in the subsequent years and capital goods exports from India, as measured by RCA index, remained uncompetitive during trade reforms. This proves the contention by Mundle and Mukhopadhyay (1992) true that is difficult to retain competitive strength of capital goods industries in the international market if competition is in terms of price alone rather than taking such non-price factors as control of market channels, lines of credit and product and process technologies into account.

Conclusions

From the above discussion we learnt that India's competitiveness in capital goods exports vis-a-vis the NICs followed some broad trends. India's relative competitive position was low during the eighties and thereafter. Even after trade liberalisation, the sector did not acquire dynamism in terms of revealing competitive edge. Such a pattern of comparative advantage of India's capital goods exports is quite dissimilar to that in the developing countries of East and South-east Asia. The policy initiatives in terms of rupee depreciation did not serve as panacea to improve international competitiveness of capital goods exports from India. Such findings would imply that non-price structural factors such as skill and technology hold the key to improvements in productivity as visualised by Sandal (1993) and can lead to permanent improvements in competitiveness.

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Annexure I: Description of Products shown in Table 1

Code No.	Description	Code No.	Description
711	Steam Boilers & Aux Plant	712	Steam Engines, Turbines
713	Intrnl Combius Pstn Engin	714	Engines and Motors NES
716	Rotating Electric Plant	718	Oth Power Generatg Machy
721	Agric Machy, Exc Tractors	722	Tractors Non-road
723	Civil Engneerg Equip etc	724	Textile, Leather Machnry
725	Paper Etc Mill Machinery	726	Printg, Bkbindg Machy, PTS
727	Food Machry Non-Domestic	728	Oth Machy For Spcl Indus
736	Metal Working Mach-Tools	737	Metal Working Machnry NES
741	Heating, Cooling Equipmnt	742	Pumps For Liquids Etc.
743	Pumps NES, Centrfuges Etc	744	Mechanical Handling Equ
745	Nonelec Machy, Tools NES	749	Nonelec Mach PTS, ACC NES
751	Office Machines	752	Automatic Data Prc Equip
759	Office, ADP Mach Prtns, Acces	764	Telecom Equpt, Prts, Acc NES
771	Electric Power Machy NES	772	Switchgear Etc, Parts NES
773	Electr Distributng Equip	774	Electro-Medel, Xray Equip
776	Transistors, Valves, Etc	778	Electrical Machinery NES
782	Lorries, Spcl Mtr Veh NES	784	Motor Veh Parts, Acces, NES
786	Trailers, Nonmotr Veh, NES	791	Railway Vehicles

□

Export Competitiveness of Autoparts Industry in the Asia-Pacific

L. Shridharan

The findings of an empirical examination of export competitiveness in a few Asia-Pacific countries are reported in the present paper. As export competitiveness is closely linked to the nature of industry, this was carried out for auto parts industry. The role of the government in relation to auto and auto parts sector was examined. The export competitiveness was studied in terms of export performance, share in world exports, export destinations, and in terms of revealed comparative advantage. The cross-country assessment has brought out the relative strengths and weaknesses of different countries in various product categories of auto parts under the complexity of global development, country policies and the state of industry.

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The real world is dynamic and under perpetual change due to continuous technological and managerial innovations. The advantages of an organisation need to be sustained through conscious efforts. Research studies in the past have attempted to relate size, concentration, institutional structure, vertical/horizontal integration of enterprise/industry to profit-cost margins and competitiveness (Bain, 1951; House 1976; Bradburd *et al.* 1982). These studies focused on the enterprises and industry. On the other hand, governments can also influence the structure and performance, and hence competitiveness of industry and enterprises through direct policies on technology, R&D, environment etc. and through indirect policies relating to macro-economic environment, fiscal and monetary aspects, protectionist measures etc. While it has played a facilitative role in countries like Japan, South Korea, Taiwan etc. (World Bank 1993; Wang *et al.* 1995), it has played an obstructionist role for the expansion and growth of the industry in countries like India (Bhagwati *et al.* 1970; Balassa 1982; Goyal 1988; and Alam 1985). Thus competitiveness is nurtured by both government policy and support, and the corporate strategy of the firms. The sum total of this would be reflected in the competitiveness of the industry, particularly through export competitiveness. This aspect was studied empirically in a few Asia-Pacific countries in relation to auto parts industry. Zeroing down on an industry was essential as competitiveness is bound to be industry specific.

Competitiveness is nurtured by both government policy and support, and the corporate strategy of the firms.

With South Korea strong in auto industry, Taiwan strong in auto parts industry and both China and India considering auto parts a promising sector for export

promotion, the industry in these four countries was chosen for the study. Beginning with a global overview of the industry (section 2), the government policy (section 3) and the structure of industry in different countries (section 4) are discussed. This is followed by an analysis of export competitiveness (section 5) and conclusions (section 6). It may be mentioned here that substantial data and information referred to in the paper were obtained through personal interaction and discussion with officials from concerned government institutions and industry associations in the respective countries.

Overview

The fate of auto parts industry is naturally associated very closely with that of the automobile industry, the latter industry dominated by firms from US, Europe and Japan. The ground rules of the industry in all aspects were substantially changed with the entry of Japanese in the industry. Lowering costs and improving efficiency through innovative means in production, operations, organisation of work and vendors, technology, use of new material, fuel efficiency, quality control etc. became absolutely essential and Japanese proved themselves to be very efficient in all these.

In auto components industry, out-sourcing of a number of parts has been a regular practice in varying degrees. Traditionally, American car makers manufacture higher percentage of components in-house as opposed to the Japanese counterparts. The outsourcing percentage is around 50 per cent in North America, 60per cent to 65 per cent in Europe and nearly 70 per cent in Japan and Japanese companies abroad (EIU, 1993). In the Japanese companies abroad (EIU, 1993). In the Japanese culture, the relationship between the vehicle maker and the component suppliers is consciously developed in the spirit of mutual partnership. Thus the number of suppliers and kept limited and a long term relationship is developed. This practice is catching up in Europe and North America also, though not to the same degree. The automobile industry globally, is highly competitive. Thus, to reduce costs, attempts are being made to evolve common parts; redesign, relocation and simplification of parts; several models on the same assembly line; reducing development cost and time etc. The parts industry, being an intermediate industry is also under high pressure from the lead sector. The relationship between the two is undergoing tremendous change from the old pattern of "make to drawings". The major challenges that the components industry has to face are:

(a) fewer suppliers to auto industry with long term relationship.

(b) demand for 5 per cent to 10 per cent reduction in cost annually when sourced from developing countries.

(c) responsibility for design, development, testing, quality and research, including covering of development costs.

(d) shorter innovation cycles.

(e) use of electronic and new materials.

(f) emerging modular system, with others as vendors to module supplier.

(g) need for high flexibility and adaptability in view of frequent phasing out of vehicle models.

The logic of these pressures become clear when one looks at the market size, estimated at US $400 billion in 1992 and expected to grow to US $530 billion by 2000 AD. Just 15 countries, mostly of European origin together with US and Japan dominate the market to the tune of 96 per cent in exports and 75 per cent in imports, suggesting a lot of intra-trade among the countries. Just 65 companies from these countries enjoyed a share of 55 per cent of the global market of components in 1992 and this is expected to go up to 588.5 per cent by 2000 AD., with the corresponding world vehicle production and registration rising to 65 million and 680 million respectively (EIU, 1993). Thus, there is a huge market for those who are competitive globally.

Industrial Policies

As noted earlier, government policies substantially influence the competitiveness of an industry. It would be fruitful to take a look at the policies towards the auto and auto parts industry in South Korea, Taiwan, China and India as a prelude to study export competitiveness. However, it must be mentioned that the discussion here is of policies as pursued successfully prior to the current financial crisis in the Southeast Asian region. South Korea is affected by the crisis. Impact on India and Taiwan has so far been relatively marginal and is expected to be within a reasonable limit. While the crisis has been particularly severe in South Korea in the macro economic sense, in the context of our discussion, it would mean cheaper availability of South Korean auto parts in the international market. Thus our understanding and analysis are not likely to be affected significantly. With this caution, the policies are discussed below country-wise:

South Korea

Korea has emerged as an acknowledged player in the global automotive scenario in the past decade or so

due to attention first paid to the machinery industry. This has been made possible by several policy measures. This was followed by the development of automobile industry. In the process the component industry was last to develop with significant import dependence. To facilitate this, the import duty on components and raw material was fixed at 8 per cent with import of raw material allowed freely. Consequent to these measures, over 4 million Korean vehicles have been exported. While logically, it should have resulted in a proportionate growth in the export of components, it did not happen due to excess dependence on import of critical components by the vehicle industry. Aware of the fact that Korean automobiles are a grade below the best in the international market, the government initiated a US$ 3 billion project in 1991 for the development of technological capability in automobile and components industry jointly with the industry. The focus was on fuel efficiency, electric/solar car, transmission and self controlled systems, safety, environmental protection etc. on the automobile side and on technology, quality common parts, modernisation and infrastructure development for the parts industry. High and stringent quality standards are imposed on the quality of both—automobiles and components, resulting in the improvement of competitiveness in both the industries.

Korea has emerged as an acknowledged player in the global automotive scenario in the past decade or so due to attention paid to the machinery industry.

Taiwan

The export of auto components from Taiwan is currently of the order of $ 2 billion per annum. This has been made possible by the industry specific policies of the government responsive to the changes in the environment. With foreign exchange reserves high, liberal technology acquisition was permitted. But to avoid duplication and to ensure deepening of technology, foreign companies with the same technological source were permitted to have collaboration with only one local firm. Similarly, responding to the changing needs of technological requirement and support at different time phases, the government suitably varied the mandatory requirement of local content rate in automobile industry. Thus, this requirement was brought down to 50 per cent since 1989 from 70 per cent earlier. A major incentive for the development of the industry was a 3 per cent concession for four years on commodity tax for indigenous development of each of body style, chassis and engine. To exploit this opportunity, three mutually competing vehicle manufacturers, together with the Industrial Technology Research Institute, a government sponsored institute, have developed a 1200 cc engine within 3 years and the engine is being used by the three vehicle companies since 1996 in their automobiles. The high standards on emission have also helped the industry to raise its quality standards.

China

In China both the auto industry and the components industry are relatively primitive. Only in the last decade or so, some significant progress has been made. The government has declared the automobile industry as a "pillar" industry. Consequently, several measures have been announced and promoted for the growth of the industry. These include promotion of joint ventures with leading multinationals for vehicle production as well as for components development. However these joint ventures are approved case by case and so are the foreign exchange requirements. In general, the control on foreign exchange is very stringent and the transactions are kept under control. In recent years, the government is encouraging the equity participation route in existing companies for foreign investment. It has been planned to rationalise the automobile industry into 6 or 7 enterprise groups from the present over 120 assembly plants. The government has resolved to develop world class automobiles by 2010 AD and specific projects are being initiated to achieve this in both automobile and the components industry. Though China lacks in technology, several world leaders are keen to get a foot-hold in China with the demand for sedans put at 1.3 to 1.6 million vehicles per annum by the turn of the century and at 3.5 to 4.4 millions by 2010 AD.

India

Until mid-eighties, the then three decade old Indian automobile industry was operating in a highly protected environment with no competition from domestic or foreign sources. Thus while the vehicle was 100% indigenised, the technology did not progress. Only in the last 10 years, and more particularly with the delicensing of the automobile industry in 1993 that real competition has emerged in the industry. Foreign equity participation of 51 per cent is permitted now, the dividend balancing condition has been withdrawn, foreign companies are to be treated at par with Indian companies and the Monopolies and Restricted Trade Practices Act and the Foreign Exchange Regulation Act have been relaxed. Special incentives are offered to export oriented units and to those located in the export processing zones. Export projects are tax free. The customs duties have

Until mid-eighties, the then three decade old Indian automobile industry was operating in a highly protected environment with no competition from domestic or foreign sources.

been brought down significantly and are currently in the range of 25 per cent to 30 per cent for most of the imports for automobile industry and for a few items it goes up to 40 per cent. Import of capital goods up to Rs. 20 million, and technology collaboration up to Rs. 10 million are automatically approved. A 24 per cent equity participation by large industrial undertakings in now possible in Small Scale Industrial (SSI) units of auto components which were earlier reserved exclusively for the SSI sector. The Indian automobile scenario had slowly begun to change since mid-eighties with the emergence of Maruti Udyog Limited[1] to manufacture 800 cc cars. Currently, with the emergence of several vehicle manufacturers in the Indian scene, there is a feeling of "over-crowding" in the industry.

Industry Structure

The prevailing industry structure provides the base for the industry's growth, development and competitive edge. A short review of this in different countries would be helpful.

South Korea

South Korea is well established in the automobile industry and is the sixth largest manufacturer in the world. Three of the Korean companies have capacities close to international norms (two with more than a million vehicles per annum). They account for 91 per cent of the capacity and 95 per cent of automobile exports from Korea. By 2000 AD, Korea plans to export 1.5 million vehicles annually, with the domestic market stabilising around 2 million vehicles per annum. With the Won becoming cheaper with the recent financial crisis, Korea may have a greater edge now.

Korea has about 1500 component manufacturers, of whom 60 are large companies and 120 actively export. Some of them are the first tier suppliers. The exports of auto components at US $ 724 million in 1993 was just 6 per cent of the total production. Partly this is due to the low level of local content rate in Korean vehicles (only 35 per cent). However, with plans to export 1.5 million vehicles annually from the level of 0.7 million in 1994, it is expected that exports of components would also increase. Also, considerable R&D efforts are on by the leading chaebols in automobile business, besides the joint research with the government.

Taiwan

The automobile industry has grown substantially in Taiwan from 2.4 vehicles per 100 persons in 1980 to 17.9 in 1994. This dramatic growth was made possible by the rapid growth in the per capita income of the nation. Both the vehicle industry and the components industry have depended on collaborations for technology, particularly from the Japanese source. There are over 400 component manufacturers of medium and large size in Taiwan and many small manufacturers mostly in low end products, exporting substantially to the after markets. Of late, there are conscious efforts to shift to original equipment manufacturers (OEMs) by the larger suppliers. In 1994, the exports were worth US $ 1.8 billion (with approximately 20 per cent to OEMs) from an estimated production of US $ 4.1 billion. Recently a 1200 cc engine has been developed through a joint research by the government and industry.

China

China has over 150 vehicle assembly plants and over 3000 component manufacturing units. The industry is currently being rationalised into 6 or 7 large vehicle assembly plants. Similar efforts are on in the component industry also with clear focus on selected categories of components. There are nearly 400 excellent component manufacturers with advanced technology and high quality. With the scramble of global automobile industry to China, there is also a scramble of global component manufacturing giants (some of them subsidiaries of global auto-giants) also. Many of them have entered into collaboration with local state-owned enterprises.

India

The automobile industry was delicensed in 1993 and with that several global automobile giants have set-up assembly plants in India, mostly as joint ventures and some on their own. This large scale interest is rooted in the estimated million plus demand for vehicles annually. The situation has naturally provided considerable opportunity to the component industry and some of them are exploiting this well.

India has a few thousand small and medium manufacturers of auto-components. About 450 of them

1. A joint venture between the Government of India and the Suzuki Motor Corporation of Japan.

are in the organised sector. The bulk of production and exports come from them. In 1994-95, the industry had a turnover of US $ 2.1 billion (with nearly 77 per cent coming from the organised sector). A little over 10 per cent of this production was exported, mostly to the after market. The Indian components industry underwent a sea change with the emergence of the Maruti car in the mid-eighties. Several new generation autoparts manufacturing units came up many in collaboration with the suppliers to Suzuki Motor Corporation in Japan. Some of the established Indian companies have also reoriented themselves to the emerging business environment. Buy back arrangements have also been worked out with a number of new collaborations. The potential for export of components seems good.

In general, Korea and Taiwan are much ahead of China and India in terms of technological capabilities. The focus of these countries are now shifting to sophisticated electronic and value added components. In a way this would be favourable to China and India, whose capabilities are in the lower end components.

Analysis of Export Competitiveness

Export competitiveness was analyzed in terms of three product categories according to the Standard International Trade Classification. Country-wise export data are available from the UN sources according to the categories mentioned below, classifications, except for Taiwan. For Taiwan, local sources were relied upon. The categories were auto parts and accessories (SITC 784.9), auto electrical equipment (SITC 778.3) and parts and components of motorcycles (SITC 785.3), or in short, motorcycle parts. The three together have been referred to as auto components and parts, meaning the entire range of components and parts industry.

Export performance

Table 1 indicates the export of auto components and parts by these countries. With an export level of US$ 1.8 billion in 1994, Taiwan was far ahead of the countries, with Korea at US$ 0.6 billion, China at US$ 0.5 billion and India at US$ 0.25 billion. Between 1988-94, the exports have been growing fastest for Korea (16 per cent), followed by India (11 per cent), China (10 per cent) and Taiwan (10 per cent). The exports of Korea, China and India have been growing from a small base while that of Taiwan has been growing from a much larger base sustaining the growth rate at 10 per cent. Taiwan's exports in the past were exclusively for after market. However, in recent years, 20 per cent of exports are destined to original equipment manufacturers. In the case of Korea, the export growth is to an extent linked to the export of Korean vehicles. In fact, the export growth can be expected to be much faster with an increase in the vehicle exports from Korea. Due to the current devaluation of Won, Korean components would be cheaper in the international market. The exports from China and India are mostly for after markets. The considerable fluctuations in the Chinese exports is possibly due to inaccuracies in the data reported. In India, while there is a 11 per cent growth over the period of 1988-94, there seems to be a stagnation in exports in recent years.

Table 1: Exports of Auto Components and Parts

(Value: US $ million)

Year	Taiwan		Korea		China		India	
	Value	% increase	Value	% increase	Value	% increase	Value	% increase
1988	1,026.3		247.3		263.6		133.5	
		14.4		27.4		–63.4		26.7
1989	1,174.3		315.1		96.6		169.1	
		–0.5		8.8		635.9		1.9
1990	1,168.9		342.8		710.9		172.3	
		10.7		1.5		34.2		17.4
1991	1,294.5		347.8		954.2		202.3	
		15.6		15.0		–74.1		31.9
1992	1,496.2		399.8		247.0		266.9	
		1.2		21.3		37.8		–6.0
1993	1,514.4		485.0		340.3		250.9	
		18.0		24.5		39.7		–0.0
1994	1,787.3		603.9		475.3		249.9	
Growth rate %								
1988-94	9.7		16.0		10.3		11.0	

Source: Computed from UN Commodity Trade Statistics and Statistics Available from the Taiwan Transportation Vehicles Manufacturers Association (TTVMA), Taiwan.

Next, export performance by product categories are analyzed (Table 2). Such details were not available for Taiwan as UN does not report data on Taiwan. Korea's strength on this basis seems to be in auto parts and accessories with an export share of 82 per cent in 1994 and an annual growth rate of nearly 18 per cent. Auto electrical equipment comes next with a share of 14 per cent and a growth rate of 7.5 per cent. While the export of motorcycle parts has been growing at 21 per cent, it has been from a very low base. Indian exports are dominated by auto parts and accessories (51 per cent) with a growth rate of 11.5 per cent closely followed by motorcycle parts (44 per cent) with a growth rate of 9.4 per cent. In the case of China also, the auto parts and accessories and motorcycle components are the two dominating categories.

Table 2: Product-category wise Exports of Auto Components and Parts

(Value: US $ million)

Year	Korea Value	Korea % increase	China Value	China % increase	India Value	India % increase
Auto parts and accessories						
1988	184.7		217.7		66.3	
		21.8		–79.8		24.3
1989	224.9		43.9		82.4	
		9.3		1362.0		3.2
1990	245.8		641.8		85.0	
		10.0		35.4		12.1
1991	270.4		869.1		95.3	
		14.5		–86.1		24.7
1992	309.7		121.0		118.8	
		23.4		40.3		–3.8
1993	382.3		169.8		114.3	
		30.0		43.6		11.3
1994	497.0		243.9		127.2	
Growth rate %						
1988-94	17.9		1.9		11.5	
Auto electrical equipment						
1988	56.0		2.4		2.0	
		41.8		58.3		75.0
1989	79.4		3.8		3.5	
		8.4		–26.3		–2.9
1990	86.1		2.8		3.4	
		–22.4		203.6		26.5
1991	66.8		8.5		4.3	
		19.9		158.8		95.3
1992	80.1		22.0		8.4	
		12.9		22.3		–4.8
1993	90.4		26.9		8.0	
		–4.2		47.6		40.0
1994	86.6		39.7		11.2	
Growth rate %						
1988-94	7.5		59.6		33.3	
Parts and components of motor cycles						
1988	6.6		43.5		65.2	
		63.6		12.4		27.6
1989	10.8		48.9		83.2	
		0.93		35.6		0.8
1990	10.9		66.3		83.9	
		–2.8		15.5		22.4
1991	10.6		76.6		102.7	
		–5.7		35.8		36.0
1992	10.0		104.0		139.7	
		23.0		38.1		–7.9
1993	12.3		143.6		128.6	
		65.0		33.5		–13.3
1994	20.3		191.7		111.5	
Growth rate %						
1988-94	20.6		28.0		9.4	

Source: Computed from UN Commodity Trade Statistics for Korea, China and India, several years.

Share in world exports

As mentioned earlier, the global production and exports of auto-components is dominated by a handful of countries and companies. Thus the countries studied have a very small share of the global trade. However, what is important is the fact that slowly but steadily the countries studied have been improving their shares. Secondly, even if the share in global exports are not significant, they are important for the individual countries, with the share of auto-components in the export basket of the respective countries increasing significantly.

As can seen from Table 3, in 1993 Taiwan had a share of 1.5 per cent, Korea 0.48 per cent, China 0.34 per cent and India 0.25 per cent in the global trade of auto components and this share has been slowly increasing for Taiwan, Korea and India. At product-category level, a similar trend in observed for Korea and India for auto parts and accessories with the shares increasing from 0.27 per cent and 0.10 per cent respectively in 1988 to 0.44 per cent and 0.13 per cent. In the case of auto electrical equipment, Korea has a share of around 1 per cent, and India does not have any significant share. In the case of parts and components of motorcycles, the share of China, India and Korea are respectively 3.3 per cent, 3 per cent, and 0.3 per cent. The strength of China and India in this category seems to be essentially in their ability to supply parts to some of the older generation bikes being used in developing countries. In the case of China, the reasons for the wide fluctuations in the country's share for all the product categories are possibly more due to data problem.

Export destinations

With the three product-categories substantially heterogeneous, a destination-wise analysis of exports for entire auto parts industry may be misleading. Hence, this was attempted at the product category level identified earlier. However in the case of Taiwan, the information was available only at the aggregate level of all components (Table 4). The major destination is USA, but the share has been gradually coming down and the share in Japan has been going up. This is due to a conscious effort by Taiwan to reduce its dependence on USA.

Tables 5 to 7 report the exports of China, Korea and India to major destinations as per the product categories. If we overlook China's exports to Hong Kong (with their merger now), USA is the single largest destination for all the countries – China, Korea and India – in most cases. Only India is an exception to this in the case of parts and components of motorcycles.

Table 3: Share of the Countries in World Exports of Auto Components and Parts

(in per cent)

Year	Exporting countries				Year	Exporting countries		
	Taiwan	Korea	China*	India		Korea	China*	India
	Auto components and parts (all)					**Auto parts and accessories**		
1988	1.3	0.32	0.34	0.17	1988	0.27	0.31	0.10
1989	1.5	0.40	0.12	0.21	1989	0.32	0.06	0.12
1990	1.1	0.31	0.64	0.16	1990	0.25	0.65	0.09
1991	1.4	0.37	1.02	0.22	1991	0.33	1.05	0.12
1992	1.5	0.40	0.25	0.27	1992	0.35	0.14	0.13
1993	1.5	0.48	0.34	0.25	1993	0.44	0.19	0.13
	Auto electrical equipment					**Parts and components off motor cycles**		
1988	–	0.99	0.04	0.04	1988	0.31	2.04	3.06
1989	–	1.05	0.05	0.05	1989	0.43	1.95	3.33
1990	–	1.00	0.03	0.04	1990	0.32	1.97	2.50
1991	–	0.91	0.12	0.06	1991	0.31	2.25	3.02
1992	–	0.95	0.26	0.10	1992	0.27	2.76	3.71
1993	–	0.97	0.29	0.09	1993	0.28	3.31	2.96

Note: *excluding exports to Hong Kong under the category of "auto parts and accessories"

Source: Computed based on data from

1. UN Commodity Trade Statistics, several years.
2. Taiwan Transportation Vehicles Manufacturers Association (TTVMA), Taiwan.

The next major destination is Japan followed by UK/ Europe and Asia. More specifically, China's export of auto parts and accessories to US have been growing at 19.2 per cent per annum during 1988-94, while Korea's growth in US market was 11.3 per cent per annum and that of India's 31.6 per cent per annum. But we naturally need to relate it to the base level from which the growth is taking place, and this is rather low in the case of India. While Singapore is another growing market for China, Japan and rest of Asia are also found to be important in terms of market share though the rate of growth is found to be negative. Once again this could be due to the possible inaccuracies in the Chinese data. In the case of Korea, Japan, rest of Asia and Europe provide growing markets. In the case of India besides USA, UK, rest of Europe, Africa and Asia have been other growing markets.

In the case of auto electrical equipment also USA has been a major destination for all of China, Korea and India. However the exports were hardly US $ 42.5 million in 1994 for Korea, with India and China far behind. Thus in this field all the countries have to make a significant advancement.

In the category of parts and components of motorcycles, Korea practically does not export. Both for China and India, Europe and Asia have been important and growing markets. Further a fifth of India's exports from this category is destined to Africa.

Table 4: Destination-wise Share of Exports of Auto Components and Part from Taiwan

(in percent)

Country	1989	1991	1992	1993	CAGR* (1989-93) in exports	CAGR* (1989-93) in import market size
USA	50.1	39.9	38.0	40.9	1.3	3.5
Japan	7.4	10.0	10.0	11.4	18.4	16.2
Europe	4.9	4.9	5.0	5.0	7.2	6.5
South	–	1.4	2.0	2.2	35.9	16.6
Africa Rest of World	37.6	43.7	45.0	40.5	8.6	5.1
Total	100.0	100.0	100.0	100.0	6.6	5.7
Exports (US $ million)	(1174.3)	(1294.5)	(1496.4)	(1514.4)		

* Compounded Annual Growth Rate

Source: 1. Taiwan Transportation Vehicles Manufacturers Association

2. UN Commodity Trade Statistics Yearbook, 1993.

Table 5: Destination-wise Share of Exports of Auto Parts and Accessories

(in per cent)

Country	1988	1992	1993	1994	CAGR* 1988-93	CAGR* 1988-94
KOREA						
USA	50.0	39.3	38.3	35.3	9.7	11.3
Canada	5.0	5.2	4.6	3.6	13.7	11.6
Japan	13.0	14.4	9.9	9.7	9.5	12.2
Rest of Asia	14.6	19.1	21.8	24.6	25.4	28.7
Europe	7.3	10.1	11.1	12.1	25.7	28.3
Others	10.1	11.9	14.3	14.7	24.0	25.5
Total	100.0	100.0	100.0	100.0	15.7	17.9
Exports (US $ million)	(184.7)	(309.7)	382.3	(497.0)		
CHINA						
USA	22.6	43.2	57.1	58.0	14.5	19.2
Canada	23.9	9.8	7.4	10.7	–24.8	–10.8
Japan	3.7	10.2	7.5	6.0	9.6	10.4
Rest of Asia	26.4	22.7	17.6	14.9	–12.3	–7.4
Europe	20.6	9.5	4.4	4.4	–30.3	–21.1
Canada	1.2	0.7	1.2	1.4	–5.1	5.1
Others	1.5	3.7	4.8	4.5	20.7	22.8
Total	100	100	100	100	–4.8	1.9
Exports (US $ million)	(217.7)	(121.0)	(169.8)	(243.9)		
INDIA						
USA	12	19	25	32.4	29.4	31.6
UK	12	10	10	11.2	6.5	9.9
USSR (east-while)	5	0	0	0.8	–38.1	–18.0
Africa	18	18	15	13.9	7.4	6.4
Asia	34	38	35	25.4	12.5	6.4
Rest of Europe	6	11	10	10.8	17.3	18.3
Others	13	4	5	5.5	–7.6	3.1
Total	100	100	100	100.0		
Exports (US $ million)	(66.3)	(118.8)	(114.3)	(127.2)		

*Compounded Annual Growth Rate of Exports.

Source: Computed using data from UN Commodity Trade Statistics for Korea, China and India, several years.

Table 6: Destination-wise Share of Exports of Auto Electrical Equipment

(in per cent)

Country	1988	1992	1993	1994	CAGR* 1988-93	CAGR* 1988-94
KOREA						
USA	59.6	52.1	60.0	49.1	10.2	4.1
Japan	3.6	7.1	4.1	4.3	13.1	10.8
UK	17.5	19.2	7.1	7.0	–8.2	–7.6
Others	19.3	21.6	28.9	39.6	19.3	21.2
Total	100.0	100.0	100.0	100.0	10.1	7.5
Exports (US $ million)	(56.0)	(80.1)	(90.4)	(86.6)		
CHINA						
USA	4.2	14.5	23.8	33.8	129.7	126.2
Hong Kong	50.0	43.6	17.1	15.6	30.8	31.5
Others	45.8	41.8	59.1	50.6	70.6	62.3
Total	100	100	100	100	62.1	59.6
Exports (US $ million)	(2.4)	(22.0)	(26.9)	(39.7)		
INDIA						
USA	5	10	6	10.7	38.0	51.3
UK	15	8	9	7.2	18.4	17.8
Africa	35	13	16	15.2	13.2	15.9
Asia	20	25	33	25.9	45.4	39.1
Rest of Europe	15	37	23	21.4	43.1	41.4
Others	10	7	14	19.6	40.6	49.1
Total	100	100	100	100.0	32.0	33.3
Exports (US $ million)	(2.0)	(8.4)	(8.0)	(11.2)		

*Compounded Annual Growth Rate of Exports.

Source: Computed using data from UN Commodity Trade Statistics for Korea, China and India, several years.

Growth in Exports and Imports

Table 8 presents an interesting comparison between the growth in exports from a country against the growth in the import market size of major export destinations during 1988-93 for each of the product categories. The exports to USA from each of the country for each product category are growing much faster than the growth in the import market size of US. However, this growth is from a low level particularly for auto electrical equipment and motorcycle parts for all the three countries. While Korea has a presence in the tough

Table 7: Destination-wise Share of Exports of Parts and Components of Motorcycle

(in per cent)

Country	1988	1992	1993	1994	CAGR* 1988-93	CAGR* 1988-94
KOREA						
USA	16.7	40.0	26.8	18.3	24.6	22.4
Japan	71.2	49.0	40.7	36.9	1.2	8.1
Others	12.1	11.0	32.5	44.8	38.0	50.0
Total	100	100.0	100.0	100.0	13.3	20.6
Exports (US $ million)	(6.6)	(10.0)	(12.3)	(20.3)		
CHINA						
USA	1.8	1.5	14.6	10.3	92.0	70.6
Hong Kong	33.1	40.7	12.3	11.4	4.1	7.2
Singapore	15.2	6.6	9.3	7.6	15.2	14.1
Rest of Asia	18.2	20.6	28.3	36.0	38.8	43.5
Europe	13.6	6.4	16.6	17.5	32.2	33.6
Canada	–	1.7	2.4	2.4	**227.1	***160.4
Others	18.2	22.4	16.5	14.8	24.6	23.7
Total	100	100	100	100	27.0	28.0
Exports (US $ million)	(43.5)	(104.0)	(143.6)	(191.7)		
INDIA						
Africa	33	27	26	20.8	9.4	1.4
Asia	36	34	33	33.0	12.6	7.9
USA	1	2	2	3.9	26.9	35.3
Europe	19	16	17	23.0	11.8	12.4
Others	11	21	22	19.3	32.2	20.6
Total	100	100	100	100.0	14.6	9.4
Exports (US $ million)	(65.2)	(139.7)	(128.6)	(111.5)		

*Compounded Annual Growth Rate of Exports.

: for 1990-93; *: for 1990-94

Source: Computed using data from UN Commodity Trade Statistics for Korea, China and India, several years.

market of Japan, the Japanese import market has been growing faster than the Korean exports to her. In most other markets (Europe, Middle East, Africa), Korea and India have improved their presence. The same is true for China with regard to auto electrical equipment and motorcycle parts. In general, the total exports from China, Korea and India have grown faster than the growth in the global market size for all product categories. The only exception, as seen from data, is auto parts and accessories from China. We have already expressed our reservations with regard to data on China. Contrary to the general trend, Taiwan is pursuing a strategy of reducing its dependence on US economy and increasing its exports at a faster rate to the quality conscious Japanese market (Table 4).

Table 8: Growth in Exports vs Growth in the import Market Size, 1988-83

(in percent)

Markets	Growth in the import market size (1988-93)	Rate of growth of exports from Korea	China	India
Auto parts and accessories				
USA	4.1	9.7	14.7	29.4
Japan	19.3	9.5	–24.8	56.2
Europe	7.4	25.7	–30.3	11.1
Middle East	3.9	26.4	–10.6	19.0
Africa	10.1	12.8	22.7	7.4
Rest of Asia	2.5	24.8	–8.0	5.4
World	5.0	15.7	–4.8	11.5
Auto electrical equipment				
USA	8.0	10.2	129.7	38.0
Japan	16.4	13.1	–	–
Europe	4.2	–6.1	–	35.5
Middle East	14.4	9.2	–	45.0
Africa	1.3	1.6	41.9	13.2
Rest of Asia	17.5	33.0	30.5	41.6
World	6.1	10.1	62.1	32.0
Parts and components of motor cycles				
USA	8.7	24.6	92.0	26.9
Japan	20.0	1.2	132.9	–
Europe	14.1	60.3	32.2	11.8
Middle East	30.0	–	44.6	29.3
Africa	7.1	–	11.0	9.4
Rest of Asia	26.6	23.3	14.3	9.5
World	14.6	13.3	27.0	14.6

Note: negligible

Source: Computed using data from UN Commodity Trade Statistics for Korea, China and India, several years.

Revealed Comparative Advantage (RCA)

The revealed comparative advantage for a country in a particular product (product category) is measured by the product's share in the country's ex-

The revealed comparative advantage for a country in a particular product (product category) is measured by the product's share in the country's exports relative to its share in the world trade.

ports relative to its share in the world trade. Alternatively, it can be looked upon as the country's share in the world trade of the product relative to the country's share in the total world trade. Thus an RCA 1 would indicate the advantage of the nation in that product. Table 9 shows product categorywise RCA indices for Korea, China and India. On the basis of RCA, a constant improvement is observed in the case of China for all product categories. Korea has improved its position in auto parts and accessories and in parts and components of motorcycles. In the case of auto electrical equipment, Korea seems to be loosing its ground as seen from RCA. Indeed it has not been a substantive area of exports for Korea. India seems to be loosing in all the three product categories in terms of RCA. This is because in the last few years, growth in exports has considerably slowed down for auto parts and accessories and auto electrical equipment, and has been negative in the case of motorcycle parts even though when viewed against the base of 1988, there is growth.

Table 9: Revealed Comparative Advantage Indices for Different Product Categories

	1992	1993	1994	1992-94*
	Auto parts & Accessories			
Korea	0.169	0.192	0.211	0.193
China	0.059	0.076	0.082	0.074
India	0.239	0.211	0.196	0.214
	Auto Electrical equipment			
Korea	0.088	0.082	0.063	0.076
China	0.022	0.022	0.023	0.022
India	0.034	0.027	0.030	0.030
	Part and components of motorcycles			
Korea	0.041	0.040	0.065	0.050
China	0.391	0.422	0.487	0.439
India	2.152	1.560	1.302	1.632

*Computed using average export levels for 1992 to 1994

Source: Computed using data from

1. UN Commodity Trade Statistics for Korea, China and India, several years.
2. International Trade Statistics Yearbook, several years.

In relative terms the nations are ordered below by their order of comparative advantage in different product categories:

Auto parts and accessories:	*India, Korea, China*
Auto electrical equipment:	*Korea, India, China*
Parts and components of motorcycles:	*India, China, Korea*

In the case of motorcycle parts, India seems to enjoy a distinct advantage far ahead of China, with Korea not a significant player in this category. In the case of auto parts and accessories, while India and Korea are closeby in terms of their comparative advantages, China is far behind. In the case of auto electrical equipment all the three countries are very insignificant players in the global trade, with Korea leading among these. The above analysis had one limitation. While the country-wise exports for different product categories were obtained on the basis of 4-digit SITC codes, the data for world exports were available only at the 3-digit level. With this having an impact for all the countries, the relative position of RCA indices are expected to be indicative of the competitive position of the countries. Also it should be noticed that RCA indicates only the relative share of the product category in the country in relation to the product category's share in the global trade. Thus, for example, the export performance of Korea in auto parts and accessories has been far superior to that of India.

Discussions and Conclusions

The export competitiveness of all the countries studied have been looked at from different angles. Taiwan with substantial exports is now targeting itself on value added products and on OE customers. On the other hand, China and India, with their low technology and export levels, are only in the after market segment. Korea still has a long way to catch up with Taiwan but has high potential Korea's focus is already on value added products and on OEMs.

Auto parts and accessories are mostly comprised of metal parts which can be said to be relatively traditional items among auto parts, but continue to have a huge demand. Thus it is natural that new entrants should pick on this category and the major markets in general are USA, Japan and Europe where the automobile manufacturing is concentrated. However, individual countries like China and India at the lower end of the ladder have worked out their niche markets. Broadly the above pattern is true of auto electrical equipment and motorcycle parts also. However, given the technological sophistication of auto electrical equipment China and India have a long way to go. In the case of motorcycle

parts, both China and India need to gear up to parts for the new generation bikes from the advanced countries.

And finally, the revealed comparative advantage indices are indicative of the relative advantage of nations. In the case of auto parts and accessories and motorcycle parts, India seems to enjoy an advantage. This is particularly high (though reducing over time) in the case of the latter and the changing nature of the motorcycle industry must be kept in mind. In the case of auto electrical equipment Korea is naturally ahead with China and India practically non-existent in exports in this field. While China does not seem to enjoy any clear advantage, it should be noted that having declared the automobile industry a "pillar" industry, very conscious efforts are being focused on the industry. Thus given the Chinese determination, the industry could grow rapidly. This cross-country assessment has brought out the relative strengths and weaknesses of different countries in selected categories of auto components in the complexity of global development, home country policies and the state of industry. In conclusion, technology is a critical factor in this field and its enhancement would depend on the joint initiative of government and industry in a country. While this is happening to a significant extent in Taiwan, Korea and China, in India such partnership measures between government and industry are yet to emerge. The sooner such measures emerge, the greater the industry would stand to gain. Such efforts should be focused on areas having a comparative advantage for higher returns to the nation.

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Factors & Frameworks of Competitiveness

K. Momaya & Ajitabh

International competitiveness has become crucial for survival and success. It cannot be improved, if we do not know what it is and how to quantify it. Understanding about competitiveness, its dynamics and improvement efforts, still appears to be very basic in India. This paper reviews the basic factors and frameworks for evaluating competitiveness at three different levels: company, industry and country. Considering the importance of competitiveness at the industry level, a framework for evaluating competitiveness is tested in context of auto component industry. Factors of competitiveness and their importance are quantified through a survey.

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Euphoria generated by liberalization of early 1990s and resultant boom is slowly giving way to gloom. There is chaos in the industry across sectors. Many firms have closed doors and others are frantically trying to remain afloat. Many countries overcome constraints of low domestic growth by focussing on exports. For instance, some developed countries are trying to overcome stagnant growth in home markets by globalization, particularly focusing on large emerging markets such as India and China. Unfortunately, for India, exports have registered very low or negative growth rates at the time when they are needed badly. The trade balance has persistently been negative and reached alarming levels (Table 1). It may not be a surprise, if in near future we again face the crisis like one of 1991.

Table 1: International Trade Performance of India

Criteria	1996-97	1995-96	1994-95
Exports (Rs. Cr.)	1,18,817	1,06,353	82,674
Export growth rate (%)	11	28	18
Imports (Rs. Cr.)	1,38,818	1,22,678	89,971
Import growth rate (%)	13	38	23
Trade Balance (Export-Import Rs. Cr.)	−20,102	−16,325	−7,297

Source: Adapted from Economic Survey, 1997-98.

Numerous reasons can be given for the problems faced by Indian firms, however one can trace them to a root cause of poor competitiveness. After liberalisation, many Indian firms are finding it very difficult to compete even in India e.g., 'The End of Manufacturing...' (BI, 1999). When competing on home turf is a big problem,

Numerous reasons can be given for the problems faced by Indian firms, however one can trace them to a root cause of poor competitiveness.

competing in dynamic global markets becomes almost impossible. There are finding to our dismay that there are wide gaps between them and global players in terms of productivity, quality, technology, service standards, management of human resources, delivery, product range, etc. When competition is a key driving force, survival and growth depend on international competitiveness. International competitiveness has really become vital for survival and success of many industries.

Following the global trend, competitiveness has recently received attention in India also, but there are many questions about the concept, its utility, application and linkages with strategy that remain fuzzy to many stakeholders. Findings of pioneer work on the subject done by Porter and his team (Porter, 1985, 1990, 1998) and annual reports by Global Competitiveness Report are now widely covered in Indian business media. Some attempts have been made in India also to clarify the subject (Manikutty, 1995; Ghemawat, 1994; Assoccham, 1996; AIMA, 1998). However, the following questions—some very simple and others too complex to be answered even by experts—remain unclear in minds of many stakeholders:

- What is competitiveness and why is it important?
- What is its significance for firms, industries and country?
- How can it be evaluated?
- What is significance of poor rankings of India on global competitiveness report and many other score cards?
- How can it be improved, at each level: firm, industry and country?
- What are the dynamics and what are the sources of competitiveness?

It is often said *"You cannot improve what you cannot measure; To put your strategic ideas into practice, you need to measure the impact of your actions and benchmark against others."* Similarly, competitiveness cannot be improved, if we don't know what is it and how to measure it.

Research on 'Competitiveness' at the IIT Delhi is an attempt to improve understanding of the subject in light of above mentioned questions and premise. Apart from efforts to get meaningful answers to the above questions, focus is on developing and using systematic constructs, frameworks and techniques to understand dynamics of competitiveness. Companies being the prime vehicle of improved competitiveness at all levels, attempts are made to help companies in evaluating and improving their competitiveness. Currently, international competitiveness of auto-component, construction and telecom industries is being researched and other important industries such as information technology, software are also being considered.

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Competitiveness

The term *competitiveness* has become popular in the 1990's, however its meaning is understood very differently by various stakeholders. It will be useful to throw some light on definitions of levels of competitiveness. It can be defined at three hierarchical levels: nation, industry/sector and company. Formal definition of competitiveness at each level, compiled by D'Cruz (1992), given below may serve as a good starting point.

Country Competitiveness: Extent to which a national environment is conducive or detrimental to business.

Sector Competitiveness: Extent to which a business sector offers potential for growth and attractive return on investment.

Company Competitiveness: Ability to design, produce and/or market products superior to those offered by competitors, considering the price and non-price tangibles.

Above definition of sector competitiveness is too abstract for our purpose. A more performance-oriented definition of sector competitiveness can be given as: *"Collective ability of an industry on performance factors such as productivity, cost, market share, international share and technology".*

There are varieties of views available, particularly in the developed countries, about competitiveness and its dynamics at different levels. Reviewing, learning about them and adapting them for specific needs can be more beneficial than reinventing the wheel. A literature survey was conducted to identify important views, frameworks and models concerning competitiveness. Most of the available models evaluate competitiveness on either national or corporate levels. There is hardly any model available for industry competitiveness evaluation. How-

ever, there are numerous popular models focussing on specific factors of competitiveness. For instance, quality is an important factor of competitiveness. Some important models are, for instance the ones embedded in the following in famous quality awards for evaluating quality performance are (Zairi, 1996):

(a) The Deming Prize (Japan)

(b) The Malcolm Balrige National Quality Award (USA) and

(c) The European Quality Award

Having some idea about competitiveness at different levels, it will be useful to understand some recent thinking about competitiveness at each level.

Competitiveness at the Country Level

Successful countries have better understanding of dynamics of competitiveness. This dispersed knowledge has been there for centuries; studies about strategies and systems of successful nations throw light on this. Porter and his team at Harvard (Porter, 1985, 1986, 1990, 1998) contributed significantly to modern thought on the subject of competitiveness. The 1998 paper focuses on macro economic environment and corporate strategies. Theory about 'Competitive Advantage of Nations' and 'Diamond framework' provided a structured framework to understand dynamics of competitiveness at country level. The framework has been applied to many country contexts, including India (Ghemawat, 1994).

'Global Competitiveness Report (GCR)', brought out annually by 'World Economic Forum (WEF)' is a comprehensive evaluation of international competitiveness of countries. Competitiveness is evaluated on more than 250 criteria grouped under 8 factors of competitiveness. This is valuable source of information about relative positions of countries. However, proper judgement must be exercised in integration and use of ranking as these have certain biases.

Competitiveness at the Industry Level

Some industries contribute significantly to competitiveness of countries. For instance, contributions of competitive automobile and electronic industries in success of Japan are well known. Porter (1990) has discussed forces shaping industry competitiveness through cases of number of industries in different countries. Competitiveness is often evaluated on trade related criteria only. Other approximate ways to evaluate competitiveness of an industry of a country can be findings relative market share of firms of that country as given in 'global 500' (Fortune 1998). However, the criteria are mostly about financial performance, and it can be biased, as only large firms are part of the sample. A more comprehensive approach to understand dynamics of competitiveness and evaluate it was adapted from the concept given in the Global Competitiveness Report (GCR, 1993). It was tested in context of Canada, Japan and the United States of America (Momaya, 1996). It is particularly of use when a detailed picture is needed. Adaptations of this model are being used and illustrated through a detailed competitiveness report for auto component industry given in the section "Competitiveness of an Indian Industry."

Competitiveness at the Corporate Level

This is the level where real 'Competitive Olympics' is played. It is also the level where competitive strategies can be formulated, implemented and results can be analysed in finite time. Naturally, this is the level, which is of immense interest to firms. Dynamics of competition and strategy are quite well understood and documented in books and journals on strategy, competitiveness and organisational performance. Indirect indicators can be found in annual rankings of business magazines/newspapers, such as Fortune, Business Standard (BS1000), Business India (BI100), etc. A more comprehensive approach is used by magazines like Asia's Top 50 most competitive firms are selected based on number of criteria. Awards such as Deming Prize, CII Quality Award can also be considered as indirect indicators of competitiveness for winning companies.

Competitiveness at all the three levels is inter-linked. The focus of research is on industrial competitiveness which is vital bridge between the levels of country and company. Clusters concept (Porter, 1998) also emphasises industry level competitiveness. Some of the Models available for evaluation of competitiveness at different levels are discussed below.

Evaluating Competitiveness

Clear understanding of current position of competitiveness through systematic evaluation is essential for sustainable journey on the path of improving competitiveness. The utility of competitiveness as a useful indicator of the overall health of an Industry has been demonstrated (Momaya, 1998). Country competitiveness provides a picture of macro context of industry and company competitiveness. For instance, poor position of infrastructure in India means that companies and industries need to develop innovative strategies to overcome the constraint.

Table 2: Comparative Competitive Ranks and Trends for India

Factors of competitiveness	1996 India	1997 India	1998 India	1998 China	1998 Japan	1998 Korea	1998 USA
Government	14	31	28	5	27	34	13
Finance	30	37	33	42	23	45	1
Internationalisation	41	43	42	20	34	46	1
Infrastructure	43	45	46	40	21	31	1
Management	32	39	32	30	24	34	1
People	44	45	45	24	11	22	8
Science and Technology	33	30	29	13	2	28	1
Domestic Economy	32	24	18	5	15	34	1
Overall	38	41	41	24	18	35	1

Source: Adapted from World Competitiveness Yearbook, 1998.
Note: The ranks are out of 46 countries in 1998.

Among the various models of competitiveness discussed above, the hierarchical model consisting of factors and criteria is one of the most appropriate for detailed evaluation. For instance, about 250 criteria are used in the World Competitiveness Yearbook (1998). These criteria are grouped into eight factors of competitiveness listed in the Table 2. The performance of India is compared with relevant countries on different factors.

India is among the bottom ranks on most of the factors and the competitiveness position is worsening. Overall, India ranked 38 in 1996 and has slipped to 41 out of 46 countries in 1998. More worrying thing is India's position among the bottom, ranks on vital factors like people, infrastructure and finance. On the top of it, the trend is negative that is, ranks have gone down on these factors. Only silver lining is slight improvement in ranks on science and technology and domestic economy. However, the ranks were and still are far below many newly industrialised economies, not to mention about developed countries such as USA and Japan.

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The hierarchical framework of evaluating competitiveness at country level discussed above has relevance at industry and corporate level also. A comprehensive model for evaluating industry competitiveness discussed earlier in the section 'Competitiveness at the Industry Level' (Momaya, 1998) is being used to identify factors of competitiveness. The topmost level of model are the three facets of competitiveness: Assets, Processes and Performance. Factors of competitiveness are classified under these three facets. Competitiveness is actually quantified at criteria level, the most basic of the three levels. Factors of competitiveness and examples of criteria for each factor are given in Table 3.

Table 3: Factors of Competitiveness

Competitive Assets	*Example of Criteria*
Factor Costs	Wages, Material, Prices, Energy
Human Resources	Quantity, Quality, Skills, Education, Attitudes
Industry Infrastructure	Related & Supported Industries
Technological	R&D investment, physical facilities, IT
Demand Conditions	Environment, Investment, Gr. Rate
Government	Supportive, Incentives, Facilitating
Intangible Assets	Brands, Relationships, Intellectual Properties
Leadership	Vision, Values, Ethics
Competitive Processes	
Strategic Management	Strategies, Formulation
Implementation	Plans, Projects, Employee Invol.
HR Development	Motivation, Training, Employment, Management committees
Technological Management	Collaboration, Technology Transfer
Synergies	Networks, Linkages
Competence Building	Alliances, Knowledge Management
Supply Chain Management	Procurement, Value Chain Management, Logistics
Operations Management	Inventory, Integration, Optimisation
Competitive Performance	
Productivity	Labour, Job, Value-Added
Human Resources	Employee Satisfaction, Employment
Quality	Customer Satisfaction, Product/ Services
Cost	Cost Comparisons, Projects
Financial	ROI, Economic Value Additions, Market Capacity
International	Trade Balance, Market Share, Exports
Technological	Patents, Commercialising, Techno-Managerial edge
Intangibles	Image

Table 4: Relative International Competitiveness: Auto Components Industry

Criteria of competitiveness	India	Japan	USA
Productivity (8)			
GDP/Worker	–1.12	0.34	0.79
Sales per employee	–1.08	0.88	0.20
Sales per investment	–0.76	1.13	–0.37
Job productivity	–1.15	0.64	0.52
% GDP per Employment	–1.09	0.22	0.87
Human Resources (8)			
Employment equity*	–0.76	0.38	1.13
Training & Development*	–1.15	0.67	0.48
Flexibility*	–0.30	1.12	–0.81
Quality/Effectiveness (9)			
Quality of products*	–1.14	0.73	0.41
Customer Satisfaction*	–1.15	0.60	0.55
Overall performance	–1.13	0.76	0.38
Independent product development*	–1.15	0.65	0.50
Improvement in products*	–1.15	0.64	0.52
Cost & Financial (7)			
Cost per unit	1.07	–0.92	–0.19
Return on Sales	1.00	–1.00	0.00
Technological (7)			
Diversification – Product Range*	–0.95	1.04	–0.09
Automation in industry	–1.15	0.64	0.52
Information Technology*	–1.15	0.52	0.63
Patents/R&D investment	1.15	–0.56	–0.60
International (9)			
Exports	–1.15	0.70	0.45
Trade Balance	–1.14	0.69	0.44
Service (7)			
Anticipate customer requirements*	–1.05	0.94	0.12
Take corrective actions*	–1.09	0.87	0.22
Transparency in Pricing*	–0.70	1.14	–0.44
Others (4)			
Environment friendliness*	–1.15	0.51	0.65
Industry Attractiveness*	0.00	1.00	–1.00
Growth potential*	–0.87	1.09	–0.22
Arithmetic Total Score	–20.34	15.41	5.66
Unit Factor Score	–5.18	4.03	1.38
Weighted Average Score	–40.61	29.73	12.73

Source: Adapted from Mukherji, 1997

Note: 1. *Denotes results from questionnaire survey. The results are based on valid sample of 21 responses from industry professionals.

2. Arithmetic total: This is computed by assigning unit weight to each criteria.

3. Unit Factor score: This is the sum of average scores of each factor

4. Weighted average score: This is the total score calculated by considering the weightages of each factor given in the brackets.

Competitiveness of an Indian Industry

It is quite evident from the literature review and experience that to enhance competitiveness of the industry, one need to have a thorough and systematic evaluation of that industry. After knowing where it stands vis-a-vis its competitors, it can try to improve in the areas where it is lagging. Although the role of environment in shaping competition as given in country and sector competitiveness definitions is important, performance criteria are often considered to be the most relevant by most business. Hence, our study is focussed on the competitiveness on performance criteria only.

The study of competitiveness of select Indian industries viz., telecom, auto components and construction industries comprises of benchmarking the industries with Japanese, US and Korean industries. Quantitative as well as qualitative data have been used. Quantitative benchmarking is based on statistical data for the industry from the respective countries. A questionnaire comprising of performance factors related to competitiveness was designed and administered to industry professionals and other stakeholders. They were asked to position India and other countries on a scale of 1 to 5, thus comparing the countries on that particular item. A summary of preliminary findings for industry, namely Auto Components industry, has been presented in Table 4. Bold capital heads in the table are factors of competitiveness. They are quantified by identifying relevant criteria given below them.

The results indicate that the Indian industry lags on most of the criteria. Japan and India are at two extremes and USA lies somewhere in between. The only silver lining in India's performance is visible in cost and financial criteria. However, sustainability on even these few criteria is questionable in wake of major weaknesses on vital factors such as human resources, technology and productivity. The results are aggregated at the bottom using different techniques. The weighted average scores are more appropriate for comparison as it also takes into account the importance of each criterion.

Implications

The findings about the competitive performance at different levels are complementary and can be used to draw some general implications. Poor performance of the Indian industry is no surprise, because we have seen equally poor performance at national and corporate levels. It is difficult to conclude concretely based on above discussed preliminary findings. How-

ever, some general implications can be drawn for Indian industries as our ongoing research about competitiveness of other industries like telecom has indicated similar worrisome trends.

International competitiveness cannot be avoided particularly in globalised industries such as Automobiles, Computers, IT and Telecom. Survival and success will depend on our ability to create the environment which can facilitate rapid improvement is crucial factor such as productivity, technology, quality, human resources management. Creating such environment in short period is an unprecedented challenge. Industry doesn't have luxury of five-year plans; life cycles are shrinking. Certainly it requires collaborative efforts of all stakeholders, firms, their associations, administration and government. Expecting government to create such an environment is not realistic, particularly in liberalised era. Companies will have to play proactive roles in implementing ideas like cluster formation and upgradation.

Survival and success will depend on our ability to create the environment which can facilitate rapid improvement is crucial factor such as productivity, technology, quality, human resources management.

Some best examples of rapid cluster formation and nurturing strategic capabilities can be found in the oriental countries such as Korea, Tailwan and Japan. This is a reason for selecting Korea and Japan for some industries in our studies. There are lessons to be learned from these countries and to be adapted to suit our needs. Indian industries need to define their core competencies and competitive strategies. Depending on the focus, they will have to concentrate their energies on specific areas such as quality, technology and productivity.

Considerable efforts are needed to improve competitiveness, both at the industry level and company level. At the industry level, appropriate ministries, associations, forums, etc. can play important roles. They may facilitate schemes for *cluster* formation, joint R&D effort, industry-institute cooperation, benchmarking, continuous evaluation of competitiveness, etc. At company level, after analysing the reasons for lack of competitiveness by proper benchmarking, the companies may go for Business Process Reengineering (BPR), Total Quality Management (TQM), Just in Time (JIT), etc. depending upon the needs of the industry and company.

Drivers of Competitiveness

Precarious competitiveness position of India and her industries are major motivators to understand dynamics of competitiveness. There are many approaches to understand the dynamics of competitiveness. The "Assets, Process, Performance" framework discussed earlier was used to capture importance of different factors of competitiveness. The quest for understanding often boils down to the question: which factors drive competitiveness? A questionnaire was developed and was administered to about 120 managers working in Delhi. The respondents were asked to give feedback on importance of three facets of competitiveness as well as give relative weight to factors they consider important. The findings of the survey are presented in Table 5.

Table 5: Relative Importance on Different Facets and Factors of Competitiveness

Assets (31%)	Wtg.	Processes (33%)	Wtg.	Performance (36%)	Wtg.
Factor Cost	6	Industry Importance	6	Productivity	7
Human Resources	7	Formal Planning	7	HR	6
Industry Infrastructure	6	Implementation	8	Quality	8
Technological	7	HRD	7	Cost	6
Demand Conditions	6	R&D	6	Financial	7
Government	6	Synergies	7	International	5
				Technological	6
Others	4	Others	4	Others	5

Indian managers appear to have sound understanding of drivers of competitiveness. The findings indicate that the weightages given by the respondents for assets, processes and performance facet are 31 per cent, 33 per cent and 36 per cent respectively. This means that Assets and Processes (Enablers) have about 2/3rd importance and Performance (Results) have 1/3rd importance. In Euro Quality Model, the *Enablers* and *Results* are given 50-50 per cent importance. The views by Indian managers can be considered progressive as ultimate source of performance lie in assets and processes.

Apart from the facets, most companies are interested in knowing the importance of individual factors. 'Implementation processes' and 'quality' performance factors received maximum weights. These were closely followed by 'human resource' and 'technological assets'; 'strategic management', 'human resource

development' and 'synergistic processes', and 'productivity' and 'financial performance'. A related survey about ways to improve competitiveness was done among 42 young managers. Increased investment in technology, R&D and infrastructure; focus on quality and benchmarking with the best emerged priority areas for action among the 45 ideas generated through brainstorming. some contradictions in role of technology in these two surveys indicate the need for more research to identify specific areas of action in enhancing technological capabilities to improve competitiveness.

Conclusions

International competitiveness is crucial for survival and growth of Indian firms and industries in today's global village. A comprehensive review of factors and frameworks of competitiveness provided valuable information about different views on country, industry and company competitiveness. Evaluation of competitiveness of India and her industries, using adaptations of some useful frameworks, portrays dismal picture in current positions and disturbing trends. Manufacturing industries such as auto-components are vital for industrial economy and integrated efforts must be strengthened to ensure survival and growth of this vital sector of economy. That will require better understanding of dynamics of competitiveness. Collaborative applied research is needed to enhance the understanding to improve corporate, industry and national performance. Collective improvements on these fronts are vital for improving quality of life.

International competitiveness is crucial for survival and growth of Indian firms and industries in today's global village.

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Feature

The Kyoto Protocol – What Next?

Udo E. Simonis

The present paper is concerned with the aftermath of the 1997 Kyoto protocol on Climate Convention (CUP3) for coping with the broader environmental and ecological issues. (i) What has happened in the process of climate policy formulation since Kyoto, 1997; what are the major issues in the debate?; (ii) What may come after the Kyoto Protocol; what will be the major issues of Kyoto? and (iii) What should accompany the Kyoto Protocol; what other institutional arrangements are needed to promote global environmental policy? This paper was presented by the author at Public Lecture at the Biannual Conference of the International Society for Ecological Economics (ISSE) in Santiago de Chile, 18th November, 1998.

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Major Issues in the Debate on Climate Policy

No doubt, the Third Conference of the Parties to the Climate Convention (COP3) in December 1997 in Kyoto with the ensuing "Kyoto Protocol" was a major breakthrough in the global process of trying to find solutions to the problems of climate change. No doubt either, that this arrangement raised many questions, probably more than it answered.

In essence, the main outcome of the Kyoto Protocol was to define legally binding greenhouse gas emission reduction and limitation targets for 38 industrial countries and the European Union as a group.

> "On an average minus 5.2 per cent for the budget period 2008-2012, ranging from minus 8 (for most countries) to 0 per cent (for three countries) to plus 10 (for Iceland)".

In essence, the main outcome of the Kyoto Protocol was to define legally binding greenhouse gas emission reduction and limitation targets for 38 industrial countries and the European Union as a group:

On many other matters, including some of the key issues-such as how to account for emissions and how to handle them – the Protocol is rather vague or even obscure; sanctions are not specified. At best, a soft approach was installed, in that monitoring, reporting, evaluation and consultation are envisaged. Hard sanctions, be it testing and assessment, dispute procedures or trade restrictions, were not included.

Fortunately, the Climate Convention of 1992, on which the Kyoto Protocol is based, is dynamic and provides for continuous regular negotiations, – and so it was that in Buenos Aires in early November was host to COP4.

Two points are striking: International negotiations on environmental issues always seem to need a final "all-night session" in order to find a compromise. Such compromise is being labelled as "victory" because otherwise negotiations could not continue:

"All-night session" =	Conflicting view until the last minute
"Victory" =	Lowering expectations because efforts were not strong enough

The main debate since Kyoto and in Buenos Aires was over the so-called *flexibility mechanisms* that might enable industrial countries to offset all or part of their domestic emissions abroad. Linked to this was the issue of introducing commitments for developing countries (which so far have none).

Besides these political questions there was a discussion of a more scientific matter: How to account for emissions and removals that are hard to estimate, such as how to account for carbon dioxide sinks, notably forests? The present paper briefly describes these issues.

Flexibility mechanisms is a fairly new word or a set of processes that have been discussed in the climate policy debate for several years and were put down in various articles in the Kyoto Protocol. They include emissions trading (ET), joint implementation (JI), and burden sharing bubbles (BSB). In actual fact, the Kyoto Protocol distinguishes two types of joint implementation:

- that between the industrial countries
- and that between industrial and developing countries via the newly introduced clean development mechanism.

Flexibility mechanisms is a fairly new word or a set of processes that have been discussed in the climate policy debate for several years and were put down in various articles in the Kyoto Protocol.

Before discussing details, it may be worthwhile to outline their origins.

The climate policy conflict structure is very diversified. There are conflicting interests between industrial countries and developing countries, between industrial countries, and between developing countries. And OPEC is a group of its own.

Some (most) industrial countries fear that attaining sharp emission reductions at home would be costly, in terms of investments, jobs and competitiveness. That's why they favour flexible mechanisms that they might use to buy emission quotas abroad. A number of countries, including industrial and developing countries, also favour such mechanisms because they could benefit from them either in terms of cash or in terms of technology transfers.

In general, the group of industrial countries most in favour of emission trading is JUSCANZ, standing for Japan, USA, Canada, Australia, and New Zealand. Most other industrial countries are less keen on flexibility mechanisms, because they believe that what is most important is achieving emission reductions domestically.

Other industrial countries, including the European Union, believe that reducing emissions will not necessarily be costly, at least not in the medium term, because new and cleaner technologies will improve international competitiveness, and will also lead to additional jobs.

Most developing countries are still very worried about the use of flexibility mechanisms. One concern is that by taking part in such mechanisms they might be selling their emission reductions too cheaply. And they often refer to the provisions included in all the environmental conventions and agreements after Rio 1992, that there are "common, but differentiated responsibilities", and that the industrial countries should "take the lead".

It is true, however, that on paper the provisions on flexibility in the Kyoto Protocol do reflect these opposing views. The articles on emission trading and joint implementation contain the provision that both should be "supplementary to domestic actions". And this initiated the debate on how to interpret this wording.

Emissions Trading

Emissions trading has provoked the most heated debate, although in the Protocol it is included only in three sentences, one of which says that "the rules have yet to be decided" and another that "trading shall be supplementary to domestic action".

Rules can be different, and the supplementary phrase can mean different things to different countries and people. To some it means little, to others it means additionality, i.e. "in addition to reaching targets entirely by domestic action". The intermediate position,

promoted by some European countries, is on fixing certain percentages (10, 15, 20 or more per cent) for the amount of emission reductions to be open for trade. As Clive Hamilton observed:

> 'While agreement on the details of the market will require further rounds of negotiations (of which Buenos Aires was one), there is already a great deal of commercial activity (and preparation) at securing opportunities to generate emission credits'.

Although it is still an open question whether there will be government emission trading only and/or private trading, up (input-users)-or down-stream (end users)-trading, small or large groups of traders, and international linkage of national emission trading schemes, objections remain. The initial objection of emissions trading continues, both among NGOs and individuals, and among governments.

They ask whether it is right, as a matter of principle, to first allocate and then to trade in permits to pollute. India in particular, pointed out in Kyoto that this question has not been debated seriously before and that the developing countries would like a voice in this.

Hostility to emission trading also stems from the assumption that it will be based on what the Protocol calls "assigned amounts". Although the Protocol implies rather than states that trading will be based on assigned amounts, that's what most proponents assume will be the case.

The group G-77 and most or all the environmental NGOs question the fairness of allocating such permits on the basis of historical emissions-or what is known as grandfathering—thereby giving the most rights to trade to those that pollute most.

The argument about whether trading is right or not, is probably not amenable to consensual agreement. It is similarly difficult to agree on the initial allocation provided for in Kyoto. In principle it would be fairer to allocate emission rights on a per capita basis instead of historical emmissions. Is that the way in which we will proceed in the future?

The argument about whether trading is right or not, is probably not amenable to consensual agreement. It is similarly difficult to agree on the initial allocation provided for in Kyoto.

If the establishment of a market for emissions trading is really in the making, as many observers believe, then continued opposition—by NGOs, industrial and developing countries—could be a big mistake, because normally it is the trading partners who are defining the rules of the game, not the outsiders.

There is a less fundamental, more pragmatic objection to emission trading that has to do with the actual agreement reached in Kyoto. Since 1990, the base year for the emission reduction plan, the economies of Central and Eastern European countries have suffered from severe depression or even collapse. As a consequence, their emissions of greenhouse gases have drastically fallen. This means that the "assigned amounts" for these countries agreed upon in Kyoto in 1997 are higher than their present levels. Particularly countries like Russia and Ukraine, for the time being, would have huge quantities of spare emissions to trade: This "hot air" issue has rather dominated the debate since Kyoto.

If, however, emissions in Russia and Ukraine would—as predicted—increase again to 96 per cent of the 1990 level up to year 2008, these countries would have little to sell; there wouldn't be much "hot air".

More important, probably, is the question whether in the coming discussion on emission trading caps or concrete ceilings for emissions, that can be traded or must be reduced domestically, will be agreed upon. There are a number of such proposals being made.

The final outcome, therefore, might be between extremes and intermediate positions, i.e.:

- national trade only
- full international trade
- clubs (like the EU)
- restricted trade (10, 15, 20 or more percent of the "assigned amounts")

And the development may be

- from no-international, only national trade
- to
  - clubs
  - restricted trade
  - full international trade, in the last stage.

Joint Implementation

As said above, the Kyoto Protocol defined two types of joint implementation:

- that between the industrialised countries
- that between industrial and developing countries (now known as CDM)

Joint implementation is project based, and not on historical emissions, and therefore escapes many objections emission trading is confronted with. Still, there are number of unsettled issues.

Joint implementation is between industrial countries with legally binding targets, and it will have to be "additional". That is, before joint implementation projects can be conducted it must be shown that they will represent an improvement of what might have happened anyway in terms of emission reductions. Also, the Protocol clearly states that project reductions must be verifiable. They should lead to real reductions, not just "hot air". Furthermore, joint implementation is subject to the "supplementary to domestic actions" phrase used in the context of emission trading. (Discussions of its meaning will therefore follow lines similar to the emission trading debate.)

As joint implementation is a purely industrial country issue, the developing countries may not want to have a large say in this. The situation for the Central and Eastern European countries is different, because for them cash and technology transfer are important categories. However, as at least some of them (like Poland, Hungary and the Baltic states) are strong candidates on the list of accession countries to the European Union, the EU structural funds might become more attractive in the medium run. Russia, Ukraine and other states of the former Soviet Union are in a different position, and may strongly favour unrestricted joint implementation.

The Clean Development Mechanism

The Clean Development Mechanism (CDM) is a new and still largely unknown institutional arrangement that emerged in Kyoto as a compromise among a wide range of different proposals from both industrial and developing countries, particularly from a Brazilian proposal. The mechanism is meant to serve as a means of channeling assistance from industrial to developing countries into projects that will result in emission reductions.

The CDM again raises a multitude of issues that have been associated with joint implementation in general. Some of these issues remind me of the debates under the "Montreal Protocol". When the Multilateral Ozone Fund was established in a second round, objections against the Montreal Protocol declined or disappeared because now the debate had to be on the conditions of the mechanism. According to recent in-depth research, the Multilateral Ozone Fund has been and still is a successful international institution – not only with regard to the huge number of projects to substitute CFC-products and technology, but also with regard to a new and democratic decision-making procedure in this institution.

The CDM again raises a multitude of issues that have been associated with joint implementation in general. Some of these issues remind me of the debates under the "Montreal Protocol".

Bubbles

The last of the flexibility mechanisms under the Kyoto Protocol is burden sharing or "bubbling". This provision was introduced into the Protocol largely because the EU used its status as a regional integration organisation to argue that it could distribute its common target among its member states how ever it saw fit, as long as the overall target was met. Almost all non-EU states argued that his was unfair – and so in the end a provision was made for any group of industrial countries to form its own bubble.

In theory, this is an attractive option since the bubbling provision contains very few rules, among them, however, a very effectful one: If states fail to meet their joint target, they will individually be in non-compliance.

In practice the poor results of Kyoto as regards emission reductions until the period 2008-2012 (the first budget period) made the environment lose: In the bubbling arrangements (the new EU position) several of the rather high self-declared commitments of individual European countries were decreased quite substantially.

To conclude: One may say that there are goods and bads of flexibility. The good thing about flexibility is that it increases the range of options to fulfill the abatement commitments. Since marginal costs differ between the various options (and countries), the fact that one can choose will on an average reduce overall abatement costs. Also, it may increase the political acceptability of the obligations adopted. The bad thing about flexibility is that the procedure becomes more complex, and that one needs to be more careful that parties do not undermine the final goal of the Protocol by abusing these complexities.

Developing countries participation

From the very beginning the issue of emission targets for developing countries was debated, if not on the basis of current emissions than with a view on future emissions.

Particularly, the United States again and again made the adoption of commitments by some of the larger developing countries a part of its own strategy. But in truth, it is not only the USA who would like at least some developing country participation. Although the climate convention strictly expresses the view that industrial countries should "take the lead" it also advocates the principle of "common, but differentiated responsibilities". And so the question remains how "leading" and "differentiation" should be interpreted.

To be clear on this point: Although Argentina and Kazakstan seem to be prepared, after Buenos Aires, any major commitment on the side of the developing countries in the future will depend on the conditions that rule the game. So, if there were agreement that it is not historical emissions ("grand-fathering") but (some sort of) equal per capita emissions, the situation would change automatically, and developing countries could easily become proponents of an active global climate policy.

Scientific issues and compliance

A big technical issue already prior to Kyoto, and again at Buenos Aires, was the uncertainity in estimates of emissions and removals of greenhouse gases, especially removals from forests.

On this topic of the sinks, a so-called "sinks group" met before and during the Kyoto meeting. This resulted in a rather obscure text in Article 3.3 of the Protocol on deforestation, reforestation and afforestation.

The issue arises from the fact that it is not easily possible to measure all emissions and removals of greenhouse gases. While in the energy sector, for example, emissions might in general be estimated at within plus/minus 5 per cent, for other sources and sinks the uncertainity on estimates can be well in excess of 50 per cent.

An estimation was made showing that when reforestation and afforestation are interpreted in a broad sense, the "Kyoto forests" in the European Union might compensate for 1.1 per cent of the total European emissions, or 14 per cent of the EU commitment. If interpreted in a narrow sense, they would compensate for only 0.1 per cent of the emissions or 1 per cent of the EU commitment.

No doubt, this poses quite some problems for prospective parties to the Protocol: If they neither know what their commitments are nor whether they are in compliance, there may be no basis for positive decisions on the Protocol, i.e. for joining it.

In June 1998, the Subsidiary Body for Scientific and Technological Advice of the Climate Convention sent the sinks problem to the Intergovernmental Panel on Climate Change (IPCC) for resolution. Delegating a problem may solve it at the end, but at first, it will postpone the solution, in this case for at least two years.

To conclude: The three main agenda problems—flexibility mechanism, developing country participation, and sinks—were hotly disputed in Buenos Aires. The equity issue ("grandfathering" or per capita emission rights) loomed large, and so it was with the other political issues. These issues must be tackled because the science of climate change is rapidly improving, and so it will be with monitoring and verification of emission reductions.

Major Issues for Kyoto II

The Kyoto Protocol was, as said at the beginning, a major breakthrough in the process of global climate policy. Very many questions addressed in the Protocol, particularly as regards its instrumentation, are still open, even after Buenos Aires. So it may be a little early to think of a Kyoto II. But joint implementation can come into full swing soon, and so it may be with the Clean Development Mechanism—whether credited or not. As some of the major industrial countries are very keen on emissions trading, this mechanism may also be installed—though on a low scale—in the not too distant future.

According to the provisions of the Protocol, the year 2005 will be the time for major stock-taking: What has been achieved, what is still lacking?

From there to the first budget period its only another three years, and the budget period will last until the year 2012, only 13 years from now!

Sooner or later, therefore, the question will arise, what comes next:

- What should be the targets for the period 2012-2020: Another 5 or 15 per cent reduction of emissions?
- Are there other greenhouse gases that need to be regulated?
- What will be the instruments? Will be three in-

struments established in Kyoto and specified in Buenos Aires suffice – or should we install additional ones, e.g. energy taxes or emission charges?

- Do we need a strong sanctioning mechanism, e.g. trade restrictions?
- And what about the institutional set-up: The Conference of the Parties, the subsidiary bodies, the Secretariat – will this structure do the job, or must it be integrated into a larger institutional arrangement?

This leads to the third point, some speculation on institutional innovations; one that is still unlikely, one that is very needed and actually already on the agenda.

Future institutional innovations

The global climate problem has attracted a lot of attention – and you are my witnesses! But there are other global environmental problems as well, and for some of them international treaties and conventions already exist, like

- the Biodiversity Convention for the biodiversity problem
- the Desertification Convention for the desertification problem
- the Law of the Seas Convention for the problem of the oceans

On other – more or less clearly definable – global problems, the international debate has reached a certain momentum, but legally binding conventions do not yet exist, as in the case of the soils and surface waters, whose quantity is decreasing, whose quality is deteriorating.

If there is a chance that international cooperation will go into these problem areas, then legally binding conventions become possible. But if the number of such conventions increases further, there would not only the question of necessary capacity building, but also of improved horizontal and vertical cooperation and coordination.

Much of the rejection and hostility towards global solutions – towards globalisation of policies – have to do with the existing power structure in the world. But if we carefully watch and listen, it is not only the nation state that is losing while civil society is gaining; it may also be, and that was recently proven, that the South is winning vis a vis the North. What the debate on a New World Economic Order did not bring about, has been brought about – although as yet only on a modest scale – through the debate on a New World Environmental Order.

The international arrangements on:

a) the ozone layer – the *Montreal Protocol*

b) climate change – the *Climate Convention and the Kyoto Protocol*

c) biodiversity – the *Biodiversity Convention*

d) the seas – the *Law of the Seas Convention*

All ended up in favour of the developing countries as regards: (i) responsibilities; (ii) financial resources and (iii) decision-making.

Astonishingly enough, not many have realized those major changes in the global power structure-not many governments, not many environmentalists, and only a few ecological economists.

Finally, therefore it is stated that

a) one would like to support the idea of the Worldwatch Institute to install, instead of the G8, the group of E8, the "Eighth Environmental Heavyweights" – as a true parity between four industrial and developing countries.

b) one would also like to draw the attention to an initiative by a group of economists and political scientists in Washington, USA, and Berlin, Germany, to install by the year 2000 a World Organisation on Environment and Development, within the United Nations system.

□

Feature

Social Gains from Female Education in India

R. Nagarajan

Social gains from female education in India using the National Family Health Survey results has been examined in the present paper. According to the NFHS data illiteracy among women of reproductive age (13-49 years) is very high in India and among the literate women proportion reaching secondary level education is very low. The analysis of NFHS results suggest that educated women marry and enter motherhood later and have fewer children than their uneducated counterparts in India..

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Investment in human capital is directly associated with socio-economic development. Education is universally recognized as an important investment in human capital. Education empowers individuals with the means to improve their knowledge, skills, health and capacity for productive work. For societies as a whole, education enriches the socio-political and cultural life of the community and enhances the community's ability to exploit science and technology for social and economic advancement. The basic message of many studies on education is that the potentials of elementary education tend to be extremely large (Psacharopoulos, 1985; 1994). Particularly the powerful influence of female education on fertility, family planning and child survival, for instance, has been clearly brought out in a large number of empirical studies (Caldwell, 1988; Kasarda *et al*, 1986; Cleland, 1990). Female education not only produces social gains by reducing fertility and improving health (the woman's own health and the health of her children) but also increases child schooling. This article is concerned with the effect of various social gains from female education in India. The present article is based on the results of the National Family Health Survey (NFHS)[1] conducted in 1992-93 in all the states of India covering 99 per cent of the India's population (for details see IIPS, 1995). The NFHS results generally show that female education affects age at marriage, fertility, family

1. The National Family Health Survey (NFHS), collected information on a range of demographic and health topics. The survey was conducted under the auspices of Ministry and Health and Family Welfare to provide national and state-level estimate of age at marriage, fertility, family planning practices, maternal and child health and the utilization of MCH services available to mothers and children. The International Institute for Population Sciences (IIPS), Bombay, conducted the NFHS in cooperation with 18 Population Research Centres throughout India. East-West Centre in Honolulu, Hawaii, and Macro International, U.S.A. provided technical assistance for all of the survey operations. The NFHS covered 24 states and National Capital Territory of Delhi, which comprise 99 per cent of the total population of India. In all, 89,777 ever-married women age 13-49 and 88,562 households were covered, using uniform questionnaires, sample design and field procedures. The data collection was carried out on a state-by-state basis from April 1992 to September 1993. For complete details see: IIPS, 1995.

planning and maternal and child health. Further, the effect of primary education of females appears to be considerable on many of the variables examined.

Education empowers individuals with the means to improve their knowledge, skills, health and capacity for productive work.

Increasing the education of females in generally accepted as the most promising avenue of change in women's access to power and control over resources as well as in demographic and health conditions. The influence of education on demographic and health conditions is assumed to derive from various dimensions of educational experiences. Schooling provides literacy skills, enables to process a wide range of information, and stimulates cognitive development (Inkeless, 1973). Education exposes a person to new ideas and to alternative lifestyles and might lead a person to question traditional norms and practices. In addition to promoting attitudinal change, education opens up economic opportunities and helps for social mobility. Benefits of educational assets have a pervasive influence on women's lives, shaping both their productive and reproductive roles (Caldwell, 1980; Kasarda *et al*, 1986). Because of the strong relationship between maternal education and demographic conditions, policy discourse has increasingly assumed that investment in women's education is important for lowering fertility and infant and child mortality and for improving maternal and child health (World Bank, 1993).

Although education has been unanimously endorsed as a fundamental right and as an explicit goal of development, women's access to schooling remains inadequate in a large part of the developing world (United Nations, 1995) and this is true in India also. The neglect of women's education has resulted in high illiteracy rates, especially among older, poor and rural women. According to the 1991 census 61 per cent of Indian women aged 6 and above are illiterates and the percentage for rural women is further higher.

The present paper specifically examines the effect of female education on age at which women marry and have their first child; the number of children they have; the use of contraceptive method, their own as well as their children's health; and utilization of maternal and child health services. NFHS's all India report classified the level of female education into the following four categories for the analysis: (i) no formal education (illiterates); (ii) literate <middle complete (primary); (iii) middle school complete (middle); and (iv) high school and above (high-school). The level of education of the sample women in India is low as can be seen in Table 1. Sixty-three per cent of the ever-married women age 13-49 have no formal education in India according to the NFHS. Nearly one-fifth have at least some primary education and seven per cent have completed middle school. One in ten women have attended at least a high school level education.

Age at Marriage

Marriage marks the point in a women's life at which childbearing becomes socially acceptable. Hence, age at which woman marry is a primary indicator of exposure of woman to the risk of pregnancy, and is, therefore, important for understanding fertility patterns. Women who marry early will have, on an average, longer exposure to the chance of becoming pregnant, and is, therefore, early age at marriage often implies early age at childbearing and higher fertility for a society. Higher female education has been shown to lead a postponement of marriage and, thereby, to later family formation and lower fertility.

Median age at first marriage in India in different educational categories of women is shown in Table 1. The median age at first marriage is defined as the age by which 50 per cent of women in age x to x+n have been married. For example, 50 per cent of women age 25-49 were married by age 16.1 in India. Large differences in median age at marriage according to women's level of education can be seen in India. The median age at first marriage is higher the more educated the women is. The difference between women with at least a high school education and all other women is especially pronounced. Overall, women who have attended high school marry at least six years later than women with no education. Among women with high school education, the median age at marriage is 21.3 years; for women with less than high school education, age at marriage ranges from 15 to 18 years. In addition, the gap between women with no education and women with primary level education is about 2 years. It means that getting some amount of primary education increases age at marriage by two years.

Early marriage among the illiterate women limit their options in life, especially in societies like India where new roles and responsibilities are emerging for women after marriage. It can also make them more vulnerable to discrimination and abuse. The adverse effect of early marriage among illiterates would be that they not only enter into marital union at very young age but also it is

Table 1: The Relationship Between Female Education and Age at Marriage, Fertility, Family Planning, Infant and Child Mortality and Maternal and Child Health in India: National Family Health Survey 1992-93

Indicators	Level of education of females				
	Illiterate	Literate < middle complete	Middle school complete	High school & above	India Total
	Illiterate	Primary	Middle	H-school	Total
Number of ever-married women	56656	16475	6508	10138	89777
Educational level of women (per cent)	63.1	18.4	7.2	11.3	100.0
Marriage					
Median age at first marriage for women age 25-49	15.0	16.8	18.4	21.3	16.1
Per cent who know legal minimum age at marriage					
For males	7.4	26.7	42.8	63.0	19.8
For females	16.2	50.1	67.1	79.3	33.2
Fertility					
Total Fertility Rate (TFR) 1990-1992	4.03	3.01	2.49	2.15	3.39
Children Ever Born (CEB) to women age 40-49	5.26	4.50	3.71	2.8	4.84
Median age at first birth 25-49	18.7	19.4	20.4	23.3	19.4
Median age at last birth 40-49	31.6	29.3	27.9	28.7	30.6
Child Bearing					
Percentage of married women who are mothers	48.1	45.1	39.3	33.0	46.0
Percentage of married women pregnant with first child	102	13.7	15.6	17.3	11.7
Percentage of married women who have begun childbearing	58.3	58.8	54.9	50.3	57.2
Contraception					
Percentage of married women:					
Knows any modern family planning method	93.5	98.3	99.3	99.7	95.5
Knows source of any modern family planning methods	84.1	95.2	97.0	98.9	88.8
Heard family planning message on radio or television	27.8	56.0	69.7	84.7	42.2
Currently using modern family planning method	31.5	44.8	42.4	45.0	33.6
Currently using modern spacing methods	2.1	6.1	9.5	20.9	5.5
Fertility Desires					
Percentage of married women who want no more children	54.0	63.0	58.5	59.7	56.7
Ideal number of children	3.1	2.6	2.4	2.1	2.9
Infant Mortality					
Neonatal mortality (NNM)	60.6	38.8	37.6	25.3	52.7
Postnatal mortality (PNM)	40.0	23.7	18.5	11.9	33.7
Infant mortality ($_1q_0$)	100.6	62.5	56.1	37.2	86.3
Child mortality ($_4q_1$)	44.3	22.8	9.2	6.2	35.5
Under-five mortality ($_5q_0$)	140.5	83.9	64.8	43.2	118.8
Maternal Health					
Percentage of mothers received no antenatal care	48.8	19.9	9.8	4.2	36.8
Percentage of mothers received no TT injections	51.7	20.9	10.0	4.4	39.0
Percentage of mothers received two doses of TT	40.3	71.9	84.3	91.5	53.8
Percentage of mothers given iron/folic tablets	38.3	66.6	77.2	85.6	50.5

(Table 1 Contd.)

(Table 1 Contd.)

Indicators	Level of education of females				
	Illiterate	Literate < middle complete	Middle school complete	High school & above	India Total
	Illiterate	Primary	Middle	H-school	Total
Place of Delivery					
Percentage of mothers delivered in public hospital	8.6	23.1	30.9	29.3	14.6
Percentage of mothers delivered in private hospital	3.2	14.7	24.5	46.0	10.9
Percentage of mothers delivered in own home	74.5	48.1	34.5	17.2	61.6
Percentage of mothers delivered in parent's home	12.7	13.1	9.3	7.0	11.9
Assistance During Delivery					
Percentage of deliveries assisted by doctors	9.9	29.6	45.5	68.7	21.6
Percentage of deliveries assisted by nurse/midwife	10.1	18.9	19.3	14.5	12.6
Percentage of deliveries assisted by TBA	41.8	30.2	20.4	10.5	32.5
Percentage of deliveries assisted by relatives/others	36.8	20.6	14.5	5.9	29.50
Breast-feeding					
Percent started breast-feeding within one day of birth	21.9	31.6	37.8	37.9	26.3
Percent of breast fed children whose mothers squeezed first milk from breast	64.9	66.1	60.4	52.6	63.5
Child Immunization					
Percentage of children fully vaccinated	24.0	46.9	60.3	70.0	35.4
Percentage of children given no immunization	40.1	16.9	8.2	4.2	30.0
Treatment of ARI					
Percentage of children taken to health facility	62.4	70.4	72.0	84.5	66.3
Treatment of Fever					
Percentage of children taken to health facility	62.9	69.9	78.8	78.4	66.8
Knowledge & Use of ORS					
Percentage of mothers knows about ORS packets	31.8	56.4	62.7	75.4	42.7
Percentage of mothers have ever used ORS packets	19.0	36.0	36.8	45.0	25.9
Treatment of Diarrhoea					
Percentage of children taken to health facility	58.0	66.0	67.5	70.9	61.2
Percentage of children not given ORS/RHS	65.6	55.9	56.2	41.6	61.2
Nutrition Status of Children					
Weight for Age: per cent below 3SD	24.7	16.7	12.4	7.8	20.6
Height for Age: per cent below 3SD	34.5	22.6	17.9	12.2	28.9
Weight for height: per cent below 3SD	3.4	3.0	2.7	2.3	3.2

Source: IIPS (1995), Table numbers: 4.5, 4.7, 5.3, 5.17, 5.20, 5.22, 6.2, 6.6, 6.27, 7.4, 7.8, 8.6, 9.1, 9.4, 9.5, 9.6, 9.11, 9.16, 9.17, 9.18, 9.20, 10.1, 10.9

Notes:

ARI: Acute Respiratory Infection.
NNM: the probability of dying in the first month of life.
PNM: the difference between infant and neonatal mortality.
ORS: Oral Rehydration Solution
RHS: Recommended Homemade Solution
TBA: Traditional Birth Attendant
SD: Standard Deviation
$_1q_0$: the probability of dying before the first birthday
$_1q_4$: the probability of dying between first and fifth birthday.
TFR: TFR is the average number of children a woman will bear during her lifetime at the rate of childbearing in a particular year.

likely that their husbands would be much older than they are. And, as with marriage, women with no education are more likely than those with high school education to become mothers in their teenage years. Not only the actual age at marriage is lower among women with no or less education than the women with more education but also knowledge about legal minimum age at marriage for males and females is much lower among illiterate women in India. For example, only 16 per cent of the illiterate women know the legal age at marriage for females whereas about 80 per cent of the women who have high school education aware about the right age to marry.

Fertility

Education has long been recognized as a crucial factor influencing fertility patterns; an extensive demographic literature is devoted to examining the role of female education in promoting sustained fertility decline (Cochrane, 1980). The evidence provides a rationale for focusing an increased investment in women's education and elimination of institutional and cultural barriers to women's schooling in policies aimed at promoting development and reducing fertility (United Nations, 1987).

Women's schooling is found to result in lower fertility through the following routes. Better-educated mothers typically demand higher levels of schooling for their children than do their lesser educated counterparts, thereby effectively raising cost of having children (Mason, 1984). These aspirations may lead them to have fewer children and to invest in more schooling. Quantity and quality of children interact in such a way that child quality raises the cost of quantity (Becker and Lewis, 1974). Studies in developed and developing countries showed that children from small families tend to have more years of schooling and perform better at school than those from larger families (King, 1987). Better-educated mothers in developing countries experience lower infant and child mortality rates since educated mothers tend to be more knowledgeable about child health-care and nutrition and are more directly involved in health-care decisions for their children (Desai and Alva, 1998). In a cross-national study, Schultz (1994) found that fully half of the effect of female schooling in lowering fertility was operating through its effect in lowering child mortality. Reduced demand for children associated with women's greater schooling result in higher motivation for fertility regulation among better-educated women. Once they have made the decision to regulate fertility, educated women are more likely to use contraception effectively.

Table 1 presents total fertility rates (TFR) for educational subgroups. A TFR of 3.4 children per women is observed in NFHS for the period 1990-92 for India as a whole. When women at the upper and lower end of the educational ranges are contrasted, fertility levels are seen to be substantially lowered among the better educated. TFR declined steadily from 4.0 children per illiterate women to 2.2 children per women with at least a high school education. Hence, the illiterate women on an average have two children more than the women who have attended a high school. This negative association between education and fertility further confirms that the effect of primary education in reducing fertility is more than the effect of other higher educational categories. The difference in TFR between illiterate women and women with primary education is one child whereas the difference between primary and middle school educated women is only 0.5 child. This difference further declines to 0.3 child between middle and high school educated women. It clearly indicates that few years of schooling or a primary education to women would reduce fertility considerably.

One way of examining trends in fertility over time is to compare the TFRs for the three years preceding the survey (1990-92) with the average number of children ever born (CEB) to women who are now at the end of their childbearing period, age 40-49. The former is the measure of current fertility while the later is a measure of past or completed fertility. If fertility had remained stable over time, the two fertility measures, TFR and CEB, would be equal or similar. If fertility has declined, TFR will be lower than CEB, with larger differences generally indicating more rapid decline. The gap between the TFR of 3.4 and CEB of 4.8 indicates that a substantial fertility decline has taken place in India: the TFR is 1.5 children lower than the completed fertility to women age 40-49. Fertility declines have also been rapid among women in all educational groups, but it has declined most rapidly among literate women with less than high school education.

Age at First and Last Birth

Age at which childbearing begins is a major determinant of fertility as well as health and welfare of mother and child. In many countries, postponement of first birth, reflecting an increase in the age at marriage, has contributed greatly to overall fertility decline. Early initia-

The illiterate women on an average have two children more than the women who have attended a high school.

tion into childbearing is generally a major determinant of large family size and rapid population growth, particularly where family planning is not widely practised. Moreover, bearing children at a young age involves substantial risks to the health of both mother and child. Early child bearing also tends to restrict educational and economic opportunities for women. The table shows that the median age at first birth among women age 25-49 in India is 19.4 years. But age at first birth differs substantially when educational level of women changes. Age at first birth is increasing considerably with the increase in the level of education: it is 18.7 years for illiterate women and 23.3 years for women with high school education. Median age at first birth for illiterate women is 4.6 years lower than the women with high school education.

Age at last birth is another important determinant of overall fertility levels. The table shows the distribution of women age 40-49 by age at last birth according to educational level of women. It shows that age at last birth to illiterate women is more or less three years higher than the educated women. Age at first and last birth in different educational categories indicates that illiterate women begin childbearing early and complete childbearing later than the educated women. Hence, the average reproductive span of the illiterate women is higher than the literate women in India. It implies that the reproductive behaviour of the illiterate mothers have substantial risk factors for both to themselves and to their children.

Age at which childbearing begins is a major determinant of fertility as well as health and welfare of mother and child.

Childbearing at Younger Ages

Early childbearing, particularly among teenagers (those under 20 years of age), has negative demographic, socio-economic and socio-cultural consequences. Teenage mothers suffer particularly from severe complications during delivery, which results in higher morbidity and mortality for both themselves and their children. The table shows the percentage of ever-married women age 13-19 who are either mothers or pregnant with their first child. The sum of these two percentages represents the proportion of young ever-married teenage women who have begun childbearing. Overall, in India, 58 per cent of ever-married teenage women have started their childbearing (46 per cent have already become mothers and 12 per cent are pregnant with their first child). Teenage childbearing by level of education shows that nearly half of the illiterate ever-married women age 13-19 have already become mothers compared to only one-third of the high school educated women: a clear negative association between education and teenage motherhood. There is no difference in the percentage of ever-married women who have begun childbearing process (those who have become mothers and pregnant with first child) in the teenage years between illiterate women and women with primary education, but married women who have attended high school are less likely to have begun childbearing.

Family Planning

Studies documented extensively the positive association between education and contraceptive use (United Nations, 1987). Educated women are more likely than illiterate women to desire smaller families and hence have a stronger motivation to practise contraception. Because of their literacy and greater familiarity with formal institutions and health providers, educated women are also better informed about available contraceptive options, correct use, side-effects, costs and sources (Cochrane, 1979). The table presents current contraceptive prevalence rate in India, that is, the proportion of married women using modern methods of contraception (sterilization, IUD, pills, condoms, etc.) during 1992-93. According to the data in table, education exerts a large influence on contraceptive acceptance by the couples. Education has a positive relationship to current use, although the differences are most evident between illiterate women and women with primary level of education. Thirty-two per cent of currently married women with no education are contraceptive users, compared to 42-45 per cent of literate women. Though education of women is positively associated with current use of modern methods, the effect is very consistent for the acceptance of modern temporary methods (or spacing methods, which includes only oral pills, condom and IUDs). The use of modern temporary methods allows mothers to space births and thus reduces infant mortality.

Knowledge of family planning methods and sources to obtain family planning services are crucial in the decision whether to use a contraceptive method and which method to use. Usually, higher the level of knowledge of family planning methods the greater the use of contraceptives. The level of knowledge of at least one modern method of contraception increases with the level of education in India. Although the knowledge of contraception is widespread, it is lowest among illiterate women. Six per cent of illiterate women do not know about a modern method and 16 per cent are ignorant about the source of method.

The effort to disseminate family planning information through mass media (radio and TV) by the government has succeeded in reaching only 42 per cent of ever-married women in India. But women's exposure to family planning messages on the radio and television is positively related with educational attainment. The proportion having heard or seen a message on radio or TV increases sharply with increasing education. Only 28 per cent of illiterate respondents reported having heard or seen a family planning message on radio or television, whereas 85 per cent of women with a high school education have heard a message.

A positive association between literacy and proportion wanting no more children is clearly evident: 54 per cent of illiterate women want to have no more children compared to more or less 60 per cent of the literate women. The average number of children considered ideal by Indian women is 2.9. Ideal number of children is associated with level education attained by the women. The relationship between mean ideal number of children and level of educational attainment is negative. Women with no education have the largest mean ideal family size (3.1) while women with high school education have the smallest (2.1).

Infant and Child Mortality

Infant and child mortality rates are basic indicators of a country's socio-economic situation and basic quality of life. The positive impact of maternal education and literacy on child survival is well documented in the recent literature (Cleland and Ginneken, 1988; Becego and Boerma, 1993; Hobcraft, 1993; Tulasidhar, 1993; Murthy, *et al*, 1995; Mosley and Chen; Govindasamy and Ramesh, 1997; Desai and Alva, 1998). It is generally recognized that improved and/or increased use of preventive and curative health practices by more educated mothers is part of the explanation for the positive relationship. Further mother's level of education is also closely associated with socio-economic factors such as income, life style, health practices, nutrition and housing and living conditions. Women who have limited education usually have low income and live in less sanitary housing conditions; thus, their children usually have a higher risk of morbidity and mortality.

Maternal Health Care

NFHS found that more than 100,000 women in India die every year from causes related to pregnancy and childbirth. This finding emphasises the urgency of insuring that all pregnant women receive adequate antenatal care during pregnancy and that deliveries take place in a hygienic conditions with the assistance of a trained medical practitioners (IIPS, 1995). Higher utilization of MCH services in the society are known to reduce the maternal and child mortality. One may expect that the utilization of MCH services by literate mothers would be different from the illiterate mothers. Women can receive antenatal care (ANC) by visiting a doctor or other health professional in a medical facility, or by receiving a home visit from a health worker or both. The data in table show that there is a strong relationship between mother's education and utilization of antenatal care. About 50 per cent of births to mothers with no education did not receive antenatal care from medical personnel, compared with only 4 per cent of children whose mothers had high school education. The corresponding proportions for children whose mothers had primary and middle school education are 20 per cent and 10 per cent, respectively. Fifty-two per cent of births to mothers without education never received a tetanus toxoid immunization, compared with only 4 per cent births to mothers with high school education. The proportion of births whose mothers received two doses of tetanus toxoid vaccine increase steadily from 40 per cent for illiterate mothers to 84 per cent for mothers who have completed middle school and to 92 per cent for mothers with high school education. Women whose level of education is low are likely to have not taken any iron and folic acid tablets during pregnancy.

An important element in reducing health risk for mothers and children is to increase the proportion of babies that are delivered in health facilities. Proper medical attention and hygienic conditions during pregnancy can reduce the risk of infections and facilitate management of complications that cause serious illness for either mother or new born. As is the case for antenatal visits, tetanus vaccination, and iron and folic acid supplements, institutional deliveries (public and private) are more common among births to well-educated women than births to poorly educated women. For example, only 12 per cent of births to illiterate women occurred in medical institutions, compared to 75 per cent of births to women with high school education. The differentials in utilization of delivery care services are even more marked between illiterate women and women with primary education. Only 12 per cent of births to illiterate women are delivered in medical institutions compared with 38 per cent of births to women with a primary level education.

There is a consistent positive relationship between education of women and trained medical assistance during delivery (doctors and nurses/midwives). Only one-fifth of births to illiterate women are attended by a trained health professional, compared with 83 per cent of births to women with high school education. Use of traditional birth attendants for delivery assistance is much higher

among mothers with no education than among those with high school education (42 per cent compared with 11 per cent). Similarly using relatives or untrained people for delivery assistance is highest among illiterate women.

Only one-fifth of births to illiterate women are attended by a trained health professional, compared with 83 per cent of births to women with high school education.

Breast-feeding

Breast-feeding practices are important determinants of children's nutritional status and many studies have shown the beneficial effects of breast-feeding on nutritional status, morbidity and mortality of young infants. The early initiation of breast-feeding is important since it benefits both mother and the infant. It is generally recommended that the first breast-milk should not be squeezed from the breast, but should be given to the child, because it contains colustrum, which provide natural immunity to the child. Colustrum and breast-milk are sufficient for new-born infant; it is not necessary to feed them anything else. In fact when neonate is given anything other than breast-milk contaminants may cause infection, leading to diarrhoea. Table 1 shows how soon after birth breast-feeding was initiated and the practice of squeezing milk from the breast according to the level of education of mother. Very clear positive association emerges between education of women and early initiation of breast-feeding. Women who have attended high school are more likely to initiate breast-feeding within one day of birth (38 per cent) compared with women who have lower levels of education, as are illiterate women (22 per cent). In general, less educated women are less likely to start breast-feeding early and are more likely squeeze the milk from the breast before breast-feeding begins.

Child Health Care

In order to reduce the risk of postnatal mortality, immunization of children against six serious but preventable diseases (tuberculosis, diphtheria, pertussis, tetanus, polio and measles) is necessary for infants (UNICEF, 1990). There is a strong positive association between maternal education and children's vaccination coverage. Children of mothers with high-school education are 192 per cent more likely to be given all vaccinations than children of mothers who are illiterates. Further, 40 per cent of children of illiterate mothers did not receive any vaccinations for preventable diseases compared to only 4 per cent of children of mothers with high-school education. Hence, the potential health risk for children born to illiterate mothers in India is very high. The two major causes of death among infants and children in India are acute respiratory infection (ARI) and diarrhoea (Central Bureau of Health Intelligence,, 1991). ARI, primarily Pneumonia, is a common cause of illness and death in infancy and childhood. Table 1 shows the percentage of children under four years of age who were suffered from fever, diarrhoea and had symptoms of ARI taken to health facility for treatment. Maternal education is found to be consistently positively associated with the proportion of children taken to health facility for the treatment of ARI, fever and diarrhoea. These educational differentials in the treatment of childhood diseases are marked when comparing the illiterate women with those who have high school education. Similarly knowledge and use of ORS packets are also increased with the increase in the level of education of women.

Anthropometry provides one of the most important indicators of children's nutritional status. Combining the height, weight and age data, three indices of physical growth describing children's nutritional status were constructed: height-for-age, weight-for-age and weight-for-height. Children who fall more than the three standard deviation below the reference median are considered to be severally undernourished. The NFHS results suggest that the mother's level of education is most important characteristic associated with children's nutritional status. As expected, undernourishment of children decreases directly with mother's level of education and children of illiterate mothers are more likely to be malnourished than children of literate mothers. In India, a large majority of young children (65 per cent) have mothers who are illiterates (IIPS, 1995), they are consequently at a high risk of suffering under-nutrition. Programmes designed to eliminate female literacy are, therefore, likely to be of crucial importance for improving the nutrition status and survival of children in India.

Anthropometry provides one of the most important indicators of children's nutritional status.

Conclusions

This article examined the association between female education and demographic and health conditions of women and children in India using NFHS data. NFHS results suggest that educated women marry and enter motherhood later and have fewer children than their uneducated counterparts in India. Educated

women are more likely to practice contraception and also they are more likely to have lower fertility intentions. Infant and child mortality probabilities are much lower for the children of educated women than the uneducated women. Educated mothers are more likely to use antenatal care services, delivery care services and more likely to use medical facilities for treatment of their children with ARI, fever and diarrhoea. Educated mothers also better informed about ORS packets and generally more likely to use of these for diarrhoeal episodes. Similarly educated women are more likely to have initiated immunization and even more likely to have ensured that their children are fully vaccinated.

The data also show that even primary level of education considerably contribute towards a better living for women and children. One may argue that given the poor quality of schools and teaching in India, especially in rural areas, it is unlikely that a few years of primary schooling can provide the information needed, for example, to alter personal and health practices. But Cleland and van Ginneken (1988) in their study on maternal education and child survival in developing countries have found that even a few years of a mother's school attendance furnish positive relationship with her child survival chances, and that this relationship holds good not only in countries with easily accessible effective health services, but also in those where primary health care system is underdeveloped.

The association between female education and demographic variables examined in this paper is clear enough to warrant policy attention. A large body of research undertaken in different parts of the world also substantiates that the women's educational advancement is a most powerful agent for social change and a promising catalist to bring down the population growth rate and to promote sustainable development. The analysis of NFHS data supports two types of policy strategy: one is the expansion of the broad-based primary education and the other is the promotion of secondary education. The effect of primary education and the other is the promotion of secondary education. The effect of primary education is considerable on many of the variables examined and also the effect of high-school education is much higher than the effect of primary education. But the proportion of women reaching high-school level education in India is very small. Therefore, expanding the educational opportunities may have a greater impact in the long run. Analysis of NFHS data also show that the utilization of maternal and child health services are much higher in South India where the female literacy and educational levels are relatively higher than in North India (Govindasamy and Ramesh, 1997). The observations made in this paper supports for continued investment in mass literacy and universal primary education in general and female education in particular. But public policies that increase women's lives should not focus education alone as there are other factors which affect lives of women and children. For example, where illiteracy is high, increasing investment on female literacy should go hand in hand with improving access to health care facilities. Because, development investment on behalf of women, including education, health, family planning and social and economic status are mutually reinforcing if pursued simultaneously. But they will yield only meagre results if pursued separately. Comprehensive development investment in women means more rewarding lives not only for women but for their families, their communities and for the nation as a whole. Generally in the Indian condition women require more policy support than their husbands. Because in India, women are generally younger than their husbands, less likely to be economically independent, less likely to remarry, not able to claim ancestral property, and have to spend considerable time in widowhood since at adulthood their survival is likely to be more than the males. Under these circumstances expanding educational opportunities to women will improve the quality of life for women and children and enhance their future contribution to development.

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Feature

Issues & Problems in Implementation of JIT Manufacturing

Suresh Garg, Prem Vrat & Arun Kanda

Considerable discussion exists about the problems and issues (technical/organisational) concerning the implementation of Just in Time (JIT) manufacturing systems. Only very few arguments are centred around the macro issues like market and economic environment. The present paper focuses these latter issues and provides some general decision models to assess the suitability of JIT implementation.

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Over the last few years, interest in the Just in Time (JIT) philosophy popularized by Japanese has been growing significantly. JIT appears to have an increasingly pervasive influence on the management of operations, especially in the manufacturing sector. JIT encompasses several integrated functional systems both within the firm and outside of it, all of which are motivated to work towards a common objective of minimizing inventories and lead times.

JIT encompasses several integrated functional systems both within the firm and outside of it, all of which are motivated to work towards a common objective of minimizing inventories and lead times.

Various authors (Bowman 1991, Corbey 1991, Inman and Mehra 1993 and Schonberger 1986) have considered the potential of JIT strategy in improving the management of production and inventory control systems. In Japan, firms emphasize developing continuous and smooth in manufacturing, since every time the line stops, it is unproductive. JIT assumes short production runs and focuses on minimizing setup. Cells are used to the extent possible, based on group technology, to eliminate or reduce distances that parts travel. The focus is always on process-designing and managing it for high quality, closely coupled, small bath and reliable manufacture.

But JIT doesn't occur in a vacuum. Japanese firms go to a great lengths to eliminate uncertainty and make all necessary resources available to ensure flow and flexibility. Problem solving also gets a great deal of attention. The emphasis is on extensive training, immediate and permanent solution of problems by getting to

the root cause. Adequacy of resources is understood by appropriate plant and equipment, the provision of high level of technical support and production engineering and emphasis on people education and training.

JIT system cannot work properly unless the suppliers to the JIT plant are also brought into the JIT fold. Suppliers are amongst the important players in the successful implementation of JIT. Vendors should be an integral part of the system.

The above discussions highlights the various requirements and the preparations needed for successful implementation of JIT manufacturing. Macro environmental factors like market conditions, economic conditions, technological advancements, logistics, infrastructure and social and educational levels of the workforce are some of the factors, which need to be considered for starting a JIT programme. These factors are discussed and general guidelines are developed for decision makers.

Implementation of JIT

The implementation of JIT challenges the traditional manufacturing practices (Vora, 1992) and involves not only technical changes but also administrative and cultural changes. The important decision regarding implementation will be to chose from the portfolio of JIT techniques to apply in the chosen area. Problems in JIT implementation can be classified under startup failure, operating failures, people related failures and logistics failures as classified by Padukone and Subarao (1993). The main challenge of JIT implementation is the concomitant change in employee involvement and organisational behaviour. Obsolete accounting practices is another major problem in the way of fuller utilization of JIT and its benefits. The barriers to more effective implementation include tokenism, difficulty in knowing where to start, lack of ground work, blind pursuit of consultants suggestions and supply chain problems.

The important decision regarding implementation will be to chose from the portfolio of JIT techniques to apply in the chosen area.

Key (1991) identified five critical barriers for successful implementation of JIT as lack of theory Z, lack of total employee commitment, attempting to produce at capacity, excessive emphasis on short run and outdated cost accounting system. Crawford *et al.* (1988), in a survey results of 29 respondents in USA, reported a number implementation problems. Broadly classified these are people oriented problems and technical operational problems.

A. People Related Problems

(i) Cultural resistance to change

(ii) Lack of resources

(iii) Lack of top management understanding or commitment

(iv) Performance measurement

(v) Lack of Communication with shop floor

B. Technical Operational Problems

(i) Inability to meet schedule

(ii) Poor quality

(iii) Lack of vendor support

(iv) Poor forecasting

(v) Data accuracy

(vi) Machinery breakdowns

Sohal *et al.* (1987) identified the three significant barriers to change with respect to Australian industry as (i) the absence of stable and harmonious industrial relations which enhance management embrace of JIT, (ii) the lack of mutual trust between management and employees and the latter's involvement in decision making, and (iii) the geographically based reliance on imported material which limits JIT diffusion. Respondents of a survey in Australian industries by Clark and Mia (1993) reported the following difficulties, listed in rank order, in implementing JIT.

1) Supplier or customer inflexibility
2) Staff resistance to change in existing systems
3) Difficulties on unexpected costs in the reorganisation of production facilities
4) Prohibitive capital requirements
5) Long suppliers lead times
6) Customer forecast inaccuracies
7) Storage problems
8) Change of staff
9) Re-evaluation of manufacturing strategy
10) JIT is inappropriate for made to order products.

Golhar *et al.* (1990) reported the lack of enough clout with suppliers to change delivery schedule, limited sources to make the operational changes necessary for JIT implementation and sufficient exposure of top management to the JIT philosophy as the main difficulties in implementation of JIT in Small manufacturing firms.

There are several issues, which need to be taken care of in the successful implementation of JIT. Some of the issues identified are rigid and beyond the control of the management. Very little discussion has been offered on the relevant manufacturing policies under an environment non-conducive to the JIT manufacturing. In this paper it is proposed that under such situations, a hybrid policy of JIT and JIC can be the most suitable and economical.

Impact of Market Conditions

There are certain market conditions which affect the implementation of JIT system. Discipline in the demand on production facilities is an important factor (Chary, 1992). The JIT system, which is a pull system, unlike the conventional job shop/batch type push system, is really weak when it comes to dealing with uncertainties or variations in the quantitative and qualitative characteristics of the market demand. JIT cannot be used in making a 'just in time' umbrella with the onset of monsoon. Also, the plant producing an ordinary umbrella cannot be used to produce a 'just in time' parachute. JIT cannot be used for a wayside canteen if it is suddenly faced with a very large marriage party tomorrow.

JIT is suitable when the service level expectations of the customer are very high. Essentially the concept of JIT was evolved to take care of demanding customers in a competitive environment. The whose system underlying JIT is driven by a pull from the customer down the chain and for the system to be effective, the process setup times are reduced, vendor's response is agile and workers are flexible and prepared to take up any task with time/cost/performance stipulations.

JIT is suitable when the service level expectations of the customer are very high. Essentially the concept of JIT was evolved to take care of demanding customers in a competitive environment.

A decision grid, named, 'market volatility-market expectation grid', shown in Fig. 1, can be used for selecting manufacturing policy in a given market environment. Management should first find out, whether the product has a stable or volatile demand. This may be captured by computing coefficient of variation of demand for the products manufactured. In general, new products, products with short life cycles, having high technological advancement, seasonality etc. have high demand variability. Variation in demand may also occur due to marketing policies like advertising and price discount of the company and competitors, government fiscal policies and pre-budget/post-budget buying syndrome.

Market Expectations	Low Market Volatility	High Market Volatility
High	**Type 1** High Flexibility Low Safety Stock (JIT Policy)	**Type 2** Critical and Challenging Policy
Low	**Type 4** Non Critical Non Challenging Policy	**Type 3** Low Flexibility High safety Stock (JIC Policy)

Fig. 1. Market Volatility–Market Expectation Decision Grid

Then it is necessary to find out the expectations of target customers. Products having monopoly, non critical in manufacturing process generally have low expectations. Thus market volatility and customer expectation are two major determinants in the choice of a manufacturing policy. Four types of market situations emerge.

Stable Market–High Customer Expectations

In this market scenario, management can build up their manufacturing operation as flexible. By having flexibility in the manufacturing system, the system is able to respond to small uncertainties of demand more economically without inventory. Additional capacity plants, flexible equipment capable of providing alternate routes, multiskilled operators are the elements of JIT manufacturing policy, helpful in responding to low level of demand uncertainties. Automobile ancillaries, having low demand uncertainties and high desired level of service can go for a JIT manufacturing system.

Volatile Market–High Customer Expectations

This market scenario is very critical and most challenging as it is characterized by volatile market of high demand uncertainties and high expectations from customers. Manufacturing policy under this environment needs high flexibility and high buffer stock so as to provide high level of service under high uncertainties. Proper design of manufacturing policy is very critical in

this market scenario owing to high risks involved. The challenge before management is to design a manufacturing policy with proper mix of flexibility and buffer stock.

Volatile Market—Low Customer Expectations

In this market scenario, the market is volatile, demand of products varies from period to period but market desired level of service is low. JIC manufacturing policy is most economical for this scenario. Keeping buffer stocks to respond to uncertainties is economical rather than building flexible systems as in JIT.

Stable Market—Low Customer Expectations

In this market scenario, manufacturers generally have low manufacturing flexibility and keep low level of inventories. These systems are non-critical, non-challenging and generally practised in public sectors enjoying monopoly of product/service with full government protection. Manufacturers of products not facing any competition and low tangible cost of shortages can follow this kind of manufacturing policy.

Impact of Economy and Industrial Development

The general economy and the industrial development of a country influence the cost of capital and cost of technological flexibility. In India, the cost of capital is much higher than that in Japan and other developed countries. The industrial development of a country affects the availability and cost of the state of the art flexible technology. Flexibility cost factor 'f' is defined as the ratio of the cost of flexible equipment to the cost of dedicated equipment of similar capacity. The value of 'f' is high in India and other developing countries, as the industry in these countries has to import the technology and depend upon the exporting country for training of manpower, repair and maintenance of technology. Four scenarios are presented in Fig. 2 and suitable policies are discussed.

Cost of Flexibility	Low Cost of Capital	High Cost of Capital
High	**Scenario IV** Partially Flexible Configuration (Hybrid Policy)	**Scenario III** Dedicated Configuration (JIC Policy)
Low	**Scenario I** Fully Flexible Configuration (JIT Policy)	**Scenario II** Partially Flexible Configuration (Hybrid Policy)

Fig. 2. Cost of Capital—Cost of Flexibility Decision Grid

The general economy and the industrial development of a country influence the cost of capital and cost of technological flexibility. In India, the cost of capital is much higher than that in Japan and other developed countries.

Scenario I: *Low Cost of Capital and Low cost of Flexibility*

Herein, a manufacturer can exploit the full advantages of JIT by going for flexible manufacturing system with capacity cushions. The various kinds of uncertainties like demand variability can be responded with very low or negligible inventories.

Scenario II: *High Cost of Capital and Low cost of Flexibility*

This has low cost of flexibility as state-of-the-art technology is available at nominal additional cost. Because of high cost of capital, it is economical to have partial flexibility with small safety stock.

Scenario III: *High Cost of Capital and High cost of Flexibility*

This scenario is prevalent in underdeveloped countries, where the cost of capital is high and the technological advancements are at a low level. The cost of flexibility is high in the absence of indigenous know-how and import of flexible equipment. This may further have high maintenance costs due to poor in-house support. In this scenario, the manufacturer can opt for dedicated lines and conventional policy of keeping safety stock.

Scenario IV: *Low Cost of Capital and High cost of Flexibility*

Because of low cost of capital, the present value of inventory carrying cost is high, hence partially flexible configuration with safety stock is most economical to respond the demand variability.

Impact of Purchasing Attributes

JIT purchasing has many benefits and should be the goal of all the organisations for all the items. JIT purchasing can produce the benefits of reduced lead times, reduced inventories, improved quality, improved lead time variability, reduced material costs and improved flexibility (Wills and Huston, 1990). Various authors (Ansari 1986, Ansari and Modarress 1990, Belt

Table 1: List of Attributes, Weightage, Characteristics and Profile of an Item

S.No.	Attributes	W_i	Characteristics				
	JIT Scale (X_i)		1.0	0.75	0.50	0.25	0
A.	**Market Considerations**						
1	Demand Rate	0.007938	V. High	High	Medium	Low	V. Low
2	Variability of Demand	0.020328	V. Low	Low	Medium	High V. High	
3	Life cycle stage	0.005376	Maturity	Steady	Growth	Introduction	Declining
4	Forecast East	0.002754	V. Easy	Easy	Moderate	Difficult	V. Difficult
5	Length of Life Cycle	0.002604	V. Large	Large	Medium	Short	V. Short
B	**Product Considerations**						
1	Functional Vs Aesthetics	0.003237	Highly Functional	Functional	Moderately Functional	Innovative	Highly Innovative
2	Substitutability	0.016692	V. Low	Low	Medium	High	V. High
3	Degree of Engineering Changes	0.005928	Never	Occasionally Often Occasionally	Frequent	Very Frequent	
5	Product Variety	0.008580	Single	Double	Some	Many	Too Many
C	**Purchaser Considerations**						
1	Value of purchase of Item	0.090090	A-Class	AB-Class	B- Class	BC-Class	C-Class
2	Criticality of Item	0.013860	Low Desirable	Desirable	Essential	Vital	Highly Vital
3	End Use of Item	0.013090	Packing Assembly	Manf	Consumable	Spare	
4	Number of Sources of Supply	0.036960	Singh	Double	Some	Many	Too many
D	**Item Consideration**						
1	Ease for Storage	0.013566	V. Difficult	Difficult	Average	Easy	V. Easy
2	Ease of Transportation	0.009044	V. Easy	Easy	Average	Difficult	V. Difficult
3	Quality (Rejections)	0.059052	Very Low	Low	Medium	High	Very High
4	Perishability (Shelf Life)	0.019817	V. Short	Short	Medium	Long	V. Long
5	Disposal/Salvage Value	0.006783	V. Less	Less	Medium	Good	V. Good
6	Price Stability	0.005054	Very Stable	Stable	Moderate	Volatile	V. Volatile
7	Seasonality in Availability	0.019684	Nil	V. Less	Less	High	V. High
E	**Vendor Considerations**						
1	Manufacturing lead time	0.053200	V. Short	Short	Moderate	Long	V. Long
2	Lead Time Reliability	0.030400	V. Good	Good	Average	Poor	V. Poor
3	Number of Clients	0.165200	Single	Double	Few	Many	Too Many
4	Distance of Vendor	0101200	Nearest	Nearer	Moderate	Far	Farthest
5	Sources of Supply	Critical	Indigenous	Freely Available	Partially Controlled	Imported	Govt. Controlled
6	Degree of Competition	0.016800	V. High	High	Moderate	Low	V. Low
7	Design Flexibility of Supplier	0.033600	V. Flexible	Flexible	Moderate	Rigid	V. Rigid
F	**Logistics Considerations**						
1	Communication System	0.060291	V. Effective	Effective	Average	Poor	V. Poor
2	Transportation Cost	0.029106	V. Low	Low	Average	High	V. High
3	Transportation Time	0.020559	V. Less	Less	Average	High	V. High
4	Transportation Reliability	0.120813	V. Good	Good	Average	Poor	V. Poor

1987, Chary 1992, Inman 1990, Kapoor and Gupta 1987, Lee and Ansari 1985 and Ramsay 1986) have advocated different characteristics to be present for successful JIT purchasing. The ideal JIT vendor can be achieved when the vendor has only one client, who has a fairly stable production schedule. Supplier with low distance, high quality, shipping high value items is the only one suitable for JIT supplies.

Supplier relationships in India are different from those in Japan both in terms of spatial dispersion as well as in terms of short term, unpredictive nature. The distances involved in India are on an average 5-10 times greater than those in Japan and there is lack of supplier network capable of responding to change. Contractual nature of relationship discourages supplier-purchaser cooperation and sharing of know how with supplier. However, certain items can be brought under the umbrella of JIT purchasing.

There are numerous attributes that affect the decision to select a purchase policy in a given situation. These attributes are both internal and external. Some are controllable and others are uncontrollable. These attributes are classified into six major categories and the Analytical Hierarchy Process is used to build a Hierarchical structure as shown in Fig. 3. The relative importance of the attributes is determined using the Expert Choice software (Saaty, 1980). This classification provides a framework to identify the situations which are suitable for JIT or JIC purchasing.

Each attribute has a number of characteristics. The presence of some characteristic is favourable to JIT purchasing and results in economic and operational advantages while other may be favourable to JIC purchasing as it may not be feasible to implement JIT purchasing. These characteristics are rated on a scale of 0-1. A score of one indicates that the characteristic is suitable for JIT purchasing and a score of zero shows the preference for JIC purchasing.

The list of attributes, their relative importance, characteristics arranged on 0-1 scale is given in Table 1. This table can be used in finding the JIT index of an item by drawing the profile. To illustrate the use of the table, profile of a component, purchased by an automobile company is drawn on this table. JIT index of a component/item can be calculated as follows:

$$\text{JIT Index} = \sum_{\text{for all attributes}} W_i X_i$$

Where W_i is the relative importance of the ith attribute and X_i is the score of the component for i^{th} attribute. For the snake diagram of the item drawn in Table 1, the JIT index is equal to 0.45. This component is suitable for JIC purchasing. Table 2 give the broad guidelines for selecting purchase and inventory policy for different values of JIT index as calculated above.

Table 2: Broad Guidelines for Selecting Purchase and Inventory Policy

JIT Index	Purchase and Inventory Policy
0.9 and above	**JIT purchase policy** • Frequent deliveries (2-4 times per shift) • Small shipment size • Singh source of supply • Long term contract • Less paper work • No safety stock • Elimination of incoming inspection • Stock to dock delivery • Exact quantity • Fair price
0.6-0.9	**JIT Like Policy** • Delivery once in a day or once in two days • Single/two sources of supply • Long term contract • Some safety stock • Fair price
0.3-0.6	**Hybrid Policy** • Delivery once in a week • Safety stock • Conventional storage and issue
Less than 0.3	**JIC purchasing** • Economic order quantity • Competitive price • large safety stock • more storage area

JIT purchase and inventory policy is suitable when the value of JIT index is high. Under this situation frequent deliveries, 2-4 times in a shift in small shipment size can be practiced. Single source of supply with long term contract is the approach suitable for vendor development. With vendor quality certification, stock to dock deliveries is possible resulting in elimination of incoming inspection, storage and material handling.

JIT purchase and inventory policy is suitable when the value of JIT index is high. Under this situation frequent deliveries, 2-4 times in a shift in small shipment size can be practiced.

For moderate value of JIT index, to begin with 'JIT like' purchase policy is suitable. The characteristics of this policy are one/two sources of supply with long term relationship. Deliveries once in a day or once in two days with some safety stock can be planned. A review of the attributes contributing to the low value of the index help in finding attributes which can be improved to reduce the degree of turbulence and make the item suitable for JIT purchasing. JIT index of this component can be improved by (a) reducing the product variety by developing one standard design for all the models and (b) reducing the number of vendors, preferably having long term relationships with one. By reducing the vendor base communication are simpler. By procuring a major share from one supplier, the number of clients of this supplier will reduce. Limited variety and high volumes also results in reduced manufacturing lead time and higher reliability of vendor. These steps, if taken, will help in improving the JIT index from the present value of 0.45 to 0.62.

The items having a low JIT index and for which JIT purchasing seems to be a remote possibility, the critical analysis and improvement of attributes can make the item suitable for JIT like purchasing. In this way, it may be possible to introduce JIT purchasing in phases.

Conclusions

JIT manufacturing has attracted increased attention in the past two decades from researchers who have tried to explain JIT implementation success and failures. Although various factors have been suggested for the limited applications and failures of J!T implementation, outside Japan, very limited work, if any, has been done to identify the macro issues to be considered before implementing JIT manufacturing. In this paper issues related to market, economy, technological advancement and purchasing attributes to develop general guidelines for taking decisions regarding JIT implementation are discussed. The paper recommends that certain situations are not conducive to JIT implementation and JIT like or JIC manufacturing is economical and feasible to implement.

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Feature

Benchmarking: A Tool for Competitive Advantage

Ajay Pandit and K.K. Khanna

We can no longer tolerate pockets of mediocrity next to world-class performance.

Jerry Junkins, President, Texas Instruments, and 1992 Baldrige Award Winner

Effective Benchmarking is an ever increasing management prerequisite for implementing meaningful positive change. It is not the latest management fad. Benchmarking has been around since the early 1980's and is widely practiced across the USA, and has been growing rapidly in Europe, Australia and Asia. The Malcolm Baldrige National Quality Award has, directly or indirectly, earmarked approximately 680 points, out of a maximum of 1000 points, to benchmarking activities. In India there is not much evidence of concerted efforts by the firms to take advantage of benchmarking. There is also need for conceptual clarity amongst the managers. Training programmes, seminars and other such forums can provide opportunity for bringing managers together for appreciating and sharing information on vital aspects of benchmarking. These issues are discussed in the present paper.

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The final decade of the twentieth century has exposed us to far reaching changes at a pace not witnessed by man in the last hundred years. Organisations that dominated their industries are discovering that their leadership is challenged in ways they never imagined. In a competitive business environment, an organisation needs to anticipate many types of changes, including shifting customer expectations, emerging technological developments, changing customer segments, evolving regulatory requirements and community/societal expectations, or strategic shifts in the thrusts made by competitors. Benchmarking has proved to be an effective tool for achieving business objectives. Since no one has the time or resources to reinvent solutions, organisations benchmark for new ideas, new insights, and best practices to give them the competitive edge. For organisations to create their own successful future, they must learn from their environment—from the best and brightest competitors, markets, products, and processes in their industry. The process for doing this is benchmarking—a management tool for search for the best anywhere in the world.

Benchmarking is an important tool for evaluating corporate strategy. In the search for competitive advantages that are inherently sustainable, it is necessary to increase the corporate learning rate that represent

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core competencies for the business. Benchmarking is an essential aspect of the strategic planning process (Watson, 1993). Benchmarking can be used for the enhancement of strategic business functions and processes to provide a sustainable competitive advantage. Key points in benchmarking include top level management support, appropriate and well-trained team members and constant communication between involved business units. Also important are commitment to change and the development of proper improvement targets and detailed action plans. Benchmarking is a process committed to delivering a strategic value to the company and should not be limited to observations but to the generation of courses of action (Pryor & Katz, 1993).

Key points in benchmarking include top level management support, appropriate and well-trained team members and constant communication between involved business units.

The American Productivity and Quality Center initiated a multi-company, multi-industry benchmarking study to capture a snapshot of current benchmarking practices, techniques, and results. Data from the 150 survey respondents helped identity emerging trends in the use of benchmarking, presented shared learning, and highlighted success stories where benchmarking has been used to achieve measurable results as a continuous improvement tool.

In India, although benchmarking has been widely talked but very little evidence exists of its successful implementation by Indian firms. On many occasions one finds managers using the term "benchmarking" without appreciating its scope.

What is Benchmarking?

American Productivity Quality Center (APQC) defines benchmarking as "the process of identifying, understanding, and adapting outstanding practices and processes from organisations anywhere in the world to help your organisation improve its performance." Note that the definition uses the word "outstanding" and not "best". What is best for an organisation depends on its unique situation.

Benchmarking is the process of identifying, understanding and adapting outstanding practices from within the same organisation or from organisations anywhere in the world to help the organisation to improve its performance. Benchmarking is the search for industry best practices that lead to superior performance (Camp, 1989). Michael Spendolini (1992) defined it as "the continuous systematic process for evaluating the products, services or work processes of organisations that are recognized as representing best practices for purposes of organisational improvement." According to Professor Malcolm Rimmer of Deakin University, benchmarking is Intelligent copying to improve business. Best practice is high performance in a particular practice or process, indicated by optimal use of resources and customer satisfaction, and validated by comparative assessment.

Benchmarking is a way of doing business that never reaches a final point where one can say "that's good enough" or the Japanese "dantotsu" (literally being the best of the best); scope for improvement is always there.

One can benchmark performance indicators or business processes which drive performance indicators. Performance indicators are usually expressed in numbers (metrics), such as:

- profit margins
- return on investment
- cycle times
- percentage defects
- service response time
- billing error rate
- sales per employee
- cost per unit of product or services

For benchmarking business processes, the study may include subjects, such as:

- how one develops a new product or service
- how one manages customer's order or billing or respond to an enquiry
- how one produces or deliver a product or service

For practical purposes, benchmarking came on the scene in the early 1980s. At this time, Rank Xerox faced nearly a fifty per cent reduction in their market share. It was discovered that unit manufacturing costs were the same as its competitors' selling price. They realized that something dramatic had to be done to turn the trends around. Rank Xerox began, in their manufacturing operations, a process of competitive benchmarking, by

which they selectively analyzed competitors products, their operating capabilities, and quality. This was expanded to not only concentrate on meeting a competitor's achievements, but to identify the means for creating processes and methods that would allow Xerox to achieve market superiority. By 1989, Rank Xerox had won the coveted Malcolm Baldrige National Quality Award, and had regained the majority of its market share losses. Rank, and other successful benchmarking organisations, realized that it was not merely copying the most successful methods or practices that would result in success, but that they had to fully understand their own company before they could apply any insight they may obtain of the fundamental technical, process and cultural characteristics that allowed the best in class to be the best. Understanding yourself, understanding how the "best" do what they do, and adapting it to your organisational realities, are the keys to achieving success. Benchmarking is one of the fundamental ways of achieving that goal. By 1984, at Rank Xerox, a corporate wide benchmarking network had been formed and since 1990 benchmarking has been totally integrated at all levels. Robert C. Camp, the father of benchmarking, has the largest individual contribution in benchmarking exercises at Rank Xerox. David Kearns, former CEO at Xerox and the champion for the introduction of competitive benchmarking, explains the rationale behind the development of this powerful competitive tool:

"We took competitive analysis one step further and came up with what we now call competitive benchmarking. It's an intense, in depth study of what we think is our best competition. It's a continuing, never-ending process, and it's an integral part of our new and stronger emphasis on quality. Ever department at Xerox should be benchmarking itself against its counterpart department at the best companies we compete with. We look at how they make a product... How much it costs them to make it.... How they distribute it, market it, sell it and support it... How their organisation works... What kind of technology they have. Then, we all go back and figure out what it takes to be better than they are in each of those areas." (Zaire, 1998).

The use of benchmarking grew rapidly throughout US since late 1980s. Benchmarking became a recognised tool in the development of a continuous improvement process. Indeed the prestigious American prize for quality, the Malcolm Baldridge award, has incorporated benchmarking into it guidelines. In India, benchmarking is a relatively unapplied technique. It has made a beginning in a small way in some of the Indian companies.

To understand fully what benchmarking is, we have to understand what it is not. Benchmarking is not a panacea or programme – it requires a long term commitment. It must be an ongoing management process that requires constant updating – the collection and sifting of external best practices and performance into the decision making and operating practices at all levels of the business. The benchmarking process must keep those conducting the studies aware of new avenues of approach and information sources while accomplishing the basic task.

The most common misconception about benchmarking is that it is numbers game (Camp, 1984). Benchmarking is not something one does halfheartedly, that is, not if one really wants results. Karin Kolodziejski, director of American strategic human resources programmes at Tektronix in Wilsonville, Oregon, puts it this way: "A lot of people claim they are benchmarking when in fact what they are doing is calling a couple of companies and talking to them about what they have done in a particular area. To call that benchmarking is stretching it."

Need for Benchmarking

Many people looking at Benchmarking for the first time doubt that organisations would willingly disclose information about themselves. Nevertheless, many successful organisations do so because they have concluded that in an age of speed and information, gaining accurate insights in the marketplace is worth some sort of reciprocal arrangement especially since the information about themselves is probably already available somewhere in the public domain, perhaps even on the internet. These organisation have discovered that Benchmarking is primarily needed for setting competitive goals that is focused on the following objectives:

- To achieve customer satisfaction,
- To identify and adapt best practices,
- To encourage creating thinking, "get out of the box,"
- To find and comprehend the practices that will help them reach new standards of performance.
- To empower their people to move forward to change existing work practices.
- To base their goals on an external orientation.
- To focus the entire organisation on the most critical business goals.

The organisations, not so successful under the competitive environments, need to pay greater emphasis on teamwork, continuous improvements and have greater awareness of customer needs.

Benchmarking should be done when:

(a) more than incremental improvement is required.

(b) the process is new to the organisation.

(c) the strategic needs require external analysis.

(d) there is a large technology gap.

(e) the performance of the organisation is unsatisfactory; and

(f) improvement seems to stagnate.

Benefits

Benchmarking is a valuable management tool because it provides a disciplined, logical approach for objectively understanding and assessing an organisation's strengths and weaknesses in comparison to the best of the best. Experienced managers of benchmarking organisations know that it is this very awareness within the organisation that is the impetus for the development, implementation, and updating of specific action plans that will improve its performance. Ken Karch (1992-1993), director of quality at Weyerhaeuser Company, says: "Benchmarking findings may lead to breakthroughs and innovation. By providing better ways of supplying products and services, it will enhance customer satisfaction. Through its participative nature, it can promote employee empowerment. It will almost certainly stimulate new ways of thinking about, and looking at, the current ways of doing things. The process of consciously searching out better ways of doing things is the essence of productivity improvement and of the learning process itself."

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Though benchmarking brings many advantages to an organisation, this in particular, leads to the following benefits:

Understanding of World Class Performance: Benchmarking is used as an improvement tool because it forces a critical view of oneself, an outside view as a comparison with the outstanding practices. This serves to gain a true awareness of oneself referring to what one is doing and how well it is being done. Benchmarking helps in getting a true awareness of "the best"; thus, leading to a better understanding of what and how to change.

Incorporating best practices into work processes: Searching for the best practices at the work process level forces continuous assessment of the external environment. The best practices identified by benchmarking, when used as the basis for setting organisation's target involves no internal debate about their veracity. Therefore, such targets are well accepted within the organisations at all levels.

Accelerated and pro-active improvement: Benchmarking is a positive, pro-active, structured process which leads to changing operations and eventually attaining superior performance. Benchmarking results in accelerated and pro-active improvements.

Breakthrough innovations: The process of benchmarking—consistently searching for new ideas for methods, practices, and processes, and of either adopting the practices or adapting the good features and implementing them to obtain the best of the best has often resulted in breakthrough innovations.

Facilitating the organisations in meeting customer requirements: Benchmarking helps in uncovering what is needed to accomplish organisational goals by searching out the best practices of efficiently meeting customer requirements. By emulating the work practices of the best performers, an organisation can usually improve its own conformance to its customer requirements. As Camp (1989) points out, the industry best practices would not exist if these were not preferred by end users.

Calibrating true productivity: When employees are concentrating on understanding their outputs and how these outputs satisfy the next person in line in the work process (or the end user), they can focus their activities on satisfying that person's requirements. This can only happen when there is a clear knowledge of what the organisation does well and real insight into how other organisations do comparable things. Benchmarking has proven itself to be an accurate process for obtaining such basic data and converting that data into actions that will produce real productivity.

Becoming more competitive: Camp (1989) says that organisations often do not make changes until the pain of competition becomes severe. Too often, by the time organisation feels the pain, either life-threatening surgery is necessary or the lead time is not sufficient to permit catching up. With benchmarking, one can see the pain coming. The actual process of searching exter-

nally for strategic data and the commitment to use what is learned, ultimately results in an organisation becoming competitive.

Implementing fact-based goals: To be competitive an organisation must certainly understand the competition, but it must also challenge its current way of doing things. This is best done by bringing in new ideas and practices from the outside. A constant, external search for successful ideas, methods and practices and the merging of them into plans and programmes of an organisation has proven to be a powerful approach to ensuring long-term competitiveness. When the new practices are based on facts, they form a foundation for building business plans and functional strategies that can be converted into solid operating plans.

Promoting a climate for change: The Benchmarking leads to promoting a climate for change by allowing employees to gain an understanding of their performance—what they are achieving now and how they compare to others—in order that they become aware of what they could achieve.

Reinforces employee development: Benchmarking fosters organisational learning thus broadening the organisation's experience base. Benchmarking reinforces employee development thus stimulating team work.

Classification of Benchmarking

Benchmarking studies may be classified either in terms of the partners (i.e. against whom to benchmark) or in terms of the subject (i.e. what is to be benchmarked). Choosing which type of benchmarking to use depends on what you want to benchmark. Accordingly the benchmarking studies may be classified as shown in Fig. 1.

Internal Benchmarking

Benchmarking against internal operations is called Internal Benchmarking. The primary objective is to identify internal performance standards of an organisation (and its affiliates) and sharing knowledge by comparing internal operations. For example, Xerox began benchmarking with its Japanese affiliate, Fuji-Zerox, and today it regularly benchmarks with that firm along with affiliates in Europe, Canada, Brazil and Mexico. Internal Benchmarking enables organisations to obtain immediate gains by identifying their best internal practices and transferring those to other parts of the organisation. This knowledge can later become the baseline for investigation and measurement involving external benchmarking partners.

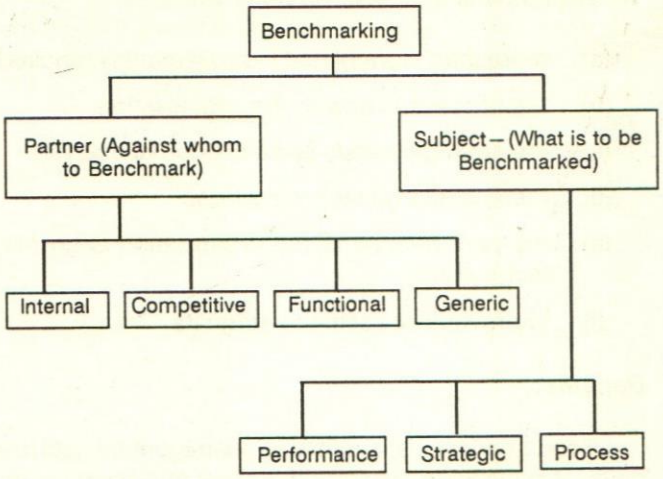

Fig. 1. Types of Benchmarking

Competitive Benchmarking

Benchmarking against external direct product competitors is called Competitive Benchmarking. Direct competitors are the most obvious to benchmark against. The objective is to compare companies in the same markets that have competing products or services or work processes. e.g. Coca Cola vs Pepsi. Comparison of a specific process with the same process in a direct competitor provides increased awareness of what your competitors are doing and how they are doing it. This procedure aids in the establishment of industry benchmarks. According to Jac Fitz-enz (1993) "if we are able to obtain data from competitors, even if the information does not appear to be competitive, it does help understand our competitive position." The advantage of competitive benchmarking is that you can see what your related performance is. For this reason competitors are often willing to join forces to participate in joint-projects. The main disadvantage, however, is that information from competitors is not that easy to obtain, beyond what is available in the public domain. Industry compensation studies are perhaps the most common example of co-operative data sharing with competitors. Another example is the Telecommunications Bench-marking consortium in America. This group of eighteen companies—many of them in direct competition with one another, including AT&T, Bell Atlantic, MCI, Ameritech, and GTE—regularly share information with one another.

Functional (Industry) Benchmarking

Benchmarking against external functional best operations or industry leaders is called Industry or Functional Benchmarking. This involves comparison of a specific process with a similar one within a broad

range of your industry but not competitors in the same market, in order to provide information on best in class practices and to help identify, understand and close gaps in your performance. The object of functional benchmarking is to uncover the best practice of an organisation as the leader in a specific area. Industry benchmarking tends to involve comparisons between firms that share some common technological and market characteristics and to concentrate on specific functions. For example, MTNL might benchmark its billing process against the billing process of British Telecom. The big advantage of industry benchmarking is that it is easier to identify willing partners, since the information is not going to a direct competitor. The disadvantages are cost and the fact that the most renowned international firms, being flooded with requests for benchmarking visits, are even charging a fee for access.

Generic (Process) Benchmarking

Benchmarking a process in one or several organisations, which are in unrelated businesses, is called Generic or Process Benchmarking. It is termed generic because it addresses functions and processes that are common to many organisations regardless of industry, including manufacturing, engineering, human resources, marketing, distribution, billing, and payroll, to name a few. For example: Xerox studying warehouse order picking operations at L.L. Bean. This type of benchmarking focuses on excellent work processes rather than on the business practices of a particular organisation or industry. Some business functions or processes are the same regardless of dissimilarities of the industries. Generic benchmarking has the potential of revealing the best of best practices. It requires broad conceptualisation but careful understanding of the generic process.

Subject-wise Classification

Performance Benchmarking

If the purpose of a benchmarking study is to identify whose performance is better—based on established measures of productivity—performance benchmarking is the easiest kind of study. The performance category of benchmarking includes all research-based studies, whether the data come from competitors or functional leaders. Performance benchmarking requires the least resource support because it relies on the analysis of data from database searches and surveys that can be conducted by an experienced librarian or a market research professional. Most organisations also find performance research a good way to begin benchmarking because it does not require contact with the organisations being benchmarked. That, in turn, means no costly plant visits. On the basis of such research an expanded study with site visits and more in-depth inquiry can easily be made.

Strategic Benchmarking

In strategic benchmarking the focus goes beyond performance leadership to examine non-industry leaders in an attempt to indentify significant trends that may provide insight into potential improvement opportunities. Strategic benchmarking is usually done by establishing benchmarking alliances with a limited number of non-competing businesses. GE is probably the most successful employer of this method, using such alliances with fewer than twenty internationally recognized businesses. Strategic benchmarking has become increasingly popular because it requires only a limited investment—usually a small professional team with sufficient funding and time to establish long-term continuity. As already noted, for many years organisations studying industry compensation practices have taken this approach.

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Process Benchmarking

Process benchmarking requires the highest commitment and experience. It means seeking the best practices through face-to-face studies and observations of key business processes, regardless of who the best practices candidate may be. Because process benchmarking requires the participation of subject matter experts, the owner of a process and process work team (the people actually doing the work) have to be involved in the study. In addition to dedicated support, process benchmarking requires extensive training, site visits, and travel expense; it will also probably lead to extensive process changes. Although the investments are great, so are the returns.

Benchmarking Process

The generic benchmarking process is illustrated in Fig. 2. The benchmarking process can be divided into

two parts, practices (processes) and metrics (measurements).

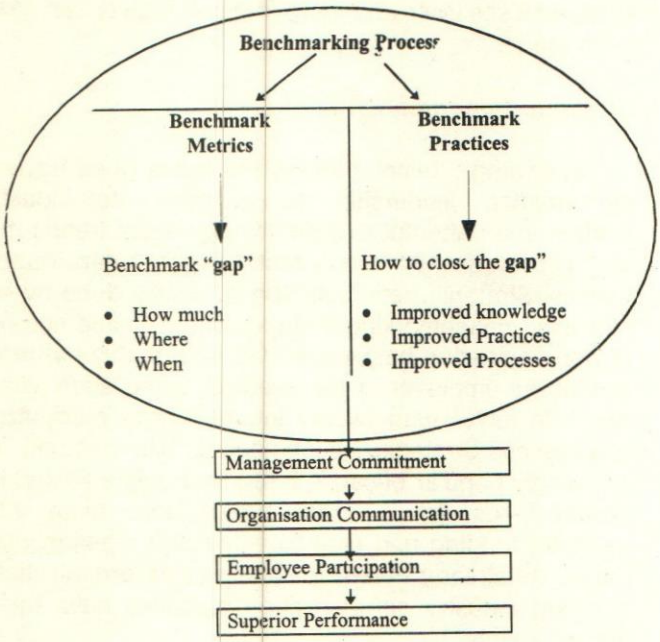

Fig. 2. Generic Benchmarking Process

Xerox and Texas Instruments have five stages and ten steps process, Alcoa uses a six steps process, and AT&T developed a 12 steps benchmarking process. Differences mostly semantic, the various benchmarking methodologies broadly reflect the same theme. The benchmarking process followed by Xerox and being also the most popular model worldwide, is summarised in Table 1.

Success Factors for Benchmarking

When benchmarking is done well, it is a powerful competitive tool. However, when it is done poorly, it can be an incredible waste of money. Seven tips that can help make benchmarking teams more successful are:

- Management commitment to benchmarking
- Openness and willingness to change
- Do the study quickly
- Choose a broad-and-shallow or narrow-and-deep scope
- Integrate critical success factors
- Do not fall for the best-in-class fallacy
- Manage the change from start

Table 1: The Benchmarking Process at Rank Xerox[1]

Phase	Objectives	Relevant Questions
1. Planning	The objective of this phase is to prepare a plan for benchmarking	i) What is the subject to be benchmarked? ii) Who are the best competitors? iii) What is the best data collection method?
2. Analysis	This phase will assist companies to understand competitors' strengths and To assess their performance against these strengths.	iv) What is the current competitive gap? v) What is the projected competitive gap?
3. Integration	The objective of this phase is to use the data gathered to define the goals Necessary to gain or maintain superiority And to incorporate these goals into companies' formal planning processes.	vi) How are the results of the analysis communicated? vii) What are the new goals?
4. Action	During this stage, the strategies and action Plans established through the benchmarking process are implemented and periodically Assessed (recalibrated) with reports of companies' progress in achieving them.	viii) What is the action plan? ix) Is the company achieving its plan?
5. Maturity	The objective of this phase is to determine when the company has attained a leadership position and to assess whether benchmarking has become an essential, ongoing element of its management process.	x) What is the plan for recalibration?

1. Adapted from Camp (1989)

Barriers

Benchmarking is used most often to create a climate for change and to bring about continuous im-

Benchmarking Application		
Absenteeism	Accounting General	Accounts Payable
Accounts Receivable	Acquisitions	Activity Based Costing
Advertising	Asset Management	Automation
Availability	Benchmarking	Billing & Collection
Budget	Capital & Debt Management	Change Management
Communication System	Community	Compensation
Competitive Analysis	Competitive Intelligence	Complaint Handling
Concurrent Engineering	Concurrent Maintenance	Contracting
Corporate Relations	Credit Management	Customer Focus
Customer Relations	Customer Requirement	Customer Satisfaction
Customer Service	Delivery	Design for Assembly
Direct Mail	Distribution	Document Control
Downsizing	Employee Benefits	Employee Communication
Employee Development	Employee Empowerment	Employee Involvement
Employee Recognition	Employee Recruiting	Employee Satisfaction
Employee Suggestions	Engineering	Entrepreneurship
Environment	Expert Systems	Facility Management
Failure Analysis	Finance	Flextime
Franchising	Franchising	Health & Safety
Help Desks	Hiring	Human Resource Planning
Human Resources	Industrial Design	Information Management
Information Systems	Innovation	Interviewing
Invention	Inventory Management	Investment Analysis
Investor Relations	Iso14400	Iso9000
Kanban	Leadership	Maintainability
Maintenance	Maintenance Management	Management
Manufacturing	Marketing	Material Management
Merchandising	Mergers	Networking Systems
Office Management	Operations	Order Fulfillment
Organisational Development	Payroll	Pension Fund Management
Plant & Equipment	Plant Shutdown	Pollution Control
Private Fleet	Process Improvement	Process Management
Producibility	Product Announcement	Product Design
Product Development	Product Life Cycle	Product Management
Production	Production Control	Project Management
Prototyping	Public Relations	Purchasing
Quality	Quality Assurance	Quality Awards
Quality Control	Quality Improvement	Quality Planning
R&D	Records Management	Redeployment
Reduction in Force	Reengineering	Regulations
Reliability	Retirement	Rightsizing
Risk Management	Robotics	Sales
Scheduling	Security Management	Self Directed Teams
Service	Serviceability	Shareholder Relations
Simulation	Small Business	Staffing
Standardization	Strategic Planning	Supplier Management
Tax & Tariffs	Technology	Telecommunications
Testing	TQM	Training
Training & Development	Transportation Management	Travel & Expense
Vendor Relations	Warehousing	Warranty
Waste Management	Workforce Diversity	

provement. However, nearly 70 per cent of process improvement initiative fails. There are a number of pitfalls which will jeopardize benchmarking projects, including the following five:

Lack of Clear, Visible, and Consistent Management Support: This is generally considered to be the number one reason most benchmarking projects/programmes fail. If it is perceived by middle managers and the rank and file that senior management is not fully committed to benchmarking and the timely implementation of results, then the project will likely be doomed.

Failure to Fully Understand and Document one's Own Process: Unless one's own processes are completely understood, and mapped properly, gap analysis is impossible and understanding of reasons for best practices is unlikely.

Selecting Too Large a Process to Benchmark: Some processes are so detailed and complex, with so many critical sub-processes, that benchmarking the entire process at once is precluded. It becomes extremely important to identify the specific processes and sub-processes that provide the most return on investment, and narrow the scope to manageable and productive proportions.

Refusal to Dedicate Needed Staff and Resources: Benchmarking, done well, takes time and resources. Proper preparation and conduct of a benchmarking study takes time and resources. Unless these resources are dedicated, benchmarking may not be successful.

Not Implementing the Best Practices: The primary reason for benchmarking is to identify, understand, and implement the best practices to improve processes. Do not benchmark for the sake of benchmarking.

Benchmarking—Ethical and Legal Issues

Benchmarking involves discussions on competitively sensitive data. Ethical and legal guidelines include the following:

- Develop a formal position on ethical and legal issues.
- Communicate organisations' position on legal and ethical issues.
- Clarify legal terms
- Put all agreements in writing
- Clarify the need for legal review
- Avoid talk about pricing or competitively sensitive costs
- Do not ask rivals for sensitive data
- Do not share proprietary data without clearance
- Have impartial third party assemble and present competitive data without names attached
- Do not disparage a rival's business to outsiders based on data obtained.

Benchmarking Application

Organisational structure throughout the many diverse industries vary, but for the most part, all organisations perform similar business processes. Whether you are from a large or small corporation, government agency, or a non-profit association, to a large extent, you share common business processes with other industries. The business process of human resources for one industry can be very similar to another. In fact, the Human Resource Management (HRM) processes may even be a critical success factor for another industry. So being able to Benchmark with that other industry is going to help you bring your own HRM process to even higher standards than your industry standard. After implementing change from your Benchmarking study, perhaps you become the new industry leader for that particular business process.

Practices and processes range from customer service to human resources, from warehousing and distribution to leadership. Even industry-specific processes, such as claims processing in insurance, are candidates for learning from any organisation that processes "orders" rapidly, including mail order houses and banks. To appreciate the potentiality and scope of application of Benchmarking, given below is the list mentioning just some of the many business processes covered by The Benchmarking Exchange (TBE), a network of engineers and professionals.

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and benchmarking for achieving service quality.

While marketing of hotel services have been published (Shanker and Sen 1997) and select issues pertaining to service quality in hotels and restaurants have been reported from India (Lakhe and Mohanty 1995), literature pertaining to the measurement of service quality in Indian restaurants could not be found. The use of the SERVQUAL questionnaire for measuring customer's perceptions of the services offered in a restaurant in New Delhi is demonstrated in this paper. The paper also examines the validity, reliability and predictive validity of the SERVQUAL instrument and analyses its applicability to the services offered in a restaurant.

Restaurant Service

The catering services offered in a restaurant can be broken down into two quality dimensions: technical quality and functional quality (Gonroos 1990). Technical quality or static quality (Day and Peters 1994) can be defined primarily as the conformance to specifications of the food and beverages prepared. Functional quality or dynamic quality refers to the manner in which the catering service is delivered to the consumers. Technical quality alone falls short of being a truly useful measure for describing how consumers evaluate the quality of service in a restaurant. While it becomes difficult for consumers to evaluate the technical aspects of the food and beverages prepared, they can surely perceive the responsiveness and kindness of the staff when they are being served. The service achieves quality in perception when it meets or exceeds the level of the consumer's expectations. These value perceptions affect consumer's satisfaction and their intention to purchase additional services and tell others about it (Zeithaml 1988).

Technical quality alone falls short of being a truly useful measure for describing how consumers evaluate the quality of service in a restaurant.

SERVQUAL Scale

Parasuraman and colleagues (1988) have developed the SERVQUAL scale for measuring service quality applicable across a broad range of services. In Its original form SERVQUAL contains 22 pairs of Likert-type items. One half of these items measure the respondents' expected levels of service while the other 22 matching items measure the perceived level of service provided by a particular organisation. Service quality is measured by the difference in scores (the gap scores) between the perceived level and the expected level of service provided. Parasuraman and colleagues (1998) have also contended that there are five dimensions of service quality that are applicable to service providing organisations in general. These are the appearance of physical facilities, equipment and personnel (tangibles), the ability to perform the promised service dependably and accurately (reliability), the willingness to help customers and provide prompt service (responsiveness), knowledge and courtesy and ability to convey trust and confidence (assurance) and the provision of caring, individualized attention to customers (empathy). The SERVQUAL scale has been widely used in research and its psychometric properties have also been examined by a number of studies (Babakus and Boller 1991; Carman 1990; Finn and Lamb 1991). Although the collective findings by and large provide some support for the validity, reliability and predictive validity of the scale, the factor-loading patterns in the original five dimensions are inconsistent across these studies. The usefulness of SERVQUAL remains unresolved (Lam 1997). There is little research regarding the use of SERVQUAL in restaurants in India. The use of the SERVQUAL instrument for measuring consumers' perception of service quality in sit-in restaurant is described below.

Methodology

The sample consisted of 60 guests who visited a sit-in restaurant in New Delhi, where an average meal costs a minimum of Rs. 100 per guest. The survey was carried out with 15 random samples each on Sunday and Thursday of one week and Tuesday and Saturday of the week after next. The self-completion questionnaire was provided to the guests when they requested for the bill after finishing their food. Sixty questionnaires were distributed, of which fifty-eight were completed and returned. Two questionnaires were in incomplete and not usable. Thus a final sample of 58 was obtained and used in the analysis.

The questionnaire contained the SERVQUAL scale, with 22 statements relating to consumers' expectations of the quality of the service that excellent restaurants should offer and 22 corresponding items relating to performance perceptions of the quality of service actually delivered. A five-point Likert response format ranging from 'strongly disagree' to 'strongly agree' was adopted instead of the original seven-point scale. The negatively worded statements contained in the original scale were rephrased and converted into positive ones. The instrument contained a question about the guests'

overall rating of the restaurant's service quality, and a question about whether they intended to return to the restaurant in future.

Results

The adequacy of the SERVQUAL scale for assessing consumer's perceptions of service quality was examined in accordance with the recommendations provided in the measurement literature (Nunnally 1978). The scale's reliability, underlying dimensionality and predictive validity were analysed.

Reliability

Items of each subscale were subjected to reliability assessment. Results of the item analysis for both the expectations and performance perception scores are presented in Table 1.

The coefficient alpha values for performance perception subscales ranged from 0.562 to 0.917 indicating that the test was internally consistent (Cronbach 1951). The item-to-total correlation for individual performance items were greater than the 0.35 cut-off value (Nunnally, 1978). The coefficient alpha values for the expectation subscales range from 0.813 to 0.923. Again, the item-to-total correlation figures for individual expectation items were greater than the 0.35 cut-off value. Reliability for linear combinations of the five subscales was also computed to assess the overall internal consistency of the expectations and performance measures. Overall coefficient alpha values were 0.939 and 0.946 for the performance and expectation scores respectively. These results were consistent with those reported in Babakus and Boller (1991), Cronin and Taylor (1992) and Parasuraman *et al.* (1988).

Dimensionality

To examine the dimensionality of the scale, an exploratory factor analysis was conducted on each of the correlation matrices of the expectations, performance perceptions and the gap scores (performance perceptions minus expectations). Factor analysis results for expectations, performance perceptions and the gap scores are provided in Table 2.

Data on the three correlation matrices produced very similar results, with one factor accounting for most of the variation in item scores. When subjected to oblique rotation, the loading did not provide a clear picture of any meaningful factor structure. A fourth round of factor analysis was also conducted using expectations and performance items together. The results identified one dominating factor representing expectations and perceptions. Factor loading from the combined solution did not differ in any significant way from those obtained with separate analyses of the expectations and perceptions.

These results suggest that the proposed five dimensions of SERVQUAL cannot be confirmed and that both scales can be treated as unidimensional with the 22 items considered as a single composite set of individual measures.

Predictive Validity

Individual item scores for expectations, perceptions and gaps were added together to obtain scores for each construct. These scores were then correlated with a single-item overall intention scale (return to the restaurant again) and another single item measure of overall quality rating. Both the overall intention scale and the overall quality rating items were on Likert scales with a five-point response format where a higher score indicated a more favourable response. The resulting correlation matrix is presented in Table 3.

All these correlation scores were statistically significant in the predicted direction. This result provided strong evidence of the predictive validity of the scale. However, it also raises questions on the role of the expectations component of the scale. Correlation between perceptions and intentions was higher than the gap scores (0.739 and 0.409). Correlation between overall ratings and perceptions was also higher than the gap scores (0.696 and 0.386). Correlation between expectations with intentions and overall quality ratings were negative.

Individual Service Quality Scores

From the study following conclusions:

1. Thus, prompt services are the most important factors customers expect from a restaurant. It is worthwhile to note that although the performance scores of these items are on average above 3.4, they still fall short of customer's expectations (average 3.82). Customers are still not satisfied with services they expect most, especially 'staff tell you when to be served' with a gap of more than 1 between expectations and perception. These are the areas the restaurant can improve in order to achieve better service quality.
2. 'Furniture and crockery are clean and tidy' shows the highest positive gap score followed

Table 1: Expectation and Performance Perception Mean Scores (N = 58)

	Items in each dimension	Perceptions (P) X	Perceptions (P) SD	Perceptions (P) Item-to-total Correlation	Expectations (E) X	Expectations (E) SD	Expectations (E) Item-to-total Correlation	Service Quality (P - E)
A.	**Tangibles**		α = 0.562			α = 0.841		
1.	Restaurant is neat and clean	4.21	0.41	0.37	3.55	0.87	0.37	0.66
2.	Environment is comfortable	4.14	0.44	0.42	3.55	0.91 0.61	0.59	
3.	Staff appears neat and clean	4.00	0.60	0.36	3.21	0.98	0.69	0.79
4.	Furniture and crockery are clean and tidy	4.21	0.41	0.37	3.40	0.86	0.44	0.81
B.	**Reliability**		α = 0.875			α = 0.871		
5.	Service is same each time	3.76	1.06	0.62	3.83	0.85	0.36	–0.07
6.	Staff is sincerely interested in serving you	3.69	0.93	0.72	3.57	0.98	0.74	0.12
7.	Service provided is right first time	3.90	0.72	0.66	3.59	0.87	0.71	0.31
8.	Served within reasonable waiting time	3.79	0.94	0.67	3.55	0.99	0.67	0.24
9.	Staff keeps accurate records	4.14	0.79	0.68	3.55	0.99	0.74	0.59
C.	**Responsiveness**		α = 0.798			α = 0.813		
10.	Staff tell you when you will be served	2.90	0.98	0.57	3.97	0.68	0.36	–1.07
11.	Staff follows your instructions promptly	3.90	0.90	0.74k	3.76	0.87	0.65	0.14
12.	Staff is always willing to help	4.00	0.53	0.59	3.59	0.87	0.66	0.41
13.	Staff is never too busy to respond to you	3.55	0.99	0.76	3.72	1.00	0.65	–0.17
D.	**Assurance**		α = 0.917			α = 0.907		
14.	Staff can be trusted	3.72	0.84	0.74	3.50	0.91	0.75	0.22
15.	You feel safe in your interaction with staff	3.76	0.74	0.75	3.31 0.89	0.71	0.45	
16.	Staff is consistently courteous	3.83	0.80	0.70	3.31	1.00	0.78	0.52
17.	Staff has knowledge to answer your queries	3.52	1.02	0.77	3.48	1.15	0.62	0.03
E.	**Empathy**		α = 0.829			α = 0.923		
18.	Waiters pay individual attention	3.83	0.89	0.81	3.41	1.24	0.78	0.41
19.	Operating hours is convenient to you	3.48	1.15	0.55	3.14	1.22	0.64	0.34
20.	Waiters take personal interest in you	3.38	0.98	0.77	3.34	1.11	0.78	0.03
21.	Staff has your best interests at heart	3.59	0.87	0.71	3.38	0.98	0.62	0.21
22.	Staff understands your specific needs	3.48	1.02	0.52	3.41	0.95	0.81	0.07

by 'staff appears neat and clean'. Since the expectation scores of these items are lower than the average of expectation scores (3.51), it can be concluded that customers are generally satisfied with these aspects of service quality in the restaurant.

3. The widest gap between customers' perceived performance and expectations are the factors of 'staff tell you when you will be served', 'staff is never too busy to respond to you' and 'service is same each time'. The restaurant does not seem to be good at telling the guests how long they would have to wait before they are served. Often, staff is not available to attend a guest. Moreover, customers experience differences in the service delivery during repeat visits to the restaurant. Since the expectations of these factors were among the highest, these are the factors that the restaurant should concentrate on in order to improve its service. That way it can not only satisfy the guests but also delight them by exceeding their expectations.

Table 2: Exploratory Factor Analyses (N = 58)

Perceptions Scale Items	Factor 1	Factor 2	Expectations Scale items	Factor 1	Factor 2	Gap Scale Items	Factor 1	Factor 2
P1	0.394	0.069	E1	0.375	–0.325	G1	0.475	–0.373
P2	0.478	0.238	E2	0.643	–0.255	G2	0.601	–0.321
P3	0.232	0.596	E3	0.726	–0.217	G3	0.604	–0.469
P4	0.423	–0.477	E4	0.474	–0.560	G4	0.486	–0.416
P5	0.664	–0.006	E5	0.388	–0.100	G5	0.401	0.264
P6	0.766	–0.412	E6	0.783	0.235	G6	0.799	0.157
P7	0.706	0.334	E7	0.744	0.366	G7	0.742	0.220
P8	0.689	–0.199	E8	0.708	0.464	G8	0.792	0.200
P9	0.723	0.063	E9	0.764	0.431	G9	0.766	0.305
P10	0.612	–0.434	E10	0.205	0.685	G10	0.310	0.666
P11	0.774	–0.273	E11	0.680	0.519	G11	0.724	0.482
P12	0.634	0.182	E12	0.699	0.305	G12	0.688	0.107
P13	0.799	0.016	E13	0.692	0.377	G13	0.752	0.283
P14	0.775	0.195	E14	0.787	–0.355	G14	0.765	–0.387
P15	0.787	0.389	E15	0.755	–0.353	G15	0.733	–0.412
P16	0.743	0.415	E16	0.816	–0.323	G16	0.728	–0.334
P17	0.801	0.236	E17	0.842	–0.100	G17	0.786	0.028
P18	0.840	–0.327	E18	0.799	–0.085	G18	0.755	0.268
P19	0.587	0.247	E19	0.675	0.016	G19	0.614	0.173
P20	0.787	–0.037	E20	0.809	0.003	G20	0.791	0.087
P21	0.753	–0.379	E21	0.668	–0.251	G21	0.607	–0.081
P22	0.556	–0.113	E22	0.846	–0.256	G22	0.739	–0.383
Eigenvalue	10.115	2.009	Eigenvalue	10.655	2.607	Eigenvalue	10.171	2.372
Variance Explained	46.00%	9.10%	Variance Explained	48.40%	11.80%	Variance Explained	46.20%	10.80%

Table 3: Correlation of Summated Scores (N = 58)

Item	Percep-tions	Expec-tations	Gap Scores	Inten-tions	Overall Ratings
Perceptions	–				
Expectations	–0.071	–			
Gap Scores	0.566*	–0.811*	–		
Intentions	0.739*	–0.015	0.409*	–	
Overall Ratings	0.696*	–0.036	0.386*	0.624*	–

* Significance ≤0.01

Conclusions

SERVQUAL appears to be a consistent and reliable scale to measure the service quality in a restaurant. The scale exhibits reliable and valid measures of patient's expectations of restaurant services and their perceptions of restaurants' level. However, the expectations, performance perceptions and gap scores have emerged as unidimensional measures without any meaningful underlying dimensions.

SERVQUAL appears to be a consistent and reliable scale to measure the service quality in a restaurant. The scale exhibits reliable and valid measures of patient's expectations of restaurant services and their perceptions of restaurants' level.

The results identify areas for improving the quality of service. The perceived service performance generally matches idealised expectations. Clean, reliable and responsive service is what customers expect from the restaurant. The results also indicate the customers' per-

ception that they are not provided with timely attention. These are the areas that the restaurant should improve in order to build a consumer-focussed attitude towards service delivery.

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Feature

Revisiting Job Design & Role Analysis: Complementation of AMTs

A. Vittaleswar

This article is an attempt to propose a framework towards successful implementation of Advanced Manufacturing Technologies (AMTs). Job Characteristics and Role dimensions are identified as motivational factors that are responsible for motivating the operator and supervisors associated with AMT. Job design/redesign and Role analysis exercises are identified as appropriate HRD mechanisms to identify and incorporate the job characteristics and role dimensions. Selection procedure and Growth Need Strength (GNS) are identified as moderators that will influence the dependency of job satisfaction and role efficacy on job characteristics and role dimensions. The paper also presents a model and concludes by providing some suggestions for conducting further research.

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The impact of economic reforms and globalisation have influenced majority of the Indian organisations to realise that their survival and growth will be primarily dependent on their ability to manufacture products or offer services, with international quality standards. This realisation has resulted in an intensified pressure on Indian organisations to acquire new and advanced technologies that are capable of manufacturing products or services of higher quality standards. It has been observed that intensified competition and shorter product life cycles are the new realities that manufacturing organisations around the world encounters in the recent years. In a volatile situation of this nature, the progress of a manufacturing organisation will be mainly dependent on the factors such as improved product quality, delivery reliability, reduced manufacturing costs and greater flexibility to manufacture a wide range of products. At the same instance, manufacturing organisations have to face and overcome constraints such as high cost of labour, shortages of labour and increasingly moving trend of labour towards service sector (Noori, 1990). The realisation of these factors has influenced many Indian manufacturing organisations to acquire proven world class technologies, relatively on a large scale in comparison with previous years. The acquisition seems to be more relevant with engineering industries, since the quality yardsticks happen to be relatively high in the segment. According to the information available from Central Manufacturing Technology Institute (CMTI), Bangalore, there are around 700 engineering industries in the country, irrespective of their

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size, are in possession of Advanced Manufacturing Technologies (AMTs). Manufacturing technologies such as Computer Aided design (CAD), Computer Aided Manufacturing (CAM), Computer Aided Process Planning (CAPP) and Computer Integrated Manufacturing (CIM) systems, have been broadly classified as AMTs (Dean Jr. *et al.*, 1992).

CAM includes Robots, Flexible Manufacturing Systems (FMS) and Computer Numerical Controlled (CNC) Machines. The common feature of all AMTs is the absorption of various routine activities carried out by operators with conventional manufacturing technologies into software and hardware. The hardware comprises of microprocessor controlled electric, electronic, pneumatic and hydraulic control systems, capable of reprogramming various machine operations and controls.

Increased usage of AMTs indicates that an increase in the production of CNC machine tools from 425 numbers in 1993 to 710 in 1994. It also expected that number will rise to 3000 in 2000 A.D. (Hindu Survey, 1994). Hence it can be concluded that the Indian engineering industry will acquire more number of AMTs in the coming years.

Implementation

However, in due course of implementation of AMTs, the early users have concluded that these technologies have not lived up to their expectations in many areas. The areas are improvised product quality, delivery reliability, reduced manufacturing costs and greater flexibility to manufacture wide range of products. It has been observed that the failure of AMTs in living up to the expectations is essentially due to the ignorance on the part of the higher authorities in predicting, recognising and responding appropriately to the behavioural issues that could emerge during the implementation. Longenecker *et al.*, (1997) based on the past research stated "growing evidence suggests that without the effective management of people, the full potentials of technology cannot be completely realised". They also emphasise that manufacturing technology without a properly trained and motivated workforce is potentially a poor investment if workers cannot maximise the potential benefits through optimal usage. As a consequence of realisation of stated factors, there is a need for organisational authorities to understand

- Key factors that are responsible for the emergence of behavioural issues
- Nature of behavioural issues
- Relationship between various key factors and influence on the behavioural issues.
- Feasibility, relevance and appropriateness of various approaches that can be adopted to motivate the shop floor personnel.

Considering the above developments, the proposed conceptual model (Fig. 1) an attempt to develop a suitable model to provide organisational authorities a comprehensive understanding or an overview of the above mentioned issues and their relationship.

Key Factor(s) responsible for effective implementation of AMTs:

High Skill Base

The foremost and an important key factor that could influence the effective implementation of AMTs are the high skill base of AMT workforce. High skill base is a pre-requisite for any workforce to be familiar and comfortable in working with AMTs. It will influence manufacturing organisations to select or recruit workforce with relevant and appropriate skills. Since these skills are found to be different in many ways from the skills regarding conventional manufacturing technologies, workforce with relatively higher educational background in turn with high skill base may get entry into organisations that have acquired AMT.

Growth and development are the factors that organisations usually address on a priority basis in the process of meeting the expectations of managerial staff. The evolution of Human Resource Development (HRD) philosophy has provided organisations with various mechanisms such as performance appraisal, potential development exercises, training etc., to address the growth and development aspects of the managerial staff. It has been observed that a HRD approach will be basically aimed at achieving integration between an individual employee and the organisation by developing the appropriate relationship (D'Souza *et al.*, 1997). However, it has been observed that the implementation of any HRD mechanism is a rare event at workforce level. This was because the expectations of workforce used to be only in terms of fulfilment of extrinsic motivation. Considering the nature of expectations of AMT workforce which are in many ways similar to that of managerial staff, it appears that the manufacturing organisations are required to understand the relevance of HRD mechanisms in case of AMT workforce. This is based on the fact that the fulfilment of expectations of AMT workforce in terms of growth and development will be an important pre-requisite to capitalise on the full potentials of AMT. Hence there is an imperative need for

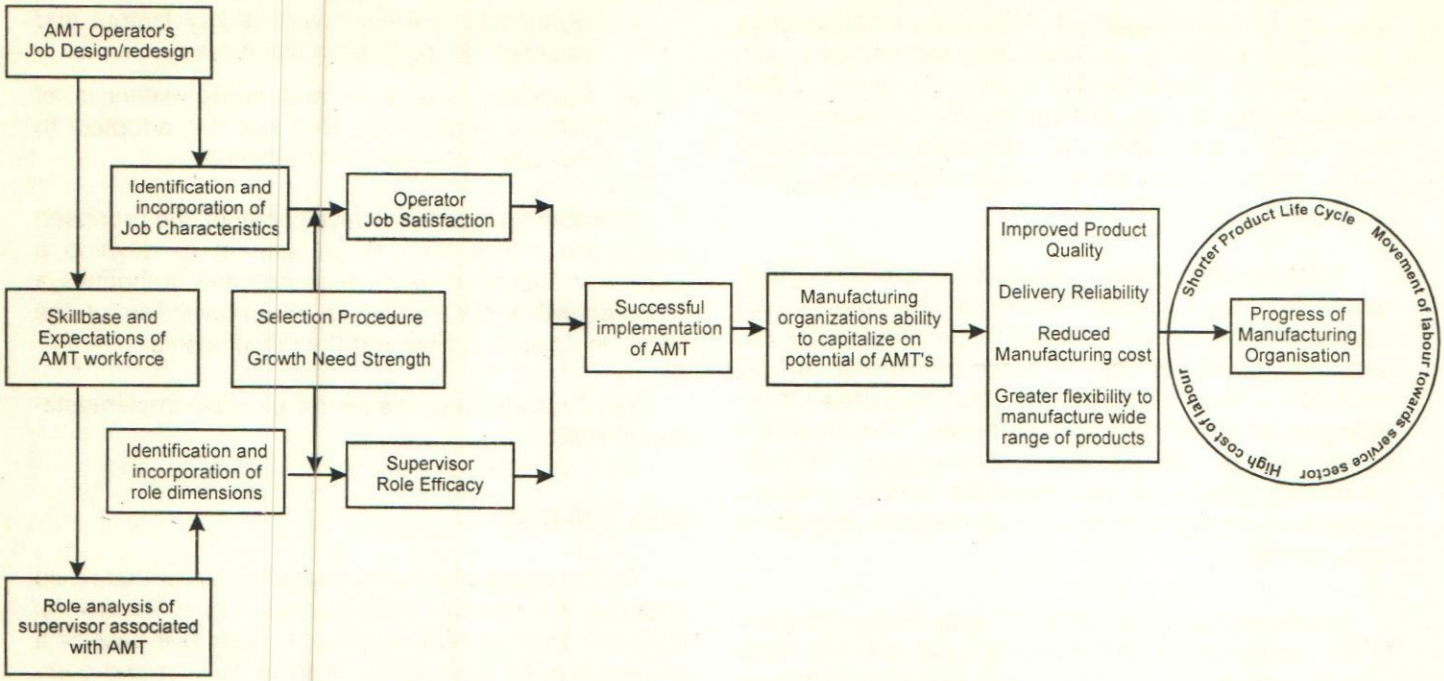

Fig. 1. A Conceptual Model for Successful Implementation of AMTs

to understand the kind of HRD mechanisms that are appropriate regarding AMT workforce.

Growth and development are the factors that organisations usually address on a priority basis in the process of meeting the expectations of managerial staff.

It has been observed that the workforce in manufacturing organisations will also anticipate intrinsic motivational aspects along with extrinsic motivational aspects in their working environment (Sayeed and Viswanathan, 1984). It was this realisation has influenced manufacturing organisations to adopt approaches such as job rotation and job enlargement to address intrinsic motivational aspects of work force. Job rotation and job enlargement have been broadly classified as the category of approaches that are meant to develop the role for the person, one of the developmental dimensions of the personal function (Pareek and Rao, 1981). It was this dimension that has been considered on a priority basis by manufacturing organisations to address the intrinsic motivational aspects of work force. However, organisations are required to understand the appropriateness and relevance of the job rotation and job enlargement regarding AMT workforce, in due consideration of its nature and expectations.

Job rotation approach appears to be irrelevant regarding AMT workforce, considering the fact that they will be in anticipation of specific responsibility in their chosen field. This is clearly evident from their specialised educational and skill backgrounds. As far as relevance of job enlargement approach is concerned, it is the inability of job enlargement to instil challenge or meaningfulness to the work (Robbins, 1996)., will make it an unsuitable approach for AMT workforce. Since the above job rotation and job enlargement approaches appear to be irrelevant, manufacturing organisations are required to adopt an appropriate approach that will fulfil the requirements of the AMT workforce. Prior to this, it is also necessary to understand the nature of behavioural issues and their relevance to various levels of AMT work force. It has been observed that AMTs will have a greater influence on operator and supervisor positions in comparison with other positions in the shop floor.

Behavioural issues

In most of the conventional manufacturing organisations the job description of an employee at the lower level of the organisation structure, usually adhere to the basic definition of the Job. The basic definition of job indicates that job is a component of work and a specific requirement to get a product of service to achieve an objective. Further, it will be surprising to note that the influence of technological determinism on the job descriptions of workforce, if not the jobs descriptions of the managers, even today in many of the contemporary organisations. As a consequence, the typical job descriptions of a shop floor

operator usually confined itself to performing repeated tasks. This job description usually does not undergo frequent changes, except on selective occasions, which compel higher authorities to redesign the same. This need may arise out of the technological requirements or to meet the situation that arises out of downsizing the workforce.

Organisations however implementing AMTs are required to re-evaluate the existing job descriptions, considering the nature of operators and their expectations. It has been observed that the aspirations of the workforce associated with new and advanced technologies are higher, since the workforce associated with these technologies is found to be better educated, highly ambitious, less patient and highly cynical in nature. (Chaubey, 1997). Further, it has been observed that in tune with the changes in the nature of the workforce, organisations are required to consider and take care of the psychological needs of the workforce. (Pande, 1997). It appears that, as far as expectations are concerned, an AMT operator is no way different from the member of workforce associated with the new technologies. The AMT operator psychological needs are appear to be in similar lines of psychological feelings that are responsible for an individual to derive job satisfaction, from the job assigned to him. Job satisfaction has been defined as an outcome of the individuals psychological feelings such as the knowledge of the results, experiencing the responsibility for the result of the job and experiencing job as meaningful one to perform. (Hackman and Oldham, 1980). It is this psychological phenomenon that is required to be considered and should be understand on a priority basis by organisational authorities while incorporating the changes to the existing operator jobs at the advent of AMTs.

Supervisor

Traditional supervisory role in most of the organisations including manufacturing organisations will be mainly confined to the following responsibilities.

1. Providing the assistance to shop floor engineer/manager in production, planning and controlling activities.
2. Responsible for maintenance of manufacturing machines and other equipment in the shop floor.
3. Recognising and providing the information regarding skills and potentials to the higher authorities.
4. Assists higher authorities in translating the organisational objectives into individual tasks of operations and resolving problems related to industrial relations.

It can be concluded, that the traditional supervisory role will be usually described in accordance with expectations from significant positions in the organisation moreover including the role occupant.

In due course of fulfilling the above-mentioned responsibilities a traditional supervisor performs interpersonal and informational roles and to a certain extent performs the decisional roles in the organisation. As a consequence, the traditional supervisory role in the organisation attains greater significance in the overall organisational structure. At the same time the traditional supervisory role also enjoys power and acquires a special identity in the organisation. These conditions will influence traditional supervisor to arrive at a psychological feeling namely Role efficacy. Role efficacy has been defined as the power to produce a desired effect occupying a role (Pareek, 1980). It has been observed that the role efficacy aspect will influence the effectiveness and efficiency of supervisor to a large extent possible. Hence organisational authorities have to understand the implications of AMT for role efficacy in case of supervisor, considering the following consequences as a result of implementation of AMTs.

1. Less dependency of operator(s) on supervisor(s). This is due to the increase in the level of educational background and skill base of operators on par with that of supervisors.
2. The self-regulating nature of AMTs has also resulted in less dependency of operators(s) on supervisor(s) regarding attending the problems related to operation and maintenance of AMTs.

The above mentioned new developments appear to have an impact on the psychological conscience of a supervisor. The impact could be in the form of a conclusion that a traditional supervisor may arrive that his role in the organisation may diminish in due course and organisation may no longer in need of his services. It also may lead to an identity crisis for the traditional supervisory role in the organisation. As a consequence traditional supervisor may also feel loss of power. However, organisational theorists have observed that the manufacturing organisations will continue to be dependent on the traditional supervisory positions even at the advent of these AMTs. The above conclusion is based on the fact that a manufacturing organisation requires supervisors due to their expertise with respect to knowledge of the production process, knowledge of work force and capabilities of monitoring employee and equipment performance (Majchrzak, 1988).

Thus the implications of AMTs for operators and supervisors respectively, result in a need to address motivational aspects in the form of job satisfaction and role efficacy. As a consequence, organisational authorities are required to adopt relevant and appropriate approaches that are capable of including job satisfaction in the operator job and maintaining efficacy of supervisory role.

The implications of AMTs for operators and supervisors respectively, result in a need to address motivational aspects in the form of job satisfaction and role efficacy.

AMTs will also provide many opportunities to traditional supervisors in addition to above-mentioned implications, to assume new responsibilities in the manufacturing organisations.

- Supervisor will be responsible for more number of machines and production processes due to the self-regulating capability of AMTs.
- Supervisors will be responsible for operation and maintenance of more complex and costly systems of capital equipment.
- Supervisors will be relieved from routine planning, progress chasing and paper work enabling them to pay more attention to issue Planning, Scheduling and knowledge management. It also provides them opportunity to look into motivational aspects of the workers.
- Authority Credibility of supervisory role may be enhanced if the supervisors are given a key role in communication relating to AMT implementation.

However traditional supervisor will be able to utilise these new opportunities, only when organisational authorities duly recognises these implications of AMT for supervisory role and redesign the supervisory by inducing the these new responsibilities.

HRD Mechanisms

Job enrichment and role analysis approaches that are designed to develop the role for the persons appear to be appropriate HRD mechanisms to address the growth and development aspects of AMT workforce. These approaches are aimed at increasing the worker's control over planning, execution and evaluation of work, an outcome that coincides with the expectations of a member of AMT workforce. However, it is essential for organisational authorities to understand the relevance of these approaches regarding various levels of AMT workforce. This is in due consideration of the observed fact that AMTs will mainly have an impact on supervisor and operator than any other shop floor personnel. Hence organisational authorities should investigate the relevance of these mechanism regarding operator and supervisory positions.

Job design/redesign approaches are the enhanced versions of job enrichment methodology, usually adapted by organisational authorities to motivate the workers by expanding the responsibilities vertically in a job. The vertical expansion will be achieved by combining the tasks, forming natural work units, and establishing client relationships, vertical leading and opening feedback channels. (Hackman and Oldham, 1980). The above process will allow the worker to carry out a complete activity. Job enrichment not only will make a worker to be more independent and responsible person, but also will increase the worker freedom and provides the feedback. These outcomes have found to be appropriate motivating factors regarding any individual who wishes to build his career, a significant characteristic of an AMT operator.

Role Analysis Exercise

Organisations usually adopt role analysis exercises to address a psychological phenomenon namely, role efficacy, which influences the effectiveness and efficiency of a supervisor role. These exercises will be executed to understand the perception of a supervisor about his role in three aspects such as role centering, role linking and role shrinking (Pareek, 1980). These three aspects broadly cover dimensions of a supervisory role such as the self-role integration, proactivity, creativity, confrontation, centrality, influence, personal growth, inter-role linkage, helping relationship, superordination. Implementation of AMTs may influence reasonably all the dimensions of role efficacy mentioned above and may result in role erosion. These outcomes will influence organisation authorities to consider the implication of AMT on supervisory role and have to incorporate appropriate changes. This is because the maintenance of role efficacy of a supervisor role will have strong influence in effective implementation of AMTs.

Although job characteristics and role dimensions may influence job satisfaction and role efficacy to a greater extent, organisational authorities are required to understand the moderating effect of any other factors

on this relationship. Regarding this moderating effect, it appears there is a need to consider the influence of selection procedure and growth need strength.

Selection Procedure

It has been observed that in most of the organisations, which AMTs have implemented, authorities have selected operators as well as supervisors from the existing work force, to work with AMTs. It is understood that the selection criteria usually adopted by authorities in this regard, basically aims at testing the abilities of operators in the areas of machining and motor skills and supervisory and maintenance skills in case of supervisor. However, the inherited and versatile characteristics of AMTs that are quite different in many ways from conventional manufacturing technologies, AMTs demand certain additional skills from workforce. AMT workforce needs to be good at abstract, conceptual and discretionary skills. Moreover workforce also need to be good at maintaining human relations, besides possessing required motor skills, in order to be comfortable and familiar with AMTs.

Manufacturing organisation that has realised the necessity of possession of abstract, conceptual, discretionary skills by workforce as a prerequisite to work with AMTs, will incorporate the appropriate aptitude test(s) to test the same, in the selection procedure. Workforce with appropriate skill base will be selected, as an anticipated outcome. However, as a consequence, there is a possibility that the selected workforce may expect opportunities to utilise its skills and abilities. The presence of these opportunities will act as primary reason for job satisfaction and acts as a motivating factor, for their lasting interest in the work. On other hand, in absence of the opportunities, there is every possibility that workforce may get dissatisfied. It is this dissatisfaction in the work, which may likely to influence their ability to capitalise the potentials of AMTs.

Hence the selection procedure adopted by organisations to select the work force for AMTs, will have a moderating effect on the relationship between job characteristics and role dimensions and their expected outcomes job satisfaction and role efficacy.

Growth Needs

Hackman and Oldham (1980) have defined growth Need Strength as phenomenon that effect the individual aspiration to learn, develop and grow in a job. According to this understanding individuals who have high growth need strength will respond eagerly and positively to the opportunities provided by enriched work. Individuals with low growth need strength, may not recognise the existence of such opportunities or may not even value them. This phenomenon appears to be very much useful in understanding another major factor that may affect the influence job characteristics and role dimensions on job satisfaction and role efficacy, regarding AMT workforce.

Accordingly, it can be assumed that the supervisors and workers who have high growth need strength will consider that their association with AMTs as an opportunity to learn, develop and grow. Supervisors and operators with low growth need strength may not react to the above situation in the similar lines. Further, it may result in work force inability to exploit the unlimited potentials of AMTs. Hence it can be concluded that the organisational authorities have to consider the presence of growth need strength in the work force as basic criteria, prior to selection of an operator or a supervisor for AMT. In absence of this understanding, one important factor that may have an indirect influence on the psychological satisfaction level of workforce associated with AMTs will be hidden forever, without being observed.

The proposed conceptual framework will be useful for authorities of manufacturing organisations in India, to understand the implications of AMTs on motivational aspects of shopfloor personnel. However, respective manufacturing organisational authorities are required to understand the relevance of the proposed conceptual frame work to the conditions prevailing in their own organisational environment. This is possible by carrying out a research study comprises of two phases. In the initial phase, authorities can administer psychological instruments such as Job Diagnostic Survey (Hackman and Oldham, 1980) and Role efficacy scale (Udai Pareek, 1980) to measure the impact of AMT on job satisfaction and role efficacy aspects of operators and supervisors respectively. Further, the collected data should be analysed to understand the existence of the relationship, in the proposed model. In the second phase of the research study, HRD authorities can conduct interviews with the personnel who are directly and indirectly related with the implementation of AMT. This is to understand the presence and effect of any ex-

The proposed conceptual framework will be useful for authorities of manufacturing organisations in India, to understand the implications of AMTs on motivational aspects of shopfloor personnel.

traneous variable in the proposed model. The information gathered could be supported with information collected from the archives, minutes of the meetings, purchase documents etc.

The outcomes of the research study will be helpful for organisations to understand the

- Characteristics of job that influence the job satisfaction aspect of AMT operator.
- Dimensions of the role that influences the role efficacy aspect of supervisor associated with AMT.
- Relevance and capability of existing HRD mechanisms in addressing the job satisfaction and role efficacy aspects of the operator and supervisor.

Conclusions

The progress of an Indian manufacturing organisation in the coming years will depend mainly on its ability to meet the expectations of the customer. The expectations are in terms of its ability to manufacture products with improved quality, adhering to the committed delivery schedules and offering a wide range of products against the customer requirements. The realisation of these expectations in turn will influence Indian manufacturing organisation to depend on the AMTs. This is due to the fact that AMTs are capable of providing ability for manufacturing organisations to meet the customer expectations. Acquisition of AMTs will influence manufacturing organisations to recruit and select the workforce with better educational background and high skill base. This is due to the fact that the workforce should possess of higher level skills such as perceptual, discretionary, conceptual and human relation oriented skills, in addition to motor skills, to be familiar and comfortable with AMTs. Further manufacturing organisations should realise the fact that the expectations of the AMT workforce differ in many ways from the existing workforce associated with the conventional manufacturing technologies. The expectations of AMT workforce will be in terms of recognition, career growth, and meaningful and challenging tasks. Organisational authorities are required to understand the fact that the fulfilment of the expectations of AMT workforce will have a strong influence on workforce's ability to exploit the full potentials of AMT. Hence it will result in a necessity for authorities of manufacturing organisations, to fulfil with the expectations of workforce on priority basis. Since the nature of the expectations of AMT workforce indicates their aspiration to grow and develop, organisational authorities are required to address the expectations of AMT workforce from HRD perspective. Organisational authorities however should also consider the fact that the influence of AMT will be more on jobs and roles of operators and supervisors respectively, in comparison with jobs of other shopfloor personnel. It is also essential for organisational authorities to recognise the fact that AMT operators and supervisors will anticipate job satisfaction and role efficacy in their respective jobs and roles. It appears HRD mechanism(s) that have adopted by the organisation authorities to design the jobs of operators and roles of supervisors respectively, will play a significant role in this regard. Hence, organisational authorities are required to understand the relevance of present HRD mechanism(s) if any, regarding their ability to meet the expectations of AMT operators and supervisors. This has to be done prior to adoption of a HRD approach. Organisational authorities can administer questionnaires such as JDS and role efficacy scale to comprehend the influence of AMT on the job satisfaction and role efficacy aspects of operators and supervisors. It should be followed by personal interviews with respondents of questionnaires to have a better insight in to the problem. Based on the findings, organisations can implement befitting job design and conduct role analysis exercises, which will address the job satisfaction and role efficacy aspects of AMT operators and supervisors. However, organisational authorities are also required to understand the presence and influence of any other factor, on the ability of job characteristics and role dimensions in fulfilling the job satisfaction and role efficacy aspects of operators and supervisors respectively. Regarding the influence of an extraneous factor, it appears that the selection procedure adopted by manufacturing organisations to select AMT workforce and growth need strength of AMT workforce will have a moderating effect in this regard.

Acquisition of AMTs will influence manufacturing organisations to recruit and select the workforce with better educational background and high skill base

Managerial Implications

Top management should comprehend the reality that the AMT workforce will perceive the job as an opportunity to grow and develop, rather than as an avenue

to fulfil day to day requirements. It is necessary for top management to assimilate the fact that the fulfilment of expectations of the workforce is an essential prerequisite to harness the full potentials of AMT. As an initial step in this direction, managerial authorities are required to incorporate appropriate changes in the existing jobs of workforce that are capable of addressing the expectations of workforce. While incorporating the changes, organisational authorities should involve concerned members of the AMT workforce and members of the organisation who are indirectly effected by the changes. It is also necessary for them to consider the fact that the changes should aim at fulfilment of intrinsic motivational aspects of the workforce, in addition to extrinsic motivational aspects. Managerial authorities also should consider impact of AMT on the supervisors, who are associated with AMTs on a priority basis, since the supervisors will play an important role during the implementation.

Manufacturing or production line managers, who are associated with AMTs, should regard the knowledge base of operators, considering their better educational background and high skill base. They can involve the AMT operators in designing the operator job design. They can adopt either specialist or operator control (Wall, T.D. *et al.* 1990), for designing the job of the operators, considering knowledge level of AMT operator. They also should consider the role erosion aspect of the supervisor at the advent of AMTs and should allocate higher responsibilities by redesigning the role of supervisors associated with AMTs.

Researchers in understanding the impact of AMTs on human resources in manufacturing organisations need to further investigate whether

- there is any commonality exist between job characteristics of the operator's job and the role dimensions of the supervisor, as far as the influence of various types of AMTs is concerned.
- specific climate features necessary for introduction and successful exploitation of AMT.

Further, the influence of AMTs on the motivational aspects of maintenance personnel who are equally responsible for the successful implementation of AMTs also merits as detailed investigation. Hopefully research in these lines will enhance the successful utilisation of AMTs and contribute towards the effectiveness of organisation.

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Feature

Reliability Analysis of Power Generation System: A Case Study

Vijayamohanan Pillai N.

The vital nature of electric power, both to our economic and personal well being, places higher reliability standards on the performance of electricity supply. The maximum likelihood estimates of availability and forced outage rates (FOR) and the loss of load probability (LOLP) measures are calculated in this study for the 10 hydro-power plants in Keralam. Though hydro-power plants are less prone to forced outage, the Kerala system stands an exception to this.

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The electric utility is unique in that its product is one that must be generated at the instant its service is to be used. As in the case of any other goods and services, a shortage of electric power is experienced whenever the demand exceeds the supply. One of the major factors that lead to shortages is the random deviations of the demand from its expected level. Capacity of a power system is in general determined after taking due considerations of such unforeseen fluctuations in demand. This is effected by means of reserve or standby capacity over and above the expected peak period demand that is to be met.

Capacity of a power system is in general determined after taking due considerations of unforeseen fluctuations in demand.

Shortages may still occur, even if the load is not wide of its expectation. These are due to generator deratings, scheduled preventive maintenance and forced outages of generators. Generator deratings result from equipment problems and changes in operating conditions, and are a function of the age of the equipment. Outage refers to a certain state of a unit when it becomes unavailable to perform its intended function due to some event directly associated with it. An outage may be either a scheduled one or a forced one. Scheduled outage (or maintenance outage is a planned event, whereby a component/unit is deliberately taken out of service at a chosen time for preventive maintenance or overhaul or repair; this is to keep the generating units in proper running condition. Forced outage, on the other hand, results when a unit falls out of service due entirely to random events such as breakdown, malfunction of equipment, etc.

Reliability Analysis

In its broad sense this refers to the probability that a component or system comprising components is able to perform its intended function satisfactorily during a specified period of time under normal operating conditions. A more modern and appropriate but at the same time simple representation of the life history of a repairable electric power system component during its useful life period is by a two-state model, the two possible states being labeled 'up' or 'functioning' and 'down' or 'unavailable'. Thus when the component fails, it is said to undergo a transition from the up to the down state, and conversely, when repairs are over, it is said to return from the down to the up state. This idea then facilitates to interpret the concept the concept of reliability in terms of the fraction of total time to component remains in the up state.

Availability and Outage Measures

Suppose the performance of a power plant is continuously monitored to record the sequence of failures and repairs during sustained operation in order to assess its performance. During each failure-repair cycle, the time to failure (when the plant is in up state) and the time to repair (when the plant is in down state) are recorded. The number of failures per unit of time is known as the failure (or hazard) rate, and the number of repairs per unit of time, the repair rate. The reliability of a power plant is often measured in terms of two availability indices, viz., instantaneous availability, A(t), and steady-state (long-run) availability, $A(\infty)$. The former refers to the probability that the power plant is operating successfully at any time t and the latter to the probability of its successful operation for large values of t, that is, in long run. Thus,

$$A(t) = \text{Prob (successful performance at time t), and}$$

$$A(\infty) = \lim_{t \to \infty} A(t)$$

The first step in an availability study is to specify certain probability models for the two variables, time-to-failure, denoted by X and time-to-repair, denoted by Y. The second step is the derivation of the availability indices which in general are the functions of the parameters of the statistical models specified for X and Y.

Usually the failure and repair rates are assumed to be constant; this leads to the assumption that the time-to-failure and the time-to-repair variables follow exponential distribution. The exponential distribution is one of the two (the other being the geometric distribution) unique distributions with the memoryless or no-ageing property. That is, future life-time of a component remains the same irrespective of its previous use, if its life- time distribution is exponential.

Thus we assume that the time-to-failure, X, is an exponential variable with parameter λ, so that its density function, viz., failure (hazard) density function, f(x), is given by $f(x) = \frac{1}{\lambda} \exp\left(\frac{-x}{\lambda}\right)$ for $x > 0$. The parameter $1/\lambda$ is the constant failure (hazard) rate. For an exponential distribution of the above form, the mean is given by λ. Hence the mean-time-to-failure (MTTF) of the power plant is equal to λ; this is also known as the expected survival time. The probability of a plant surviving a time t in a constant failure rate environment, i.e., its survival function, denoted by R(t), is then obtained by integrating the failure density function, f(x), and is given by R(t) = exp(–x/lambda).

Similarly we assume an exponential model with parameter mu for the time-to-repair variable Y, so that the density function of Y, viz., the repair density function, g(y), is $g(y) = \frac{1}{\mu} \exp\left(\frac{-y}{\mu}\right)$, for $y > 0$, in this model, $1/\mu$ is the constant repair rate and its reciprocal, μ, is the mean down (repair) time (MDT) or the expected outage time. The sum of MTTF and MDT is termed the mean- time-between-failures (MTBF) or cycle time.

Shooman (1968, Chapter 6) and Gnedenko, Belyayev and Solovyev (1969, Chapter 2) have shown that for the above exponential models, the instantaneous availability of a power plant is

$$A(t) = \frac{\lambda}{(\lambda + \mu)} + \frac{\mu}{(\lambda + \mu)} \exp\left\{-\left(\frac{1}{\lambda} + \frac{1}{\mu}\right)t\right\}$$

The steady-state availability is obtained by taking the limit of A(t) as t approaches infinity. This gives

$$A(\infty) = \frac{\lambda}{(\lambda + \mu)} = \frac{MTTF}{MTBF}$$

Corresponding to these availability measures we can also define two down-state probabilities, instantaneous forced outage, denoted by F(t) and steady-state forced outage, denoted by $F(\infty)$ (Pillai, 1992, Chapter 4). Thus the instantaneous forced outage of a plant is

$$F(t) = 1 - A(t) = \frac{\mu}{(\lambda + \mu)} + \frac{\mu}{(\lambda + \mu)} \exp\left\{-\left(\frac{1}{\lambda} + \frac{1}{\mu}\right)t\right\}$$

and the long-run (steady-state) forced outage is

$$F(\infty) = \mu/(\lambda + \mu) = MDT/MTBF.$$

In practice, however, the parameters λ and μ of the exponential models assumed for the time-to-failure (X) and time-to-repair (Y) are usually unknown. Thus the availability and outage indices are also unknown for most practical problems. Hence we need to estimate these measures from a sample of values on X and Y. Note that both A(t) and A(∞), as well as F(t) and F(∞), are functions of λ and μ, the parameters of the exponential models assumed for X and Y. We can, therefore, obtain the maximum likelihood estimates of these measures by substituting the maximum likelihood estimators (MLE) of λ and μ in the above results.

To calculate the maximum likelihood estimators (MLE) of λ and μ, we observe the power plant unit through n failure-repair cycles, and collect the data on n time-to-failure ($x_1, x_2, \ldots, x_n$) and n time-to-repair ($y_1, y_2, \ldots, y_n$). Actually the data sets are two independent exponential samples.

The maximum likelihood procedure as developed in Kendall and Stuart (1967, Chapter 18) gives the following estimators:

the MLE of λ is $\lambda = \Sigma x_i/n$

the MLE of μ is $\mu = \Sigma y_i/n$

Thus the maximum likelihood estimators of availability and outage are obtained by substituting λ and μ into the above results.

The steady-state (long-run) forced outage is generally known as forced outage rate (FOR), computed as a ratio of the unit's down-time to the total service (on-line) plus down-time.

FOR = forced outage hours/(forced outage hours + service hours).

Note that these measures do not take into account the maintenance requirements.

Loss of Load Probability (LOLP)

The unreliability of a system in this context is viewed as its inability to meet the daily peak load. This measure thus describes the expected accumulated amount of time in a given period, usually a year. Lûss of Load Probability (LOLP) is usually expressed in terms of days per year, hours per day or as a percentage of time. In the last case, i.e., when expressed as a fraction of time, the LOLP can be taken as the probability that there will be a shortage of power (loss of load) of any magnitude in the given period. Hence the name loss of load probability. When expressed as the expected accumulated amount of time during which a shortage of power is expected accumulated amount of time during which a shortage of power is experienced, the measure is more correctly referred to as the loss of load expectation (LOLE). The LOLP measure was first introduced by Calabrese (1947).

The unreliability of a system in this context is viewed as its inability to meet the daily peak load. This measure thus describes the expected accumulated amount of time in a given period.

Given the outage or availability probabilities, the probability corresponding to each available capacity state can be calculated. Remember that the probability of the simultaneous occurrences of two or more independent events is the product of the respective event probabilities. The available capacity states takes on 2^N values, equal to the number of combinations of up and down units (due to forced outages) in an N-unit system.

By combining the availability of each capacity state with the system load duration curve (LDC) we obtain the expected risk of loss of load. A load duration curve is defined as a function whose abscissa specifies the width of the time interval, usually the number of hours in a year, during which customer's demand for power (D) equals or exceeds the associated level of load (L) given on the ordinate. Thus it shown the time duration for which a capacity outage would cause A loss of load ($D \geq L$). By normalizing the time variable as a proportion of the total, the value at any point on the abscissa can be taken as the (cumulative) probability that the corresponding load will be equaled or exceeded ($D \geq L$). Because of its monotonicity and continuity, the function can be inverted to obtain the proportion of this time interval. This inverse function can in turn be interpreted as the complementary cumulative density function (i.e., the distribution function) of the customer's demand.

Suppose the customer's daily maximum demand on a power system over one year can be represented by a normal distribution with mean and standard deviation. Then the proportion of time during which a capacity outage would cause a loss of load (i.e., $D \geq L$) is given by

$$\text{Prob}\,(D \geq L) = 1 - \text{Prob}\,(D < L) = 1 - \phi\,(z)$$

where $z = (L - \eta)/\sigma$, and $\phi(z)$, and (z) is the area under the standard normal curve given by

$$\phi(z) = (\sqrt{2\pi})^{-1} \int_{-\infty}^{z} \exp(-x^2/2)\, dx$$

which can be read off a standard statistical table. L here denotes the available capacity in a certain capacity state; thus we obtain the proportion of time during which a forced outage results in a loss of load ($D \geq L$) in each of the possible capacity states. The relative contribution of this outage to the overall system loss of load is then obtained by multiplying the availability of a certain capacity state by the corresponding proportion of time that available capacity level is equaled or exceeded. The total LOLP is the sum of all contributions due to the different capacity outages. Multiplying the LOLP by 365 then gives the expected cumulative number of days in a year when loss of load is experienced due to forced outage.

Hydro-Power System

Till quite recently, Kerala had a pure hydro-electric power system. Even after the commissioning of the thermal power stations in the near future, Kerala would still have a predominantly hydro-power system. All the 10 old and major power stations are considered in this study. These power stations in the descending order of age with their important characteristics are given in Table 1.

The total installed capacity of the Kerala power system as provided by these 10 power stations (as in 1993) is 1476.5 megawatt (mw) against an estimated demand of 1710 mw (as per the 14th Power Survey). For the last two decades Kerala has been suffering from severe capacity shortage in the power sector. Even by 1984-85, the State had an installed capacity of only 1011.5 mw against an estimated demand of 1122 mw. During the two decades from 1976, Kerala's installed capacity in the power sector was growing at an exponential rate of only 3 per cent per annum against 6 per cent of the maximum demand, which in effect was restricted in many ways by power shortage.

Availability and Forced Outage Rates

The relevant data for a period of 19 years from 1978-79 were collected from the Kerala State Electricity Board (KSEB); in the case of Idukki II stage (3 units) and Idamalayar, commissioned during 1985-87 period, the data are from this period onwards.

Table 1: Kerala Hydro-Power System: Characteristics of the 10 Hydro-Power Plants

Power Station		Unit Capacity (No.×mw)	Installed Capacity (mw)	Average Designed Generation Potential (mu)	Storage Capacity (mu)
	(1)	(2)	(3)	(4)	(5)
1.	Pallivasal	3×5+ 3×7.5	37.5	284.7 (86.7)	79.54 (27.9)
2.	Sengulam	412	48	182.2 (43.3)	49.61 (27.2)
3.	Neriamangalam	315	45	237.4 (60.2)	67.58 (28.5)
4.	Panniar	215	30	157.7 (60.0)	45.47 (28.8)
5.	Poringalkuthu	48	32	171.7 (61.3)	63.43 (36.9)
6.	Sholayar	318	54	233.0 (49.3)	99.47 (42.7)
7.	Sabarigiri	650	300	1337.7 (50.9)	770.32 (57.6)
8.	Kuttiadi	325	75	268.1 (40.8)	41.46 (15.5)
9.	Idukki	6130	780	2397.6 (35.1)	2147.88 (89.6)
10.	Idamalayar	237.5	75	380.2 (57.9)	254.45 (66.9)
			Total	5650.3 (43.7)	3619.21 (64.1)

Note: Figures in brackets in column (4) are percentage of average generation potential in installed capacity, and in column (5), percentage of storage capacity in average generation potential.

The estimated annual mean-time-to-failure (service time) and the mean-down-time (forced outage time), both measured in months, of each of the units of the 10 hydro power generating stations are given in Table 2, along with the derived availability and forced outage rates. For example, the maximum likelihood estimates of MTTF and MDT of Pallivasal unit I are 10.771 and 0.633 months respectively and hence the maximum likelihood estimates of $A(\infty)$, $F(\infty)$ and $A(t)$ are

$$\hat{A}(\infty) = \frac{10.771}{10.771 + 0.633} = 0.945,$$

$$F(\infty) = 1 - \hat{A}(\infty) = 0.055, \text{ and}$$

$$\hat{A}(t) = 0.945 + 0.055 \exp\left\{-\left(\frac{1}{10.771} + \frac{1}{0.633}\right)t\right\},$$

respectively.

The long run availability is the highest, coming very close to unity, for (all the units of) Kuttiadi power

Table 2: Unit-Wise Estimates of Availability and Forced Outage

Plant and Units	Annual Mean-time-to-failure (months)	Annual Mean-down-time (months)	Steady-state Availability	Steady-state Forced Outage	Instantaneous Availability
Pallivasal					
I	10.771	0.633	0.945	0.055	0.945 + 0.055 exp (–1.674t)
II	10.885	0.369	0.967	0.033	0.967 + 0.033 exp (–2.802t)
III	9.949	1.273	0.887	0.114	0.887 + 0.114 exp (–0.886t)
IV	9.907	1.183	0.893	0.107	0.893 + 0.107 exp (–0.946t)
V	10.711	0.711	0.938	0.062	0.938 + 0.062 exp (–1.5t)
VI	10.858	0.512	0.955	0.045	0.955 + 0.045 exp (–2.044t)
Sengulam					
I	9.201	0.829	0.917	0.083	0.917 + 0.083 exp (–1.315t)
II	9.12	0.132	0.986	0.014	0.986 + 0.014 exp (–7.664t)
III	8.329	0.67	0.926	0.075	0.926 + 0.075 exp (–1.612t)
IV	5.32	3.477	0.605	0.395	0.605 + 0.395 exp (–0.476t)
Neriamangalam					
I	10.098	0.185	0.982	0.018	0.982 + 0.018 exp (–5.501t)
II	8.96	0.247	0.973	0.027	0.973 + 0.027 exp (–4.166t)
III	9.725	0.463	0.955	0.045	0.955 + 0.045 exp (–2.263t)
Panniar					
I	4.999	2.563	0.661	0.339	0.661 + 0.339 exp (–0.59t)
II	6.166	1.244	0.832	0.168	0.832 + 0.168 exp (–0.966t)
Porinegal Kuthu					
I	9.258	0.932	0.909	0.091	0.909 + 0.091 exp (–1.181t)
II	9.828	0.345	0.966	0.034	0.966 + 0.034 exp (–3.004t)
III	9.916	1.237	0.977	0.023	0.977 + 0.023 exp (–4.315t)
IV	9.955	0.205	0.98	0.02	0.98 + 0.02 exp (4.987t)
Sholayar					
I	5.14	3.549	0.592	0.408	0.592 + 0.408 exp (–0.476t)
II	6.319	2.129	0.748	0.252	0.748 + 0.252 exp (–0.628t)
III	7.045	1.308	0.843	0.157	0.843 + 0.157 exp (–0.907t
Sabarigiri					
I	10.561	0.129	0.988	0.012	0.988 + 0.012 exp (–7.867t)
II	9.9	0.628	0.94	0.06	0.94 + 0.06 exp (–1.694t)
III	8.952	0.568	0.94	0.06	0.94 + 0.06 exp (–1.872t)
IV	8.983	0.688	0.929	0.071	0.929 + 0.071 exp (–1.564t)
V	8.821	0.806	0.916	0.084	0.916 + 0.084 exp (–1.354t)
VI	8.723	1.377	0.864	0.136	0.864 + 0.136 exp (–0.841t)
Kuttiadi					
I	7.064	0.018	0.998	0.002	0.998 + 0.002 exp (–55.52t)
II	7.012	0.014	0.998	0.002	0.998 + 0.002 exp (–72.9t)
III	7.034	0.0097	0.999	0.001	0.999 + 0.001 exp (–103.5t)
Idukki					
I	9.495	0.211	0.978	0.022	0.978 + 0.022 exp (–4.844t)
II	9.375	0.808	0.921	0.079	0.921 + 0.079 exp (–1.344t)
III	9.662	0.444	0.956	0.044	0.956 + 0.044 exp (–2.354t)
IV	7.698	0.157	0.98	0.02	0.98 + 0.02 exp (–6.505t)
V	6.007	0.383	0.94	0.06	0.94 + 0.06 exp (–2.781t)
VI	6.793	0.219	0.969	0.031	0.969 + 0.031 exp (–4.706t)
Idamalayar					
I	9.53	0.428	0.957	0.043	0.957 + 0.043 exp (–2.444t)
II	9.022	0.547	0.943	0.057	0.943 + 0.057 exp (–1.94t)

plant. Neriamangalam, Poringalkuthu, Idukki and Idamalayar plants also have higher availability for all their units. All but two (units III and IV) of the 6 units of Pallivasal and 5 units (except unit IV) of Sabarigiri also have higher availability; Sengulam also follows suit with only one unit (IV) having higher FOR. The remaining two plants, Panniar and Sholayar, bear the whole brunt of higher FOR. Sholayar unit I has the highest FOR of 0.41 (Sengulam unit IV also comes very close to it with a FOR of 0.40); Parriar unit I follows with only 66 per cent of availability.

It is worth finding that an average outage of more than 1 month in I year occurred in the case of 9 out of the total 39 plant units; Sholayar unit I and Sengulam unit IV share the fate of having the maximum mean outage of a cumulative period of about 3 ½ months; the credit of having the minimum mean outage of less than 1 day in 1 year goes to the 3 units of Kuttiadi, with 7-13 hours a year only. One unit of Sabarigiri and four units of Pallivasal take up the maximum mean service period of nearly 11 months, and the minimum of around 5 months come out with one unit each of Sengulam, Panniar and Sholayar.

In the case of Kuttiadi, instantaneous availability readily collapses on the steady-state one, owing to the least MDT (or FOR). For all other plant units, the long run evolves through time limit. For Sabarigiri unit I and Sengulam unit II, it takes a cumulative period of nearly 3 months to reach the steady state; other units take much more time. In the case of Sengulam unit IV and Sholayar unit I, with very high FOR, the long-run is evolved across a cumulative period of more than 40 months.

Averaging all the data, we find that the whole system has an annual MTTF of 8.366 months per unit and an annual MDT of 0.92 months per unit. This gives the following availability and FOR:

steady-state availability, $\hat{A}(\infty) = 0.901$,

steady-state forced outage, $F(\infty) = 0.099$, and

instantaneous availability, $\hat{A}(t) = 0.901 + 0.099 \exp(-1.206t)$.

A cumulative time of about 15 months is required for translating the 'instant' into the long-run in this case. Also note that the representative (system) unit remains shut down for about 3 months time. A 10 per cent FOR in the face of capacity shortage imposes a heavy tax on the system. Assuming an annual average generation of 5500 million units (mu), with sufficient hydraulic power capacity, this level of FOR implies a potential energy shortage to the tune of $5500 \times 0.099/0.901 \approx 600$ mu a year. At an average revenue of Re. 1 per unit as at present, this represents a financial loss to the system of Rs. 600 million a year. Moreover, the potential energy (lost) of 600 mu is equivalent to about 115 mw installed capacity at 60 per cent load factor. A zero FOR in this case then implies that it could dispense with the investment requirement of adding about 115 mw capacity to the system, saving immensely in capital costs and working expenses. Note that this saving is in addition to the gain in sales revenue.

Capacity State Probabilities

The first step in the estimation of LOLP is to find out the available capacity state probabilities. Table 3 reports the distributed levels of available capacity with the corresponding probability of occurrence in accordance with the different combinations of up and down (due to forced outages) units of each of the 10 power stations. The estimation procedure of the availability in each capacity state is demonstrated in Table 4 for the case of Panniar plant with 2 units and hence $2^2 = 4$ capacity state combinations. Note that in the '1 up, 1 down' capacity state here, we have two combinations of up and down units, and hence the availability of this capacity state is the sum of the individual availabilities in the two combinations ($0.111 + 0.282 = 0.393$). The available capacity probabilities of all the states add up to unity.

Pallivasal, as shown in Table 3, has different levels of available capacity and availability in each of the possible capacity states due to different unit capacities—it has 3 units of 5 mw each and another 3 of 7.5 mw each. Thus is the '1- unit-down' capacity state, we will have two levels of available capacity, depending on the capacity of the unit that goes down; if a 5 mw unit fails, the available capacity will be 32.5 mw and in the other case, 30 mw. Also note that in two capacity states ('3 units up', and '2 units up'), the same level of available capacity (15 mw) is obtained; in the '3-units-up' state, it may so happen that all the 3 units of 5 mw each may be in operation (with the other 3 units of 7.5 mw each may be in service. All other plants have same-capacity units and hence each capacity state has a unique level of available capacity and probability.

As is already evident, Kuttiadi has the highest availability (almost nearing unity) of maximum capacity (when all units are up). Only 3 plants have an all-units-up availability of more than 90 per cent; interestingly, in the case of Sholayar, the availability of 2 units out of the 3 is greater than that of all the three. There is a higher (30 per cent) chance for one-unit outage for Sabarigiri as compared with other plants in its peer-group.

Table 3: Availability and Non-Supply Duration in Different Capacity States

Power Station	Capacity State	Available Capacity (mw)	Availability	Proportion of Non-supply Duration (z)
Pallivasal	All Units up	37.5	0.6478	0.0039
	5 Up, 1 Down	32.5	0.143	0.0409
		30	0.1509	0.1003
	4 Up, 2 Down	27.5	8.978E-3	0.2061
		25	0.0333	0.3594
		22.5	0.011	0.5398
	3 Up, 3 Down	20	2.0918E-3	0.7123
		17.5	2.387E-3	0.8461
		15	2.424E-4	0.9306
	2 Up, 4 Down	15	3.851E-5	
		12.5	1.499E-4	0.9738
		10	5.35E-5	0.9918
	1 Up, 4 Down	7.5	2.76E-6	0.9979
		5	3.359E-6	0.9995
	All Units Down	0	6.184E-8	1
Sengulam	All Units Up	48	0.5061	0.0069
	3 Up, 1 Down	36	0.4244	0.2514
	2 Up, 2 Down	24	0.0662	0.8686
	1 Up, 3 Down	12	3.752E-4	0.9982
	All Units Down	0	3.482E-6	1
Neriaman galam	All Units Up	45	0.9123	0.2266
	2 Up, 1 Down	30	0.0852	0.8389
	1 Up, 2 Down	15	2.451E-3	0.9968
	All Units Down	0	2.19E-5	1
Panniar	All Units Up	30	0.5501	0.2389
	1 Up, 1 Down	15	0.393	0.9207
	All Units Down	0	0.0569	0.9998
Poringal kuthu	3 Up, 1 Down	24	0.1514	0.67
	2 Up, 2 Down	16	8.454E-3	0.9608
	1 Up, 3 Down	8	1.881E-4	0.999
	All Units Down	0	1.459E-6	1
Sholayar	All Units Up	54	0.3732	0.0008
	2 Up, 1 Down	36	0.4527	0.2877
	1 Up, 2 Down	18	0.158	0.9793
	All Units Down	0	0.0161	1
Sabarigiri	All Units Up	300	0.6422	0.1446
	5 Up, 1 Down	250	0.2985	0.5636
	4 Up, 2 Down	200	0.0542	0.9115
	3 Up, 3 Down	150	4.895E-3	0.9948
	2 Up, 4 Down	100	2.286E-4	0.9999
	1 Up, 5 Down	50	5.001E-6	1
	All Units Down	0	3.468E-8	1
Kuttiadi	All Units Up	75	0.9941	0.242
	2 Up,1 Down	50	5.877E-3	0.6026
	1 Up,2 Down	25	1.128E-5	0.8888
	All Units Down	0	7E-9	0.9854
Idukki	All Units Up	780	0.7685	0.0017
	5 Up, 1 Down	650	0.2081	0.1922
	4 Up, 2 Down	520	0.0222	0.883
	3 Up, 3 Down	390	1.254E-3	0.9994
	2 Up, 4 Down	260	3.415E-5	1
	1 Up, 5 Down	130	4.942E-7	1
	All Units down	0	2.839E-9	1
Idamalayar	All Units Up	75	0.9024	0.0655
	1 Up,1 Down	37.5	0.0951	0.9032
	All Units Down	0	2.45E-3	1

Note: E-n - 10^{-n}, For example, 8.978E-3 = 8.978×10^{-3}

Table 4: Estimating the Available Capacity Probabilities of Panniar Power Station

Capacity State	Unit I 15 mw	Unit II 15 mw	Available capacity (mw)	Availability
All Units Up	Up	Up	30	0.6611 × 0.8321 = 0.5501
1 Up, 1 Down	Up	Down		0.6611 × 0.1679 = 0.111 +
	Down	Up		0.8321 × 0.3389 = 0.282
			15	= 0.393
All Units Down	Down	Down	0	0.3389 × 0.1679 = 0.0569

Except two minor plants (Panniar and Sholayar, accounting for only 6 per cent of the total installed capacity, 7 per cent of the total average generation potential and 4 per cent of the total storage capacity), all other power stations in general have an expected available capacity that is more than 90 per cent of the installed capacity (reported in the last column of Table 5 and column (4) of Table 6). For the system as a whole, 90 per cent of the capacity is expected to be available, with a system FOR of about 10 per cent.

LOLP

The second step in the estimation of LOLP is to

bring in the load duration curve (LDC) and derive from it the complementary distribution function of customers' demand. This we accomplish by assuming that the customers' daily maximum demand on the Kerala power system follows a normal distribution. Thus data on the daily maximum demand on each of the 10 power stations in 1995-96 were collected (from the KSEB) and the respective mean and standard deviation were estimated (Table 5). The maximum demand on Kuttiadi power house is the most variable (due to seasonal operation necessitated by insufficient storage) and that on Idukki, the least.

Table 5: Daily Maximum Demand and LOLP of the 10 Power Stations

Power Station	Daily Maximum Demand (mw)		LOLP	LOLP (days/ year)	Expected Available Capacity (mw)
	Mean	Standard Deviation			
Pallivasal	23.041	5.43	0.04195	15.31	34.89 (93.03)
Sengulam	31.513	6.711	0.1681	61.35	41.17 (85.76)
Neriamangalam	38,518	8.604	0.2807	102.46	43.65 (96.99)
Panniar	24.955	7.073	0.5501	200.8	22.4 (74.67)
Poringalkunthu	26.658	6.059	0.2689	98.14	30.65 (95.87)
Sholayar	32.129	6.942	0.3014	110.01	39.29 (72.77)
Sabarigiri	256.019	41.411	0.3156	115.18	278.88 (92.96)
Kuttiadi	56.769	26.026	0.2441	89.09	74.85 (99.8)
Idukki	595.377	63.126	0.0622	22.69	685.24 (87.85)
Idamalayar	54.845	13.38	0.1475	53.83	71.25 (95)
System (Average)	1139.82		0.23804	86.89	1322.27 (89.55)

Note: Figures in brackets in the last column are percentage of expected available capacity to installed capacity.

The estimation procedure of LOLP is illustrated for the case of Panniar (in Table 6) with a mean daily maximum demand of 24.96 mw and a standard deviation of 7.07 mw. Using these parameters, the available capacity in each possible state is transformed into its corresponding standard normal variate, z, and the associated area under the normal curve, $\phi(z)$, is found from a standard statistical table. This area or probability represents the (cumulative) proportion of the non-supply duration, i.e., the proportion of time during which the load equals or exceeds the available capacity, determined by forced outages in a certain capacity state. Thus in the case of Panniar, about 24 per cent of the time the maximum demand is likely to equal or exceed the available capacity of 30 mw when all the units are in operation; or, is other words, in the 'all-units-up' capacity state of Panniar, about 24 per cent of the time a forced outage is likely to result in a loss of load. It increases to 92 per cent in case any one unit falls down.

Table 6: Estimating the LOLP of Panniar Power Station

Capacity State	Available Capacity L_i (mw)	Availability	Expected Available Capacity (mw)	z_i	Non-supply Duration	Relative Contribution to LOLP
(1)	(2)	(3)	(4) = (2) × (3)	(5)	(6)	(7) = (3) × (6)
All Units Up	30	0.5501	16.5	0.713	0.2389	0.1314
1 Up, 1 Down	15	0.393	5.9	−1.41	0.9207	0.3618
All Units Down	0	0.0569	0	−3.53	0.9998	0.0569
		Total = 22.4 (74.67)			LOLP = 0.5501	

Note: $z_i = (L_i - 24.955)/7.073$

The expected loss of load in each capacity state is calculated by multiplying the non-supply duration by the respective availability in that state. Summing this over all the capacity states yields the measure of LOLP of 0.55 for Panniar, which means that on the whole about 55 per cent of the time a loss of load is expected due to forced outages in the case of Panniar. Assuming 365 days in a year, the expected loss of load is 365 × 0.55 = 201 days in one year, the expected accumulated amount of time during which demand equals or exceeds the available capacity causing a loss of load due to forced outages.

The proportion of time intervals during which loss of load is caused by different capacity outages in the case of all the 10 power plants are given in the last column of Table 3. This non-supply duration, when all the units are in operation, is negligible for only 5 plants—Pallivasal, Sengulam, Sholayar, Idukki and Idamalayar. About 24 per cent of the time a loss of load is experienced in the case of Panniar and Kuttiadi even when all the units are in operating condition. For Neriamangalam it is 15 per cent. Obviously, the factors determining the extent of the non-supply duration are the capacity-demand gap and the variability (standard deviation) of the demand distribution. The smaller the capacity-demand gap, the larger will be the non-supply duration. A surplus capacity coupled with low demand variability or a deficit capacity with high demand variability results in a short non-supply duration. For Kuttiadi the major influencing factor is obviously the higher demand variability,

whereas in the case of Neriamangalam, Poringalkuthu and Sabarigiri, the smaller capacity-demand gap appears to be the main culprit for larger non-supply duration. Both the factors seem to act on Panniar.

If one unit is thrown out of service, demand is likely to exceed for more than 50 per cent of the time in the case of as many as 6 plants and for more than 80 per cent of the time in the case of 3 plants—Neriamangalam, Panniar and Idamalayar. If the available capacity is only one-half of the installed capacity, then demand tends to exceed it for more than 80-90 per cent of the time is general.

The estimates of LOLP, both as a proportion of time and in terms of number of days a year, for all the 10 plants are given in Table 5. Panniar has the maximum LOLP of 201 days in 1 year, followed a little far by Sabarigiri (115 days), Sholayar (110 days) and Neriamangalam (102 days). Evidently, the major determinants of this measure are the distribution of availability and non-supply duration in the capacity states. Thus, for example, in the case of Panniar, larger non-supply durations, coupled with the associated, not so small, availability of the respective capacity states contributed to its higher LOLP (Table 6); that is, the relative contribution to LOLP of larger non- supply duration of lower capacity states is significantly high in this case. On the other hand, for Kuttiadi, the relative contribution to LOLP of larger non-supply durations are negligibly smaller. The minimum LOLP is enjoyed by Pallivasal (15 days in 1 year) and Idukki (23 days in 1 year). A simple average of the LOLPs of all the 10 plants gives the system LOLP of 0.238 or 86.9 days in 1 year with a coefficient of variation of 58.3 per cent.

The vital nature of electric power, both to our economic and personal well being, has prompted the developed countries to place higher reliability standards on the performance of electricity supply. For example, most of the U.S. electric power utilities are designed on the technical assumption that the total accumulated time of supply interruptions (forced outages) should be no more than 1 day in 10 years. This evidently appears to be a very strict design criterion even for developed countries. Some studies (for example, Telson (1975)) have in fact shown this 1-day-in-10-years reliability target as economically unjustified, and that it could reasonably be reduced without adversely affecting the economy. Though the reliability performance of an under-developed electricity supply system such as Kerala's is by no means comparable with that of the developed countries, the estimates of LOLP reported here seem on all counts to be stupendously higher. That the expected cumulative outage time of the power generating system in Kerala amounts to 87 days in 1 year is a shocking revelation of the kind of service rendered. Moreover, a loss of load of 115 days in 1 year that one of the only two major power plants (that is, Sabarigiri) suffers from serves as a telltale mock-reliability design criterion.

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Feature

Industrialization and the State: Role of Industrial Ecology

Bhaskar Majumder

It is realized that industrialization is essential if an economy is to develop. But the transformation of natural resources for industrialization is accompanied by serious environmental degradation. When this transformation of nature by man, instead of showing a symbiotic relationship between man and nature, shows a man-centric effort to conquer nature and ultimately overpower it, the economy that is aimed to be built by man to protect himself and prosper, is itself stressed. This gives the background of one's understanding on industrial ecology. If mankind is to live over generations, the eco-system which feeds them has to be sustained and there comes the question of controlling man's exercise of power over nature. In the present paper rural resource-cum-need-based technology is stressed because, first, technology converts community-cum-based isolation of cross-sections of society into a production-based interdependence, and second, technology shows how the resources can be organized and used in production.

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A consensus has already been revealed by the economic policy-makers at the national level, that there is no escape from industrialization if an economy is to develop (Singh, 1979, p. 586). An economy may be understood as a structure of production and consumption of utilities. This production is nothing but a techno-social transformation of nature. Natural resources by themselves do not have exchange-value, unless they come in the domain of trade: in other words, unless some of these resources become tradable like getting the shape of bottled potable water meant for sale in the market. Even when they are not tradable, these resources have two values, one use-value, the other 'option-value' (Dasgupta and Maler, 1997, p. 15). "Irreversibility" in the use of natural resources shows the extension of human choice in using these resources at a future date; even if man exercises his choice now in using and transforming resources, he has to ensure regeneration of these resources for his future use and use by his future generations.

Natural resources by themselves do not have exchange-value, unless they come in the domain of trade: in other words, unless some of these resources become tradable like getting the shape of bottled potable water meant for sale in the market.

It is often argued: that this conversion of natural resources is accompanied by serious environmental degradation (The World Resources Institute, *et al*, 1998, p. 51). It is a fact that the economy is a 'guest', self-invited to extract and consume resources from nature. In other words, the 'guest' grows at the cost of the 'host', viz, the Earth's ecosystem; the growth of the economy is conventionally understood as (i) a dynamic shift from

agriculture to industry, which is a structural question, (ii) the rate of growth of industrial output which is a growth question. Both these dimensions, viz, the structural transformation and the reliance on high-speed industrial growth, takes man far from nature in its original form and distorts nature. In other words, when this transformation of nature by man, instead of showing a symbiotic relationship between man and nature, shows a man-centric effort to conquer nature and ultimately overpower it, the economy that is aimed to be built up by man to protect himself and prosper, is itself stressed. This gives the background of our introductory understanding on industrial ecology.

The concern for commodity production or creation of utility for uplift of quality of human life is as old as the birth of economics as a branch of scientific analysis (Chakravarty, 1988, Kuznets, 1961, p. 13; Kuznets 1965, p. 63, 83-84, 105; Kerr, 1993, p. 5, 9). It is well established by now, however, that the positive volume of physical output, positive rate of growth of output and a move from lower-order production to higher-order production on a national and global level may fail to ensure the objectives of sustainable development. By sustainable development, a process of development that is eco-friendly, dependent on use of renewable energy in production, is meant: aiming at replenishing the exhaustible natural resource base and relying on people's participation in development. If ensured, it will imply that 'future generations will be no worse off than today's if they have at least an equivalent overall resource base consisting of a mix of natural, infrastructural, and knowledge capital' (World Bank, 1998/99, p. 102). We assume no tradeoff between people of present and future generations, by any indices of social benefits and costs. But the concern always remains at present since the type of development pursued now will have a spillover effect on present generations and also future generations to come. A new look at industrialization thus is necessary. In the process of industrialization, shocks are embedded, whereby not only people at present may be excluded from the processes of production or may be declared surplus, but also the generations to come may experience jobless and ruthless industrialization. This type of industrialization may be pursued at present by individuals in rich and poor countries alike having command over natural resources and technology. A necessity thus arises to reorient industrialization. This is the point where the state has to impose checks and balances on industrialization and has to work as a shock-absorber. We accept the State as a super institution that tries to ensure, in principle, mutuality of interests of people in a society with diverging interests.

By sustainable development is meant: aiming at replenishing the exhaustible natural resource base and relying on people's participation in development.

Abbreviations Used

DMEs:	Developed Market Economies
ASEAN:	Association of South East Asian Nations
TWCs:	Third World Countries
US:	United States
TNCs:	Transnational Corporations
NICs:	Newly Industrializing Countries

Utilization and Protection of Natural Resources

The benefits of industrialization are visible since the days of thefirst industrial revolution that originated in the United Kingdom (UK) more than two centuries back: the benefits of a shift from a rural, agrarian economy to an urban, industrial economy, the benefits of a shift from lower-order technology based lower-order products to higher-order technology-based higher-order products. However, the costs associated with this industrialization that got manifested from the beginning were not questioned during those days of the 18th and the 19th centuries. These questions are being raised now, e.g., industrialization-borne air and water pollution and increasing exposure to health hazards, human displacement and other socio-economic costs (The World Resources Institute, 1998, p. 51). It is being observed that the rates of industrial growth in developing countries, particularly in China, East Asian NICs and ASEAN countries, within a span of a few decades after the Second World War have outpaced the growth rates of European industrialized countries. It is observed that 'as part of this growth, industrial wastes are growing in quantity and becoming more varied, more toxic, and more difficult of dispose of or degrade' (The World Resources Institute, 1998, p. 51). Use of natural resources for industrial purposes has not only endangered the need to maintain the long-run capacity of the earth, but has also endangered the short-run capacity of agriculture. What is meant by this capacity? 'The carrying capacity of an eco-system is the maximum stress it is capable of absorbing without it changing to a vastly different state. Eco-systems are endemically subject to natural shocks and surprises... The self-reorganizing ability of eco-systems determines its capacity to

respond to the perturbations they are continually subjected to' (Dasgupta and Maler, 1997, p. 4). The carrying capacity degrades by 'environmental deterioration-including soil erosion, aquifer depletion, rangeland deterioration, air pollution' etc. (Brown and Mitchell, 1998, p. 168). Since such degradation adversely affects agriculture, hence it affects industries too. The impact is also felt beyond national boundaries (Brown, 1998, p. 7-8). For instance in rivers go dry, it means not only water scarcity but also food scarcity. At the national level, the problem can be temporarily solved by imports of food; at the global level, there is not even any short-term solution.

It is often alleged that the process of industrialization in the TWCs is more material-intensive than what it is in DMEs. It is a fact that the production-system in DMEs today is less material-intensive relative to not only what it is in TWCs but also relative to their own past production processes. The TWCs are yet to acquire that development in technology and choose that product mix which may be knowledge or brain-intensive what the DMEs now can boast of because of their great leap forward in technology. An opinion has been floated of late that 'the huge material flows associated with industrialization can be reduced in developing economies if these countries go directly from the pre-industrial to the post-industrial stage of development, leapfrogging the intermediate stage' (Brown and Mitchel , 1998, p. 171). This is impracticable and unacceptable for any country in the Third World aspiring for industrialization. What is more serious is that the DMEs, particularly US, export health hazards to other countries, particularly to the TWCs who are linked with the DMEs, directly or indirectly, through trade-aid-finance-technology-defence (The World Resources Institute, 1998, p. 4). The problems that emerge from the attempted industrialization in the TWCs thus are not always internal to the national needs, but are embedded in their attempts to follow the technology-demand structure of DMEs and in their attempts to catch up with the economic structure of the DMEs within a few decades, the structure which the DMEs could build over more than two centuries. Now that the DMEs have shifted from capital-using and labour-saving industrialization to information-cum-brain intensive production, the TWCs are advised to follow the path. There has indeed come a 'timeless advice' from a quarter that the TWCs should 'invest and poles. Instead of relying on the transportation system to carry a letter to distant destination, modern technologies can send a facsimile halfway around the world using the global network of satellites. And with computerization, e-mail can replace the fax, eliminating the need even of paper. Similarly, if developing countries bypass the automobile stage of development, going directly to sophisticated public transportation and to bicycles, they can save huge amounts of materials and energy, while providing greater mobility' (Brown and Mitchell, 1998, p. 171). The advice ignores the history of industrialization of countries now bracketed as DMEs. The DMEs, through their executive arms of TNCs, today follow assembly-line production across countries what may be called translocalization of production. It is not clear if the advice covers TNCs operating in TWCs. If yes, the advice ignores the mechanism of command of TNCs over natural resources physically internal to TWCs, thus also manipulating consumption in favour of DMEs where they originate from. The fact is that 'the developed countries can enjoy their current consumption levels precisely because the developing countries are subject to deprivation, and it is extremely doubtful, from a resource point of view, whether the poor nations can ever achieve similar standards as the rich' (Reddy, 1981, p. 229). It may also be that the advice either presupposes that the TWCs have by 1990s attained the stage of industrialization that the DMEs attained by pre-Second World War period or ignores the socio-economic reality of the TWCs.

It is often alleged that the process of industrialization in the TWCs is more material-intensive than what it is in DMEs.

There is no doubt that rapid industrial growth, accepted as a compulsion by the policy makers in TWCs, has converted nature into a suffocating space spreading air pollution, water pollution and hazardous wastes. But then transnationalization is no less responsible for this polluting environment in TWCs where labour costs are significantly lower relative to what they are in DMEs, hence encouraging for TNCs to relocate their production. 'Between 1988 and 1995, Multinational Corporations invested nearly US $422 billion worth of new factories, supplies, and equipment in developing countries. In 1995 alone, the flow of private capital into the developing world totaled close to US $ 180 billion' (the World Resources Institute, 1998, p. 53). During 1992-94 exports of banned and restricted pesticides from ports in US to the developing world totaled more than one lakh metric tons (The World Resources Institute, 1998, p. 44). It is thus not only a question of tacking the industrialization-linked maintenance of, possibly productivity-linked expansion of, resources but also one of planning localization of industrial production. The role of the State in resource-maintaining-cum-generating industrialization has to be understood in this national and global context.

A Alternative Pattern for Industrialization

This question of industrialization arises when the existing pattern is not sustainable. Industrialization by itself is a shock that destroys the traditional social structure and its associated value system (MacPherson, 1985, p. 143-144). Environmental degradation expressed as erosion in natural resources and reducing capacity of the eco-system to ensure the attempted industrialization the world over is a significant indicator of the shocks that industrialization imposes on future generations of people. Technological progress associated with industrialization is itself 'a major cause of environmental problems, but technological progress and innovation can also be part to the solution' (World Bank, 1998-99, p. 107).

'A sustainable economy is one powered by renewable energy sources. It is also a reuse/recycle economy. In its structure, it emulates nature, where one organism's waste is another's sustenance' (Brown and Mitchell, 1998, p. 169). In this light let us review what steps the state can adopt for release of positive forces for sustainable industrialization:

(1) The State, or the decision-making inter-industrial or even intra-industrial activities are understood in terms of balance equations between 'waste' as input for industry 1 and waste as output for industry 2. Thus, industrial waste should not be considered as a final product, as a 'bad' rather than a 'good', as a 'cost' rather than a 'benefit' for the economy and society. Once waste of industry 2 is utilized for absorption in industry 1, the 'bad' is converted into a 'good'. This two-industry frame can be extended for n (n 2) industries.

(2) The economies in the countries of the Third World are basically based on production of primary commodities. 'Building a sustainable food economy depends on protecting cropland both from soil erosion and from conversion to non-farm uses. It also means using land and water more efficiently' (Brown and Mitchell, 1998, p. 172). While stopping conversion of farm land to non-farm uses is constrained by economic and industrial factors, including private ownership over land, the problem of soil erosion can be tackled by afforestation, water management planning etc. While individual and group initiatives are supporting actions, the state initiative should be primary in ensuring soil conservation and maintenance of croplands for agricultural purposes. In fact, raising water productivity (water-saving techniques of agricultural production) should be a complementary goal of raising land productivity.

(3) The State has to encourage that technology which is socially constructive, which is energy-conserving, which is manpower- deploying. Capital-intensive and ecologically destructive techniques, other than for consumer essentials like electricity and for strategic purposes like atomic energy, should be highly taxed by the State. Material-intensive technology cannot be skipped at this stage, given the state of knowledge and skill of the manpower in TWCs, but state preference should be for use of locally available material resources, rather than depending on importing of resources from abroad or making the economy a dumping ground for chemicals and pesticides from abroad. The 'choice of appropriate technology-guided control of industrial ecology is a difficult proposition. It is true that 'Monitoring whether a particular technology is being used may be much easier than monitoring the level of pollution. But the choice of technology standards requires sophisticated knowledge of technologies – knowledge more likely to reside in regulated firms than in regulated institutions' (World Bank, 98-99, p. 109).

(4) Localization of Industries is a big challenge to the State. The chemical industries and industries hazardous for health should be far away from human settlements. A region-based study on industrial ecology is needed to see the viability of use of industrial wastes for production purposes, e.g., use of flyash, a waste from thermal power plant for example, in cement industry, in brick industry, in road construction, in filling lands without destroying its fertility.

(5) The problems related to localization of industries and human settlement lead to other problems e.g., transportation and the type of industries selected. The selection of industries appropriate for the region is conditioned by physical characteristics like availability of resources and manpower fir for the industries selected and by economic characteristics like price of inputs including labour, market etc. Regarding transportation, it is understood that energy-intensive automobile-centered transportation systems as are in use in industrial societies lead to congestion and hence they are ecologically destructive. Hence, one suggestion comes for TWCs that bicycle is the appropriate transport vehicle for them. This seems to be contradictory when we talk about setting up of

plants at a long distance from human settlements and then encouraging people to go to these plants as workers by bicycles, thereby ignoring the misuse of human energy and misuse of time. If bicycle as a means of transport is accepted as ecology friendly, then the type of products/industries has to be simultaneously ecology-friendly, so that people need to move only a few Kms. from residential areas to workplaces in which case the very problem of setting up of hazardous plants becomes redundant. A feasible solution by consensus to this problem of appropriate selection of industries by location and type, transportation system and human settlement are so complex that only the State can dare to accept the task.

(6) For sustainable industrialization the state has to move from non-renewable energy sources to renewable energy sources, e.g. from coal and water-based sources to solar and wind-based sources. Electricity comes from coal-based thermal power plants and hydropower systems. 'Hydroelectric power.... is clean energy, causing no air pollution. But large dams and their reservoirs take up land, and if not carefully designed and sited can require the relocation of large number of people and damage eco-systems' (World Bank, 1998, p. 107). The question related to construction of large dams for generation of electricity, human displacement and probable disaster by flood in case of loose boundary of large dams constructed are serious for the State. Another aspect of exhaustible energy base in continuous use of firewood (cheapest and often free) by poor people for cooking purposes in TWCs. In addition to community participation in afforestation, the state has to encourage Science and Technology (S&T) to develop solar power plants.

'One reason for today's environmental problems is that the market does not tell the truth' (Brown and Mitchell, 1998 p. 181). It is then the 'visible hand' of the State that has to intervene, initiate steps for eco-friendly industrialization. State is empowered by fiscal instruments, pricing policies, acts and regulations. Imposition of taxes on environmentally destructive activities not only brings revenue to the government but also checks those activities. The State has to shed its 'soft' character internally to implement steps to release sustainable and people-friendly forces of industrialization. The task is not skipping industrialization but regulating it.

Relationships Society-Industry-State

A Flow Chart 1 with the following assumptions has been constructed:

(i) There is a given vector of products and a given vector of associated technologies;

(ii) There is no restriction on generation of pollution. Individuals in the Society are isolated maximizers of their present benefits;

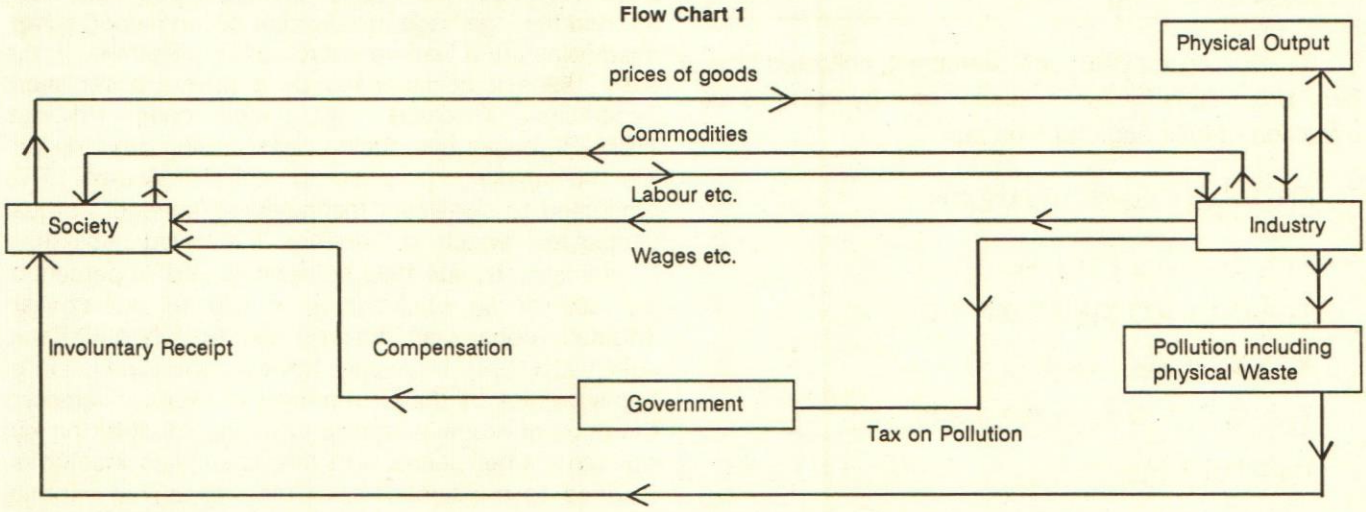
(iii) The Government represents a weltare State and hence imposes taxation on pollution on the assumption that pollution is 'bad' (leading to health hazards)

(iv) The Government is a maximizer of tax yield and Individuals in Society claim a Share of this tax yield

The Flow Chart then will look like the following:

Individuals constitute a society and go to the industry as isolated productive agents to produce physical output. These individuals voluntarily participate in the process of exchange: controllers of technology running the industry

Flow Chart 1



sell commodities while sellers of labour-power buy those commodities. Either because of the type of inputs used or because of the nature of technology applied for producing this output, pollution including physical waste is generated by the industry. Individuals in society receive this pollution also, obviously for which they do not pay anything to industry, pollution being 'bad' as opposed to 'good'.

The Government represents a Welfare State and hence collects taxes on population, taxes imposed on industry per unit of the product or any other norm planned by the Government. While the Government does not impose any quantitative restriction on the product produced by the industry and is satisfied by maximization of tax yield, the individuals know that it is a welfare State and hence claim a share of the tax yield in the form of 'compensation'. Thus, there may come distribution of taxation of the individuals in society, and the society is compensated by the industry for generating pollution, the government is the link between the society and the industry.

Let us now relax assumption (iii) partially, i.e. it remains a welfare State but the government may not impose taxation on industry when it is seen as two firms, Firm 1 producing pollution or waste while Firm 2 absorbs that waste. Let Firm 1 be Thermal power plant' producing electricity as 'good' and 'flyash' as bad. Let firm 2 be 'brick plant' producing bricks using flyash. How does it work then? Let us use the Leontief type Input-Output Frame.

Input-Output Frame

Inputs to → Inputs from ↓	Firm 1	Firm 2	Final Demand	Governm ent	Final output
Firm 1	X_{11}	X_{12}	C_1	T_1	X_1
Firm 2	X_{21}	X_{22}	C_2	T_2	X_2
Human Resource	H_{01}	H_{02}	–	–	H_0

T_1 denotes tax yield for Government, collected from Firm 1. Similar is for T_2. Taxation is paid by the firms as a fraction of their aggregate output.

The Balance Equations here are:

$$X_1 \geq X_{11} + X_{12} + G + T_1,$$

$$T_1 \geq O, C_1 > O, X_{12} > 0, X_{11} \geq 0$$

$$X_2 \geq X_{12} + X_{22} + C_2 + T_2,$$

$$T_2 \geq O, C_2 > O, X_{21} > 0, X_{22} \geq 0,$$

$$H_0 \geq H_{01} + H_{02},$$

$$H_{01} >, H_{02} > 0,$$

Here X_{12} includes both electricity and Flyash.

The Production functions are:

$$X_1 = f(X_{11}, X_{21}, H_{01})$$

$$X_2 = F(X_{12}, X_{22}, H_{02})$$

Here for Firm 1, a part of X_{12} is flyash generated by Firm 1 that goes to Firm 2; Firm 2 converts it into bricks that goes to $C_2(>0)$. X_{11}, a part of X_{12} and C_1 are parts of electricity produced by Firm 1 and allocated as own use, X_{11} (>0), intermediate use in Firm 2, a part of X_{12} (>0), and final use C_1 (>0). C_1 is autonomous part of total demand for X sub 1 which shows the strength of Firm 1 for survival. So long as C_2 remains positive, this strength of Firm 1 is multiplied, C_2 being autonomous demand for flyash-converted bricks. Since Firm 2 absorbs the waste (flyash) generated in Firm 1, apparently the government does not have any role to play here as a fiscal authority. Still the society may involuntarily pay in terms of health hazards (surrendering future options of leading a healthy life) that the transportation of flyash creates while it gets shifted from Firm 1 to Firm 2. Then the Government will have to arrange for appropriate means of transport and/or impose control over mode of transport to carry flyash from Firm 1 to Firm 2. This is a short term measure, if society's judgement is against the mode of transport followed by firm 1 and firm 2 at present.

There are associated problems, however. Even if Firm 2 absorbs the waste of Firm 1, ecological problems may come from Firm 2 itself not directly from 'flyash' considered as an input but from the technology Firm 2 adopts in producing bricks. For Firm 2, it may be input (flyash) neutral and technology-dependent. For example, let us 'consider Mexico's 20,000 small, traditional brick Kilns. Fired with highly polluting cheap fuels, such as used tiers, garbage, used motor oil, and wood scrap, these kilns are a leading source of air pollution... In the early 1990s a coalition led by a private association, Federacion Mexicana de Asociaciones Privadas (FEMAP), began introducing clear-burning propane into the brickmaking colonias of Ciudad Juarez. This amounted to significant technological change, not just simple fuel switching, because it involved substantial fixed costs... by late 1993 between 40 and 70 percent of the 300 or so brickmakers in Ciudad Juarez had adopted propane as their primary fuel' (World Bank, 1998/99, p. 114). Ultimately, however, the elimination of fuel subsidies by the Government of Mexico increased the price of propane relative to debris. Most of the kiln operators when faced with this change in incentives, reverted to traditional fuels. This shows that informal

regulation may be powerful but can not repeal the lows of economics (World Bank, 1998/99, p. 114).

Peoples' Participation

The pressure groups in society indeed complement the regulatory mechanism of the State for sustainable industrialization. 'The public may know that a given industry discharges pollutant's into the environment, but it rarely knows how much each factory is discharging. It is the second piece of information that, when disclosed, puts pressure on the firm and gives it an incentive to comply with pollution standards' (World Bank, 1998/99, p. 113). In fact, the people constituting the society working at the grassroots level can be an effective link between industry and state in the latter's endeavour to maintain pollution free industrial environment.

Who are concerned for industrial ecology of the TWCs, particularly when industrialization process itself is not matured relative to what it is in DMEs? 'The reason is that poor people in poor countries cannot cope with the same margin of error as people living in rich countries can' (Dasgupta and Maler, 1997, p. 14). The production-cum-consumption basket of rural poor in TWCs is composed of local resources, including forest for fuel, fodder and food; any degradation in these resources means not only declining standard of living but also retrogression of the basis for production.

Conclusions

The question of use, protection and renewal of natural resources through peoples' participation requires at first ensuring the preconditions for appropriate utilization of existing resources. Some of these resources are already explored and some are explorable. There is no recorded historical date when such explorations started. But if mankind is to live over generations, the eco-system which feeds them has to be sustained and there comes the question of controlling man's exercise of power over nature. This is the context where the role of the State comes in. Sustainable industrialization is not society-neutral and hence not independent of social consensus and cooperation. It causes more social harm when the policy makers, constituting the State elite, are rejected by people rather than when the policy makers choose to ignore the people at the bottom. In this paper we stress on rural need-based technology and draw the attention of the State in this regard primarily because technology can convert community and caste-based isolation of individuals into a production-based interdependence. We stress on rural resource-specific technology secondarily because the endemic nature of mass poverty and inequality is derived not only from differences in initial private ownership over resources but also from how the resources are being organized and used in production. A time-phasing development of resource-specific products and product-specific technologies explains the way how industrialization can be organized and sustained. The state has to play a central role here by encompassing people left out from the domain of development. This can show the way how the State can ensure empowerment of people through participatory development and ensure symbiotic relationship between man and nature.

The question of use, protection and renewal of natural resources through peoples' participation requires at first ensuring the preconditions for appropriate utilization of existing resources.

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Feature

Determinants & Resource Use-efficiency in Poplar-based Agroforestry

Sudhir Kumar Jain & Parmatma Singh

To meet raw material requirements, Wimco, the biggest match industry in India, has been promoting since 1984 poplar-based agroforestry through projects approved by National Bank for Agricultural and Rural Development (NABARD) in the northern region of India. This study identifies the determinants and examining the resource use-efficiency in poplar plantations. The method adopted is useful for the applications of the economic tools in agroforestry projects particularly in the case of non-availability of data over period of time. Efficient use of resources can make this land use system more attractive to farmers. For sustainability and expansion of poplar-based agroforestry system on farms, farmers with different socio-economic background should be encouraged with different policy measures.

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Declining forest area and low productivity of forests[1] have led to the need for the promotion of sustainable alternate land use system which can support the growing demand for timber, fuelwood and fodder without jeopardizing foodgrain production. Furthermore, restriction to access of wood-based industries to forest through the forest policy of 1988 (GoI, 1988) has compounded this need. Governments and wood-based industries have taken initiatives and have identified several forest crops for cultivation with agricultural crops in different geometry on farmers' land for different agroclimatic conditions. However, because of low enthusiasm among farmers for introducing forest crops on their cultivation, this proposition could not get as much attention in the farming system as it deserves. Therefore, area under agroforestry could not increase considerably. Whether India's degenerating forest wealth and slow growth of area under agroforestry/farm forestry will meet the demands of the growing population without any changes in directions and policies is a matter of concern.

Governments and wood-based industries have taken initiatives and have identified several forest crops for cultivation with agricultural crops in different geometry on farmers' land for different agroclimatic conditions.

Wimco, the largest match industry in the organised sector in the country, has been promoting poplar-based agroforestry in several districts of the northern region of

1. 0.69 m^3 ha^{-1} $year^{-1}$ which is less than the one tenth of the world average, i.e., m^3 ha^{-1} $year^{-1}$.

India through agroforestry project[2] approved by the National Bank for Agriculture and Rural Development (NABARD) since 1984. Poplar *(Populus deltoides)*, a fast growing forest crop, has been found suitable to the northern region and its timber to several soft wood-based industries. Several studies (Chaturvedi, 1982, 1992; Singh, 1988; Jain, 1996) have shown that poplar-based agroforestry is profitable on farms. Since exotic varieties of it are grown on fertile and irrigated land and unlike eucalyptus, they demand a large amount of inputs for their profuse growth. Poplar cultivation and its promotion on farms depend on a number of multiple variables besides its agroclimatic suitability. Besides expanding area under poplar-based agroforestry on farms, there is need for optimising its growth output. High output from poplar will ensure not only high return from agroforestry resulting in its sustainability but will also help in achieving the objective of supply of wood and fuelwood.

High output from poplar will ensure not only high return from agroforestry resulting in its sustainability but will also help in achieving the objective of supply of wood and fuelwood.

Keeping these in view the present study aims at

- identifying the factors affecting the area under poplar-based agroforestry.
- examining the resource use-efficiency in poplar plantations.

Sources, Data and Methodology

Data were collected through stratified sampling techniques from six blocks (Bhavalkhera, Daddrail, Kant, Puwayan, Tilher, and Nigohi) of Shahjahanpur district of Uttar Pradesh where Wimco's poplar-based agroforestry project has been under implementation since 1984. One hundred and seventy six farmers (40 per cent of the agroforestry adopters in the selected blocks and 25 per cent of total agroforestry adopters in the district from 1986 to 1993, one coppice period) were selected randomly. Since activities involved in poplar plantations from establishment to harvest stretch over eight years, farmers in the harvest stage (eighth year) could not be expected to recall the details pertaining to the establishment stage (first year). A reasonable approach would be to select eight groups of farmers, each group representing a particular age of a plant in the current year. On the basis of this logic, eight groups of agroforestry adopters were chosen; each group comprised 22 adopters. Since it is difficult to get data/information for a complete life cycle of poplar tree from individual farmer, a life-time matrix was constructed for each sample unit on all parameters through interpolation technique.[3] The life-time matrix gives complete information for full life span of perennial crops for each sample farmer. Therefore, the tools of production economics, viz. resource use-efficiency, production function analysis and factor shares, etc., can be applied to this data set (Chand, 1994). Data pertains to the agricultural year 1993-94. Information regarding inputs employed for different ages of poplar plants were collected from respective group of farmers. Volume of timber of the plants was determined by the number of trees under a particular range of the girth at girth at breast height, height and taper of the trees using the quarter girth formula. Data regarding girth at breast height, height, and incremental growth of poplar tree were collected from Wimco, Agroforestry Division in Shahjahanpur district.

Regression analysis was one to find out factors affecting the area under poplar-based agroforestry. Various mathematical functions were tried out using the least square method. In terms of coefficient of multiple determination (R^2) and significance of explanatory variables, the linear function was found to have the best fit. It is expressed as follows:

$$Y_t = A + b_1 X_{1t} + b_2 X_{2t} + b_3 X_{3t} + b_4 X_{4t} + b_5 X_{5t} + U_t$$

Where, Y = area under poplar plantations, X_1 = total area of the land owned by the farmer in hectares, X_2 = literacy of the head of the family who takes decision on his farm expressed in terms of score (illiterate = 0, primary = 1, secondary = 2, intermediate = 3, graduate and above = 4), X_3 = off-farm income, implying total income earned from other than agricultural enterprise on the farm by family members of the farmer

2. Under this agroforestry project, Wimco provides technical assistance to the farmers, good quality planting materials developed at its nurseries, tying up of institutional finance as well as gives guarantee to purchase proceeds after harvest at a remunerative price.

3. For constructing the life time matrix for the variable (X_j), the index is computed by the formula; $K_h = X_{jh}/S_j$, where, K_h is an index for the value of variable under consideration, 'h' is an unit of sub-sample in j^{th} age year and X_{jh} is the value of variable at h sample unit which belongs to j^{th} year. S_j is the average of the sub-sample in j^{th} age of the tree. K_h indicates that the value of variable, say X_1 for the hth unit is K_h times the sample average. Based on this, the missing values of the variable for h^{th} unit in the past and for the future life of poplar tree are obtained by multiplying the average value of each sub-sample by K_h.

in a month and expressed in terms of score (Rs. 500–1000 = 1, Rs. 1000–1500 = 2, Rs. 1500–2000 = 3, more than 200 = 4), X_4 = per cent area under irrigation, and X_5 = Income from agricultural crops. b_1, b_2, b_3, b_4, b_5 are regression coefficients of the explanatory variables. U_t is a random term accounting for unexplained variations in the dependent variable.

For determining the input-output relationship and productivity of resources applied in poplar plantations, production function analysis was done for six years and eight years of the plantations. For the production function analysis, inputs applied in the different age of poplar were pooled up to the period of the plantations considered for the analysis. For selecting an appropriate form of the production function, linear, quadratic, and Cobb-Douglas production functions were tried out using the least square method. On the basis of the diagnostic tests, the Cobb-Douglas production function was found to have the best fit. The Cobb-Douglas production function as specified below was estimated.

$$Y_t = a\, X_{1t}^{\ b1}\, X_{2t}^{\ b2}\, X_{3t}^{\ b3}\, X_{4t}^{\ b4}\, X_{5t}^{\ b5}\, U_t$$

The production function in the log linear form can be expressed as follows:

$$\ln Y_t = \ln a + b_1 \ln X_{1t} + b_2 \ln X_{2t} + b_3 \ln X_{3t} + b_4 \ln X_{4t} + b_5 \ln X_{5t} + \ln U_t$$

Where, Y = gross income from poplar in rupees per hectare, X_1 = bullock labour in hours per hectare (including tractor hours used), X_2 = human labour in man-days per hectare (one man-day comprises eight hours of work per adult male labour), X_3 = expenditure on fertilizers and manure in rupees per hectare, X_4 = Number of irrigation and X_5 = capital expenditure on seedlings, plant protections and other costs incurred in the cultivation of poplar in rupees per hectare. U_t is a random term accounting for unexplained variations in the dependent variable. Human labour is used in poplar for the purpose of intercultering, leader training, pruning, straight bole formation, removal of injured twigs and application of plant protection measures, irrigation and fertilizers and manure. While bullock labour is used for ploughing, leader training and pruning.

The conditioning indices[4] for both equation were estimated for the examination of multicollinearity. Their value are less than 10 which shows that both the equations are free from multicollinearity.

Since the coefficient of an explanatory variable in the Cobb-Douglas production function is the elasticity of production with respect to the variable, the marginal physical product (MPP) of a particular input was calculated by taking the first order partial derivative of the function with respect to the concerned say, X_1. The MPP of input is calculated at geometric mean level. Since output was expressed as gross income in rupees, the marginal value product (MVP) of an input was obtained directly from the first order derivative of the equation with respect to the input concerned.

Allocative efficiency of an input is examined by comparing the ratio of the marginal value product of the input to its price. The use of an input is considered to be efficient if its marginal value product is just sufficient to cover its acquisition cost (Raj, 1964; Singh and Kahlon, 1975). An input is said to be over-utilized or under-utilized, if the ratio of the marginal value product to price of the input is less/greater than unity plus the rate of interest of capital in per cent. It indicates that in the case of over-utilization/under-utilization of an input in the production process, profit can be increased by reducing/increasing the use of that input.

For the purposes of the present study Shahjahanpur district situated in the mid-western region of Uttar Pradesh was chosen. About 80 per cent of the population of this district depends on agriculture for their livelihood. In this district, agriculture is less developed. Paddy, wheat and sugarcane together account of about 75 per cent of the cropped area. The district has just 2.45 per cent of total area under forests. Before 1986, there were only stray plants on the fields and a very few fruit orchards. Wimco under the NABARD sponsored agroforestry[5] project from 1986 to 1994, enabled 610 farmers to plant 4,39438 poplar trees (ETPs) in 878.87 hectares.

Results and Discussion

Factors affecting poplar plantations

Farm size, income from agricultural crops, off-farm income, irrigated area and literacy were identified as significant explanatory variables affecting the area under poplar plantations. They explained 59 per cent of the variations in the dependent variable (Table 1). Among these five significant variables, farm size was the most

4. The conditioning index is the square root of the ratio of the largest eigen value of X'X where X is the regressor matrix, to the smallest eigen value of X'X. See Belsley *et al.* (1980) for the use of conditioning index as a measure of multicollinearity. They consider conditioning indices in excess of 30 to pose substantive complications.

5. Wimco Seedling Limited, Rudrapur, Nainital (U.P.).

important explanatory variable explaining alone 42 per cent of the variations. All significant factors were positively associated with the area under poplar plantations. The results indicate that farm size was the most important factor for putting the land under tree plantations. Since the first preference of farmers having smaller size of holding is to raise the agricultural crops to earn a regular income, asking them to plant poplars may not serve the purpose well. Income from agricultural crops was another important factor influencing the area under the plantations. Since high investment is required for planting and maintenance of poplars, a high income from agricultural crops can give a good support in meeting the capital need of tree plantations and family during waiting period. Off-farm income is also decisive in allocating land for three plantations. Since off-farm income provides continuous additional income as well as economic security, farmers can afford to forego some present farm income in the expectation of higher income at a latter date. Irrigated area and education of the farmer also played contributing role in allocating land for poplar plantations. As poplar demands heavy irrigation at least in its early stage for profuse growth and education backs up for the introduction of new practice on farms.

Farm size, income from agricultural crops, off-farm income, irrigated area and literacy were identified as significant explanatory variables affecting the area under poplar plantations.

Table 1: Regression Coefficients, Standard Errors and Coefficient of Multiple Determination of Factors Affecting Agroforestry

Factors	Constant	Regression Coefficient	Coefficient of Multiple Determination (R^2)
Farm Size	–0.69	0.251* (0.021)	0.59
Non Farm Income		0.066** (0.033)	
Literacy		0.066*** (0.038)	
Irrigated Area		0.010*** (0.005)	
Income from Crops		0.00001* (0.000002)	

Notes: Figures in the parentheses are standard error

* Significant at 1 per cent probability

** Significant at 5 per cent probability

*** Significant at 10 per cent probability

Resource Productivity and Resource Use-efficiency

Production Function Estimates—It is seen from Table 2 that human labour, bullock labour, number of irrigation, fertilizers and manure and capital jointly explained about 74 and 76 per cent of variations in gross income from poplar plantations of six years and eight years respectively. The partial elasticities of production of all inputs were less than unity with positive sign for both six years and eight year of plantations, implying diminishing marginal productivity of the inputs. In other words, by holding other inputs constant at their geometric mean levels and increasing any one of them, income would increase at a diminishing rate.

Table 2: Elasticity of Production of Poplar in Six and Eight Years of Plantations

tion years	Number of observations	Constant $Log_e a$	Human labour (in days)	Bullock Labour (in days)	Number of Irrigation	Fertilizers and Manure (in Rs.)	Capital (in Rs.)	Coefficient of Multiple determination R^2	Conditioning Index
Six	176	1.04 (0.59)	0.33 (3.04)	0.18 (2.71)	0.37 (7.33)	0.39 (8.22)	0.34 (1.76)	0.74 {0.73}	6.73
Eight	176	1.42 (0.91)	0.37 (3.52)	0.16 (2.89)	0.36 (8.36)	0.38 (7.79)	0.31 (1.88)	0.76 {0.75}	6.16

Note: Figures in the parentheses are t - values and figures in bracelets are the values of adjusted R^2

The responsiveness of the production to bullock labour was relatively low. However, poplar responded better to fertilizer and irrigation than human labour and capital. In the case of eight years of the plantations, these variables were also positively significant at one per cent probability. The results show that responsiveness of the production to the inputs in eight years of the plantations were similar to its responsiveness in six years of the plantations. However, elasticities of production with respect to bullock labour, irrigation, fertilizers and capital declined marginally in eight years of the plantations as compared to those in six years of the plantations. Responsiveness of the production to human labour has increased marginally in eight years of the plantations as compared to six years of the plantations.

Resource Productivity

Marginal value products (MVP) of the inputs were computed at their geometric mean levels from the estimates of the production function. The results show that both six years and eight years of the plantations had a scope for yielding gross income higher than the obtained income by increasing the application of these inputs (Table 3). Marginal value products of these inputs

except fertilizer were higher in eight years of the plantations than those in six years of the plantations. The reason for high marginal value products of these inputs in eight years of the plantations is that the market value of proceeds of poplar increases substantially after certain girth and maturity of the plants. Therefore, it indicates that the application of inputs at an optimum level in the early age of the plants is highly contributive to increasing the gross value at the maturity time.

Table 3: Productivity of Various Inputs in the Six and Eight Years of Poplar Plantations

	Marginal Value Product of Resources at Geometric Mean Level (in Rs.)				
Plantation years	Human labour	Bullock labour	Irrigation	Fertilizers and Manure	Capital
Six	119.98	383.17	1599.77	7.23	6.97
Eight	164.14	463.32	1963.44	5.85	9.25

Resource Use-efficiency

There existed a high degree of inefficiency in the use of the resources in both six years and eight years of plantations (Table 4). The inefficiency level of the resource use further increased in the eight years of the plantations. The increase in inefficiency in eight years of plantations has also above stated reason. Among the inputs, use of irrigation, fertilizers and manure and capital were highly inefficient in the cultivation of poplar. The improvement in the efficiency of their use would contribute significantly to increasing the output.

Table 4: Resource Use-efficiency/Allocative Efficiency of Various Inputs in Six and Eight Years of Poplar Plantations

	Ratio of Marginal Value Product and factor price				
Plantation years	Human labour	Bullock labour	Irrigation	Fertilizers and Manure	Capital
Six	3.99	3.83	10.66	7.23	6.22
Eight	5.47	4.63	13.08	5.85	8.26

Conclusions

Introduction of a new land use system on farms through persuasion and incentives does not ensure its wide coverage, acceptability, and sustainability unless it suits to the socio-economic condition of farmers apart from its suitability to agroclimatic conditions. The results of the study show that farm size, income from agriculture, irrigated area, off-farm income and literacy are important variables for bringing a larger area under poplars. There exists a need for designing different agroforestry models for different farm size. This leads us to prescribe block plantations on large farms, row plantations irrespective of farm size which Wimco has done. This kind of geometric arrangement would also not jeopardize foodgrains production. Creation of off-farm employment opportunities to farmers, particularly to those have small holdings, would be another helpful step in the promotion of agroforestry. Measures such as, broadening of the outlook, creating an awareness for growing trees through informal education, training demonstration and extension efforts including development of modern agroforestry farm in a village/block by the agency concerned may also motivate farmers on a large scale. Promotion of modern agricultural technology can increase farm income from agriculture on the one hand and the other reduce the loss of foodgrains, thereby farmers can afford to opt for forest crop on their farms.

Creation of off-farm employment opportunities to farmers, particularly to those have small holdings, would be another helpful step in the promotion of agroforestry.

Profuse growth of poplar which is highly sensitive to amount and time of the application of inputs, therefore highly competitive to others crops for inputs, depends on efficient use of scared resources. The results show that human labour, bullock labour, fertilizer and manure, irrigation, and capital greatly influence the output of poplar. However, there is a great inefficiency in the use of these inputs in the study area. This may be due to first experience of farmers with poplar owing to which farmers were not much aware of the response of poplar to these inputs. The optimum use of inputs would not only increase the economic performance of poplar but also sustain the interest of the growers in agroforestry. Therefore, it calls for strengthening extension and training in different aspects of poplar based agroforestry with emphasis on efficient use of inputs.

For the sustainability and expansion of poplar based agroforestry system on farms, farmers with different socio-economic background should be encouraged with different policy measures. Corrective measures should be taken for the efficient use of resources for better economic performance of the crop.

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Feature

Policy Simulations for Groundnut Crop in the Punjab State

Jaswinder Kaur and J.S. Chamak

Oilseeds is an integral part of Indian farming system; especially the groundnut seeds cropping. In Punjab this has been the major crash crop until 1978-79 but since then the area under its cultivation has declined almost to 10%. The author traces out the causes of this decline and through a mathematical simulation model for the growth of oilseeds & in state has arrived at vital policy measures for development.

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Oilseeds constitute an integral part of the Indian dietary and farming system and India occupies a pre-eminent position amongst the oilseeds producing countries in the world (Acharya, 1993). It accounts for nearly 15 per cent of its gross cropped area and 10 per cent of the total value of agricultural produce and 5 per cent of the GNP. (Ninan, 1989). Amongst oilseeds, groundnut is most important for vanaspati production contributes to more than 53 per cent to the total oilseeds output (Kapila, 1982). Groundnut also put to several non-food uses like manufacturing of lubricants, illuminants and raw material for glycerine and soaps. Groundnut cakes are the important by-product and are used as feed for livestock and as fertilizers to agricultural crops. Its kernals are rich source of vitamins and proteins, and can also be used for preparing milk and curd (Pavaskar, 1979).

In Punjab, Groundnut was a major crop until 1978-79 in terms of both area and output of oilseed crops. The area under groundnut crop in the state which was about 60 per cent of the total area under oilseeds in 1970-71, declined to less than 4 per cent in 1995-96. Although, due to favourable techno-price factors for cereal crops, mainly wheat and paddy, the acreage under groundnut crop has been declining since early seventies, but its demand has persistently been increasing overtime (Chatha, 1987). Hardly any studies deal with the evaluation or qualification of the effects of various policy alternatives for sustained and stabilized growth of oilseeds in the State. Interacting behaviour of production and marketing operations can be studied properly and efficiently only in a comprehensive model

In Punjab, Groundnut was a major crop until 1978-79 in terms of both area and output of oilseed crops.

formulation (Chamak, 1987). The Groundnut oilseed sector model developed in this study mainly aims at knowing the interacting behaviour of its various components as a result of possible changes in some irrelevant policy instruments.

Interacting behaviour of production and marketing operations can be studied properly and efficiently only in a comprehensive model formulation

Specifically, the objectives of the study (pertaining to a period of 27 years, viz. from 1967-68 to 1993-94) are:

(i) to formulate a policy simulation model for groundnut crop for Punjab state and estimate the structural parameters of the model, and

(ii) to quantify the impact/effect of various policy alternatives on the production, acreage, farm harvest price, demand of groundnut oil and its exports from Punjab to other states.

Methodology

The entire groundnut oilseeds sector system has been subdivided into five components, viz. area, production, farm harvest price, demand of groundnut oil and exports of groundnut from Punjab to other places. Five interdependent structural equations with respect to these components of the entire system have been formulated in a system of simultaneous equations in such a way that each endogenous variable also appeared as an exogenous variable atleast once in any other equations of the model in order to maintain simultaneously amongst various relationships present in the model. Mathematically, the model has been formulated as under:

(a) Area Response Equations

$$AG_t = b_0 + b_1 FHPG_t + b_2 AG_{t-1} + b_3 YRG_t + b_4 IRG_t + b_s PRG_t U_{1t}$$

(b) Production Function

$$QG_t = a_0 + a_1 AG_t + a_2 ORFG_t + U_{2t}$$

(c) Farm Harvest Price Equation

$$FHPG_t = \beta_0 + \beta_1 FHPR_{t-1} + \beta_2 AAPO_t + U_{3t}$$

(d) Demand (Groundnut oil) Function

$$DGO_t = \alpha_0 + \alpha_1 E{\times}G_t + \alpha_2 Y_t + \alpha_3 T_t + \alpha_4 PM_t + \alpha_5 PGO_t + \alpha_6 GPT_t + \alpha_7 SOO_t + U_{4t}$$

(e) Export Equation

$$EXG_t = \gamma_0 + \gamma_1 QG_t + \gamma_2 DGO_t + \gamma_3 MSG_t U_{5t}$$

Specification of the variables

AG_t, AG_{t-1} =	Area under groundnut during the period (t) and (t-1) respectively, 000' ha
$AApo_t$ =	Annual average price of oils other than groundnut oil during the period (t), rupee per quintal.
DGO_t =	Demand of groundnut oil during the period (t), tonnes
$FHPG_t$, $FHPG_{t-1}$ =	Farm harvest price of groundnut during the period (t) and (t-i) respectively, rupees per quintal
GPI_t =	General Price Index, per cent
IRG_t =	Irrigated area under groundnut in the state during the period (t), 000' ha
MSG_T =	Marketed surplus of groundnut during the period (t), thousand tonnes
$ORFG_t$ =	Overall rainfall during sowing and production period of groundnut during the period (t), cms
PGO_t =	Price of groundnut oil during the period (t), rupees per quintal
PM_t =	Price Index of milk and milk products during the period (t), per cent
PRG_t =	Price risk of groundnut during the period (t), percent.
QRG_T =	Production of groundnut during the period (t) thousand metric tonnes
SOO_t =	Supply of other oils (rapeseed-mustard, linseed, sesamum) during the period (t), tones
T_t =	Taste variable expressed as 1, 2, 3.....27 for the years of the study period
Y_t =	Income (state gross domestic product) during the period (t), rupees in crores
YRG_t =	Yield risk during the period (t) calculated as the standard deviations of three years, yields of groundnut, per cent.

Table 1: Three Stage Least Squares (3SLS) Parameter Estimates and other related statistics for the simultaneous equations of groundnut model for Punjab, 1967-68 through 1993-94

Endogenous variables	Exogenous variables	Units of variables	Parameter estimates	t-value	other related statistics	
AG_t	Intercept		–45.419**	–2.189	R^2 =	0.9753
	$FHPG_T$	Rs/quintal	0.0337*	1.763	DW =	0.7649
	AG_{T-1}	000' hectares	0.9930***	12.470	F =	178.61
	YRG_t	per cent	–0.0041	–0.098	RHO =	0.0871
	IRG_t	Per cent	0.0413	0.557		
QG_t	Intercept		–9.636	–1.400	R^2 =	0.9766
	AG_t	000' hectares	0.973***	32.535	DW =	0.9496
	$ORFG_t$	Centimeters	0.1567	1.452	F =	501.79
					RHO =	–0.2944
$FHPG_t$	Intercept		–71.878***	–4.190	R^2 =	0.9798
	$FHPG_{t-1}$	Rs/quintal	0.0987***	3.673	DW =	2.5661
	$AAPO_t$	Rs/quintal	2.623***	6.706	F =	583.99
					RHO =	–0.2944
DGO_t	Intercept		56655.8***	6.283		
	EXG_t	000' quintals	–483.72***	–4.174	R^2 =	0.7773
	Y_t	Rs in crores	–0.758	–0.510	DW =	2.1414
	T_t	Time period (1, 2, 3.....27	–1572.01	–0.546	F =	20.76
	PM_t	Per cent	63.55	1.020	RHO =	–0.2961
	PGO_t	Rs/quintal	–8.889**	–2.096		
	GPI_t	Per cent	66.635	1.611		
	SOO_t	Tonnes	–0.393**	–2.698		
EXG_t	Intercept		–26.594**	–2.246	R^2 =	0.4658
	QG_t	000' metric Tonnes	0.3496	1.121	DW =	0.6674
	DGO_t	Tonnes	–0.001*	–1.796	F =	10.10
	MSG_t	000' quintals	–2.338	0.905	RHO =	–0.1022

Note: *, **, *** significant at 0.10, 0.05, 0.01 probability levels, respectively.
R^2 = Coefficient of multiple determination; DW = Durbin - Watson Statistics
Rho = Coefficient of autocorrelation; F = Variance ratio

The presence of autocorrelation (correlation between the successive values of residuals of the model) was tested with the 'Durbin-Wastson's statistic. The incidence of multicollinearity was detected with the help of the Klein's method. The significance of regression coefficients was tested with the one tail t-test at 0.01, 0.05. 0.10 probability levels. The value of R^2 (coefficient of multiple determination) has been used to determine the explanatory power of the estimated model.

'Reduced form equations' of the model were used for various simulation experiments in order to examine the simultaneous impact of all explanatory variables included in all the equations on the analogous variables of the model. The immediate impact of policy changes on the endogenous variables of the model was obtained by estimating the difference of the 'disturbed solution' and the 'control solution'. A control solution is one when no change in any endogenous variable is proposed and the 'disturbed solution' refers to the situation when some change in one or more than one endogenous variables has been contemplated.

Results and Discussion

Estimated Structural Parameters of the Model and Inferences

The results as obtained through the system of simultaneous equations by applying Three Stage Least Squares Method of estimation are presented in Table 1. From this table it is seen that five explanatory variables included in the area response equation has accounted for 97.53 per cent of the total variation in the area under groundnut, showing good explanatory power of the model. The d-statistic value of 1.7649 revealed the state of inconclusiveness for the detection of autocorrelation in the error terms of the model.

The lagged area and the irrigated area were both found to be significant at 0.01 probability level. Each one thousand hectares of land put under groundnut during the preceding year has induced the farmers to bring about 0.993 thousand hectares under this crop in the current years: The parameter of irrigated area carried a negative sign indicating reduction of groundnut area due to tendency of the farmers to transfer irrigated area to cereal crops, mostly to its competing crop, paddy. The coefficient of farm harvest price (0.034) which was found to be significant at 0.10 probability level indicated that each one rupee per quintal increase in the farm harvest price would bring about 0.034 thousand hectares more area under groundnut in the state.

The parameter of irrigated area carried a negative sign indicating reduction of groundnut area due to tendency of the farmers to transfer irrigated area to cereal crops.

Production Function

The production function of groundnut included mainly two explanatory variables, i.e., the area and overall rainfall during sowing and production period of groundnut 97.66 per cent variation in the total production of groundnut. The d-statistic (1.9496) indicated the absence of autocorrelation in the errors of this function. The area under groundnut had significantly affected its production. Each one thousand hectares more land put under groundnut would increase 0.973 thousand metric tonnes of groundnut. The weather had remained favourable to this crop during the sowing and production period of groundnut.

Farm Harvest Price Equation

Lagged farm harvest price of rice (competing crop of groundnut) and annual average price of other edible oils had jointly explained 97.98 per cent of total variation in the farm harvest price of groundnut. The calculated d-statistic (2.5661) gave no evidence of serial correlation in the errors of this equation. These two explanatory variables were turned out to be significant at 0.01 probability level. Each one rupee per quintal increase in the farm harvest price of rice and each one rupee per quintal increase in the annual average price of other edible oils (except groundnut) had brought about Rs. 0.10 and 2.62 per quintal increase respectively in the farm harvest price of groundnut.

Demand Equation

A total of seven explanatory variables included in the demand function of groundnut had explained 77.73 per cent of variation in the demand of groundnut oil. The value of d-statistic of 2.1414 had shown no evidence of the presence of autocorrelation in the errors of this function. The coefficient on the export variable (–483.7) was found to be negatively significant at 0.01 probability level, and coefficients on the price of groundnut oil (–8.889) and the supply of other oils (–0.393) were both found to be negatively significant at 0.05 probability level. This implied that each one thousand quintals increase in the exports of groundnut would cause a reduction of 483.72 tonnes in the domestic demand of groundnut oil, ceteris paribus. Similarly, each one tonne increase in the availability of other oils in the market would tend to cause a reduction of about 0.393 tonnes in the demand of groundnut oil. The non- significant but negative signs of coefficients of income and taste variables indicated that a rise in the level of income and consumers preferences for better substitutes had tended to decrease the demand of groundnut oil.

An exports equation included three explanatory variables, namely, production, marketed surplus and demand of groundnut oil and these three variables explained 46.58 per cent of the variation in the export of groundnut. Only the demand of groundnut oil turned out to be a significant variable (significant at 0.05 probability level). Its coefficient indicated that every one tonne increase in the demand of groundnut oil would cause a decline of 0.001 thousand quintals in the exports of groundnut. The other coefficients though not significant were indicative of having their favourable impact on the exports of groundnut from Punjab to other states.

Policy Simulations

The following simulation experiments were performed on the groundnut model of the Punjab state:

Sim 1: Control solution was obtained by taking averages of endogenous variables of the model with no change in the policy variables.

Sim 2: When area under groundnut was increased by 5 per cent over the existing level.

Sim 3: When annual average price of rice was increased by 5 per cent over the existing level.

Sim 4: When annual average price of other oils was increased by 5 per cent over the existing level.

Sim 5: When supply of substitute oils was increased by 5 per cent as a result of the adoption of improved technology.

Table 2: Effort of Simulation Experiments on Average Level of Endogenous Variables of Groundnut Model (Average: 1984-85 through 1993-94)

Simulation		AG_t (000' ha)		QGt (000' MT)		FHPGt (Rupees/Quintal)		DGOt (Tonnes)		EXGOt (000' Qtl)	
		Simulated average	Change over simulation	Simulated average	Change over simulation	Simulated average	Change over simulation	Simulated average	Change over simulation	Simulated average	Change over simulation
Sim. 1	Control solution	99.11	–	95.82	–	384.92	–	3990.90	–	21.11	–
Sim. 2	When lagged area under groundnut is increased by 5 per cent	99.18	0.07 (0.07)	95.93	0.11 (0.11)	384.92	0.0 (0.0)	4183.35	192.45 (4.82)	22.25	1.14 (5.40)
Sim. 3	When lagged farm harvest price of rice is increased by 5 per cent	100.57	1.46 (1.47)	96.33	0.51 (0.53)	400.70	15.78 (4.10)	4120.88	129.98 (3.26)	20.60	–0.51 (–0.42)
Sim. 4	When annual average price of other oil increased by 5 per cent	100.28	1.17 (1.18)	96.05	0.23 (1.24)	391.97	7.05 (1.83)	4130.61	139.71 (3.50)	20.88	–0.23 (1.09)
Sim. 5	When supply of other oils is increased by 5 per cent	100.00	0.89 (0.90)	95.82	0.00 (0.00)	384.92	0.0 (0.0)	3968.88	–22.02 (–0.55)	18.81	–2.3 (–10.89)

Figures in parentheses are percentage changes over the control solution

The results of these policy alternatives are given in Table 2. The levels of area, production, price, demand and export for simulation 1 (control solution) were estimated at 99.11 thousand hectares, 95.22 thousand metric tonnes, Rs. 384.92 per quintal and 3990.90 tonnes, respectively.

To measure the impact of increase in the area under groundnut in order to meet the increasing demand of edible oils in the state, an increase of 5 per cent in the area under groundnut during each preceding year of the study period has been assumed increase had exerted positive impact on the area under groundnut by 0.07 thousand hectares in the current year. Its simultaneous effect on groundnut production was positively higher by 0.11 thousand tonnes (0.11%). The farm harvest price of groundnut, however, did not experience any change as a result of an expansion in area under groundnut. The demand of groundnut was increased by 192.9 tonnes (4.82%) and exports by 1.14 thousand quintals (5.4%) over the control solution level (simulation 2).

As a result of 5 per cent increase in the farm harvest price of rice (simulation 3), the area, production, price and demand were all increased to the extent of 1.46 thousand hectares (1.47%), 0.51 thousand metric tonnes (0.53%), Rs. 15.78 per quintal (4.10%) and 129.98 tonnes (about 3.26%), respectively over the base-line simulation. However, the exports to other states were declined by 0.51 thousand quintals (about 2.42%).

Another policy option (simulation 4) which could be adopted was the increase in the average annual price of other oils. Due to 5 per cent positive change in this variable, the area under groundnut went up by 1.17 thousand hectares (about 1.2%), production by 0.23 thousand metric tonnes (1.24%), farm harvest price by Rs. 7.05 per quintal (about 1.8%), demand by 139.71 tonnes (about 3.5%). The export was, however, declined to 0.23 tonnes (about 1.09%).

When supply of other oils in the state was thought to be increased by 5 per cent (simulation 5), then the area under groundnut had shown a little of 0.89 thousand hectares (0.9%), while the production and farm harvest price has remained totally unaffected. The demand of groundnut oil was decreased by 22.02 tonnes (0.55%), probably due to availability of other substitutes of groundnut oil in the market. The exports of groundnut oil were decreased by 2.3 thousand quintals (about 10.89%) as a result of this policy option.

Summary and Conclusions

The econometric simulation model of groundnut in Punjab contained area, production, farm harvest price, demand of groundnut oil and exports equations. The structural parameters of the model in a simultaneous equations system were estimated by using Three Stage Least Squares (3 SLS) method of estimation. The time-series data pertained to the period 1967-68 through 1993-94. Simulation experiments were conducted by comparing the 'control solution' average values with the 'disturbed solution' average values under various policy alternatives.

The findings reveal that the area allocation to groundnut was mainly determined by three factors, lagged and irrigated area under this crop and the farm harvest price of groundnut. The production of groundnut was contributed only by area under this crop. The farm harvest price of groundnut was significantly influenced by the farm harvest price of its main competing crop., rice and average price of other oils prevailing in the state. The main determinants responsible for increase in the demand of groundnut oil were found to be its own price, supply of other oils and exports quantity of groundnut from Punjab to other states.

The findings reveal that the area allocation to groundnut was mainly determined by three factors, lagged and irrigated area under this crop and the farm harvest price of groundnut.

The policy of area expansion (say by 5%) would have a positive impact on production, demand of groundnut oil and exports quantity to the extent of 0.11, 4.82 and 5.40 per cent, respectively. This policy option, however, did not exert any effect on the farm harvest price of this commodity. When there was a 5 per cent increase in the farm harvest price of rice, a competing crop of groundnut, there happened to be a simultaneous increase in the farm harvest price of groundnut by Rs 15.78 per quintal, which in turn induced area under groundnut by 1.46 thousand hectares, and hence, rise in production by 0.51 metric tonnes and hence increased domestic demand of groundnut oil by 129.98 tonnes. This policy measure, however, caused a decline of 0.51 thousand quintals in the exports of groundnut. When average price of oils other than groundnut was increased, it had a positive influence on the area, production, price and demand but caused a decline in the exports of groundnut. A strategy of increasing supply of other oils would cause decline in the demand of groundnut oil and exports quantity of groundnut from Punjab to other states.

Thus, it is seen that a well-integrated model's various aspects of a system of a promises to work as a guide to decision makers and administrators for proper planning and action.

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Book Reviews

Garment Exports: Winning Strategies *by Darlie O. Koshi,* Prentice Hall of India Pvt. Ltd., p. 298, Rs. 350, Hardbound.

For a couple of years in the past, a pressing need for a comprehensive and systematic analysis of the apparel industry in India was being felt to ascertain as to where Indian firms stand in the world markets and to assess their strengths and weaknesses. Professor Koshy's book on Garment Exports: Winning Strategies comes as a timely treatise for the Indian firms to prepare themselves to compete in the next millennium. Based on extensive surveys of the Indian garment exporters and overseas importers, book provides an in-depth analysis of the international marketing of Indian apparels. The book is a must reading for the garment exporters, professionals associated with garment trade and the policy makers to face the emerging challenges in the garment export markets. The book would also prove to be of immense help to researchers in the field and students undergoing professional courses in international business, fashion designing and apparel marketing for apprising themselves of the intricacies of the garment manufacturing and trade.

The discussion in the book runs over ten chapters. The foreword is from Alfred V. Sloan, Jr. Professor of Marketing at the Fashion Institute of Technology, State University of New York, New York, USA. Chapter 1 is an introductory chapter and sets the stage for detailed discussion of the evolution of world clothing industry and trade, and imposition of quota restrictions on clothing imports by the developed countries since 1950s. The chapter then makes a detour of India's position in the world garment markets and changing supply base of world clothing trade. The garment exporting countries in future would be intensely jostling with one another for market share under quota free world trade regime. China has fast emerged as a major competitor in the last few years and might further consolidate its position after the phase out by appropriating as much as 60 to 80 per cent share in European Union (EU) and United States markets due to superior quality and competitive prices of its products. Bangladesh, Philippines, Pakistan and Turkey are other countries which have experienced phenomenal growth in their shares in recent years and would emerge as the potential competitors in the world clothing markets.

At present both the fashion and basic garment exports from India do not offer any differentiation. There is a heavy export product concentration. Just two items, viz., men's shirts and women's blouses, account for about 40 per cent of the country's total garment exports. The author strongly makes a case against relying heavily upon factor advantages accruing to the country by way of cotton fabric availability, inexpensive labour, handicraft resources and other factor endowments. The author contends that in addition to factor endowments, cost advantage can be gained through efficient worldwide sourcing of raw material, improved productivity and a wide range of services. In view of poor performance in the world markets and lower unit value realisations, Indian garment industry needs to urgently make a move towards gaining competitive as against comparative advantage for meeting threats from the emerging competition in the world apparel markets.

Chapter 2 is a curtain raiser, providing an overview of studies undertaken in India on the garment industry and its exports, and points out as to how a shift has taken place in the focus of these studies during the last three decades. The author makes a reference to some of the international studies in the area which suggest world garment manufacturing and exports show a distinct cyclical pattern of growth across nations. Rise in manufacturing costs in South Korea and Taiwan, and displacement of these countries as leading garment exporters in the world bear a testimony to this cyclical pattern. The coming years can be golden years for India, Bangladesh, Srilanka and Pakistan for garment exports provided they take cognisance of these market developments and initiate steps for seizing the emerging opportunities. He also delineates segmentation of world garment markets and suppliers into distinct groups and points out that the criteria used by the overseas retailers

to source their supplies differ across consumer segments. the author urges the exporting community to emphasize on "order winning" rather than "qualifying" objectives to compete in the changed market place. Both the manufacturing and marketing advantages need be developed for attaining long term competitive advantages. Elaborating the concept of sustainable competitive advantage, he opines that higher order advantages (e.g., product design, product uniqueness, brand reputation, etc.) are far superior to lower order advantages (e.g., low labour cost or cheap raw material) because the former permit differentiation which is not easy for competitors to imitate. The advantages can be made sustainable by continuously identifying distinct advantages and making constant improvement therein.

Chapter 3 is devoted to international marketing of apparels. Indian firms in the opinion of the author practise international marketing in a very rudimentary form and focus more on exports rather than on other more involving forms of international marketing. China and Vietnam in contrast predominantly depend on joint ventures with overseas parties. Features and challenges of fashion marketing such as severe market competition, low intrinsic value of the product, strong reliance on psychological obsolescence, high product seasonality leading to shorter product life and requiring higher mark ups and faster turnover, etc., are highlighted. Since Indian firms in essence specialise in low priced items, their ability to move on to a higher price level without a channel change is somewhat restricted. And changing channel is not that easy because sourcing criteria, process and systems differ across different types of channels.

Chapter 4 deals with the quality issues relating to garment exports. Positing quality as a composite concept, the author suggests exporters to take into account not one but several dimensions of quality such as performance, features, reliability, conformance, durability, serviceability, aesthetics, etc. Further it is the customer's view point that should be taken into account while defining the quality and delivering customer satisfaction. Exporters should keep in mind that quality expectations differ from one customer segment to another, and hence only one quality level cannot be appropriate for satisfying different customer segments. Sources of poor quality of Indian garments such as poor quality of cloth, sewing and sizing defects, colour variations, poor packaging and delivery have been discussed. Author spells out forty-five quality rules which, if adhered to, can help exporters in carving a niche for themselves in the world markets.

Chapter 5 provides a SWOT analysis of India's garment exports. Majority of the Indian firms are of small size—having an average capacity of 20 machines, and are characterised by low investment and use of poor technology. Compositionwise, there is a heavy concentration on men's shirts and women's blouses (both quota items). India has not tapped its potential for non-quota items such as industrial and occupational clothing, basic garments, bath robes, blazers, cardigans, babies' garments, dressing gowns, swimwears, hundred per cent wool/wool blends suits, etc.

An analysis of India's market share and growth rate vis-á-vis those of other exporting countries in the destination markets, viz., European Union, Germany, UK, France, italy, the Netherlands, USA and Japan, has been attempted in Chapter 6. The analysis clearly brings out India's weak position in the destination markets.

Findings of the survey of 107 Indian garment exporters carried by the author to gauze the exporter' perceptions about buyers' expectations and sourcing criteria in respect of fashion and basic garments are presented in Chapter 7. The results indicate gross.overestimation by the exporters of their value chain elements, sharp differences prevailing between the 'top 100 exporters' and the "rest-of-the-garment exporters', and negative perceptions of the 'top-100 exporters' and the 'rest-of-the-garment exporters' about other garment exporters. Exporters are found 'stuck in the middle' in regard to both the basic and fashion garments on various value chain elements. Perceptual differences between garment exporters' self assessment and overseas buyers' assessment on various value chain elements point to value chain mismatch.

Chapter 8 provides the results relating to a survey of 92 overseas importers in the eight countries that the author undertook to assess perceptions of the overseas importers and stores. Findings reveal that India's advantages in the value chain lie in design, service and price. The disadvantages relate to delivery, fabric (quality and availability), product quality and image. Only service and design elements show minimum perceptual distance between India and largest supplier country. A product-cum-import channel-cum-destination countrywise analysis provides important cues for reconfiguring value chain for each destination country, market segment and retail channel and for different product groups. Author's opinion is that India needs to project its package of competitive advantage through repositioning, while reaching the levels of largest supplier country in other aspects. The qualifying criteria of delivery, fabric (quality and availability) and product quality need to be achieved to make the order winning criteria of design and service effective. The price competitiveness, however, should always be maintained.

Based on the findings of the analysis in the study, a wide ranging strategies to capture and retain India's position in the garment markets in the post-MFA period are spelt out in Chapter 9 and 10. While Chapter 9 focuses upon transition strategies required to withstand the challenges emanating from the transition from MFA regime to quota-free regime under WTO by year 2005, Chapter 10 elaborates winning strategies for gaining competitive advantages to thrive and succeed in the post-MFA era. The strategies recommended in these two chapters range from achieving higher unit value realisations, diversifying product mix, entering into new markets such as Japan, Australia and South Africa, improving export performance through joint ventures, strategic alliances and technical collaborations, promoting exports by using domestic apparel market leverage, backward integration, fabric quality assurance, manufacturing and product quality assurance, management of lead time, channel selection and specialisation, exploiting design advantage, making use of fashion market information and computer networking, branding, upgrading technology, skills and technical expertise, improving management capability, developing marketing advantages, competitive positioning, ensuring strategic fit with the buyers' expectations, training of the labour force and building infrastructure.

On the whole, the book provides a comprehensive analysis of a wide ranging issues affecting the garment industry and exports. The suggestions provided in the book on the basis of author's in-depth understanding of the industry and empirical surveys undertaken would indeed go a long way in withstanding the MFA phaseout challenges and seizing upon the opportunities to emerge as a major garment exporter in the world garment markets. All the chapters have been well written and are in a prose that makes the book interesting to read and comprehend. The long exceptions are Chapters 7 and 8 which suffer from lack of methodological clarity. The terms 'importance' and 'performance' used in the first few sections of Chapter 7, for instance, have not been explicitly distinguished and create confusion in the mind of reader. The author talks of five factors in the chapter (p. 139), but all these factors and their respective scale items are not presented and discussed in the chapter. Percentage variation explained by a factor has mistakenly been construed as reflecting factor importance. The chapter is also silent about the scales used for measuring perceptions and weights employed for computing perceptual distances. Furthermore, no questionnaire has been provided to ascertain as to exactly what questions were asked to elicit the required information. Reliability tests have not been performed to assess the consistency of scale items comprising a given factor.

Similar gaps exist in Chapter 8. The author talks of four types of importer segments in the sample profile, but discussion pertains to only three types of importer segments. In the absence of questionnaire used for the overseas survey, there is some confusion whether the perceptual data collected from the importers pertain to the importance of attributes or performance/satisfaction perceived by the importers in regard to these attributes. The problem arises because sometimes author refers to these data in terms of satisfaction levels and sometimes he refers to them in terms of importance levels.

Expecting a few aforementioned methodological lapses, discussion in the book is quite straight forward and provides a pragmatic view of the industry and its operations. This book is definitely a welcome piece to the literature and shall win applause from the exporting community as well as the policy makers, researchers and students of professional management institutes.

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Industry Under Economic Liberalisation: The Case of Indian Electronics *by K.J. Joseph,* Sage Publications, New Delhi, Thousand Oaks, London, 1997, p. 243, Rs. 325 (Cloth).

The volume under review is a revised version of author's Ph.D Thesis, wherein he analyses the issues related to electronics under liberalisation programme with case studies of computer and television industries. Much attention has been given to explain the transfer and development of technology under the liberalisation programme. Another aspect which has been analysed in this volume are the output growth, employment generation, regional dispersal and external balance of the electronics industry under liberalisation.

The book containing seven chapters begins with an analysis of changes in the product structure in an input output framework. Issues such as the impact of investment decisions on output, inter-sectoral linkages, and the problems affecting Indian components sector are also discussed. This study has been conditioned by the fact that it is too early to carry out an expost facto evaluation of the economic reform programme. Since electronics industry has been subjected to substantial liberalisation in the 1980's itself, this sector was chosen to draw some tentative lessons for the industrial sector as a whole. Moreover, electronics cannot be treated as an industry but more as a broad sector comprising electronic consumer goods, electronic capital goods,

and electronic intermediates. The author argues that this uniqueness has made the lessons from electronics all the more relevant to the industrial sector as a whole.

An immediate impact of the liberal policies has been an unprecedented shift in the product structure. In the case of electronics such a shift was evident in terms of a marked increase in the share of electronic consumer products at the cost of electronic intermediates and electronic capital goods. Since electronics is a broad sector with a number of subsectors, the possible implications of these changes in the product structure are examined using an input-output matrix for electronics in Chapter 2. The case study of computers in the framework of the 'structure-conduct-performance' (S-C-P) paradigm illustrated the broad trends in the market structure of major electronic products in the country (Chapter 3). In general, the study found that firms pursued market-oriented competitive strategies instead of technology-based differentiation strategies with the objective of maximising their short run profits.

The case study of the television industry (chapter 4) has been primarily oriented towards analysing the regional dimension of market concentration. In each of the regional markets, a major part of the sales was accounted for by a few brands; a few firms thus enjoyed some degree of monopoly power in the regional market, though their share in the national market was small and diffused. Also, a positive association between firms' performance (price-cost-margins) and their regional market power was found empirically valid in the context of regional market segmentation.

The technology behaviour of firms (chapter 5) under the liberalized policy regime was oriented more towards technology import. The outcome was a phenomenal increase in the total number of foreign collaborations in the electronics industry. The technological progress achieved in electronics industry was import induced rather than the result of in-house R&D.

The overall implication of the process of restructuring—the changes in the structure of the industry and behaviour of firms—was found to be associated with an unprecedented output growth (chapter 6). However, an entrepreneurial decisions were guided purely by market forces, much of the investment got allocated to the production of quick profit yielding consumer goods based on imported kits and components. In fact, a single product exercised dominant influence in each of the sub-sectors: television receivers in electronic consumer goods, computers in electronic capital goods and electron tubes in electronic intermediates. At the same time, there has been a more equitable regional distribution of industrial output due to the promotional role played by the State Electronics Development Corporations.

The present study offers certain lessons and raises a few questions. With liberalisation, market structure may become more competitive with its attendant efficiency gains and growth. But the removal of entry barriers is only a necessary and not a sufficient condition to make an industry competitive. Hence, additional strategic intervention by the state may be called for protecting the interests of both consumers and labourers.

The author suggests that the policy of globalisation may be advantageous to those industries which have acquired substantial industrial capabilities over time. Government policy should be aimed at inducing the firms to adopt healthy competitive strategies based on internal technological capability rather than on import-dependent production and marketing. It needs to be recognised that the international competitiveness and local technological capability are complementary processes.

The study concludes after raising some policy wise difficult questions such as what should be the form, content and direction of state intervention so that the private sector is disciplined without the reappearance of rent seeking? What sort of new institutions are to be created or existing ones to be adapted to ensure an efficient absorption and diffusion of imported technologies so as to provide necessary signals to investment to avoid lop-sided growth and to act as a watch-dog for the combined interests of consumers, labourers and capital?

In general, this book provides a scholarly exposition to the economic liberalisation question that was much debated than understood. He has used various analytical tools to explain rigorously the phenomenon of economic liberalisation and its implications in India. This book will serve as a very useful companion to policy makers, academics and general readership for providing an in-depth understanding on the impact of economic liberalisation in Indian industry particularly electronics sector.

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Management and Productivity Enhancement: New Approaches, 1997, Asian Productivity Organisation, Tokyo.

Liberalisation, globalisation and the new regimes as ordained by WTO have e thrown up new challenges for

the corporate world. The basic interpretation and understanding of the concept of productivity has undergone a change. The emphasis is more on strategic improvements and customer satisfaction. There has been a dire necessity to develop new approaches to manage and enhance productivity. Many organisations in member countries of Asian Productivity Organisation (APO) have developed and implemented new approaches.

The present volume in this context is a compilation of various papers presented at the "Symposium on Management and Productivity Enhancement: New Approaches" organised at Dhaka from January 6 to 9, 1997 with a view to review and develop an understanding of the emerging concepts of productivity and its improvement process as well as to share the experiences of member countries of the APO.

The book is divided in two parts. First part includes six resource papers. These papers are intended to provide a clear theoretical background of the subject and to set the tone for discussion. Second part comprising of country papers provides experiences of member countries. A wide spectrum of political and social systems has been covered.

Prof. Kwan-Kuo Hwang in his paper 'Chinese Corporate Culture and Productivity' brings out the positive features of the Chinese culture which help in productivity and also such characteristics which stand in the way. Chinese family business is characterized by familism, authoritarianism and personalism (based on dominating cultural traditions of Confucianism). The author advocates a frequent cultural exchange between the East and the West and recommends a reward system in the spirit of legalism to raise productivity.

Khader's paper 'Total Quality Management and Beyond' is an excellent paper which traces the quality movement in a historical perspective and recommends adoption of TQM to meet competition in the world faced with new challenges of liberalisation and globalisation. The paper is laced with case studies of organisations which benefitted from this approach. Benchmarking is another significant tool to raise productivity. Prof. Osman-Gani in his paper 'Benchmarking: A Conceptual Analysis' examines such issues as, what is benchmarking, types and the process of benchmarking and how to use benchmarking to raise productivity and quality. Mizanur Rahman Shelly in his paper 'Privatization for Efficiency and Productivity' has presented a study of problems faced by developing economies making transition from predominantly state-controlled and bureaucratic systems to privatizations. The new challenges are not only from across the national borders but even from within.

The necessity of cordial labour-management relations to raise productivity forms the theme of A.K.M Mashiur Rahman's paper 'Labour-Management Co-operation for Productivity'. The author points out that for productivity improvement, commitment of workers is essential. Structure of trade union organisations should be conducive to labour management consultation. Better capacity utilization should be the objectives. Entrepreneurs and managers should be motivated and a belief should be generated that both sides, that is management and workers gain by co- operation.

The concept of productivity is still an emerging discipline although the word as such has been in usage for the post several decades. There are many fallacies, inconsistencies, flaws and misconceptions built around it. Even a universally acceptable formal definition of 'Productivity' has yet to be arrived at R.C. Monga, in his well reasoned paper, 'The Contemporary meaning of Productivity' seeks to examine the meaning of 'Productivity' and ways as to how to improve the same. These perspectives have indeed become the corner stones of any modern day model on productivity management. These perspectives have been very elaboratively examined by many contemporary authors including Ramsay, Prokopenko, Prem Vrat, Sardana and Sahay (Productivity Management: A Systems Approach).

The second part of the book comprises of 'Country Papers' which constitute a basic asset. The papers in this part deal with sectoral development and focus on approaches that suit local, social, cultural, economic and political settings. In many instances unique productivity approaches have been developed. Manjural Islam's paper on Bangladesh highlights its unique problems: one of the most densely populated countries, lowest per capita income, predominately an agriculture country and a low national productivity index at 109 (1990-base 1985 = 100). The author has emphasized the role of the management, Govt., private sector and partnership between the developed and developing countries to improve the productivity.

In 1990s, the Republic of China (Taiwan) achieved the economic level of developed countries. Yang Kuan-chang in his paper on ROC argues that this was largely possible because of privatization which not only brought in competition in industry but improved the overall efficiency of the economy. ROC has taken up steps to accelerate the liberalization programme and privatization of state owned enterprises.

Jagdishwar Singh in his paper on Fiji focuses on the role of quality of managers and importance of management development for productivity. The author details

efforts made in this direction by Mt. Eliza International, a non-profit organisation. Activities at the institute towards its clients are fully integrated to the business plans of the organisations.

Country paper on Hong Kong by Joseph Wing Sang Poon details services offered by Hong Kong Productivity Council (HKPC) to promote excellence in productivity. Hong Kong manufacturers have already moved up the value adding ladder of design and innovation in place of low value adding labour orientation. In consonance with this environment, HKPC offers programmes which enhance development of people, process, product and partnership.

M.L. Surya Prakash in his paper on India provides a brief review of work carried out by National Productivity Council of India (NPC) towards propagating and promoting productivity consciousness in India. At micro levels are productivity awards, institution of Productivity Day and Productivity Month and the holding of seminars. At macro level, NPC undertakes unit level studies and creation of awareness. The paper is very sketchy and does not do full justice to NPC. These who work in industry know the splendid work carried out by NPC in productivity movement.

Country paper on Indonesia by Masrul. S. concerns the role played by the Regional Productivity Development Board (RPDB) in the province of Jambi. RPDB carries out activities of providing training, extension services, consultation, guidance and undertakes productivity measurement. It has also instituted Productivity awards named 'Paramakarya' and 'Siddhakarya' given annually to companies. One highly innovative activity carried out by RPDB is to select a village and to make it the most productive (Productivity Village) as a model for the companies as well as for the society.

Kamarul Bahari Bin Yaakub's paper on Malaysia presents a thoroughly researched detailed account of how Malaysia has achieved tremendous increase in productivity since late 1980s when private investment was promoted through major policy changes. Automation, skill upgrading, improving process, reducing wastage and productivity performance incentives are the important productivity measures adopted. Towards this achievement, National Productivity Corporation has played an important role in the involvement and enhancement of productivity culture. Vision 2020 envisions Malaysia as a fully developed nation by the year 2020. The author brings out the challenges and the tasks ahead for the civil service, corporate sector and the NPC. It is a highly thought provoking paper.

Country paper on Mongolia by Pagvajav-Un Shurchuluu details programmes and activities of National Productivity and Development Center to help companies become the learning organisations. Mongolia is facing acute socio-economic difficulties with low productivity, rising production costs, lagging capital formation and insufficient growth rate. NPDC has developed vision, mission and goal for proper orientation. Philippines is yet another country where productivity movement has taken strong roots. Caridad F. Aspiras in his paper on Philippines describes the role and actions of Philippine Quality and Productivity Movement Inc. (PQPM) a non-stock, non-profit organisation to promote quality and productivity in key sectors. PQPM represents the private sector in multi-sectoral committee, has instituted Malcolm Baldrige National Quality Award Criteria and has adopted programme thrusts towards training, productivity related policies, staff capability building etc. Shamila Razaak's paper on Sri Lanka highlights some of the important strategies as adopted by the Govt. to improve productivity in the country which has a higher literacy rate, higher life expectancy, lower death rate better quality of life, yet is less developed. The author considers that the primary role of the Govt. would be to create awareness for faster growth.

Country paper on Vietnam by Pham Ba Cuu mentions gains of improvement in productivity since the implementation of economic renovation started 10 year ago. GDP has doubled. The author recommends human motivation as a very important factor to improve quality and productivity. A new approach has also been suggested to measure productivity.

Kiribati faces many physical constraints: land area of only 810 sq. km, 33 coral islands, smallness and remoteness, Ioataake Timeon in his paper counts private sector and privatization of public enterprises as important steps towards economic growth and productivity.

Without doubt the book under review should prove to be of great value to administrators, researchers and to all those who are engaged in the profession of propagating productivity movement.

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Cotton Textile Industry *by P.S. Mohana Kumar*, Reliance Publishing House, New Delhi, 1997.

In the present book the author has sought to bring out a comparative study of the productive and financial

performance of the public, private as well as co-operative sector spinning mills in Kerala, which are also categorised into small scale and medium scale. He employs a number of appropriate indicators for measuring performance. For instance analysis concerning technical efficiency, productivity, cost structure, capacity utilisation, profitability, technical change etc. are done in the course of the book. The first chapter clearly delineates the research design, issues, objectives, scope and coverage of the study, besides putting stress on the hypothesis which lays down that private sector is more efficient than public sector, that there is a direct relationship between efficiency and firm size, that larger the firm-size, greater is the capital intensity and lower is the capital productivity.

An elegant outline of the origin, growth and structure of the cotton textile industry with special stress put on the state of Kerala has been provided in the second chapter. On can have a concrete idea about the technical processes relating to cotton-yarn spinning. The next chapter Sector-wise and size-wise comparative focuses on different types of productivities (sector-wise and size-wise comparisons). The results are divergent and often violate the hypothesis regarding firm-size, ownership and productivity, thus rendering difficult the relevant policy prescription.

In Chapter 4 the technical efficiency considerations are considered and in this context due reference has been made to the frontier and best practice techniques given by Farrel and Salter. Employer of a deterministic frontier production function is a commendable attempt to measure inter-firm differences in efficiency. The study indicates 100 per cent technical efficiency of the private sector firms. Capacity utilisation coefficient which largely deterrhine technical efficiency has been fully analysed in the next chapter five. The private sector followed by NTC mills constantly display high utilisation percentage as well as low year-to-year variation compared to KSTC and co-operative sector. The author has undertaken the pains of conducting floor-level interview to elicit the basic reasons lying behind underutilisation of productive capacity in many of the mills. The impact of production efficiency, capacity utilisation etc. are generally reflected in the movement of profitability which are deftly analysed in chapter six through several ratio parameters.

Any analysis of the differential performance of various category of mills would remain incomplete unless the respective cost implication are taken into account and this finds reference in chapter seven of the book, which makes use of appropriate statistical tools to analyse the cost data. And the eighth chapter is devoted to the analysis of technical change of spinning mills in Kerala.

The last chapter sums up the findings of the study along with a note of conclusions and policy recommendations which are well argued and meticulously thought out. Finally the list of tables and bibliography at the end may be of immense help to any researcher working on textile sector. Overall the book is valuable contribution to enhancing one's understanding of the differences and problems of functioning of spinning mills.

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GATT/WTO: Trips, Trims and Trade in Services *by N. Gopalswamy,* Wheeler Publishing, 1998, Price: Not mentioned.

The boost to global trade after the signing of the Uruguay Agreement and the setting up of the WTO has been one of the most important hall marks of the last decade. But despite the gains from the new multilateral trade agreement there has been much debate about its actual implications for both the developed and the developing countries. Critics have pointed to various negative aspects of many of the provisions of the agreement on the developing countries. This book, which seeks to clarify some of the important provisions regarding measures of trade in property rights, services and investment measures, is a welcome addition to the list of books which has come up on the subject in recent times.

And though the book focuses on these three significantly important areas which has been subject to much debate in recent time it takes care to put the issues in its proper perspective by discussing the evolution of the GATT agreement. The annexures gives additional information on the broad contents of the various agreements. Some of the earlier chapters also discuss in detail the organisation and structure of the World Trade Organisation and its implications for the growth of regional blocks and for developing countries like India.

Almost one third of the book deals with aspects related to the trade in intellectual property rights. The chapters on the intellectual property rights investigate the various issues relating to copyrights, trade marks, designs and patents and also give at the end of the chapters the legal provisions on these issues under the existing Indian laws and also the points of contention between the different players. Areas of special interest in the Indian context like drugs and pharmaceuticals, agriculture, textiles, trade and environments and social services are discussed in separate chapters.

The chapters on trade related investment measures and trade in services are not adequately dealt with because the on growing progress in these areas is much slower presently. Here also the author takes care to focus on the areas of particular interest to developing countries. The Indian context is also discussed in detail.

The information contained in this book is a good guide for all beginners interested in the exciting changes taking place in the area of international trade. One major drawback is that many of the chapters are so cluttered with information in bits and pieces on almost all related aspects of international trade and Indian trade policies that it often becomes a hurdle for smooth reading. A lot of editing would have surely increased the readability. Other things missing is a bibliography of the original materials used for writing the book and a subject index.

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Quality Samurai by *T.R. Natarajan and Edwina Pio*, Macmillan India Ltd., 1999.

Indian Economy has just started changing its dominant colour from protectionism to market place competition. Its entrepreneurs have therefore been in the beginning of readjusting their competency profile to meet rising competition. Strengthening marketing competency has been the first choice for Indian businessmen to enrich its capability to meet competition. Acquisition of high- tech system and machinery follows closely thereafter in their calculation of combating growing competition. One may think that the making use of employees' hands and heads is the easiest thing to do but on looking at the reality, it is the most difficult one. Changing mindset is the toughest exercise on the part of those who are placed in the upper strata of Indian society. This is also globally true. Western management took at least three decades to appreciate huge potentiality which are left untapped with the employees and which can be made use of in building up appropriate competency in a cheaper way to face competition. That is why Japanese industries took a lead in many sectors during eighties. It is, therefore, at this juncture open to Indian management to decide which routes – installing high cost high-tech solution or changes is style and structure to utilise employee potentiality fuller or a hybrid one – Indian managers need to follow. The title of this book is just a stimulant to Indian top managers to think in this line.

The book comprising 19 chapters presents various aspects of a new management approach termed as Total Quality Management (TQM) in a very lucid manner. The book is replete with many stories and anecdotes to explain various principles of TQM. Almost all the important aspects of TQM covering employee empowerment, management's new role to facilitate employees, team working, communication etc. which form foundations for TQM are included. Besides in a very interesting manner some of the basic Japanese management practices like Kaizen, Quality Circles and 5S are discussed. The style of presentation in all the chapters has been unique and interesting to experienced managers who may be afraid of reading serious stuff on the subject.

The style of presentation though praise worthy may not be liked by many of Indian readers who may like to read this subject more as a "subject matter" to satisfy their intellectual persuasion. The book is not definitely a text book as it does not speak about theories and their explanations. Nor it has adopted a book style of describing prescriptive details of methodologies – what to do "step by step". The later kind has been so much rampant in the set of current day publications that one gets impression that there are no principles indeed to be learnt.

This book is an interesting reading for Indian managers who prefer to learn the basic principles through a light reading. The reviewer whole heartedly recommends the current book to this group of readers. Students of academic institutions may not find the book an interesting and useful one. Consultants and practitioners may not find the book providing any serious coverage of the subject. But they may find many of the stories and anecdotes useful for their uses while explaining serious staff.

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In Search of Cooperative Values *by D. Jha*, Vikas Publishing House Pvt. Ltd., New Delhi, Rs. 225.

Cooperatives are unique type of organisations with its institutional characteristics, ownership and operational components. It acts as a means to ether the free market economy or with the utmost socialist pattern of development. Therefore, many a times cooperatives are referred as alternate institutions and organisation of development. The fundamental component which enables the cooperatives to this uniqueness is the cherished values it uphold irrespective of environment – political or economic.

The book under review is a deep search and insight into the evolution of cooperative movement in India with

it's cherished value systems. It apprises the present state of cooperatives vis-a-vis the value systems which sustain the very concept of cooperation. There is concern over the identification of cooperatives as government agencies either as a tool for achieving the plan targets or for politics mileages. Such cooperatives are not autonomous or democratic either. The book therefore raises the fundamental question as should all the cooperatives be alike? Right answer to this question must be finding the essence of cooperation, the essential institutional variables and their structure in different type of cooperative establishments. Today cooperatives are at crossroads in search of these variables. The biggest question mark, however, is their sustenance between the approved values and viability as commercial entities.

The second chapter is a smooth pilgrimage through the cherished cooperative values and the dilution it has undergone over the years. The author questions the new generation of cooperators on their beliefs and commitments. The fundamental character of mutuality and honesty is highly emphasised to uphold the cooperative values. It is convincingly argued that once the basic concept of mutuality is approved, other values like equity, equality, democratic outlook, autonomy, everything will follow it. This perhaps brings in the transparency in their commercial operations as well.

The book further attempt to conceptualise the cooperation as a discipline. A set of behavioural patterns it bring forth for the members. The effectiveness of cooperatives lies in this set of behavioural patterns and the members adhering to it. Coupled with this the dedication, determination and pooling of resources as capital sources make the cooperative superior. The author has convincingly gone to the extreme step of saying that cooperatives are the outcome from the imperfections of the market economy. As cooperatives does not have the individual risk as in the privately managed owner operated establishments, their chances of sustainability is more.

The book is a sincere attempt to bring out the factors that cripple the cooperative movement. Chapter 5 is fully devoted to identify and explain practically what ails the cooperatives. A series of factors are identified. For instance, the absence of cohesive union of persons, lack of member participation, deviation from democratic management etc. are critical among them. Therefore, the areas for rejuvenating cooperatives are also identified. In order to compete with the international mercantile capital, the book emphasis for the components such as state of the art technology, professional and managerial skills, capital mobilization, and above all a committed and visionary leadership. The book categorically argue for an image building initiative from the cooperators to ensure their sustainability in the new competitive world environment.

The book also deals in elaboration with the areas of cooperative principles, guidelines with its evolutionary phases etc. The author believe that in the 21st century, cooperatives are the alternates to save the mankind from the political and ideological evolutions. Altogether, the book is a timely dissemination of new thoughts and idea to change the dimension of cooperative focus from the protected environment to an eternal horizon. The most important revelation of this book is that if the outcome of the rich experience of the author in cooperative movement and his concerns for the future of cooperative organisations.

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Controlling Pollution—Incentives and Regulations *by Mrs. Shekhar Mehta, Sudipto Mundle and U. Shankar,* Sage Publications India Private Ltd., New Delhi, 1997, p. 144, Rs. 250 (cloth).

In any industrial process, by which the raw materials are converted to finished products, waste generation is unavoidable. Over the years, these wastes were managed through strategies like IGNORE, DILUTE or CONTROL. The Governments across the globe were trying to enforce the environment regulations through Command and Control mechanisms, while the industries continued to view the pollution control investments as a burden on their exchequer. In India, in spite of all the strict environmental regulations, the ambient air and water quality has been deteriorating day by day. Many reasons can be attributed to this. Poor enforcement, lack of concern and commitment to the environment, low prosecution success rate, etc., can be some of them. However, to alleviate this situation, it is high time that we come up with an alternative to the 'Command & Control' regime, whereby one can take the industries in the stride towards proper compliance of the regulations and a better environment.

Pollution Prevention or Waste Minimization is seen as a proactive approach to deal with the industry's waste related problems. This approach is now being promoted by the Indian Ministry of Environment itself, among the industries; by which the industries' overall productivity is increased simultaneously bringing down the strain on the environment. Waste, though low in quantity, will however be generated in these

conditions too; which has to be appropriately treated before disposal.

The second section is the crux of the book, where the whole concept of incentives is taken up. It highlights various pollution control systems and policies existing in the developed countries, as well as their experiences. The authors have also suggested a choice of these instruments that could be applicable to the Indian conditions. The authors have also recommended a 'Standard and Incentive Regime for Pollution Control in India' which takes care of factors like Compliance, Collusion and Harassment. This appears to be a good recommendation, which could be taken up for further deliberations.

The authors have come up with a menu of four different pollution control regimes, which are applicable to only point sources for which the net operating costs are positive. Industries emitting hazardous and toxic emissions are not covered by this scheme. *The attempts made by the authors are though good enough; the absence of environment specialists stands glaringly exposed in the options evolved.* The option #1, which involves government clean up, would mean the government playing the double role of complying agency cum enforcer. This would mean a clash of roles as well putting into doubt whether the whole system would take a turn for the worse. There could be a lot of associated management problems also associated with this. Option #2, with a third party operating the clean up operations already exist in the form of Centralized Effluent Treatment Plants (CETP's). However, these plants also face a host of management problems especially regarding charging from the individual units, monitoring of the waste parameters and appropriately treating these wastes by proper segregation.

The option of tradable permits may give rise to a lot of hue and cry by agencies viewing it as selling the right to pollute. However, it may be construed that for sustainable development, the economy and environment have to co-exist. The baseline or the existing environment status has to be properly ascertained and the permits have to be very judiciously issued with appropriate bodies keenly watching the trade proceedings and the ambient environmental status. This option could be used as a good tool for regional planning to event out the concentrated environmental degradation, rather than at existing industrial sites. However, the other existing regulations have to be incorporated with this option for if the same has to be implemented separately, it would mean increasing the administrative hassles.

Section three of the book is an attempt to validate the model developed by the authors using the data on effluent emissions from a pulp & paper plant. However, the actual validations would be possible if the team can validate the same during an actual environmental audit study. Section four concludes the study.

Though the attempt made by the authors may be well appreciated for their initiative and the field chosen, lot of work has to be put in, along with specialists of the concerned field, so that appropriate solutions can be developed with mutual consensus, and have them put up to the policy makers for further deliberations and adoption of the same as a viable alternative to the existing pollution control regime. The book as such can only be recommended as a base material to those who do research on these lines, to develop the models further and cover up the gaps left by the authors.

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Professor G. Parthasarthy's Writings on Indian Rural Economy in Transition, edited *by D. Rajasekhar,* Printwell Publishers Distributors, Jaipur, 1998, p. 236, Rs. 400.

Post-independent India has witnessed several structural changes in Government policy which focussed on poverty alleviation. Towards this end the Government has pursued a nation wide interventionist policy. Land reforms (Land Ceiling Laws and tenancy Reforms) were introduced to bring in institutional changes. Commercial banks were nationalised so that credit became more accessible to the poor, including marginal and small farmers. Several agricultural development programmes of national importance have also been implemented, to make a dent on rural poverty.

What has been the impact of these changes on rural poverty and the rural poor? What was the impact of a modest growth in agriculture on rural poverty? If positive, what was its nature? What was the impact of technological changes on agrarian structure and poverty? Did it have an impact on the access of land to the poor through lease market and on employment opportunities for the poor? What has been the impact of anti-poverty programmes on the rural poor? If positive, will it be sustainable in the long run? What policy changes are required to sustain growth with equity in rural India? In light of these, Prof. Parthasarathy's writings on land reforms, macro issues on rural development, HYV technology, poverty alleviation, dynamics of rural poverty etc., are of immense importance.

Prof. Parthasarthy has strongly argued for land reforms as the land was concentrated with land lords, and absentee land lordism was popular. The green revolution discouraged land reforms and strengthened the consolidation of holdings as it was proved that the usage of new technology, HYV seeds and other modern inputs give positive results if the holdings are larger in size. The large farmers stopped leasing out the land to the marginal, small and landless as they were not in a position to implement modern technology and inputs. This has led to a lack of access of land to the weaker sections. Therefore, tenancy legislation was strongly advocated to benefit the weaker sections. He warns that "if the renewed rhetoric on land reform is not supported by required political will, the most likely prospects are further deterioration of access to land for marginal owners and landless, growth in informal tenancy and more insecure conditions for tenants affecting not only equity but also growth".

To make the marginal and small land owners sustainable, Parthasarathy advocates that these farmers have to go in for crop diversification from less remunerative crops to more lucrative ones. To make this possible special employment programmes should concentrate on land and water resources development and infrastructure for human resource development.

The conclusions drawn in this volume were based on a wide variety of data sources. Macro data (from NSS, population Census) on land ownership, poverty, unemployment, etc., have been used for the purpose. The arguments made in the papers are weighed in the light of evidence from other studies—both at micro and macro levels. Some case studies have also been included to obtain greater insights into the process.

This book raises several researchable issues and policy questions notably on rural poverty, tenancy, labour, employment, unemployment and provision of minimum wages etc. Therefore, it will be of considerable interest to the researchers as well as to the policy formulators, especially in the context of current structural adjustment programme and the need to carry out the reform process with a human face.

To conclude, these articles are concerned with rural poverty, its dimension and alleviation, and deal with a wide range of issues related to the transition process of the Indian rural economy. It is, therefore, an asset to the researchers and educational institutions. Though at first glance it may look like 'old wine in a new bottle', the recommendations made in the writings of Prof. Parthasarthy are still worth examining as long as poverty and unemployment exist in developing economies like India. Dr. Rajasekhar has done a commendable job of editing these articles and organising the material found in this volume.

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Empowerment in Organisations: How to Spark Exceptional Performance *by Judith F. Vogt. and Kenneth L. Murrell,* S. Chand and Company Limited, Ram Nagar, New Delhi-110 055, 1997, p. 246, Rs. 600.

This book containing 10 chapters attempts to explore the concept and to suggest strategies and approaches to empowerment. Further, the authors have also discussed about the future organisation structure emphasizing empowerment for individuals and organisation.

In the introductory chapter they briefly discuss about the changes in the society with a view on the evolution of the empowerment concept. The authors say that still the concept of empowerment has not yet clearly defined; it probably meant that 'empowerment as an interactive process based on a synergistic, not a zero-sum, assumption about power'. They appreciate the professionals for their interventions focusing on self and organisation development. Empowerment is not an outcome but is a process begins with self development and goes into group organisations, nations and society on the whole.

Chapter 2 focuses on the opportunity of crises, numbering six i.e., the energy crisis, crisis of confusion, crisis of conflict, crisis of stress, crisis of alienation, and spiritual crisis. The authors believe that every crisis is an opportunity for organisations and individuals to develop in future.

Third chapter explores about leadership for empowerment. They say that concept of power in leadership should be redefined. The concept of control should be replaced by facilitator. The authors also discuss about the managers empowerment role which broadly classified into informing, deciding, planning, evaluating, motivating and developing. Each role is explained with the help of case vignette.

In chapter 4 the authors looked at some foundations of the concept of empowerment wherein they reviewed evolution of the concept. Further, emphasis is laid on concepts like motivation, values, leadership, environment, adult learning, organisations, structure, systems

integration and its relations with empowerment, and also gives comprehensive explanation regarding the correlation between empowerment and these concepts.

In chapter 5 exploring framework for empowerment, views of Kanter, Murrell, Thomas and Velthouse on empowered behaviour have been explained along with analyzing the OD-empowerment relationship wherein they argue that OD focus on organisation development through individual growth. Finally, a process model of empowerment has discussed. The authors say that individual commitment is central to the process of empowerment. Concepts like communication, trust, participation, competence, teamwork and quality also help in the process of empowerment. The next chapter discusses about six characteristics of managerial and organisational empowerment behaviour through 18 case vignettes. The authors attempt to explain these characteristics are met, making the reader to understand the concept more clearly. Further, the authors claim that effective group is the vehicle for empowering organisation.

The parallel action empowerment has been emphasized in chapter seven saying that individual empowerment and organisation empowerment has to go together then only the process of empowerment is complete. In the chapter 8 the authors discussed about two empowerment strategies/interventions. The first intervention is about the various strategies of empowerment like systemic empowerment, structural, programmatic, individual and managerial empowering interactions. They also talk about some caution to be taken and have given various criteria for evaluating empowerment intervention. The second empowerment intervention, is an holistic approach, mentioning about theory Z, leadership, enhancement, cross-cultural competency, training and adhocracy.

In the next chapter the authors evolved seven principles required for enacting empowerment in the organisation and also analysed various steps for empowerment process. They emphasized that an external resource person will enhance the process of empowerment. Further, focus was on aspects of planned change and development of self, which they claim will enrich the empowerment process in organisation.

The chapter 10 begins with a brief description of the future individual work life in empowered organisation along with five settings for future empowerment, wherein five fields i.e., education, health care, law, government and business are discussed.

The authors concluded the book by describing process of power drive which empowers individuals and the organisation as well.

The present book on empowerment is simple and nice to read. The authors presentation style is good. The authors limited the scope of the concept by referring only to American organisation and society, further they didn't talked about its applicability to other cultural settings. The reader may find repetition of some concepts. This book is recommended for managers especially at the middle and top also for general public to know more about future empowered organisations. Students can also get some benefits for their conceptual clarity and to understand future trends in empowerment.

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