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Corporate Social Responsibility – An Ideological Whitewash or A Transformational Elixir?

Subrata Chakraborty

Ever since business activities started in an organized manner, tussle began between its two major perspectives – economic and social. Eventhough apprehensions have been expressed that in order to become socially responsible, business may have to sacrifice its primary goal of wealth creation, the concept, as such, is not rejected. Efforts continue to find an appropriate operational approach which can dovetail the two perspectives and create a win-win situation for both business as well as the society. This paper is an attempt to examine the issues involved and to explore the feasibilities of coming out with an operational approach.

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The subject of corporate social responsibility appears to be saddled with controversies. Views greatly differ on the question of accountability. Arguments swing from one extreme, advocating total moral accountability to the other, suggesting that, any serious concern about doing social good may be detrimental to the economic goals of business. This raises a question mark on the very concept itself, not just on the steps of its implementation. According to Jones (1996) the concept of corporate social responsibility is not viable in the presence of a historically grounded understanding of capitalist political economy. Through-out the 1960s and 1970s, scholars searched for a definition of a corporation's social responsibilities. (Wood, 1991b). An analysis of the literature on the subject of business and its relationship with society indicates that much of the discussions fall into either of its two dominant orientations – property rights and citizenship rights – both having been examined from an individual's standpoint instead of being looked at from viewpoint of citizenship's collective responsibilities.

The concept of corporate social responsibility is not viable in the presence of a historically grounded understanding of capitalist political economy.

There are diverse views on how organizations are to be seen vis-a-vis the living beings. Whilst some take the position that corporations are not organisms and are more like machines (Danley, 1990), there are others who advocate that corporations can be held morally responsible for their actions (Donaldson, 1985; French, 1990). Some take a middle path advancing that, though the corporation may be a secondary moral agent, it is not

morally autonomous (Werhane, 1985). These debates, over the years, appear to have overshadowed the very purpose with which the concept was initially proposed, resulting in a polarisation of thoughts and absence of a clear definition of what corporate social responsibility really is.

Carroll (1979) observed that "the social responsibility of business encompasses the economic, legal, ethical and discretionary expectations that society has of organizations at a given point in time". In the words of Frederick (1986 a) "The fundamental idea of corporate social responsibility is that business corporations have an obligation to work for social betterment". Davis (1973) offered the classical definition of corporate social responsibility as "the firm's consideration of, and response to, issues beyond the narrow economic, technical and legal requirements of the firm... (to) accomplish social benefits along with the traditional economic gains which the firm seeks". All these, while shedding some light on an otherwise confused issue, leave it far at an abstract level without providing clear answers to certain contentious questions that often arise during implementation.

Apparently, there is a tussle between the two schools, one champions the cause of legal rights while the other speaks about moral responsibilities. To disentangle from this endless debate a suggestion has been made that we break away from the mould of economics-versus-ethics, ethics-versus-social control and move away from the mindest that social responsibility is all pain-and-suffering (Wood, 1991a), so as to be able to appreciate the social obligations of business. There have also been suggestions to replace the concept of corporate social responsibility with, something like, "corporation and the good life" (Freeman, 1991) instead of simply carrying on with the fruitless debate between what Swanson (1995) calls, the economic and the duty-aligned perspectives, and searching for a trade off. Certain issues remain contentious, particularly those which implicitly or explicitly suggest the need for changing any of the long held orientations of business.

Despite this divergence in views, the idea *per se* has not been rejected. Much of the debate is focussed around the question of feasibility, not so much on desirability. Even those who oppose the concept because of its possible adverse impact on business's prime goal of wealth creation, do not seem to be really averse to it, if it can be shown that economics and ethics are compatible objectives. The suggestion to shift away from a somewhat abstract concept of corporate social responsibility to a more tractable one, like corporate social responsiveness (Frederick, 1978; Walton, 1988) is perhaps indicative

Much of the debate is focussed around the question of feasibility, not so much on desirability.

of a desire to find a suitable operational philosophy. In fact researchers, over the past decade or so, have been working to develop an appropriate implementational framework (Wood, 1991b; Jones, 1996) which can integrate economics and ethics meaningfully, and make the concept operational.

Ongoing Debate—A Synthesis

On taking stock of the viewpoints expressed in the ongoing debate, it appears that these can be grouped into four broad categories, viz., fundamental, contractual, conceptual and moral. While fundamentalistic views are considerably different from those of the rest, authors expressing either a contractual or a moral view seem to differ only on the question of how exactly "business accountability" can be defined and made operational in the overall context of creation of social good. Conceptual debates have been largely concentrating upon the issue of finding a suitable method of implementation rather than focussing on things like rights, economics or ethics.

The fundamentalists hold a somewhat radical view on the subject, as evidenced from Friedman's (1970) statement, "Business of business is business". According to some of the authors holding this viewpoint, any attempt to tie business, implicitly or explicitly, to anything other than its economic responsibility may undermine its prime goal of wealth creation. Levitt (1983) goes to the extent of saying that any effort made in the direction of corporate social responsibility of business can be bad for business as well as bad for the society. According to him, business should see itself as being" at war... And like a good war, it should be fought gallantly, daringly and above all not morally". Klonosky (1991) observes that in the traditional stakeholder model (Bruono et. al, 1990) corporation managers and directors only have the responsibilities to the owners of the firm. According to Klonosky (1991), the more fundamental question, however, is whether corporations are to be considered as social institutions. In the words of De George (1990) "Corporation is an autonomous entity, ...owned and run by a freely constituted group... It is not a creation of society. The corporations, seen from this point of view, are fully private and economic institutions designed only to make money and hence, have no moral or social obligation".

"Business of business is business".

The proponents of moral theories can be further divided into two subgroups based on the views they express. One of these subgroups maintain that corporations could be treated much the same way like human beings, hence they can be held morally responsible as well as accountable for actions within their control (Werhane, 1985). Those who advocate a social contract theory are also included in the same group for the purpose of the present discussion. This subgroup observes that business is fundamentally a social institution and hence has social responsibilities, and points out that corporations are servants of the larger society (Bruono et. al, 1990). According to Sohn (1982), a corporation is an institutional citizen, has duties as well as rights and privileges. Anshen (1983) argues that there is a social contract for business eventhough this contract may be an "evolving document". Desjardins (1990) opines that corporations exist only because individuals come together to carry out jointly the business of producing goods and services and the particular form of that joint activity in any society is determined by social norms. He points out that the conclusion of the corporation being social by its very nature, is inescapable. Corporations, according to French (1990), are not only to be held responsible but be treated as fullfledged moral persons. These articulations, while bringing to bear societal expectations about how corporations should behave and be responsible for various acts of omission and commission, throw up several questions especially in matters related to practice. Looking at the confusions that prevail at the operational level, Walton (1988) raises certain fundamental questions which are of significance to the researchers involved in the development of moralist/social contract theory. These are:

- What precisely defines the range of an organisation's obligations?
- Is a firm's ethos different from its conscience?
- Who is primarily at fault when things go wrong, the entity or the individual?
- Are morale and morality transferable terms?

Walton's (1988) questions merit some thought, particularly in today's post Fordist era (Hall & Jaques, 1989) of business, characterized by network-based production as the dominant model of business organisation.

Even as early as in 1965, Ayn Rand (1985) expressed somewhat similar views saying, "Yes, this is an age of moral crisis... Your moral code has reached its climax, the blind alley at the end of its course. And if you wish to go on living, what you now need is not to return to morality... but to discover it". "What is morality, or ethics? It is a code of values to guide man's choices and actions – the choices and actions that determine the purpose and course of his life. Ethics, as a science, deals with discovering and defining such a code... No philosopher has given a rational, objectively demonstrable, scientific answer to the question of why man needs a code of values. So long as that question remained unanswered, no rational, scientific, objective code of ethics could be discovered or defined. The greatest of all philosophers, Aristotle, did not regard ethics as an exact science; he based his ethical system on observations of what the noble and wise men of his time chose to do, leaving unanswered the questions of: Why they chose to do it and why he evaluated them as noble or wise".

Perhaps this lack of a rational, scientific and objective code of ethics is responsible for the kind of difficulties experienced in the implementation of the concept leading authors like Mahon and McGowan (1991) to ask a few probing questions.

- When is the organisation expected to act in the interest of the "common good"?
- Where is the "common good" best served by organisational actions?
- Who is to perform the evaluation of (1) and (2) above, and when is to be undertaken?
- What degree of common good is to be taken into account?
- What costs are to be considered in such assessments of the "common good"?

Seemingly, the perception of the so called "common good" remains an innate concept, something similar to the Kantian (1929) view of *a priori* knowledge. Thus, a consensus on issues like how to measure social performance of a corporation and who should do such measurement evaluations is likely to remain an elusive goal, despite all the efforts that had been put in so far to resolve the controversies (Wood, 1991b).

Frustrated by such experiences, some scholars have turned to public policy as an alternative to social responsibility (Buchholz, 1977) with the conviction that society can choose to allocate its resources the way it wants, using criteria that it deems relevant and can seek implementation of the policies through legislation. Further, when business acts in manners contrary to normal expectations of society, only public policy can replace the dictates of the market.

Public policy approach appears *prima-facie* advantageous in some ways. Firstly, it brings to the fore the institutional context of business. Secondly, it can greatly facilitate operation of the concept that otherwise seems to remain something like a pious doctrine. Thirdly, the governments, especially in democratic set-ups, have the legitimate right to act on behalf of citizens in manners that could shape corporate behaviour so that the same matches the expectations of the society (Buchholz, 1991). Public policy approach, therefore, does help in providing an escape route from subjectivity and vagueness and also comes up with an operational alternative which, undoubtedly, is a more objective and value-neutral basis of measurement.

However, to rely on public policies in order to make corporations behave in a socially responsible manner, has the possible danger of corporate social behaviour being measured purely on the basis of absence of certain vices, punishable by law; and not on the presence of necessary virtues, valued by the society. Hence, there exists a distinct possibility of creating an environment in which the legal boundaries of performance are seen as moral limits of action. Therefore, eventhough the public policy option may be helpful in lending operationalization to a somewhat innate concept, its adoption by the society could also mean taking away the very heart of the concept, in view of the possibility of its ignoring the deeper value issues. Be that as it may, it is the public policy orientation that seems to have given birth to an alternate concept called corporate social responsiveness or CSR 2. According to its proponent, corporate social responsiveness refers to the capacity of a corporation to respond to social pressures (Frederick, 1978). CSR 2 tries to establish a link between a corporation's internal operations with those of the expectations of the society. The arguments in favour of CSR 2 are: corporations adopting this concept would be in a position to identify what needs to be done and what capabilities are to required to do those, thus enhancing the ability to develop operational linkages between what and how. Notwithstanding the suggestion to adopt corporate social responsiveness (CSR 2) in place of corporate social responsibility (CSR 1), so as to make things operationally workable, none other than Frederick himself pointed out the indispensability of ethics in corporate affairs. In fact, in a subsequent recommendation (Frederick, 1986b) suggested that the term 'responsiveness' in his CSR 2 be changed with the term 'rectitude' so that the importance of remaining morally upright is not lost sight of, naming this modified model CSR 3. While recommending CSR 3 (Frederick, 1986b) observed, "In viewing the social performance of corporations, we look for more than mere responsibility and more than mere responsiveness. We want corporations to act with rectitude, to refer their policies and plans to a culture of ethics that embraces the most fundamental moral principles of human kind."

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Inspite of all these suggestions and developments the pivotal controversy that continues to plague the entire debate is whether moral character is an essential property of corporate existence (Dunn, 1991). Perhaps inadequate understanding on matters like how corporate response to societal needs is to be measured is primarily responsible for this state of affairs. Indeed, there could be other factors too, contributing to the present state of things. The key concern, however, is how can the relationship between business and society be made more symbiotic, each contributing to and benefitting from the development of the other.

New thoughts are emerging on matters like corporate mindset, organisational management systems and day-to-day operations including the individual level activities. Looking at the current trend in thinking, it seems that the belief at the moment is, corporations could be left to exhibit responsible behaviour much on their own, rather than be compelled by legal forces, excepting only a few bare minimum regulatory laws. However, corporations must be made aware of what is expected of them in clear and operational terms. Wood (1991b) addressed this important issue by suggesting a model for analysing corporate social performance. Significant contribution from Wood's work is the demonstration of interrelationships among the following topics:

- Principles of corporate social responsibility expressed on the institutional, organisational, and individual levels.
- Process of corporate social responsiveness as environmental assessment, stakeholder management and issue management.
- Outcomes of corporate behaviour as social impacts, social programmmes an social policies.

Research works of more recent times (Swanson, 1996; Jones, 1996) have been examining Wood's

model from different perspectives, keeping in view its application potential. The focus seems to be to find an answer to the most pressing question: how can and do corporations contribute to constructing "the good society"? In their search for a satisfactory answer to this question researchers are proposing new kind of relationships between business and society and are also looking into the concepts of value based management (Sivakumar, 1985; 1996). Notwithstanding these advances, Huse and Eide (1996) observed that the principles and processes of stakeholder management are still conceptually at an embryonic stage.

Emerging Scenario of Business

Several changes that took place in business environment during the past couple of decades, especially those occurring in the more recent years, have directly or indirectly emphasized the need for business organisations to become more 'caring'. Slowly, the business is beginning to appreciate the fact that it stands to gain from improved relationships with owners, customers, suppliers, employees and the natural environment. Simultaneously, the competitive pressures are forcing business to take a somewhat longer term view instead of being hooked on to the traditional short sighted approaches. It is being realised that no matter how much money a company earns in a year, there is no guarantee that it would do well in the following year. Some of the practices business could overtly or covertly adopt earlier to externalise cost and enhance its own gains may no longer be possible because of growing environmental concerns and the consequential increase in watchdog activities. Steiner and Steiner (1985) observe, "people no longer look at goods and services in terms of simple possession and utility, but are also considering the drain the production of goods and services make on world's resources, the working condition in factories where they are made, the pollution their product entails, their reliability and safety and the way the fruits of production are distributed". Quite apart from such pressures and restrictions it seems more than likely that corporations, in future, may get evaluated on their contribution in constructing a good society, given the fact that government alone cannot possibly do all that is needed to provide good quality of life to the citizens. Thus, days of greater cooperation and effective partnerships appear to be on the card, not only for the benefit of the internal operations of business but also to promote cooperation and coordination between business and society. Given the present trend in thinking, it is not unlikely that shareholders in future are seen only as investors, not owners and the management at the apex level gets carried out by an independent agency, and not by the representatives of shareholders. Whether a change takes place in the group that manages a corporation is not really the issue. What is of significance is, future business will hardly be able to function as a totally autonomous entity pursuing its own ends keeping itself insulated from the demands of the society. Already there are signals suggesting that business should get concerned about ecologizing, in addition to economizing. This would mean that instead of being only in the pursuit of finding ways to efficiently convert inputs to outputs, organisations would have to work towards developing symbiotic and integrative linkages with the environment and function adaptively to sustain life. Cooperative linkages and collaborative behaviour are likely to become the important new norms.

Organisations would have to work towards developing symbiotic and integrative linkages with the environment and function adaptively to sustain life.

Smith (1988), drawing a distinction between Japanese and American business states "Japanese and American management were 95 per cent the same and yet differ in all important aspects". "The Japanese corporation is not simply a money making device,... it is a social instrument, it seeks to answer the individuals social, psychological and spiritual needs as well". The Scandinanian countries too have some very significant views with regard to the position of certain non-shareholder interests in the policy of company management (Canon, 1992). These views are likely to make a great impact on the future work of European Countries—including the ongoing harmonisation in the field of corporate social responsibility (Broberg,1996). Many American business organisations are also reportedly moving in the direction of integrating ethical considerations into their decision making processes.

Another interesting development that took place in recent years is in the matter of operational focus shift—shift from result to process. Business today seems to be in a position to appreciate the importance of process. In fact there is a growing realisation that business results are only the consequences and hence cannot be the cause of action (Chakraborty, 1996). Secondly, even if result does trigger action, it either fails to effectively link cause with effect or initiates the corrective action much too late. Need is, therefore, being felt to develop a comprehensive

understanding of the business process so as to be able to map not only the actions and outcomes but also the processes relating to various interactions and integrations. This shift in emphasis towards the process is likely to be of help in designing business processes that can integrate the interests of all major stakeholders, viz, suppliers, customers, employees, shareholders and above all, the society.

Business results are only the consequences and hence cannot be the cause of action.

Some of the recent management thoughts such as, niche marketing, creation and delivery of customer value, mass customisation, business process reengineering, employee empowerment, co-makership with vendor, corporate citizenship, all seem to get derived from the understanding that it is interdependence, not independence, that is going to help business in the coming days. May be the mounting competitive pressures have prompted this new understanding. Whatever be the trigger, a process of transformation seems to have begun – transformation from narrow self centered outlook to a somewhat broader collective orientation. Viewed in today's context corporate social responsibility indeed becomes an ongoing process and not a fixed mission (Klonosky, 1991). Like any other process, this also needs to be monitored by remaining in constant touch with the society so that effective symbiotic relationships are worked out, treating it as an ongoing exercise in catering to the societal needs jointly.

The important question is, whether such a process could really be put in place. There are both apprehensions as well as expectations. Some authors express doubts whether this kind of organic integration between business and society is at all possible (Jones, 1996; Swanson, 1996) given the traditional mindset, created and dominated by the neoclassical economic theories. However, there are others who seem to feel that such integration had been there in the past (Sivakumar, 1985), it is only a matter of revitalising some of the age-old process steps, which, over the years, have become somewhat incongruous.

It is interdependence, not independence, that is going to help business in the coming days.

Towards Promoting a Responsible Behaviour

Usefulness of becoming value driven is being realised now, more than ever before. It is recognized today that all stakeholders are essentially value seekers, eventhough each of them may define the term in their own way. No doubt, value sought by a customer is different from what is sought by a supplier, the two get eventually interconnected. It is hardly possible to deliver value to customers without having a committed group of suppliers. So much so, one cannot develop a committed pool of suppliers without having loyal customers. The analogy is much the same when it comes to corporations own employees vis-a-vis the wider society. After all, corporation draws its manpower from what is made available to it by the other systems operating within the broad societal framework. One can hope to get good people only if the society from where they come is good. Hence, creation of a good society is in the interest of business, given the present environmental scene. To inculcate the necessary value orientation, corporations should look at business from the standpoint of contributions made in improving the quality of life of all its stakeholders, not just the economic goods and services provided. This would mean that while making any decision, the business has to carefully evaluate the gains and losses, keeping in view both short term and long term interests of all its stakeholders, instead of simply looking at things from its own narrow perspective. The term value is to be interpreted from both economic and societal perspectives. The crucial question, however, is how does one go about designing an appropriate framework and use the same to monitor the process of exhibiting responsible behaviour, i.e., maintaining and improving value concerns in every aspect of decision making?

The major challenge that confront business in this era is the question of ethics in business and many corporations are vigorously addressing the challenge (Keogh, 1988). Till date the framework best known to make advancement in this direction is the one proposed by Wood (1991b). The three facets of corporate social performance model proposed earlier by Wartick and Cochran (1985) provided the foundation in Wood's work. These facets are: (a) motivating principles, (b) behavioural processes, and (c) observable outcomes of corporate and managerial actions relating to the firm's relationship with its external environment. Building on the work of Wartick and Cochran, Wood (1991b.) proposed the definition of corporate social performance as "a business organisation's configuration of principles of social responsibility, process of social responsiveness, and policies, programmes and observable outcomes as they relate to firm's societal relationship". Using this definition, Wood provided a conceptual

framework outlining the principles of corporate social responsibility, processes of corporate social responsiveness and outcomes of corporate behaviour, taking into consideration the principles relating to legitimacy, public responsibility and managerial discretion.

All stakeholders are essentially value seekers.

Sivakumar (1985) points out that Indian scriptures prescribed an organisational philosophy which will facilitate attainment of spiritual goals of life and thus define organisation's purpose in terms of promoting social welfare. These scriptures, according to Sivakumar, show how organisations can develop socially responsible stakeholder policies and base their decisions on values. In other words, it appears for Sivakumar's work that value based management is neither a pipe dream nor an impossible goal as far as India is concerned. What is required for its implementation is the will to go ahead with it. To quote Bhagvan Sri Sathya Sai Baba, "Thoughts are responsible for deeds. If thoughts are good, the deeds will be good. If the deeds are good, life will be joyful". (Dividine Discourse, July 30, 1989).

Value based management is neither a pipe dream nor an impossible goal as far as India is concerned.

Experiences of a company like Boeing suggest that ethics is to be approached as a system issue and not just a problem of eliminating faulty practices of correcting bad individuals (Keogh, 1988). In more recent times, work of researchers like L'Etang (1995) contain similar observations. To be able to look at ethics as a system issue and approach the same through a process, certain changes may be necessary on things like business mindset, management system and day to day activities. Perhaps Wood's (1991b.) suggestion to look at things at the institutional, organisational and individual levels also echoes similar sentiments. It is not really important whether the above two articulations bear identical meanings. What is necessary is a conceptual as well as an operational integration between thought, word and deed.

The following mindset level changes appear essential for operationalisation of the corporate social responsibility concept.

* Breaking away from a trade off mentality and seeking congruence between economics and ethics.
* Looking at ethics in its spirit rather than be confined to its letters.
* Treating ethics as a systemic issue, not as an exercise of correction of deviations.
* Seeking integration among the following
  - Organisation philosophy
  - Value based leadership
  - corporate culture
  - Stakeholder policies
  - Value based decision making

An obvious question that will worry the business Leaders is whether this societal orientation will directly or indirectly affect the firm's economic prospects. Yoshimori (1996) looked into this question examining the differences in the concept of the corporation and their possible implications for corporate performance. Yoshimori made a comparison between Japan and the United States and Europe using the Japanese concept as the standard. The concept of corporation, in Yoshimori's analysis, is defined as the answer to the question: "In whose interest should the firm be managed?" He presented three broad divisions, monistic, dualistic and pluralistic, depending on the type of governance prevailing in a country. Monistic outlook being entirely shareholder oriented, treats the firm as private property of its owners. The dualistic concept puts a premium on the shareholder's interest, but the interests of the employees are taken into account as well. The pluralistic approach assumes that the firm belongs to all the stakeholders, with the employees' interest taking precedence. Based on the findings of certain study reports, the pluralistic concept seems to come out better, both on efficiency and equity perspectives, observes Yoshimori (1996). Citing evidences Yoshimori mentioned that pluralistic organisation is not typically a Japanese concept. In Germany and USA too this was thought of and can be made operative. Thus moving towards ethics or operating on certain values are neither new thoughts (Sheldon, 1923) nor something detrimental to the overall interest of business (Yoshimori, 1996). They have been adopted by organisations and are known to produce positive business results.

The next question would be the implementational steps at the organisational level. There have been suggestions to this effect made by researchers and also experiences of organisations to fall back upon. A useful

concept proposed in this direction is moral fractals. Goodpaster (1985) recommended this concept and has shown that the same can lead to differentiation of ethical attributes at different scales of individual, organisation and the system itself. An analysis of the organisations, achieving success in imbibing the spirit of corporate social responsibility, reveals the presence of the following key organisational attributes in them:

- Strong and effective leadership
- Organisationwide commitment
- Concrete, well-articulated corporate plans built upon the foundation of well-understood and practiced corporate values
- Encouragement to local units of the organisation to frame their own versions of value statements based on local perceptions and needs
- Explicit statements of belief and policy
- Performance evaluation and compensation linked with execution of social responsibility
- Confidence and respect for people
- Concern for the welfare of every individual as well as the society
- Sharing of beliefs and responsibilities
- A high value on trust, having it and earning it.

An important ingredient to success seems to lie in the ability to reconceptualise the corporation as a network of relationships. More specifically, to imbibe the social responsibility concept the relationship between business and society is to be seen as:

- A cyclical and not a linear process (that is what goes round, comes around as opposed to means–end kind of relationship);
- A balanced one (all debts paid on all exchange matters rather than seeking opportunities to externalize cost to the society);
- Interdependent, not independent (no part can exist without the support of the other);
- Adaptive and self-consistent (growth of any part vis-a-vis the impact on society).

An important ingredient to success seems to lie in the ability to reconceptualise the corporation as a network of relationships.

Winning attribute today is "simultaneous", not "either or" or "sequential".

The change process should be seen as a 'therapeutic' (Schein, 1985) one, where change happens inside a group but as a result of interaction between the inside and the outside. At the individual level this orientation can be brought about through participative management. Preston and Port (1974; 1975) observe that participatory management is a process mechanism that sensitizes the managers to the needs and desires of internal stakeholders. Collins (1996) drawing conclusion from four case studies points out the benefits of adoption of participatory management in general and implementation of gainsharing in particular, in having a direct impact on improving company relations with owners, customers, suppliers, employees and the natural environment.

There are many corporations, both in India and abroad, who are known for their value based approaches. While a corporation is free to make its own choice on the route it wants to take to become value based and ethics driven, the fountainhead of all activity is in the organisational philosophy (Sivakumar & Rao, 1996). To become value based at the operational level is not really difficult once the commitment develops. The real hurdle is to get over the traditional mindset that believes without questioning that to achieve one thing one must sacrifice another. Winning attribute today is "simultaneous", not "either or" or "sequential". There are going to be increasingly greater demands on corporations to simultaneously fulfil the expectations of all the stakeholders. This may require not just cosmetic changes but radical transformation. Researchers will do a service at this juncture if they intensify their efforts and come up with models that could help in easy implementation of the corporate social responsibility concept.

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Focus

Corporate Social Responsibility: Need & Concepts

H.C. Chaudhary

Organisations in the past were concerned mostly with making profits and leaving the well-being of others to individual acts of charity. In recent years, the attention of businessmen, philosophers, scientists and the general public has been directed to issues concerning the social responsibilities of the management too. Today, one of the organisation's primary goals is its obligation to operate in a socially responsible manner. Today's managers must be aware of and act on what society expects from their organisations. This paper examines the need and the concept of corporate social responsibility and its related aspects.

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Organisations are open systems dependent on their environment. This dependency requires managers to be concerned with the society's views and expectations. This is true of all types of organisations: businesses, schools, hospitals and governments. Social responsibility has, of late, become a more significant issue as society has developed higher expectations from organisations and managers (Kast & Rosenzweight, 1988).

Every business firm is a part of the total economic and political system and not an island. It is at the centre of a network of relationships to persons, groups and things. The businessman should, therefore, consider the impact of his actions on all those to which he is related. He should operate his business as a trustee for the benefit of his employees, investors, consumers, the government and the general public. His task is to mediate among the investors, to ensure that each gets a fair deal and that nobody's interests are unduly sacrificed to those of others (Tripathi & Reddy, 1993).

The businessman should operate his business as a trustee for the benefit of his employees, investors, consumers, the government and the general public.

In recent years, the attention of businessmen, philosophers, scientists and the general public has been directed to issues concerning the responsibilities of the management, the ethical and legal practices of managers, and the entire set of value systems of the business community (Massie, 1976). All business organisations in general and private enterprises in particular today are judged by criteria which are very different from those of half a century ago. They have not only to be efficient to satisfy the industrialists by

earning them more profits or satisfy the investor and financier by paying them more dividend and interest, they have also to be conscious of their wider social responsibilities.

Business is a part of society and its actions have both economic and social ramifications. It would be practically impossible to isolate the business decisions of corporations from their economic and social consequences. As our society grants considerable freedom to business organisations, in return businesses are expected to operate in a manner consistent with the society's interests (Wright, etal 1992).

Social responsibility is the recognition of the fact that organisations have significant influence on the social system and that this influence must be properly considered and balanced in all organisational actions. It simply means that organisations must function as a part of larger social system because they are, in fact, a part of the system (Davis,1993). Managers must consider the impact of their decisions and actions on the society as a whole and must assume responsibility for their activities. They should take steps to protect and improve the welfare of the society. In short, managers must evaluate their decisions and actions, not just from the perspective of organisational effectiveness but also from the perspective of social welfare. Thus, today, the society expects business to help preserve the environment, to sell safe products, to treat its employees equitably, to be truthful with its customers, and, in some cases, to go even further by training the hard-core unemployed, contributing to education and the arts, and help revitalize urban slum areas (Wright, et al, 1992).

The society expects business to help preserve the environment, to sell safe products, to treat its employees equitably, to be truthful with its customers, and, in some cases, to go even further by training the hard-core unemployed, contributing to education and the arts, and help revitablize urban slum areas.

Corporate Social Responsibility: Concepts

Social responsibility is a nebulous idea and hence is defined in various ways. Social responsibility refers to the expectation that business firms should act in the public interest (Wright et al; 1992). Corporate social responsibility is, seriously considering the impact of the company's actions on the society (Koontz & Weihrich;

Corporate social responsibility refers to the businessman's decisions and actions taken for reasons at least partially beyond the firm's direct economic or technical interest.

1988). It has been defined as the manager's responsiveness to public consensus (Berle, 1963). Social responsibility is an organisation's obligation to engage in activities that protect and contribute to the welfare of society (Davis & Frederick, 1984).

The social responsibility of business refers to such decisions and activities of a business firm which provide for the welfare of the society as a whole alongwith the earning of profit for the firm. The business firm functions and acts in such a way that it will accomplish social gains (social output) alongwith the traditional economic gains (economic output) in which the business firm is interested (Reddy, et al; 1990).

Thus, it can be said that corporate social responsibility refers to the businessman's decisions and actions taken for reasons at least partially beyond the firm's direct economic or technical interest. The social responsibilities are obligations to pursue those policies, to make those decisions or to follow those lines of action which are desirable in terms of the objectives and values of our society.

The term social responsibility refers to two types of business obligations (Davis, 1974). These two obligations are:

- The Socio economic Obligation
- The Socio human Obligation

The Socio economic Obligation of every business is to see that the economic consequences of its actions do not adversely affect public welfare. This includes obligations to promote employment opportunities, to maintain competition, to curb inflation, etc. The Socio human Obligation of every business is to nurture and develop human values such as morale, cooperation, motivation and self-realisation in work.

Another concept, quite similar to social responsibility is social-responsiveness, which in simple terms means "the ability of a corporation to relate its operations and policies to the social environment in ways that are mutually beneficial to the company and to society (Davis & Frederick, 1984; P. 564).

Business Involvement in Social Actions

The appropriate nature of an organisation's social responsibility is a matter of intense debate. At one extreme are those who strongly believe that organisations are in business solely to produce goods and services that society wants and that they are entitled to make profits in return. For these people, social responsibility is simply not an issue. At the other extreme are those who believe that organisations should be allowed to do business only if they help solve social problems,do not cause any harm and put back some of the profits they earn to work for society. This disagreement is not one that lends itself to quick and early resolution (Dunham & Pierce, 1989).

Table 1: Arguments in favour of Social Involvement of Business

1. Public needs have changed, leading to changed expectations. Business received its character from society and consequently has to respond to the needs of society.
2. The creation of a better social environment benefits both society and business. Society gains through better neighbourhoods and employment opportunities; business benefits from a better community, since the community is the source of its work force and the consumer of its products and services.
3. Social involvement discourages additional government regulation and intervention. The result is greater freedom and more flexibility in decision making for business.
4. Business has a great deal of power which should be accompanied by an equal amount of responsibility.
5. Modern society is an interdependent system, and the internal activities of the enterprise have an impact on the external environment.
6. Social involvement may be in the interest of stockholders.
7. Problems can become profits. Items that may once have been considered waste (for example, empty soft drink cans) can be profitably used again.
8. Social involvement creates a favourable public image. Thus a firm may attract more customers, employees and investors.
9. Business should try to solve the problems which other institutions have not been able to solve. After all, business has a history of coming up with novel ideas.
10. Business has the resources. Specifically, business should use its talented managers and specialists, as well as its capital resources, to solve some of society's problems.
11. It is better to prevent social problems through business involvement than to cure them. It may be easier to help the hardcore unemployed than to cope with social unrest.

Source: Based on Davis & Frederick (1984).

A decision as to whether companies should extend their social involvement requires a careful examination of the arguments for and against each action. Certainly the society's expectations are changing and the trend seems to be toward greater social responsiveness. (Knootz & Weihrich, 1988). Arguments for and against business involvement in social actions are shown in tables 1 and 2, respectively.

Some observers have argued that social responsibility should not be part of the management's decision-making process. (Smith, 1952; Friedman, 1970). It has been maintained that the business functions best when it sticks to its primary mission – producing goods and services within society's legal restriction. In other words, its sole responsibility is to attempt to maximise profits. When it goes further than that by tackling social problems, business is spending money that should more properly be returned to its stockholders. The stockholders, who have rightfully earned the money, should be able to spend that money as they see fit, and their spending priorities may differ from those of business (Friedman, 1970).

Table 2: Arguments Against Social Involvement of Business

1. The primary task of business is to maximize profit by focussing strictly on economic activities. Social involvement could reduce economic efficiency.
2. In the final analysis, society must pay for the social involvement of business through prices. Social involvement would create excessive costs for business, which cannot commit its resources to social action.
3. Social involvement can create a weakened international balance-of-payments situation. The cost of social programmes, the reasoning goes, would have to be added to the price of the product. Thus, companies selling in international markets would be at a disadvantage when competing with companies in other countries which do not have these social costs to bear.
4. Business has enough power, and additional social involvement would further increase its power and influence.
5. Business people lack the social skills to deal with the problem of society. Their training and experience is with economic matters and their skills may not be pertinent to social problems.
6. There is a lack of accountability of business to society. Unless accountability can be established, business should not get involved.
7. There is not complete support for involvement in social actions. Consequently, disagreements among groups with different viewpoints will cause friction.

Source: Based on Davis & Frederick (1984).

In reality, however, business is part of society, and its actions have both economic and social ramifications.

Business is part of society, its actions have both economic and social ramifications.

It would be practically impossible to isolate the business decisions of corporations from their economic and social consequences (Wright et al, 1992). Hence, the society today demands that companies operate in a socially responsible manner and that management exhibit high ethical behaviour in their conduct.

Conclusions

There are significant changes taking place in social, political, economic and other aspects of modern life. These changes make it appropriate to re-examine the role of modern business. Society, awakened and vocal with respect to the urgency of social problems, is asking managers, particularly those at the top, what they are doing to discharge their social responsibilities and why they are not doing more. The demand for greater social awareness from the business organisations is an important part of the society's attempts to make them more responsible to the needs of mankind.

All managers must obey the law, but social responsibility goes beyond the requirements of law. Social responsibility is an organisation's obligation to engage in activities that protect and contribute to the welfare of society. The question of the social responsibility of business is a matter of increasing concern. Traditionally, the role of business was limited to efficient production of goods and services. This role has expanded to include the broader social consequences of business activities. Managers must evaluate their decisions and actions, not just from the perspective of organisational effectiveness, but also from the perspective of social welfare. Today, all managers must be aware of what society expects from their organisations and whether their actions meet these expectations. Managers have to behave ethically and honour social values when persuing effectiveness goals.

All managers must obey the law, but social responsibility goes beyond the requirements of law.

Thus, the essential philosophy of social responsibility is what Keith Davis (1993) has said "We are all part of one social system, and we all live together on one planet. We must act according to those facts."

We are all part of one social system, and we all live together on one planet. We must act according to those facts.

Acknowledgement

This paper is based on a series of articles published on Corporate Social Responsibility in different business magazines, journals and books. The object has been to assemble the ideas of different researchers/authors which have been developed from several years' practical experience in the field of Corporate Social Responsibility. The author is extremely grateful to them for the immensely helpful guidelines from their work.

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Rural Development & Corporate Involvement

V. Raghuraman

Business, inevitably, has impacts on communities, societies and natural environments in which it exists, separately from the market driven transactions that are its main focus. World class business now accepts its responsibility both to mitigate the impacts where they are negative and pro-actively turn them in to business and social advantages where possible, argues the author.

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Development Process

Development is a process of transforming an existing environment reality of a status quo, stagnant society into an organic, responsive and self propelled one. It encompasses its social, economic, political and cultural components. Thus, development takes place in a given environmental context and entails the pursuit of certain objectives.

Rural Development – Process & Approaches

Rural development is a process of facilitating empowerment of the people, leading to self-reliant and self-sustaining activities, initiated through the interventions of external agencies. The external agencies helping the process of rural development can be broadly classified as belonging to various approaches:

- Voluntary Agencies
- Cooperatives
- Corporates
- Government Agencies

The process of rural development is basically achieved through certain management tasks performed by these agencies. (Fig. 1)

Rural development is a process of facilitating empowerment of the people, leading to self-reliant and self-sustaining activities.

Broadly two kinds of management tasks need to be performed, plan formulation and plan implementation.

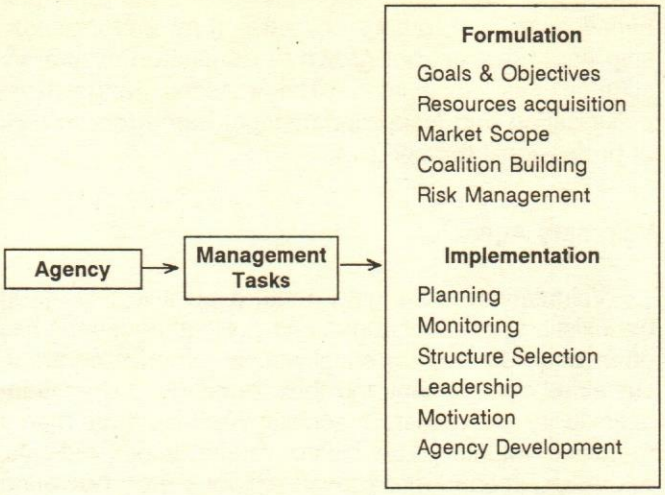

Fig. 1. Management Tasks Performed by the Agencies

At the formulation stage, any agency taking up this task has to meaningfully define the goals and objectives. It has to devise the ways to effectively mobilising and equitably displaying the resources. Also a careful thought has to be given while deciding on the ways to increase the effectiveness of the programme through focused efforts and to efficiently consolidate the gains from the existing work.

At the implementation stage effective decision needs to be taken as to what all areas need strengthening of focus. The ways of evaluating performance to provide the context for planning are essential. The type of organisational structure more suited to the kind of development also demands attention. Finally comes the most important task; choosing the right kind of people, the job of motivating them and evolving the leadership suited to the needs of development.

Once the objectives have been defined, the following will need consideration at the formulation stage.

- Manageable focused and low risk entry points ensuring credibility for programmes.
- Programmes need to be consistent with 'felt needs' of beneficiary groups.
- Incremental addition of other programmes to encompass eventually socio-economic and cultural areas.
- Mobilising demand to correspond to surplus creation.
- Ensuring hierarchical consistency between goals and objectives.

Finally comes the most important task; choosing the right kind of people, the job of motivating them and evolving the leadership suited to the needs of development.

At the strategy implementation stage the following tasks need to be performed:

- Feasibility studies and surveys.
- Plan for gradual agency withdrawal corresponding to beneficiary development.
- Establish clear quantitative performance measures which can lead to effective review.

While formulating and implementing the rural development Programme, the whole structure should be:

- Flat and decentralised, permitting networking.
- Informal communication channels integrating agency, beneficiary and community groups, particularly at the interface.
- Autonomy for field vis-a-vis parent headquarters for operating flexibility.

A proper selection of people is very important for carrying out the rural development programmes. For this purpose the specific task would be:

- To draw expertise (technical and administrative specialists) from external sources.
- To induct "committed" individuals with strong representation from the beneficiary group. The foremost thing in getting committed people is the importance of non-economic rewards such as self fulfillment and recognition.

This coupled with a continued,committed and pragmatic leadership at the top and other levels, wherever necessary, makes the programmes really effective and successful.

The foremost thing in getting committed people is the importance of non-economic rewards such as self fulfillment and recognition.

The Four Organisational Forums

As has already been defined, rural development entails managing the process of change by aligning and integrating the available resources to raise the standard of living of the people and provide an equitable distribution of surpluses in a healthy social climate. The task can be performed by the following organisations either independently or collectively (Fig. 2).

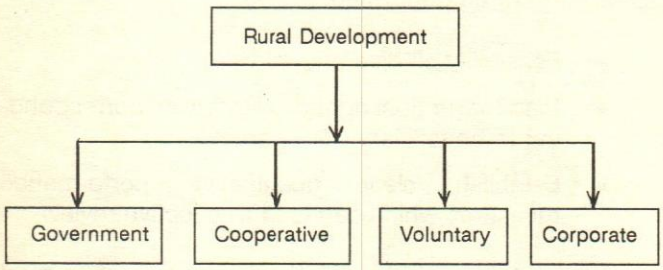

Fig. 2. Organizational Agencies for Rural Development.

Government Agencies

The Government is the most pervasive agency which is entrusted with the task of overseeing the developmental process. The quantum of resource at its disposal is large. This is, however, a function of planning priorities, the ruling party's ideological stance and political salience of the programmes. However, its sheer size inhibits the operational flexibility demanded by the heterogeneity of individual sites. This springs from its need to standardise its delivery systems to ensure uniformity of strategy across the country to raise the efficiency of delivery. The programmes handled by the Government agencies are generally characterised by poor managerial skills and techniques, poor leadership, lack of continuity, etc.

Its sheer size inhibits the operational flexibility demanded by the heterogeneity of individual sites.

Co-operative Agencies

The Indian co-operative movement today claims to the largest co-operative structure in the world with four lakh societies of fifty different types covering 98% of the rural and urban areas. Our co-operatives have evolved from the mercantile service agencies to integrated supply, production and distribution societies. The democratic structure constituted by the member beneficiaries to promote collective rural entrepreneurship has, however, not grown to dominate the rural institutions as anticipated. The reasons range from politicisation and inappropriate legal framework to lack of professional temper.

Voluntary Agencies

Voluntarism in bringing about a positive change in the existing socio-economic and political equations has often been praised for effectiveness, emotive contract, sustained commitment and their tremendous operational flexibility and grassroot access. We have more than a thousand voluntary agencies of varying hues—radicals, reformists, techno-managerial, religious etc., operating at various levels from grassroot to national. Often characterised by a dominant leader, its success is often attributed to the personality and the consequent indispensability. Inadequate diverse resources (financial, techno-managerial, human) has often been its principal weakness.

Corporates

These agencies are also of a voluntary nature, but with organisational objectives of the parent organisation different from those of other forms. These agencies have either economic and/or social motives to bring about a change in the rural areas. We have more than 60 companies that have involved themselves in rural development in a spirit of enlightened self-interest . Their principal strength is resource availability both financial and techno-managerial. The number of companies that had participated in development prior to the removal of Sec. 35CC of the Income Tax Act had been considerable, providing resource support to voluntary action. Today, the corporate sector is considered as the prime source of "professionalism", induction of which into developmental work is much sought after.

The Corporate Involvement : Many Facets

The corporate involvement in rural development or more popularly known as the 'social responsibility of business' is prevailing from ages immemorial and is not a new ethic. It is increasingly recognised that the business is one of the main engines of rural development. The main task of business is the provision of goods and services that people want at prices they can afford. However, in performing this task, business inevitably has impacts on the communities, societies and natural environments in which it operates, separately from the market-driven transactions that are its main focus.

It is increasingly recognised that the business is one of the main engines of rural development.

There is no doubt that the corporate sector has been contributing to the development of rural areas by way of generating employment and providing inputs for increasing agricultural production and the like. World class business now accepts its responsibility both to mitigate the impacts where they are negative and proactively turn them into business and social advantage where possible. It is being accepted now that sensitive personnel management, sustainable environmental management and positive involvement in local communities are signs of good business. The Associated Chambers of Commerce and Industry of India (ASSOCHAM) has been involved in the task of rural upliftment for almost five decades now. It started its active participation in social upliftment of the masses four decades ago.

World class business now accepts its responsibility both to mitigate the impacts where they are negative and proactively turn them into business and social advantage where possible.

ASSOCHAM formed the Rehabilitation Trust of Khem Karan Trust as it is more popularly called. It was established for the relief, rehabilitation of those areas of India which were or may be affected by the hostilities between India and Pakistan and in particular of the inhabitants of such areas in the state of Punjab. The then President, ASSOCHAM had remarked, "It seemed to the Associated Chambers that we could make some gesture symbolic of our desire to mitigate these losses and hardships, if we were to work near the cease-fire line and, helped by the skills and experience of our members, establish an area where villagers would be rehabilitated without departing from the standard laid down elsewhere in India. We hope ... to establish a progressive and prosperous farming community which will not only be successful but which will act as a centre of a gradually extending area of efficient methods".

ASSOCHAM offered to plough free of charge, four acres of each family holding. In five weeks 3500 acres of land was attended to, sowing included. Almost 12,000 people were given a new lease of life. Escorts, provided a fleet of tractors, farm implements and pump generator sets. It was a rehabilitation effort that won accolades from FICCI as well. And before pulling out of Khem Karan, a small town in Punjab, ASSOCHAM handed over the assets to the residents, for their future use.

Education for Girls & Family Planning Schemes

The family planning and education schemes have often been discussed by the Apex Advisory Council of ASSOCHAM. A Senior Member of ASSOCHAM has remarked that family planning is not just a social problem, but an economic issue in which corporate inputs would help in launching focused programmes if targetted effectively.

Most of the industrial establishments located in the remote areas are already running schools, which in addition to providing opportunities to the employees' children, are also open to the general public.

Given below is a brief narration of a few of the ASSOCHAM members engaged in family planning activities.

TISCO

Tata Iron & Steel Company Ltd. has a full-fledged Director of Family Planning who runs their centre for Family initiatives. This is a model organisation using all kinds of initiatives at all stages of man's development namely birth, childhood, adolescence, adulthood, planning and training for quality of life, marriage, parenthood, old age and the final phase. Thus, it looks at the family in a holistic manner with special emphasis on happiness to which family is known to contribute no less. A notable development in this direction is the Tata Workers' Union representing 38,000 workers of the company which is in the process of setting up a population cell of its own through which the progress of family planning acceptance by the employees will be monitored by responsible office-bearers and union leaders themselves. The

Most of the industrial establishments located in the remote areas are already running schools, which in addition to providing opportunities to the employees' children, are also open to the general public.

TISCO has devised a programme of offering monetary incentives to acceptors, both among the employees and non-employees.

Larsen & Toubro Limited

This is one of the largest engineering companies in India with its main works located at Andheri, Mumbai, where a Welfare Centre looks after the welfare of the employees and the community. The centre renders safe health services for the community such as family planning, mother and child care, immunisation, leprosy education, treatment and control of leprosy, tuberculosis education and treatment etc. Various other services are also offered free of cost to the community through their integrated out patient department and counselling services.

Lucaus TVS Limited

This is a pioneering company in the field of family planning, which had introduced both motivation and services in its plant, much before the National Family Planning Programme got underway. Up-to-date records of employees and their family members are maintained with excellent motivational and clinical services available at the factory premises. In addition, eight employees including union office bearers (six male and two female) were specially trained for motivational skills in places like Gandhigram Institute. The company lays special emphasis on evaluating the programme constantly and for this secures guidance from leading social service organisations and government departments. Hence, it makes qualitative improvement in the functioning of the programme from stage to stage.

Escorts Limited

The company has a very well-developed medical and health-care programme with which family welfare programme is fully integrated. The company has also adopted 20 nearby villages for family planning work. The motivation for small family norm flows from the top management to the trade union leader and to the worker, unimpeded. The result is that as much as 73 per cent of all eligible couples among the employees are fully covered by programme's services. In fact, the health and family welfare services offered by Escorts are considered a model for the industry. It has a well-modulated programme of information, education and communication and a sliding-scale package of incentives for those adopting sterilization. However, employees are considered for promotion if they have small families.

Godrej & Boyce

* Considering the importance of non-formal education, Godrej & Boyce under its welfare schemes, have antenatal and post-natal clinics to educate mothers about hygiene, child care, nutrition, immunisation and family planning.
* Attached to such a clinic, there is a place with provisions for teaching special skills to women in crafts, tailoring, embroidery etc. which would increase their earning capacity.
* Adult literacy classes are conducted which, besides imparting basic knowledge in reading and writing, are also centres for discussion on various social and individual problems.
* Group lectures and meetings are also used as media for exchange of information on a variety of issues, as is being done by Bajaj Auto Ltd. on issues like population, education, sex education, family planning, health and family budget. It also makes use of posters, magazines and films towards re-orientation to beliefs and ideas.

Glaxo (I) Ltd.

Over the last 16 years, the company's social responsibility programme have steadily supported:

- The physical and mental health and rehabilitation of the under-privileged, women and children in particular.
- The promotion of the sanitation and hygiene and environment preservation.
- Consumer education and promotion of consumer rights.

Programmes of Glaxo's social responsibility unit are as follows—

External

- Rural Health Services—Aligarh
- Shishukalyan Snehi Swayamsevak Sanstah—Bombay.
- Quality Streets Circle—Bombay.
- Bombay Municipal Schools Sponsorship Programme.
- Public Health/Consumer Education, by way of Audio Visuals and print production.
- Charitable Donations and Goodwill Advertising.

Rural Health Services

Since 1982, upto March 1995, the Corporate Social Responsibility unit planned, implemented and supervised a Rural Health Services programme near Aligarh in collaboration with the Rural Health Committee of the Indian Medical Association, Aligarh Branch. Two villages, Surajpur and Govali, were adopted. The project's healthcare achievements include:

- A mobile health clinic and a healthcare dispensary – safe drinking water, immunisation, improved sanitation and drainage.
- Improved education facilities.
- Enhanced environment awareness.

Urban Outreach Programmes
Shishukalyan Snehi Swayamsevak Sanstah

In 1979. Glaxo promoted a voluntary body – The Shishukalyan Snehi Swayamsevak Sanstah which runs various development activities for the slum community at Worli, Kiliwada, with a focus on deprived children and women. The main objective was to promote physical and mental development of under-privileged children located in the Worli-Kiliwada community near the Glaxo Worli Factory.

The Sanstah is a major source of funds which are interested mainly through: –

- Membership subscriptions
- Glaxo India donations
- Special fund raising programmes

The trust also employs a Professional Social Worker.

Brooke Bond Lipton (I) Ltd.

Brooke Bond Lipton (I) Ltd. has made a significant contribution in Eath district in U.P. The following activities are being undertaken by our member company.

- Brick paving of villages & link roads. (10000 sq.mtrs./annum)
- Safe drinking water provision
- Maintenance of wells
  * Deep water borewells (50/annum)
  * 8 UV water systems (2)
- Sulabh Shauchalaya
- Electrification of villages
- Centres for cattle breeding (20)
- Base camps (40)
  * Mother & child Immunisation
  * Family Welfare
  * Diagnostic camps
  * Eye camps.
- Veterinary Health camps (500/annum)

Live stock productivity enhancement by providing proper nutrition to animal, installation of proper vaccination programme, fodder development, undertaking proper training programmes etc. are a few methods by which the company achieves the objectives.

- Land Productivity Improvement
  * Alkaline Land Reclamation (500 acres/annum)
  * Demonstration Farm
  * Provision of improved seeds
  * Soil Testing support
- Commercial crop cultivation – chicory, peas.

ASSOCHAM Drinking Water Project

ASSOCHAM, in its Platinum Jubilee Year, has rededicated itself to the upliftment of the living conditions of the poor and the down- trodden by initiating a Drinking Water Project for over 100 villages. The project was formally launched by then the Prime Minister, at the time of the 74th Annual Session of ASSOCHAM in September 1994.

The Salient features of the project –

The Need

1. More than 80 per cent of the disease encountered in villages are water borne.
2. Villagers have to trek long distance to fetch drinking water.

The Water Requirements

* 40 litres of safe drinking water per capita per day (1 pcd) for human consumption.

* 30 litres per cattle per day additionally for cattle in the desert districts (DDP).

* One handpump for every 250 persons.

* The water source should exist within a horizontal distance of 1.6 kilometres and within 100 metres elevation difference.

Orissa Cement Ltd.

Dalmia Bharat Seva Trust (DBST) is the frontal agency of Orissa Cement Limited to carry out Socio-economic development work in the villages around, mostly inhabited by adivasis, Rajgangpur Town in Sundargarh, Distt. Water scarcity is a perennial problem. It has adopted 7 villages on the basis of Block Panchayat's Report. With mercury touching 45-48 degree centigrade, the tubewells brought succor relief to the inhabitants.

Chemplast Sanmar Ltd.

Chemplast Ltd. has adopted 11 villages in and around Mettur, Tamilnadu.

SRF Ltd.

The SRF Ltd. has taken up a Rural Development Scheme to provide drinking water facilities to cater to the three villages i.e. Vallur, Melur and Attipaltu in Meenjur Panchayat, Saidapet Division, Madras.

Bajaj Group of Companies

Janakidevi Bajaj Gram Vikas Sanstha is doing various rural development activities for the betterment of the village people such as agriculture extension programme, cow development, sanitation programme, literacy, biogas plants, tree plantation etc. This Sanstah has adopted two villages namely Malegaon of Malegaon Gram Panchayat and Kune wadi of Inglun Gram Panchayat for drinking water supply.

ITC Ltd.

ITC Ltd. has adopted 40 villages in Andhra Pradesh to provide safe drinking water to the residents of the villages.

Summing-up

These are just a few instances of companies which have committed themselves to ASSOCHAM drinking water project.

ASSOCHAM carried out a survey last year to find out the financial commitment of the corporate sector towards social development and it was heartening to note that on an average 0.99% of the gross profit is being invested for social development activities. Some of the companies such as J.K. Synthetics, Brooke Bond Lipton (I) Ltd., Glaxo India Ltd., Tata Group companies,Arvind Mafatlal Group companies, etc. have contributed significantly in the area of social development through their rural health services, urban outreach programme, infrastructure development, livestock productivity enhancement, land productivity improvement, etc.

The Government incurred more than 40 per cent expenses towards administration of social projects. This is in contrast to 10 to 12 per cent administration costs experienced by the corporates. ASSOCHAM constituents will be eager to help Government of India and State Governments in carrying out social projects with corporate involvement. This would increase corporate involvement in social projects and also let the social budgets reach the intended beneficiaries more effectively.

Corporates have realised that economic growth without social justice would not be stable. While corporates have to concentrate on business activities, it is possible for governmental agencies and non-government organisations to tap the corporates effectively for launching programmes of interest to the local environment whether it would be agro forestry, drinking water or marketing of agricultural products, etc. In the days to come, the partnership between government and the corporate sector in furthering social development would become more than manifest and also through open new institutions. □

Stakeholders vs Stockholders: The Key Issue in Corporate Responsibility

Albert A. Blum

Corporate decisions have a far reaching impact on the national economy in the present times and hence the alarming trend of the corporate bias in favour of its stockholders at the cost of the employees and the community at large is being viewed with increasing concern. The author argues that this trend has to be reversed for the benefit of all concerned.

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Whether to support stakeholders or stockholders is at the core of the current struggle over how much corporate social responsibility there should be. This struggle, in various dimensions, takes place in many countries around the world. Stockholders are those who own the firm through the possession of stocks in a company, while stakeholders are those affected by or involved in the operation of the firm. The latter includes stockholders, but it also includes many who do not own stock but who are affected by the firm's operations: employees, managers, customers, unions, citizens, environmentalists, and so forth.

Corporate Decision Making

Robert Reich, the secretary of labor in the United States Government, discussed the role of both groups in corporate decision making in a recent article in which he called for a "new era of corporate citizenship."

> "Whether we like it or not—whether we recognize it or not—corporate decision makers have significant influence over the future strength of America's families and communities. Yet corporate executives...argue that they must do what is in the interests of stockholders even at the expense of employees and the communities in which they live."

As a result, Reich argues that if the executives' argument is accepted, an implied social contract is ending—a social contract in which management made decisions by balancing the needs of the various stakeholders with the needs of stockholders. Instead, managers now pay less attention to the requirements of stakeholders, but are increasingly more concerned with the wishes of stockholders—with various stockholders

as a result suffering. (Reich is not the only politician talking about the needs of stakeholders. The leader of the British Labour party, Tony Blair, also emphasizes the needs of stakeholders as he discusses his political platform.)

Managers now pay less attention to the requirements of stakeholders, but are increasingly more concerned with the wishes of stockholders—with various stockholders as a result suffering.

This overwhelming concern with stockholders explains why AT&T recently decided to lay off 40,000 employees. The management at AT&T knew that decision would result in the stock market rewarding AT&T by buying its stock and thereby causing a rise in its stocks' value. The management also knew that the downsizing decision would result in a payoff to themselves in that the top AT&T executives would see their compensation rising at an even more rapid rate than before (its Chief Executive Officer is reported as now making 20 million dollars a year). The gap between the compensation given to the company's top executives and those of its lower level employees will become even greater.

Corporate Ownership

Further confusing the issue is the nature of corporate ownership. Since stockholders theoretically own the company, they are the people who are supposed to govern the company. But, in fact, most stockholders neither act as owners, nor wish to believe they should act as the owners of the firm. They often bought stocks not because they wished a share in the ownership of the company, but rather as a form of legalized gambling. Many stockholders, when they purchased stocks, did not concern themselves with how they might help the company improve either economically or socially. Rather, they bought the stocks, hoping that stock prices would rise for reasons having little to do with any decisions the stockholders might make except to buy or sell those stocks—a decision based upon their expectations or hopes that stock prices will go up or down. This decision is often no more "scientifically" based than those of a gambler. As a result, too often, Las Vegas has replaced Wall Street.

Since these owners of a firm do not make decisions directly affecting the overall operations of the firm, the question is, who does. Top executives, led by a CEO and the board of directors of a firm do. These decision-makers, do not own an appreciable share of the stocks of the company. They are, in many ways, employees of the firms not unlike their subordinate employees whom they might decide to downsize.

The top executive, the CEO, is normally chosen for his position by the board of directors. This board not only theoretically supervises the CEO, but also helps ensure that through generous stock options and lucrative compensation packages, he will be paid a high salary, whatever the successes or failures of the firm he heads. In fact, since the CEO and the board are aware that a downsizing would normally result in higher stock prices, and since the CEO plays a major role in choosing the personnel who serve on the board, one might assume that the board's decision to downsize might cause some citizens to raise their eyebrows and wonder about the ethics or objectivity of those making the decisions that so negatively affect many loyal employees but that so positively benefit those making the decision. It must be remembered that board members are often related to the CEO by being his fellow executives at other companies, relatives, friends, or subordinates in the company which the CEO heads. If politicians benefitted so clearly from such close and intimate ties, many citizens would not hesitate to question such behaviors and not vote for them in the next elections (as, for example, they did not vote for such accused politicians in the recent elections in India and elsewhere.).

This is clearly an ethical dilemma. The members of the boards are not owners of the firm (at best, they own some stocks in the firm); many of them, the CEO who, in turn, does not own the firm; yet they are close associates both claim that all of their decisions are not biased in favor of themselves. They claim that their decisions, some of which result in tremendously high incomes for the executives and bigger benefits for board members are made with the stockholders in mind since they claim they represent them.

Therefore, the boards and the CEO may be, in fact, acting in their own self-interest when they try to satisfy the needs of the stockholders for higher value for their stocks by laying off thousands of employees and middle

The boards and the CEO may be acting in their own self-interest when they try to satisfy the needs of the stockholders for higher value for their stocks by laying off thousands of employees and middle managers.

Downsizing results in many of the firm's stakeholders becoming unhappy even if the stockholders are not.

managers. They justify this act by claiming it will lessen costs and increase the profits and productivity of the firm. Perhaps, but it surely does raise the prices of stocks, thereby increasing their value to stockholders (including the CEO and the board members) and also increasing, at the same time, the compensation packages of the CEO and, to a lesser degree, board members.

If the downsizing hurts the terminated employees and perhaps is not a socially responsible act, so be it, declare the board and the CEO, for it was being done for the good of the company and for the good of the stockholders. (The decision may in fact be for the good of the company, but given the various suspect relationships already discussed, it is difficult to separate company-interest from self-interest in the action). Downsizing may make the board members happy (surely usually richer); it may make the CEO happy; and it may make the stockholder happy as they all note the higher value their stocks have. Who is made unhappy by the decision to downsize? Surely the employees of the firm who have been fired are unhappy; surely those at work in the firm who are worried that they may be fired next are unhappy; surely many of the customers who have fewer people from the company to serve them are unhappy; surely members of the society are unhappy since they have to pay for the social costs involved in helping those employees who have been terminated through, for example, more unemployment insurance payments, and as they become increasingly concerned with the country's economy. Thus, downsizing results in many of the firm's stakeholders becoming unhappy even if the stockholders are not.

Corporate Goal: Profit vs Social Responsibility

Of course, there are many who sincerely believe that a firm's sole concern should be with increased profits which should result in higher stock prices. Higher profits are defined as progress for those who believe that the firm's commitment should appropriately be only or mainly with stockholders and not with other stakeholders. These free enterprise followers believe that the sum total of selfish economic decisions by company executives and boards of directors will result, all things being equal, in the long run, in the common good. And if there is any failure in this process, private philanthropy should step in to help out.

There are those, however, who reject this argument as at best being amoral and surely not logical. They, therefore, argue that corporations instead have to be socially responsible, be concerned with their stakeholders, and act directly for the common good. They offer a few reasons for this approach: First is the belief that a company would benefit if it produced goods of high quality; was concerned with the environment; paid its employees a satisfactory wage; sold its quality products at a fair price; and used a share of its profits, for example, to help disadvantaged youths in the community or sponsored a local art museum. Such actions would convince civic-minded citizens to buy from such a firm.

Second, in many societies, the government steps into business activities when companies leave a vacuum of evil—for example, caused by racial and employment discrimination. Governments around the world practice variations on a theme called affirmative action, because companies, in fact, have been unfairly and often illegally discriminating against certain groups of potential employees. Governments, therefore, feel impelled to pass laws to protect groups discriminated against by companies—when the former demanded such societal actions. Therefore, if companies want to have less government intervention in their business activities, they should take actions which are socially responsible, thereby giving governments less to do.

If companies want to have less government intervention in their business activities, they should take actions which are socially responsible.

These reasons for corporate social responsibility are important but there is another—a commitment by the company to care for its stakeholders—its customers, its employees, its fellow citizens, and others around the world is necessary if it wants to keep its customers. (Bhopal should remind everyone of how important the latter is). If a firm is not concerned with any or all of its stakeholders, then the stakeholders will become angry or resentful and take actions against the company (or business in general) wherever it might be located, as they did many times in the past.

Ethics: Personal & Business

But, given its other concerns, why should executives in a company be troubled about these responsibilities? Is it not enough, they argue, for a firm to produce the best products possible at the best possible

price in a competitive market, and by doing nothing else, in fact, be socially responsible? This argument is naive because the market rarely operates in the way Milton Friedman and free marketers claim it does. (What they really mean in that the economy should act that way rather than that it does act that way). There is a need for social responsibility to cushion the failures of the free market economy on those who are its victims.

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But there is one other reason why a firm should act in a socially responsible fashion that we have not mentioned which should perhaps be the most important reason why firms should be socially responsible. This reason involves how executives look at themselves. A famous psychiatrist has claimed that the main cause of the high level of neuroses among businessmen is the conflict they sense between the code of ethics the businessmen had been brought up to believe in and which they use to guide themselves in their daily lives with the code of business ethics which they believe they have to follow and obey as they act as executives in the business world. Most executives recognize that as human beings they should be responsible and caring about their family, friends, their associates, their community—or with those who are their personal stakeholders. When they act in the role of a company executive or as a member of a board of directors, should they not be similarly concerned with the firm's stakeholder as they are with their personal stakeholders in their private lives? Why should executives feel the need to replace their daily code of ethics with an often conflicting

The conflict between their needs and their Stockholders' needs with those of their stakeholders will lessen as will their own personal conflict in values.

business code of ethics which has some different commandments—that for example we should obey a law of supply and demand as something akin to an ethical commandment rather than as an explanation, often wrong, as to how our economy sometimes works or should work.

By making a decision to follow his society's moral code in business as well in private, a socially responsible executive may be accused as being a "do-gooder" and as a violator of some of the economic principles consecrated as truths by a number of politicians and professors and imprinted in various bibles called economics textbooks. But he need not view this label as an insult. An executive who is socially responsible and has his firm act socially responsibly may, in fact, not only be called a do- gooder, but he might also feel good and so might his firm and its stockholders. They may feel good because by having their firms behave in a socially responsible manner, they may be helping the firm achieve an ethical imperative—namely, achieving the greatest good for the greatest number—a marketing goal as well as an ethical one. Therefore, the parties involved can, in fact, feel good since their business code of ethics will have merged with their personal code. The conflict between their needs and their Stockholders' needs with those of their stakeholders will lessen as will their own personal conflict in values. Otherwise, the conflicting values will result in an unhappy choice; "one dead, the other powerless to be born."

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Corporate Social Reporting: A Suggested Framework

M.K. Kolay

The paper suggests a standard framework of corporate social reporting for possible adoption by corporate houses in India. The report includes corporate social performance pertaining to different areas of concern of four major interest groups viz. employees, consumers, local community and the society in general. The corporate social performance for each interest group consists of the extent of their social involvement in the relevant areas of concern (both positive and negative) and the effectiveness of such involvement in terms of favourable and adverse consequences of the interest groups. The framework suggests the use of physical parameters and other surrogate measures besides financial figures.

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Corporate social responsibility is no more a jargon of convenience but has become a reality. Corporate houses of all countries are expected to behave in a socially responsible way in tune with the needs of the economic, political and social environment of the country, be it as a social goal distinct from profitability or care for the social constituents as the result of strategic moves in the pursuit of profitability itself (Kolay, 1995). Business organisations, willingly or unwillingly have, by now, accepted the philosophy and started reporting their contribution as responsible corporate citizens in their annual accounts.

Corporate Social Reporting (CSR) has a history of development stretching back over many decades. Lewis et. al (1984) revealed corporate financial reporting to employees dating back to at least 1919. Social Audit Limited and Counter Information Services of U.S.A. arose in early 1970's (as reported by Gray, 1990) to monitor, audit and publicize the deeds of companies. Mccomb's (1978) survey listed the most common areas of CSR occurring in the US under four different areas of concern: environmental disclosure, employee related information, product related information and community affairs disclosure. Hogner's (1982) study of U.S. Steel Annual Reports over eight decades highlights a long and rich history of CSR.

Corporate Social Reporting : Range

The 1975 Corporate Report and the 1977 Green Paper on the future of company reports speak of an impressive history of accounting to society and CSR in U.K. Deutsche Shell AG Annual Report (1975), as reported by Bergh (1976), reflects the extent of fulfillment of social responsibility under five distinct corporate objectives viz., consumer services, product and process development, return to investors, employee interests and public interests. United Nations Economic and Social Council suggested in 1977

thirty two disclosure items under five categories viz., labour and employment, production, investment programmes, organisational structure and environmental measures as standards for disclosure in CSR for transnational corporations.

In the eighties, CSR of American and Canadian companies put a definite emphasis on the introduction of environment-friendly products and processes and environmental protection as also on ethical behaviour of managers, particularly in the rapid growth financial services industry. Annual reports of the top hundred companies in U.K. during the 1980s focus on two broad areas in their CSR viz. socially responsible actions which have a direct bearing on the nature of business undertaken by the company and charitable donations and sponsorships which bear no direct relation to the company's business but fulfill a useful PR function for the company concerned (Vyakaranam, 1992).

In India, where the economy is based on the principles of democracy and socialism, the social responsibility of the corporate sector has been emphasized from time to time. The social balance sheets of some of the public sector corporate houses reflect the extent of fulfillment of social behaviour (SAIL, MMTC and others). Even a few organisations belonging to the private sector (ITC, 1975; TISCO, 1980) reflect in their annual reports their involvement in community development and social welfare projects, besides increased investments on their employees.

Available literature on CSR reflect that reports range from cursory remarks in chairman's statement to social cost-benefit analysis and balance sheets of accounting facts and figures (Trotman, 1979; Guthrie & Mathews, 1985; Cowen, Ferreri & Parker, 1987; Guthrie & Parker, 1989). CSR being voluntary and not in response to any legal requirement, till date no uniform reporting practice has been evolved suitable to any specific country's social needs. Infact, the problem lies in identifying the specific social interest groups and the major areas of concern relevant to those interest groups, specific to a particular country's present state of economic, political and social environment and their needs and aspirations. Secondly, it is considered to be an accountant's job to put a value tag to social consequences to draft the social profit and loss account and balance sheet as another section of Annual Accounts. Organisational investments towards social interests may be readily available with the accountants to report, but investments alone do not reflect the whole range of organisational involvement, not to speak of the favourable or adverse consequences on the society. The Pearce Report (1989) in U.K. with greater demand from the accountants in the new green order of corporate responsibility is an evidence of anxiety in this direction. Perhaps, what is needed now for our CSR is:

Organisational investments towards social interests may be readily available to report, but investments alone do not reflect the range of organisational involvement, not to speak of the favourable or adverse consequences on the society.

- To have a consensus opinion first on the choice of the different interest groups for whom organisational social responsibilities fulfillment needs to be assessed and reported.
- To agree on the priority areas of concern of the different interest groups and then with respect to such areas of concern, to decide on the measures, organisational investments and situational parameters that would suitably reflect corporate social involvement in terms of their decisions and actions as the causal dimension of corporate social performance.
- To agree on suitable indicators of corporate social effectiveness to reflect the end-result dimension of corporate social performance.

The present paper makes an attempt to suggest a suitable generalized framework for CSR on the above lines relevant to Indian corporate sector.

Relevant Interest Groups

In the contest of the existing situation where exploitation of labour still continues even in the midst of a plethora of legal provisions, safety of workers needs to be enforced at times legally, efficient executives are fired as scapegoats of corporate frauds, care for the employees can not go without reporting under a social banner. Besides the social value of such information, it would be all the more necessary for internal management, to serve at times as an eye-opener to the short-term profit-hungry managers to reflect on the real condition of their most important asset base.

Next comes the interest of consumers in order of CSR. No doubt, corporate houses initiate the manufacturing of goods and services based on consumer demand and consumers are considered as another important asset base of the organisation, but at times production is restricted at the cost of consumer services

or to push the seconds to improve profitability. Quality is compromised by certain corporate houses with still cheaper inputs even at the cost of health hazards to consumers. These perhaps really justify the cry the social reporting of even another asset base, the consumers.

Industrial houses invest a good amount of money for the development of their neighborhood and the local community but questions arise whether it is good enough compensation for the 'green' and the change in the fabric of the local community. Everybody would be curious to observe such a balance in the CSR. Such information would be a good guide too for the internal management to adopt appropriate strategies to best manage its public image asset base.

Apart from the impact on the local community, organisations consume the scarce resources of the country but in turn play a strong role in building up the country's economy for the benefit of the masses. Here again, the balance of cost and benefits must be the cause of concern in the mind of the common man in the society.

Organisations consume the scarce resources of the country but in turn play a strong role in building up the country's economy for the benefit of the masses.

The interests of the national economy, the minorities, the youth group, so also of the senior citizens are important considerations from the point of view of the society. Environmental aspects, as considered separately again by some of the researchers, are no doubt important, but being functional in nature and mainly affecting the neighbourhood and local community, perhaps may conveniently be considered as one of the areas of concern of the local community. Fair return on capital to protect the interest of the investors as a part of social reporting as considered by some of the researchers, reflects the profitability performance and is well covered under the usual reporting of the companies' financial performance.

Therefore, CSR may be considered to include the following four interest groups namely:

- Employees
- Local community
- Consumers
- Society

Measure of Corporate Social Involvement

Employees as the interest group

Three broad areas of concern of the employees would be relevant to reflect the corporate social involvement viz.:

- Living standards of employees
- Quality of work life enjoyed by the employees
- Training and development for further growth of the employees.

Living standards of employees may be reflected by rate of compensation (i.e. wages and salaries including perquisites) and the extent of welfare provisions made for the employees. Table 1 reflects the possible areas of welfare provisions for a generalized situation which, of course, would vary depending upon the size of the company and its policies. More importantly, both the measures are in definite financial terms to reflect the standard of living made possible by an organisation for its employees.

Table 1: Employee welfare provisions made during the year ended

(All figures in '000 monetary units)

Description	Expenditure		Gross block at year end
	Revenue	Capital	
Township and housing including supply of electricity and water at concessional rate			
Transport at concessional rate			
Uniforms			
Canteen facilities			
Medical facilities			
Health insurance			
Sick leave payment			
Medical bills reimbursed			
Hospital facilities			
Education facilities			
Study leave payment			
Scholarship, sponsorship etc			
Awareness programmes on drugs, AIDS etc			
Leave facilities			
Leave salary payment			
Leave encashment			
Leave travel Concession			
Holiday homes			
Cultural activities and recreational facilities			
Cultural programmes			

Sports association
Club membership fees
In-house club
Monetary benefits (other than compensation)
Puja bonus/exgratia payment
Production/productivity - linked bonus
Rent Subsidies
Rebate on company products/services
Marriage/birth grant
Part-time working payment
Suggestion Scheme payment
Retirement benefits
Contribution to PF, gratuity, superannuation, pension etc.
Insolvency insurance
Township land development and allotment

Quality of work life may not be reflected by safe working condition and the related investments alone particularly when, workers need to work at times continuously standing near the furnaces, stretching even more than the scheduled hours when the reliever does not report in the following shift. The plight of executives may not be much better when they have to continue working in office late hours even on Sundays and public holidays, otherwise they may be asked to quit. In a bid to increase production and productivity at times employees are stretched beyond their limits. Favouritism in lieu of personal gains prevails at all levels in many a corporate house, but employees may not dare to point out, not to speak of a formal grievance handling procedure. In such a scenario, the quality of work life in the corporate sector relevant to both workers and executives may be reflected by a number of situational factors under six major areas as reflected in Table 2.

Table 2: Quality of worklife enjoyed by the employees during the year ended

Description	Operational parameters	
	Worker	Executive
Work duration		
Weekly avg. clocked-in hours per individual		
No. of holidays in the year		
No. of days leave (other than sick leave) actually allowed in the year		
Physical condition		
Percent need to work in the standing position		
Percent work in normal temperature		
Percent work in air-conditioned		
Percent work in hot condition		
Percent work in noise-free condition		
Percent work in dust and fume free condition		
Safety		
Safety provisions made during the year ('000 mu)		
Mandays spent on safety training		
Job security		
Percent on temporary basis		
Percent of employees not yet made permanent		
No. of employees whose services were terminated		
Nature of job		
Percent of employees engaged in routine jobs		
Percent of employees given additional jobs during the year		
Percent of employees transferred to new assignments during the year (other than promotion cases)		
Percent of employees who have to work against targets		
Work environment		
Percent of employees working in groups		
Percent of employees affiliated to recognised unions		
Avg. no. of days spent formally per head on employee counselling, grievance handling etc.		

The training and development facilities offered by an organisation may be reflected conveniently by the financial outlay figures as well as by the extent of mandays spent by them on training as presented in Table 3.

Table 3: Employee training and development during the year ended

Description	Expenditure		Gross block at year end
	Revenue	Capital	
Training and development expenditure ('000 mu)			
Inhouse training centres			
Workers training centres			
Technical training institutes			
management development centres			
Nominations to external programmes			
Workers			
Executives			

	Operational parameters	
	Worker	Executive
Mandays spent on training by an employee on an avg. during the year		
Probation period (new recruits and promotion)		
Regular Working (other than on promotion)		

The measures of social involvement in the above three areas together would reflect th causal dimension of social performance with employees as the interest group (as in Fig. 1).

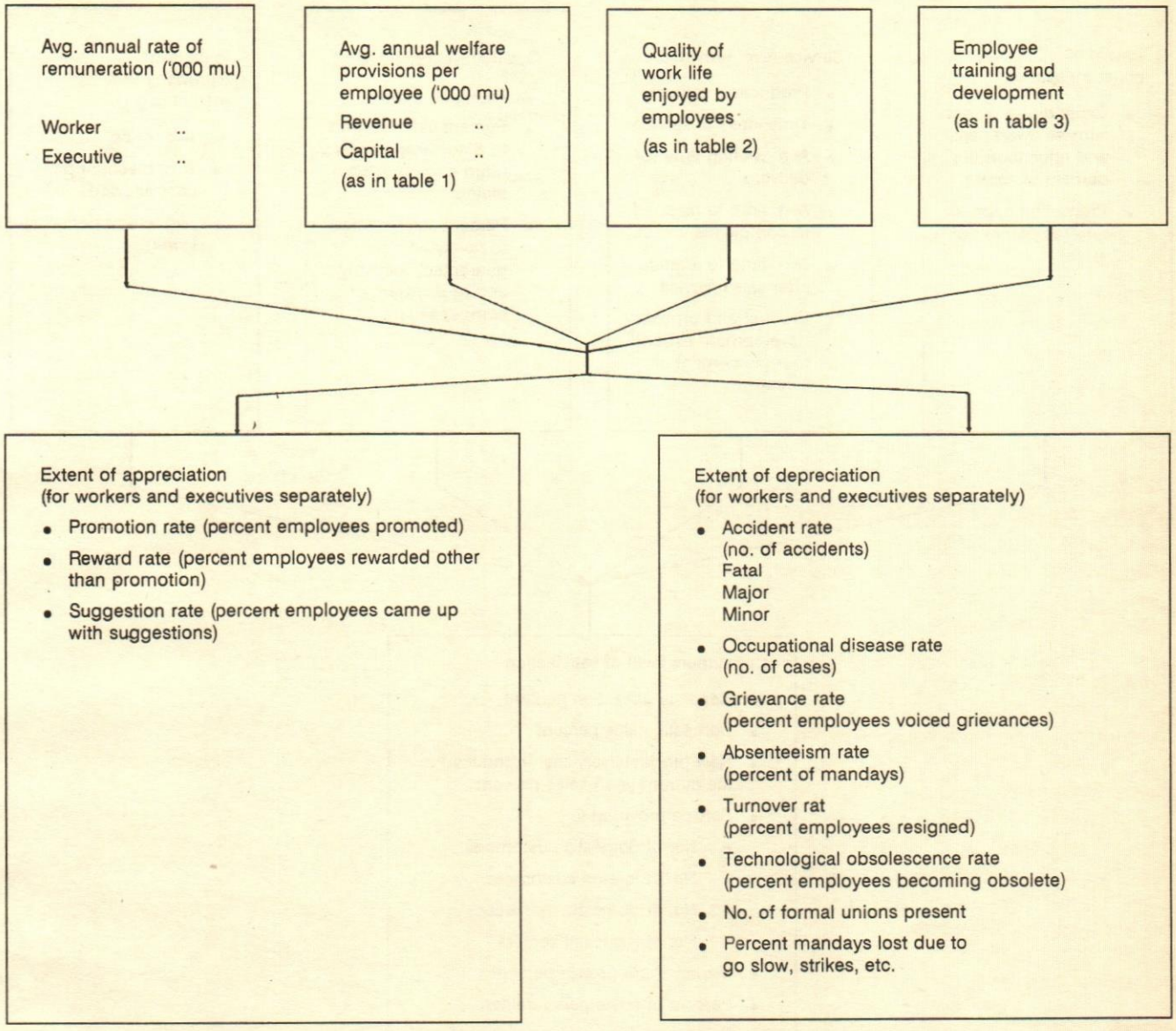

Fig. 1. The extent of well-being of employees

Consumers as the Interest Group

Four broad areas of concern of the consumers would be relevant to reflect corporate social involvement viz.:

- Extent of consumerisation
- Service level provided
- Quality level provided
- Effective price level charged

In the present day acute competition, when organisations are busy developing new products and processes to outstrip their competitors, consumers need to be given the necessary knowledge base to judge the pros and cons of different competiting products to take an optimal decision. In such a scenario the extent of consumerisation may be reflected in CSR by the proportion of expenditure on consumer awareness and product promotion as in Fig. 2.

Organisations in their own interest should provide the best possible product at the earliest possible time, but at times, the facilities are too meagre to cope with the ever-increasing demand, not to talk of timely delivery. In certain cases again, monopoly power drives down the level of services. As such, the service level may be reflected by production capacity, timeliness of

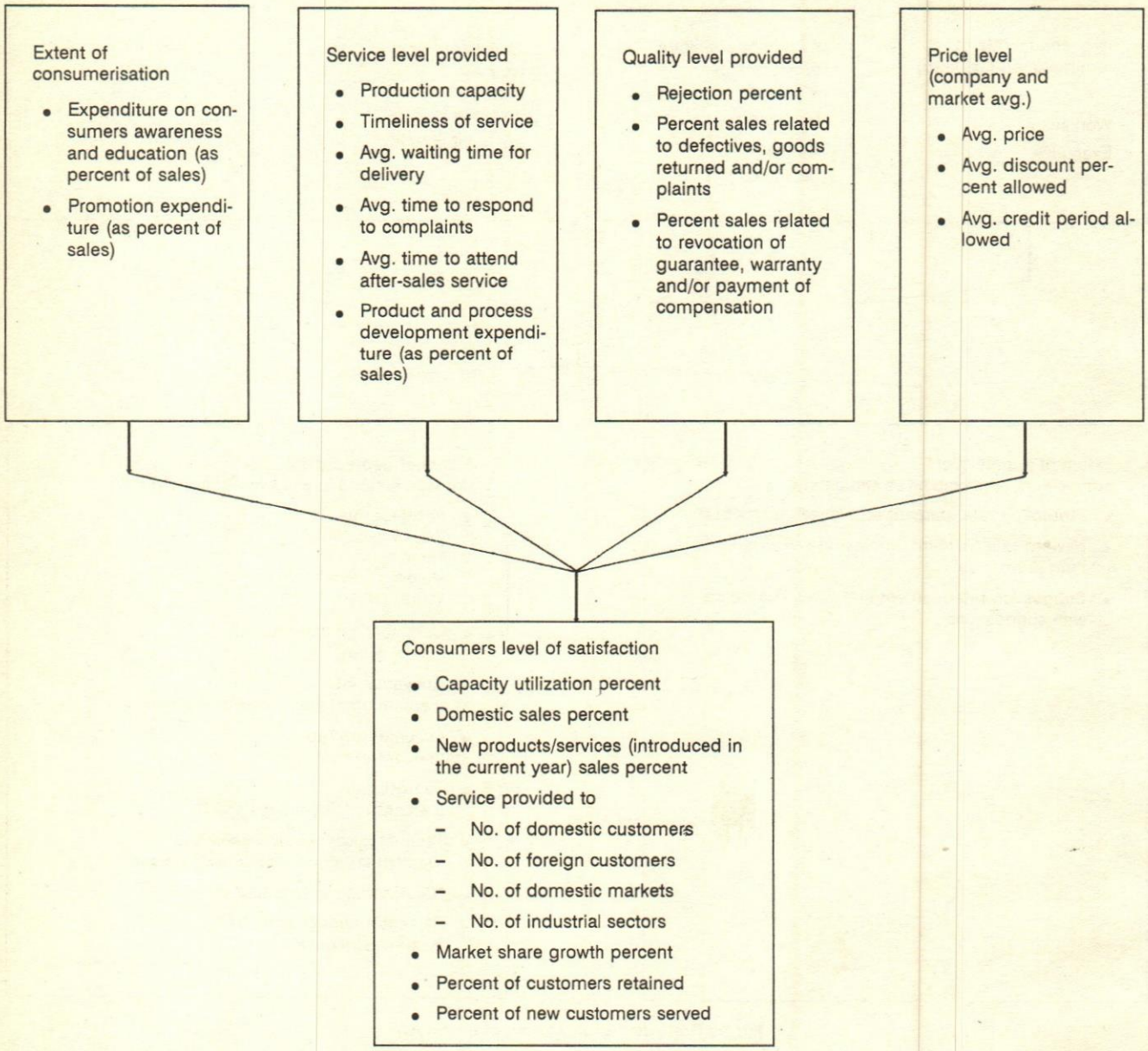

Fig. 2. The extent of services to consumers (for routine and non-routine products separately)

service and product and process development expenditure. Suitable surrogate measures wherever necessary have been suggested for the measure of such situational factors as in Fig. 2.

Likewise organisations should provide in their own interest the quality of products at least equal to that of competitors. But here again, quite often the level of technology adopted results in poor quality of products and services. At times, short-term profit goal leads to the use of cheaper inputs, endangering the quality level. The level of quality offered, in the negative side of the scale particularly for CSR, may be reflected by the extent of rejection and defectives and proportion of sales in respect of which compensation needs to be paid for damages as shown in Fig. 2.

The effective price level for CSR may be reflected in the conventional sense by price level, discount allowed and the credit terms offered by a company, relative to those of market averages, as presented in Fig. 2.

The measure of consumerisation, service level, quality level and the effective price level together

would reflect the social involvement i.e., the causal dimension of social performance relevant to consumers as in Fig. 2.

The measure of consumerisation, service level, quality level and the effective price level together would reflect the social involvement relevant to consumers.

Local Community as The Interest Group

Besides the rehabilitation of the displaced and the efforts to protect the environment from its own emission and waste disposal, organisations try to improve the local public health services amenities. At times, they contribute towards education and training of the local folk as well as towards games and sports and cultural activities. Many a time they play a key role in nurturing local SSI units and promoting entrepreneurship development. Thus, corporate social involvement regarding the local community mainly pertains to two broad areas viz.

- Community protection
- Community development

But the organisational contribution for the protection and development of the community may not be anywhere near the harms the organisations cause to the neighbourhood. Besides the pollution causing health hazards to the local residents, the area gets congested due to severe increase in traffic. The high income level of employees pushes up the cost of living in the area causing hardship to the other residents. Local area is infused with educated and skilled manpower of the organisation but they may all belong to different religion causing at times communal disturbances in the region. More locals may be educated and trained now and get jobs in the industrial houses but social evils are likely to increase in the area due to industries in the locality. Thus, the corporate social involvement in the negative side in the areas of concern of the local community pertains to:

- The waste disposed
- Traffic density
- Cost of living
- Level of communal harmony
- Social hazards

The extent of social involvement under community protection and development may vary depending upon the specific needs of the locality and the amount of organisational investments; however, in a generalized situation the organisational investment pattern may be as in Table 4.

Table 4: Contribution towards the development and protection of the local community during the year ended

(All figures in '000 mu)

Description	Expenditure		Gross block at the year end
	Revenue	Capital	
Rehabilitation of the displaced			
Land for the displaced			
Home for the displaced			
Public amenities			
Land and road development and maintenance			
Development of sewerage and maintenance			
Development of market place and maintenance			
Development of park and garden and maintenance			
Public health services			
Awareness camps and programmes on road safety, anti-drug, AIDS etc.			
Primary health centres			
Medical and hospital facilities at concessional rate			
Education and training			
Schools and Colleges for the community			
Vocational training centres			
Adult education programmes			
Public library			
Facilitation of local industries			
Support to local industries			
Support to develop local raw material resources			
Promoting local entrepreneurs			
Public facilities			
Contribution to games and sports			
Contribution to cultural activities			
Development of volunteer services			
Patronising local clubs			
Respond to other local Social causes			
Environment protection			
Pollution control expenditure			
Expenditure to reduce and recycle waste			
Expenditure to develop environment-friendly products			
Expenditure to protect the local area			

The corporate situation that causes anxiety in the minds of the local community may be reflected by operational parameters in case of the extent of waste disposed and traffic density, whereas in other three areas of concern suitable surrogate measures have been suggested as in Table 5.

Table 5: Organisational situation at work, during the year towards the community ended

Description	Relevant parameter
Waste Disposed (qty.)	
Solid	
Liquid	
Gas	
Traffic density (i.e. no. of vehicles used by company and its employees)	
Heavy	
Medium	
Light	
Disparity in income	
Organisation	
No. of employees	
Avg. pre capita income	
Local area	
Population	
Avg. per capital income	
Disparity in religion, caste etc.	
Percent belonging to different religions in the organisation	
Percent belonging to different religions in the locality	
Road towards social evils	
Total annual entertainment expenditure on behalf of its office and employees ('000mu)	
Total amount ('000 mu) involved during the year in organisational	
Frauds	
Malpractices	
Theft	
Total no of employees treated during the year for	
Occupational diseases	
Drink excesses	
Drugs	
AIDS	

The corporate involvement in terms of organisational investments in the positive side and the harmful situation it creates in different areas in the negative side is reflected in Fig. 3.

Society as the Interest Group

Organisations now-a-days, in a bid to survive in the midst of rapid technological advances and acute competition, invest quite heavily to come up with new materials, products and processes, reduce cost and improve the productivity of scarce resources, thus facilitating the national economy and consequently the society. Organisations at times invest in different areas of interest of general public like health, education, sports etc. Special schemes of development are drawn up for the minorities, scheduled castes and scheduled tribes and the handicapped, besides responding to social crisis.

Thus, the areas of corporate social involvement with society as the interest group pertain to two broad areas like the growth and development of the national economy in particular and the development of the society in general.

As against the contribution to the society as above, organisations consume various scarce natural and national resources of the country. Such areas of concern need to be taken into account to judge the extent of corporate social involvement.

Table 6: Contribution towards the interests of the society in general during the year ended

(All figures in '000 mu)

Description	Amount
Areas of concern of national economy	
Research and development expenditure towards:	
Technology development	
Import substitution	
Reduction in consumption of	
Non-renewable natural resources	
Other constrained resources	
Investments made in:	
R & D centres	
Ancillary Units	
Small scale industrial units	
Sick units rehabilitation	
Other domestic industrial houses	
Tax payment	
Areas of interest of general public	
Health and family welfare	
Medical and hospital services	
Education and training	
Art and culture	
Publications	
Games and sports	
Facilities to senior citizens	
Areas of concern of general public	
Control and removal of social evils	
Development of the minorities	
Education	
Training	
Others	
Facilities for the handicapped	
Response to social crisis like floods, famine, earthquak fire etc	

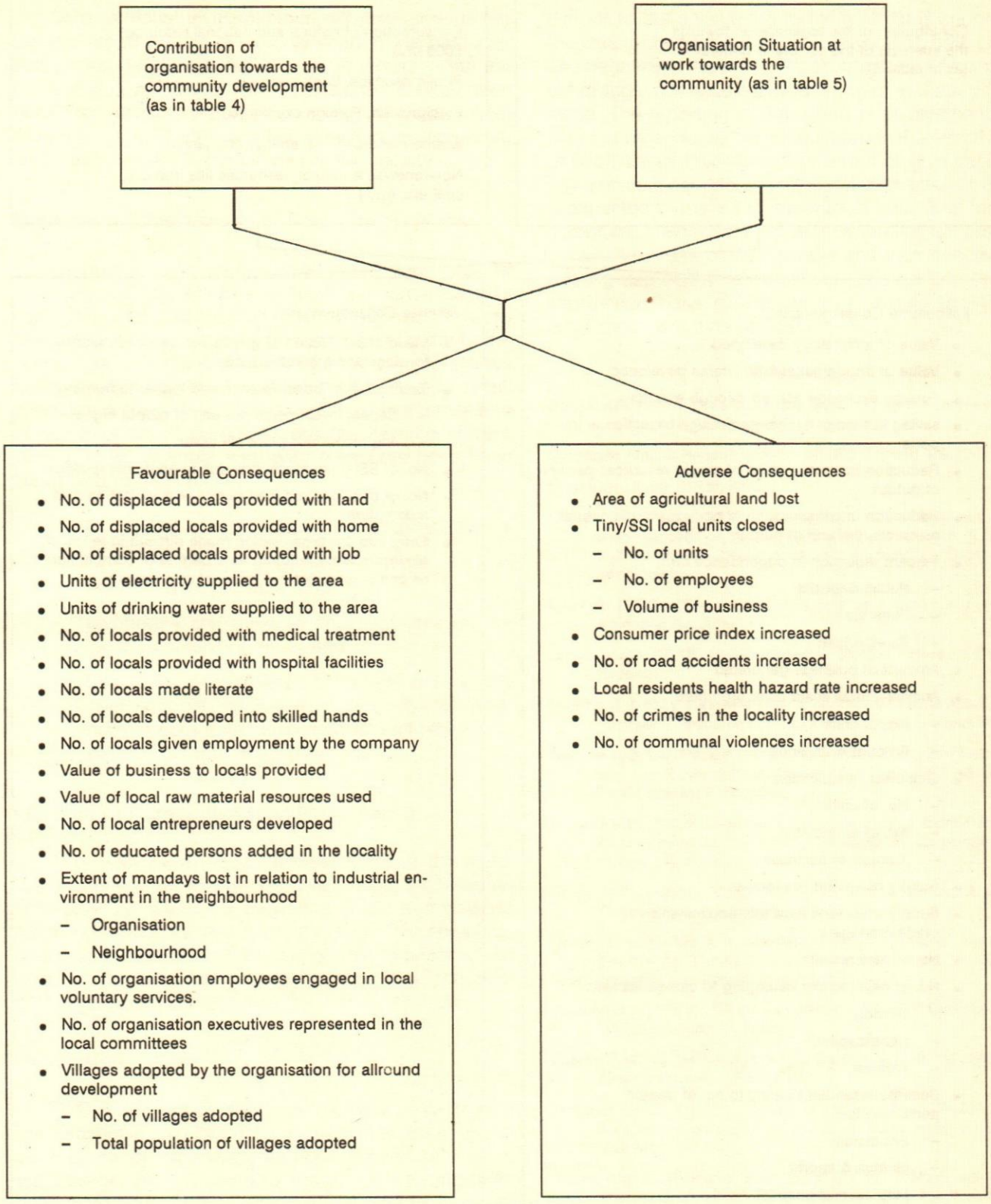

Fig. 3. Impact of the organisation on the local community during the current year

Focus

Reshaping Corporate Social Performance Reporting

V.K. Vasal

The present study aims at examining the consensus between the attitudes of the preparers and the users of corporate annual reports towards the disclosures on corporate social performance through the medium of annual reports. Using sample data from central public sector companies for a period of four sample years, the conclusions of the study are that there is a general agreement between the attitudes of the preparers and the users of annual reports, and that the views of neither the preparers nor the users of annual reports are currently in agreement with the levels of actual corporate reporting on social performance.

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According to Friedman (1962) the well-known economist, the only social responsibility of businesses is to maximize profits. However, over the last three decades or so, besides the financial profitability, there has been a growing concern all around about the responsibilities of the business units towards the society. This clamour for the social responsibilities of business has found its support, *inter alia*, in the legitimacy or social-contract theory (idealism) as well as in the economic self-interest (pragmatism), and socially responsible attitudes of business enterprises (Gray & Perks, 1982). In line with this new thinking, various authoritative accounting bodies all over the world have also recognized that modern business organisations owe an account of their social performance to the various interest-groups in the society (for instance ASSC, 1975; AICPA, 1977).

Significantly, there is a convergence of opinions amongst leading professional accounting bodies and renowned accounting researchers on the major constituents of social responsibility information. To illustrate, NAA (1974) has identified four major areas of social performance reporting as community involvement, human resources, physical resources and environmental contributions, and product or service contributions. Ramanathan (1979) includes the following areas in his format: employee related information, pollution and environmental protection data, product safety, energy usage, research and development activity, productivity statistics, and community projects and relationships. Ahmed and Zeghal (1986) have categorized social

Four major areas of social performance reporting are community involvement, human resources, physical resources and environmental contributions.

reporting information under environment, energy, fair business practices, human resources, community involvement, products, and others. Thus, social responsibility accounting can be defined as the measurement and subsequent reporting of the social impacts of business activities[1]. It includes information on business activities concerning employees, products, economic resources, environment and society in general.

Social responsibility accounting can be defined as the measurement and subsequent reporting of the social impacts of business activities.

Social Reporting – Indian Scene

The first authoritative support to social responsibility disclosures by companies in India came from the Sachar Committee, Government of India (1978). The Committee had observed that in the development of corporate ethics, we have reached a stage where the question of the social responsibility of business can no longer be taken lightly. The corporate sector must accept the fact that although profits are indicative of sound business health, contribution to social progress is equally becoming a measure of corporate achievement. The question of social responsibility of the business is no longer in dispute. The only relevant consideration is how far and in what manner can the business discharge it. In a far-sighted recommendation, the Committee proposed an amendment in the Indian Companies Act so that "a provision may be made in the Act that every company along with the Directors' Report shall also give a Social Report which will indicate the quantify, in as precise and clear terms as possible, the various activities relating to the social responsibility... which have been carried out by the company in the previous year".

Subsequent to the recommendations made by the Sachar Committee, Indian Companies Act has been amended in 1988 and corporate disclosures on such items as Energy Conservation, Research and Development, and Foreign Exchange Earnings and Outgo have been made mandatory under the law. Further, the Companies Bill, 1993 (now withdrawn) had proposed disclosures on 'Environmental Protection' as a part of the annual reporting by the companies.

1. In this paper, terms 'social responsibility accounting', 'social responsibility disclosures', 'social accounting' and 'social reporting' have been used interchangeably.

Objectives

With the growing accountabilities due to social responsibilities, it has become imperative for the business units in India to institute such information systems which could effectively measure, report and evaluate their social performance on a periodic basis. Over the years, business corporations have deployed a large variety of mediums to disseminate information on their working and affairs to the external business participants – investors, employees, customers, the government and the public at large. Of all the mediums, however, Corporate Annual Report (CAR) remains the primary, most popular, longer lasting, and extensively accessible medium of communication. In fact, since 1988, as already stated, Indian Companies Act has also mandated annual reporting on some aspects of social responsibilities through the medium of CARs. But, as all the companies are under an obligation to observe the requirements of the law, there is hardly any corporate choice but to disclose the mandated social reporting information. In view of the foregoing, the focus of the present study is on analyzing the attitudes of the preparers and users of annual reports towards legally-non-mandated disclosures, termed 'Extended Social Reporting' (ESR), which are being displayed currently through the medium of corporate annual reports. Undoubtedly, ESR is a meaningful indicator of the enlightened self-regulation and pro-active behavior by a company.

It has become imperative for the business units to institute such information systems which could effectively measure, report and evaluate their social performance on a periodic basis.

In terms of ESR, the main objective of the present study is to examine the consensus between the preparers and users of annual reports on the social responsibility disclosures made by the central public sector companies (CPSC) in India. As a part of the study, degree of associations between informational preferences of preparers and users of CARs with the levels of actual corporate disclosures on ESR items have also been examined.

Method

In order to achieve the stated research objective, the following steps are taken. Those items of ESR which are being disclosed consistently by the companies through their annual reports have been identified. A

Findings

Based on the past evidence and commonly held beliefs, three hypotheses have been put to test. These are: there is a lack of consensus between the attitudes of preparers (intended outcomes) and those of the users (desired outcomes) towards disclosures on ESR items; the actual corporate performance (observed outcomes) is a reflection of the attitudes of the preparers (intended outcomes), and there is a general disagreement between the actual corporate performance (observed outcomes) and informational preferences of the users (desired outcomes). (Chandra, 1974; Chen & Lambert, 1977; Belkaoui, 1979; Firth, 1979; Firer and Meth, 1986; and Courtis, 1992).

For testing the above hypotheses, empirical results obtained by using the method outlined are presented in table 1 and table 2. In table 1 empirical findings on the attitudes of preparers, users and corporates towards disclosures on selected ESR items are presented. Table 2, shows the inter-group associations between the disclosure preferences of accountants, users and the companies.

Table 2: Degree of Association Between Groups

Spearman's Rank Correlations:	RAVG	RPREP	RUSER
RAVG	1.0000	.3433 (0.040)	.2374 (0.117)
RPREP	.3433 (0.040)	1.0000	.8443 (0.000)
RUSER	.2374 (0.117)	.8443 (0.000)	1.0000

N of cases: 27 (t-values in brackets)
RAVG – Ranks of average actual reporting on information items in 1988 to 1991
RPREP – Ranks of Perceptions of preparers of annual reports
RUSER – Ranks of Perceptions of users of annual reports.

In table 1, levels of average actual disclosures on ESR items through the annual reports have been ranked in the descending order. That is, higher the percentage reporting on an item, lower is its rank. A perusal of results is sufficient to reveal the prevalent disclosure preferences of the CPSC in India. Likewise, the attitudes of the preparers and users of annual reports towards the relative importance of disclosures on each of the ESR items have been ranked in the table in the descending order. It is indeed noteworthy that the highest rated item by both the preparers and the users is 'Description of operational activities (including service spectrum) (mean rating of 4.400 for preparers and 4.540 for users). Similarly, the lowest rated item by both the preparers and users is 'Comprehensive Social Accounts – Income Statement and Balance Sheet' (mean rating of 1.726 for preparers and 2.303 for users). Further, the range of importance weights assigned to ESR items is also almost the same – 2.674 for preparers and 2.237 for users. These findings provide first indications of a fair degree of closeness in the attitudes of preparers and users towards disclosurers on corporate social performance.

In order to examine research hypothesis number one, first of all, significant differences between weights assigned to each ESR item as shown in table 1, have been detected by horizontal analysis (on an item-by-item basis) by using both parametric (Student's t-Test) and non-parametric (Mann-Whitney U-Test) statistics. The results of these tests reveal that the hypothesis of no difference between the perceptions of preparers and users has been rejected at 5 per cent level of significance for only 7 (25.95%) and 6 (22.22%) items respectively, using Mann-whitney U-Test and Student's t-Test. Even at 10 per cent level, the hypothesis is rejected only for 9 (33.33%) items for both Mann-Whitney and t-Test. That is, differences between the importance weights assigned by the preparers and users of annual reports to two-thirds of the ESR items are statistically non-significant even at 10 per cent level. The specific items for which hypothesis of no difference has been rejected at 5 per cent, using Mann-Whitney test, are listed. Notably, these are the items whose disclosures through CARs are perceived differently by the preparers and users of the annual reports:

- Employer-employee relations and productive man-days lost
- Attitude of company toward social responsibility
- Safety and occupational health
- Statement of distribution of value added
- Comprehensive social accounts – income statement and balance sheet
- Revenue capital expenditure on social overheads
- Efficiency ratios in consumption of bought-out inputs.

On the whole, the results show that, contrary to the common belief and the stated hypothesis, there is a general consensus between the perceptions of the preparers and users of annual reports. This is evident from the acceptance of the hypothesis of no difference in a large majority of cases. More specifically, the Mann-Whitney test shows that, at 5 per cent level, there is an evidence of a general consensus on 20

(74.07%)[4] of the 27 items included in the disclosure index. In a nutshell, weights assigned by preparers and users to ESR items are generally in agreement.

Weights assigned by preparers and users to ESR items are generally in agreement.

Whereas a general consensus between the attitudes of the preparers and users of annual reports on disclosures of ESR items (examined individually) is obvious from the above findings, a possibility exists that there may be a lack of association between the two groups on the relative importance of disclosing these items. In order to examine this possibility, as a second step, the first hypothesis has been tested in terms of a vertical analysis (an inter-group lack of agreement on the relative importance of ESR items) by using the results on Spearman's Rank Correlation Coefficients as shown in table 2. Results on inter-group associations presented in the table suggest that the relative importance of disclosures on ESR items to preparers and users are significantly and highly related to each other. In fact, the value of the observed correlation coefficient is as high as 0.84 besides being statistically significant at 1 per cent level of significance. These findings imply that the degree of association between the views of preparers and users of annual reports is very high[5] and there is a consensus between the two groups on the relative value of ESR information presently finding a place in the corporate annual reports.

While examining the consensus between the views of the preparers and users of annual reports, Belkaoui (1979), Firer and Meth (1986) and others have, besides examining the inter-group association between the preparers and users, also examined the inter-group associations between the actual corporate disclosures on the one hand and the views of the preparers and users on the other. It is done in order to comprehensively analyze the situation at hand and identify the major cause(s) for any (mis)match between the views of preparers and users. This comprehensive approach has been adopted in the present study as is obvious from the further testing of hypotheses numbered two and three.

For the second hypothesis, results presented in table 2 show that the value of correlation coefficient between the relative levels of actual corporate reporting on ESR items and inclinations of the preparers of annual reports is a low at 0.34 (more particularly when compared with a high correlation coefficient of 0.84 between the perceptions of the preparers and users of annual reports). Also, the value of the coefficient is significant only at 5 per cent level but not at 1 per cent level of significance[6]. In other words, the results imply that, contrary to expectations, the degree of association between the views of the preparers and the actual content on ESR items in corporate annual reports is rather weak. In operational terms, the results have shown that relatively more reporting is being done by companies on items having relatively lower importance to the preparers of annual reports.

For hypothesis number three, results presented in table 2 show that, as expected, actual corporate reporting on ESR items has a low degree of association with the perceptions of the users of annual reports. The value of the coefficient is observed to be 0.24 and is found statistically non-significant even at 10 per cent level of significance[7]. The results imply that there is a lack of association between the informational preferences of the users and the actual content on ESR items in the corporate annual reports. In operational terms, the results have revealed that relatively more reporting is being done by companies on items having relatively lower importance to users of annual reports.

Relatively more reporting is being done by companies on items having relatively lower importance to users of annual reports.

To sum up, the analysis of results has led to the following inferences relevant to each of the three research hypotheses tested in this study:

- Contrary to a common belief, there is a consensus between the attitudes of preparers and users of annual reports towards disclosures on corporate social performance. Stated alternatively, the results reveal that preparers of the

4. This finding is comparable, for example, to the consensus on 25 (83.33%) of the 30 items reported by Belkaoui (1979), though not on ESR items.

5. Incidentally, the value of coefficient in this study is much higher than the coefficient of 0.73 observed by Belkaoui (1979) in Canada; and 0.75 by Firer and Meth (1986) in South Africa.

6. The value of correlation coefficient obtained in this study is lower than values of 0.44 and 0.56 observed by Belkaoui (1979) and Firer and Meth (1986), respectively.

7. The coefficient value recorded in the study is lower than 0.59 and 0.24 observed by Belkaoui (1979) and Firth (1979), respectively; but higher than 0.13 found by Firer and Meth (1986),

annual reports for CPSC understand the informational needs of users very well and, given the will and ability to disseminate information on the part of companies, they are well equipped to meet corporate social responsibility obligations towards users adequately.

- The results on the association of the actual disclosure with the perceptions of the preparers suggest a lack of agreement between the two. The results, interpreted along with the findings obtained on association between the perceptions of the preparers and users, provide evidence that as informational needs in a social system increase, the preparers of annual reports tend to be realizing these needs at a faster rate than the overall corporate system involved in producing and supplying the information. However, a weak correlation of the preparer's views with the actual disclosure suggests that they are not in a position to convey their understanding of users' informational needs through the medium of CAR. This could possibly be due to various internal and external constraints.
- The results on the association of the actual disclosures with the perceptions of the users suggest either a general corporate ignorance of the users' informational needs or a lack of will and ability of companies to fulfill ESR informational needs of the users.

Notably, the most important implication of the findings summarized above is that for disclosing information on corporate social performance through CARs, industry accountants as an intermediary between the users as consumers of information and companies as suppliers of information are apparently very well informed of the users' needs and preferences. However, the disclosure attitudes of accountants are not seen matching highly with the actual reporting by the companies. This observed behaviour of accountants can possibly be due to various personal, organisational and environmental constraints. These constraints are: a lack of will on the part of accountants to disseminate information, additional cost involved in accumulation and dissemination of information, fear of misuse of information by business competitors, and last but not the least, accountants not having the final say in deciding the contents of the annual reports. In the light of this, it is proposed that industry accountants should be given enough space and freedom in deciding the actual content of social responsibility disclosures through the CARs. This would indeed be a step forward in making corporate social reporting more meaningful and useful in the years to come.

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Feature

Market Efficiency & Relative Strength Theory—Some Preliminary Evidences

Rudra P. Mahapatra

The relative strength theory holds that stocks which had outperformed the market in the past should continue to outperform the market in the future. Conversely, stocks that have done poorly should continue to perform poorly. If this theory is correct the stock market cannot be an efficient market. The present study contains a test of the relative strength theory in the Indian stock market. To some extent the findings of the study support the relative strength theory and disclose that Indian stock market is less efficient in the short run, but more efficient in the longer run.

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The Efficient Market Theory is not properly understood by a large segment of the financial community. This theory holds that market prices fully and instantaneously reflect all available information. In this sense, share prices are said to be correct and provide accurate signals for resource allocation (Firth, 1986). In other words, in an efficient market, all relevant information is fully reflected in stock prices so that no investor is able to make excess profits based on any existing information. As such, informed competition establishes stock prices and these offer investors a fair combination of risk and expected return. By virtue of this, even in major markets, professional investors "cannot beat the market by picking the winning stocks consistently." This fact has been well supported by empirical studies carried out by financial experts during the last three decades in developed countries such as, U.S.A., U.K., Australia etc. But smaller and less developed stock markets may not be efficient to the same extent. In these markets, the individual investors may be able to earn above normal return by picking stocks that can out-perform the market. In this context, Wai and Patrick (1973) suggest that "the most profitable line of research would be in detailed case studies of capital markets in specific developing countries."

In an efficient market, all relevant information is fully reflected in stock prices so that no investor is able to make excess profits based on any existing information.

Indian Stock Market Scenario

Although India is a vast country, its stock market is relatively small compared to the U.S. and U.K. markets. However in the recent times the Indian stock market is

among the most interest generating market places in the world. Investing population wise, it ranks third in the world next only to United States and Japan. In the last two years, the liberalisation measures initiated by the Government have paved the way for the opening up of the Indian economy to the international market. Measures like abolition of the Office of the Controller of Capital Issues, granting powers to the Securities and Exchange Board of India, full convertibility of the rupee on capital account, disinvestment of shares of public sector undertakings, allowing setting up of private sector mutual funds, commencing of operation of OTC Exchange of India etc. would surely lead to the widening of the horizon of the Indian capital market. Despite this the Indian stock market still looks 'under developed.'

Capital Market Efficiency: A Review

Capital Market Efficiency has been divisionalised into three levels: the 'weak' form, the 'semi-strong' form and the 'strong' form (Roberts, 1967; and Fama, 1970). Under the 'weak' form share prices fully reflect the information implied by all prior price movements. This means that there is no relationship between the past and future price movements. This in turn implies that the best linear predictor of tomorrow's price is today's price so that future price changes cannot be predicted from historical price changes. Consequently investors are unable to profit from studying charts of past prices. The weak form of efficiency has also been designated in literature as 'random walk hypothesis.' The semi-strong form efficient market theory holds that stock prices adjust rapidly to all publicly available information. This implies that using publicly available information, investors will not be able to earn above normal rates of return after considering the risk factor. The strong form of the model holds that all information affecting stock prices, both public and private, is reflected in stock prices. If the market is not efficient in this form, individual investors might have an edge in acquiring new information and might be able to earn above normal returns. Although there are these three levels of efficient market model, they are not independent of the another. The test presented in this paper pertains only to the weak form of the model.

The overwhelming conclusion from the accumulated research studies is that major stock markets are efficient at least in their weak form. Kuehner and Renwick (1980) and Firth (1986) provide an excellent review of empirical studies on market efficiency. However recent studies of the weak form market model relating to Indian stock market offer inconsistent findings. In one of the earlier studies Rao and Mukherjee (1971) applied spectral analysis to weekly averages of daily closing quotations of just one company's share and found no evidence contrary to Random Walk Hypothesis. Sharma and Kennedy (1977) tested the random walk model, by runs analysis and spectral densities, against representative stock market indexes of the Bombay, New York and London Stock Exchanges during 1963-73. They found that stocks on the Bombay Stock Exchange obey a random walk and are equivalent in this sense to the behaviour of stock prices in the markets of advanced industrialised countries. Sharma (1983) tested the Integrated Moving Average form of random walk model suggested by Box and Pierce (1970) with the help of 23 individual stocks traded on the Bombay Stock Exchange for the six year period of 1973-78. His study result disclosed that the random walk model appears to be an adequate representation of the price behaviour of individual stocks traded on the Bombay stock Exchange. Gupta (1985) examined the equity share price behaviour in India during the period January 1971 to March 1976 and specifically tested the random walk hypothesis using daily and weekly prices of 39 shares. He employed the serial correlation tests and runs test and found evidence in support of random walk hypothesis. Barua and Raghunathan (1986) argued that the Indian capital market was inefficient. They justified this with the help of an illustration of Reliance. Rao (1988) employed serial correlation analysis, runs test and filter rules to the week end share price data of 10 blue chip companies over the period 1983 to 1987. His study result supported the random-walk hypothesis. Pandey and Bhat (1988) in their study denied the existence of market efficiency in any of its three forms. However, their study findings related only to market participants' attitude and perceptions in the understanding and acceptance of Efficient Market Hypothesis. Yalwar's (1989) study was based on 122 common stocks listed and actively traded on the Bombay Stock Exchange covering a period of 20 years i.e. from 1963-1982. His study results disclose that the Bombay Stock Exchange is efficient in the weak form at least in pricing frequently traded common stocks. Choudhury (1991) applied both the serial correlation test and the runs test to daily log prices of 93 actively traded shares for the period January 1988 to April 1990. The test results according to him, do not appear to support the hypothesis of weak form of market efficiency. Ranganatham and Subramanian (1993) in their study attempted to test the weak form of Efficient Market

The conclusion from accumulated research is that major stock markets are efficient at least in their weak form.

Hypothesis using the frequency domain approach of spectral analysis. The results of the analysis show that to some extent the Indian stock market is inefficient in its weak form. However, they have failed to provide any generalisation due to limited sample size.

Since the above studies on the Indian stock market offer inconsistent findings, more extensive testing using alternative measures and time periods is needed.

Relative Strength Theory

The relative strength theory holds that stocks which had outperformed the market in the past should continue to outperform the market in the future. Conversely, stocks that have done poorly, should continue to perform poorly (Wong & Mak, 1983). If the theory of relative strength is correct, it is possible to derive useful information from past prices for predicting future prices. This situation will occur only when the market is not efficient in the weak form. Based on this logic of the theory, attempts have been made in the past by financial experts to examine the Efficient Market Hypothesis both in the developed and developing economies. Levy (1967) in his work tested the random walk hypothesis using different strategies based essentially on relative strength. His study based on the weekly closing prices of 200 stocks from the New York Stock Exchange covering a 200 week period from 1960 to 1965, found some evidence of non-randomness of US stock prices. However Jensen and Bennington (1970) questioned Levy's conclusion and maintained that the theory of random walk has not been refuted. In another study Dawson and Wong (1981) found almost no statistical relationship between stock performance in one year and the next during 1972-1979 for the Hong Kong market. Wong and Mak (1983) examined the behaviour of weekly closing prices of 28 major stocks in the Hong Kong market during 1976 to 1980. The study results disclose that the theory of relative strength fairly accurately describes the behaviour of Hong Kong stock prices. Accordingly, the Hong Kong market is not likely to be an efficient market.

The relative strength theory holds that stocks which had outperformed the market in the past should continue to outperform the market in the future. conversely, stocks that have done poorly, should continue to perform poorly.

It is in the above backdrop, the present paper seeks to consider the question, whether a measure of relative strength for major stocks traded in the Indian stock market can provide information useful for predicting future price performance. This task has been accomplished in the present study by the application of relative strength theory. The rank correlation analysis has extensively been employed to examine the relative strength in the performance of 26 major stocks traded in the Bombay Stock Exchange during January 1989 to December 1992 to derive inferences.

Methodology

Twenty six equity stocks listed and actively traded in the Bombay Stock Exchange during January 1989 to December 1992 constitute the sample. Adequate care was taken to exclude the stocks that had no transactions in any of the months falling within the study period i.e. from January 1989 to December 1992. Further care was also taken to exclude the stocks which have changed their nominal value during the study period. As such, all the 26 scrips selected for the present study conform to the above two criteria. Month end prices of the selected stocks were collected for the study period from the various volumes of Bombay Stock Exchange Official Directory for the purpose of analysis. There were 48 months within the four years study period beginning from January 1989 to December 1992. The monthly price data were not adjusted for dividends or issue of bonus/right shares. This may possibly introduce error in the data. However, it is not likely to impair the findings of the study.

Keeping in view the objective and scope of the study, the rank correlation analysis was employed to test how well a stock's rank of performance at period 1 matches its rank in period 2. Rank correlation is a measure of the degree of association between two sets of ranks observation. If the rank of performance at period 1 is the same as the rank at period 2 for every pair of observations, the rank correlation co-efficient will equal +1. Further it implies complete agreement in the order of ranks. If there is no consistency the co-efficient will be zero. If the rank at one period is precisely the reverse of the other, the co- efficient will be –1. This will imply complete disagreement in the order of ranks. The co-efficient can never be greater than +1 or less than –1.

In this study to compare a stock's rank of performance to different time periods, the return on that stock needs to be calculated. The return on a stock j for time period t is calculated by using the following formula:

$$r_{j \cdot t} = \frac{P_{j \cdot t} - P_{j \cdot t-1}}{P_{j \cdot t} - 1}$$

Where $P_{j \cdot t}$ is the price of stock j at various periods (t = 1,2,3,4,...) However the price of stock j at different time periods represents the average of the highest and the lowest price. Using the above formula the returns on all the 26 stocks, there were 26 ranks for each period. The degree of rank correlation between two successive sets of ranks was measured by Spearman rank correlation coefficient.

The significance of the rank correlation co-efficient was tested by using a special table (Levin, 1979). According to this table, in the present study with n = 26, the rank correlation coefficient is significant at the 0.10 level when the absolute value of rank correlation co-efficient is greater than 0.329. It is significant at the 0.05 level when the value is greater than 0.389. The above test of significance will disclose whether or not there exists a correlation between the two sets of price changes.

The raw data in respect of all the 26 stocks covering the period January 1989 to December 1992 were then transformed into monthly, quarterly, half yearly and yearly returns for the rank correlation tests. For the computation of the monthly return of a stock, the time lag is one month and therefore there is a maximum of 47 transformed return figures for each sample stock for monthly rank correlation tests during the study period. For the quarterly return the time lag is three months and 45 transformed figures were obtained for each stock. Similarly there were 42 and 36 transformed figures for each stock for the half yearly and yearly returns respectively. Using the 47 monthly returns data series, 46 rank correlation coefficients were obtained. Similarly, we could derive 44 quarterly, 41 half yearly and 35 yearly rank correlation co-efficients. These correlation coefficients include coefficients for all possible paired consecutive monthly, quarterly, half yearly and yearly returns.

Results

The present study employed rank correlation analysis in order to discover whether the performance of a stock in one period relates to its performance in the following period. The length of period used for performance observation included one month, one quarter, half year and one year. In the monthly rank correlation test, all the 26 stocks were ranked by their returns for each month and the rank correlation coefficient was computed for every two successive months. Similarly rank correlation co-efficients were also computed for every two successive quarters, half years and years. The detailed results of rank correlation tests are summarised in table 1. The summary results in this respect are disclosed in table 2.

Table 1: Detailed Results of Rank Correlation Tests

Sl. No.	Paired Observations	r_s
1	2	3
Monthly		
1.	Feb 89–Mar 89	0.326
2.	Mar 89–Apr 89	0.599*
3.	Apr 89–May 89	0.448*
4.	May 89–June 89	0.046
5.	June 89–July 89	0.066
6.	July 89–Aug 89	0.280
7.	Aug 89–Sept 89	0.212
8.	Sept 89–Oct 89	–0.099
9.	Oct 89–Nov 89	0.041
10.	Nov 89–Dec 89	0.213
11.	Dec 89–Jan 90	0.542*
12.	Jan 90–Feb 90	0.295
13.	Feb 90–Mar 90	0.426*
14.	Mar 90–Apr 90	0.549*
15.	Apr 90–May 90	0.209
16.	May 90–June 90	–0.083
17.	June 90–July 90	0.133
18.	July 90–Aug 90	0.352**
19.	Aug 90–Sept 90	0.521*
20.	Sept 90–Oct 90	0.181
21.	Oct 90–Nov 90	0.088
22.	Nov 90–Dec 90	0.037
23.	Dec 90–Jan 91	0.246
24.	Jan 91–Feb 91	–0.387*
25.	Feb 91–Mar 91	0.350**
26.	Mar 91–Apr 91	0.421*
27.	Apr 91–May 91	0.348**
28.	May 91–June 91	0.122
29.	June 91–July 91	0.268
30.	July 91–Aug 91	0.093
31.	Aug 91–Sept 91	0.010
32.	Sept 91–Oct 91	0.392*
33.	Oct 91–Nov 91	0.557*
34.	Nov 91–Dec 91	0.375**
35.	Dec 91–Jan 92	–0.200
36.	Jan 92–Feb 92	0.299
37.	Feb 92–Mar 92	–0.037
38.	Mar 92–Apr 92	0.032
39.	Apr 92–May 92	0.043

(Contd. Table 1)

(*Contd. Table 1*)

1	2	3
40.	May 92–June 92	0.320
41.	June 92–July 92	0.174
42.	July 92–Aug 92	–0.039
43.	Aug 92–Sept 92	0.302
44.	Sept 92–Oct 92	0.376**
45.	Oct 92–Nov 92	0.285
46.	Nov 92–Dec 92	0.076
Quarterly		
1.	Feb 89–May 89	0.269
2.	Mar 89–June 89	0.430*
3.	Apr 89–July 89	–0.218
4.	May 89–Aug 89	–0.139
5.	June 89–Sept 89	–0.208
6.	July 89–Oct 89	0.049
7.	Aug 89–Nov 89	–0.118
8.	Sept 89–Dec 89	0.399*
9.	Oct 89–Jan 90	–0.092
10.	Nov 89–Feb 90	–0.058
11.	Dec 89–Mar 90	0.207
12.	Jan 90–Apr 90	–0.055
13.	Feb 90–May 90	0.247
14.	Mar 90–June 90	0.146
15.	Apr 90–July 90	0.094
16.	May 90–Aug 90	0.236
17.	June 90–Sept 90	0.004
18.	July 90–Oct 90	–0.085
19.	Aug 90–Nov 90	0.448*
20.	Sept 90–Dec 90	–0.298
21.	Oct 90–Jan 91	0.207
22.	Nov 90–Feb 91	0.082
23.	Dec 90–Mar 91	–0.147
24.	Jan 91–Apr 91	–0.120
25.	Feb 91–May 91	0.159
26.	Mar 91–June 91	–0.280
27.	Apr 91–July 91	0.083
28.	May 91–Aug 91	0.189
29.	June 91–Sept 91	0.048
30.	July 91–Oct 91	0.189
31.	Aug 91–Nov 91	0.030
32.	Sept 91–Dec 91	–0.362**
33.	Oct 91–Jan 92	0.101
34.	Nov 91–Feb 92	–0.071
35.	Dec 91–Mar 92	0.229
36.	Jan 92–Apr 92	–0.044
37.	Feb 92–May 92	–0.413*
38.	Mar 92–June 92	–0.103
39.	Apr 92–July 92	–0.020
40.	May 92–Aug 92	–0.259
41.	June 92–Sept 92	–0.042
42.	July 92–Oct 92	0.100
43.	Aug 92–Nov 92	–0.055
44.	Sept 92–Dec 92	0.087
Half-Yearly		
1.	Feb 89–Aug 89	–0.368**
2.	Mar 89–Sept 89	0.168
3.	Apr 89–Oct 89	–0.307
4.	May 89–Nov 89	0.252
5.	June 89–Dec 89	0.069
6.	July 89–Jan 90	–0.102
7.	Aug 89–Feb 90	–0.471
8.	Sept 89–Mar 90	0.031
9.	Oct 89–Apr 90	0.146
10.	Nov 89–May 90	0.101
11.	Dec 89–June 90	–0.367**
12.	Jan 90–July 90	0.021
13.	Feb 90–Aug 90	0.148
14.	Mar 90–Sept 90	0.210
15.	Apr 90–Oct 90	0.180
16.	May 90–Nov 90	0.023
17.	June 90–Dec 90	0.206
18.	July 90–Jan 91	–0.409*
19.	Aug 90–Feb 91	0.136
20.	Sep 90–Mar 91	0.287
21.	Oct 90–Apr 91	0.508*
22.	Nov 90–May 91	0.069
23.	Dec 90–June 91	0.091
24.	Jan 91–July 91	0.041
25.	Feb 91–Aug 91	0.254
26.	Mar 91–Sept 91	0.397*
27.	Apr 91–Oct 91	0.172
28.	May 91–Nov 91	0.446*
29.	June 91–Dec 91	0.341**
30.	July 91–Jan 92	0.334**
31.	Aug 91–Feb 92	0.203
32.	Sept 91–Mar 92	0.069
33.	Oct 91–Apr 92	–0.207
34.	Nov 91–May 92	0.125
35.	Dec 91–June 92	0.146
36.	Jan 92–July 92	0.232
37.	Feb 92–Aug 92	0.199
38.	Mar 92–Sept 92	0.362**
39.	Apr 92–Oct 92	0.092
40.	May 92–Nov 92	0.269
41.	June 92–Dec 92	–0.034

(*Contd. Table 1*)

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Yearly		
1.	Feb 89–Feb 90	0.177
2.	Mar 89–Mar 90	–0.106
3.	Apr 89–Apr 90	0.206
4.	May 89–May 90	0.327
5.	Jun 89–June 90	0.066
6.	July 89–July 90	–0.081
7.	Aug 89–Aug 90	–0.120
8.	Sept 89–Sept 90	0.047
9.	Oct 89–Oct 90	–0.069
10.	Nov 89–Nov 90	0.242
11.	Dec 89–Dec 90	–0.355**
12.	Jan 90–Jan 91	–0.003
13.	Feb 90–Feb 91	–0.260
14.	Mar 90–Mar 91	0.265
15.	Apr 90–Apr 91	0.245
16.	May 90–May 91	–0.088
17.	June 90–June 91	0.253
18.	July 90–July 91	0.106
19.	Aug 90–Aug 91	0.102
20.	Sept 90–Sept 91	–0.191
21.	Oct 90–Oct 91	0.321
22.	Nov 90–Nov 91	0.255
23.	Dec 90–Dec 91	0.083
24.	Jan 91–Jan 92	0.100
25.	Feb 91–Feb 92	0.045
26.	Mar 91–Mar 92	0.523*
27.	Apr 91–Apr 92	–0.013
28.	May 91–May 92	0.025
29.	June 91–June 92	0.164
30.	July 91–July 92	0.040
31.	Aug 91–Aug 92	0.412*
32.	Sept 91–Sept 92	0.089
33.	Oct 91–Oct 92	0.320
34.	Nov 91–Nov 92	–0.102
35.	Dec 91–Dec 92	0.015

*Significant at the 0.05 level
**Significant at the 0.10 level

As shown in table 2, of the total 166 rank correlation coefficients, 72.1 per cent are of positive signs and 27.9 per cent are of negative signs. There are 33 coefficients, (around 20 per cent of the total) that are significantly different from zero at the 0.10 level. On raising the acceptable confidence point to the 0.05 level, only 20 of the total 166 coefficients were found significant, accounting for around 12 per cent of the total number of coefficients. Further as evident from table 2, at the 0.10 level of significance, 14.5 per cent of the total number of coefficients were positively significant and 4.9 per cent were negatively significant. When the acceptable confidence point was raised to the 0.05 level, 9.8 per cent of coefficient were found positively significant and 1.8 per cent turned negatively significant. This evidence disclosed that the relationship between the relative performance of a stock in two successive periods was on an average, very low.

However, a close look at table 2 further disclosed that there was a clear tendency for the chance of positive relation between the stock performance in two consecutive periods to increase as the length of the time intervals used for performance observations decreases, with the individual exceptions of the quarterly observations. For the total number of rank correlation coefficients, the percentage of positive coefficients increased consistently from 68.6 per cent yearly returns to 87 per cent for monthly returns with the individual exception of the quarterly returns, while the percentage of negative coefficients decreased from 31.4 per cent to 13 per cent. Here also the exception was quarterly returns. The chance of significant positive relation between returns in two successive periods also exhibited the same tendency. For those coefficients significant at the 0.10 level, the chance of positive relation increased from 5.7 per cent to 30.4 per cent, while the chance of positive relation increased from 5.7 per cent to 19.5 per cent by shifting the acceptable confidence level to 0.05. Thus the above results clearly support the notion of significant positive relation to some extent between the relative performance of a stock in two consecutive months. This further indicates that the theory of relative strength is holding good to some extent so far as the monthly returns data are concerned. In other words, the market is found to be probably not efficient when the length of time intervals used for performance observation declines from one year to one month.

There was a clear tendency for the chance of positive relation between the stock performance in two consecutive periods to increase as the length of the time intervals used for performance observations decreases.

This further implies that the Indian Stock Market is less efficient in the short run, but more efficient in the longer run. However, the above cited inference still needs closer examination to arrive at a definite conclusion. More

Table 2: Summary Results of Rank Correlation Tests (Number and Percentage)

Periods	Rank No.	Correlation +	Coefficients −	Significant No.	at +	0.10 level −	Significant No.	at +	0.05 level −
Monthly	46	87.0%	13.0%	15	30.4%	2.2%	9	19.5%	0.0%
Quarterly	44	52.2	47.8	5	7.3	4.9	4	6.8	2.3
Half-Yearly	41	80.5	19.5	10	14.6	9.7	5	7.3	4.8
Yearly	35	68.6	31.4	3	5.7	2.8	2	5.7	0.0
Total	166	72.1	27.9	33	14.5	4.9	20	9.8	1.8

Source: Compiled from table 1.

The Indian Stock Market is less efficient in the short run, but more efficient in the longer run.

research with larger sample and longer time period will prove to be useful in gaining better insight into this complicated issue.

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Feature

New Product Innovation Strategy & Technology Management

P.N. Rastogi

This paper delineates briefly the nature, significance, key success factors, and dimensions of design and implementation of a product innovation strategy, by a company. A product innovation strategy differs qualitatively from a product development strategy in terms of its greater risk and uncertainty. The concept of the competitive product platform is advanced in this context. The relationship of the product innovation strategy of a firm with its management of technology is explicated next. A new paradigm of managing technology and R&D, from Japan is highlighted in this context. This impact of this paradigm on product innovation is brought out and illustrated with examples. Finally, the importance of 'soft' elements like values, vision, and creativity, for the success of product innovation efforts, is stressed.

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New products provide a leading edge to the corporate strategy of many successful manufacturing firms. They open up new markets and new business opportunities. Superior technological capabilities expand the range of a company's new product choices from improvement and development to innovation. Product innovation, in turn, broadens a company's strategic leverage, and strengthens its competitive position. Product innovation, however, differs qualitatively from new product development in terms of its higher levels of risk and uncertainty. Its focus is on developing new and superior products based on the innovative use and development of the power and potential of new technologies, or of the creative combinations of the old and the new toward engendering new functionalities and features.

New Product(s) Development Innovation Strategy

In order to succeed in development and launch of new products, companies need to pursue and implement a company-specific approach. The latter is driven by corporate objectives and strategy, with a well-defined new product(s) strategy at its core. New product(s) strategy helps identify new market and product opportunities, and is in turn, influenced or shaped by them. It specifies the type of markets, products (including product-line extensions), technologies, resources, skills, and the company's strategic orientation.

A company's corporate or business strategy is closely related to the nature of products to be produced and sold, and the markets to be served and/or targeted. Market selection and product delineation are two basic dimensions of a corporate strategy. New product innovation/development strategy however, also possesses some distinctive characteristics of its own which may be outlined as follows:

- New product development/innovation (NPD/I) strategy defines and specifies measurable goals

for new product innovation efforts, and helps the company achieve its corporate strategy objectives. The latter may include sales, revenue, profit, and growth, over a given time span. The objectives may be disaggregated further, business unit wise and/or product wise.

- NPD/I strategy defines and specifies the markets, applications, technologies, and products, on which the company will focus its efforts. The conjunction of markets, where the product is to be sold, product applications (or customer needs to be served), technologies to be used for producing the product, and the product's concept and features, may together be deemed to define the firm's competitive platform for that product. Competitive platforms for products are specified and determined by the identification and assessment of new product opportunities at the level of the firm's business strategy.
- NPD/I strategy also correlatively specifies the action plans i.e., how the company intends to exploit the new product opportunities in the context of its strategic objectives. The plans may typically include one or more entry strategies or their differential combinations. The entry strategies may range from internal product development to licensing of selective technologies, joint ventures, strategic alliances, and acquisition of other companies.

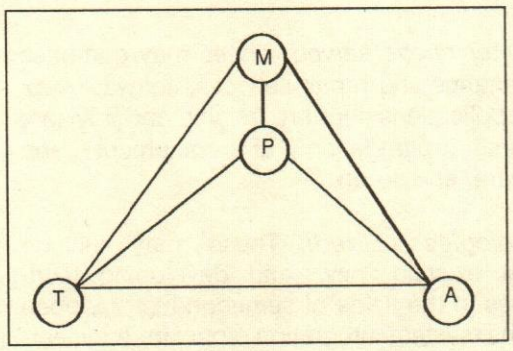
New Product Competitive Platforms

A company can properly plan for and acquire resources, people, skills, hardware, and technological knowledge, only on the basis of its designated priorities of markets and technologies. Building of resources and technologies in terms of right people, money, skills, materials, machines, and infrastructural requirements, and putting them in place, need appreciable leadtime, as well as, clarity of the firm's strategic thrust and direction.

The definition of a company's new product competitive platform(s)[1] is seen to be governed by the following major considerations apart from possible company-specific factors:

- The attractiveness of the platform in terms of visualized market growth, and the magnitude of market opportunities.
- Strength of the company in terms of its resources, technological competences, engineering skills, and the capability to leverage them effectively toward enhancing the competitiveness of the product platform(s).

The concept of a competitive platform for a new product may diagrammatically be represented as in Fig. 1.



M - Market attractiveness and skills needed and available (synergy)

T - Technological competences available and needed (synergy)

A - Product applications or customer needs to be served

P - Product concept design, features, and functionalities (manufacturability)

Fig. 1. The Competitive Platform of New Product Innovation

- The potential synergy of the firm's technological and marketing competences in its new product development/innovation efforts. Synergy is the essential relationship between the new and the old. The new business builds on the old, and utilizes resources and skills from the old marginal cost.
- Manufacturability of the product in terms of its concept, design, features, and functionalities. This implies the focusing of product innovation efforts in terms of employing related and relatively familiar technologies, and manufacturing methods, as far as possible.
- The company's future vision, and its relatively long term strategic perspective towards envisioning future markets, products, and technologies.

Definition and specification, of a company's new product competitive platform(s) clarify and resolve its strategic issues of opportunity identification, assessment and selection. They also delineate the foci of the firm's new product development efforts in terms of business, market, product concepts, and technology areas.

1. The concept of a platform in the present context may also include where appropriate, categories like core, low-end, high-end, replacement, and next generation products with reference to a given product definition.

The competitive platform for a new product, may also be delineated in terms of the following three dimensions or axes (Abell, 1980):

- *Customer groups served:* For a firm manufacturing digital computers, customer groups may for example, include, banks and financial institutions, industrial and service firms, universities, government departments, hospitals, trading firms, and so on.

- *Customer needs served:* These may comprise maintenance and repair services, software support, applications support, training and advisory services, upgradation of equipment and hardware, and so on.

- *Technologies utilized:* These may include several existing, new, and developing technologies in the fields of semi-conductors, open systems, system integration, software engineering, and so on.

A company may locate its present business base along the above three dimensions or axes, and then move on to each of the three axes i.e., identify other customer groups, applications, and technologies. Such an exercise may help uncover a number of new but related competitive product platforms and provide the firm with a strategic opportunity to gain competitive advantage in terms of leading edge products and technology(ies), enhance the firm's competitive and business strength in a cumulative manner.

Formulating Product Innovation Strategy

A product innovation strategy relates to a new product development, but the converse may not be true. A new product development strategy is often characterized by efforts to improve existing products, to provide various models of existing products, or to extend the existing product lines or families. A product innovation strategy on the other hand, focuses on developing products that have either not existed before, or existed in the same form, or with the same attributes. This, in turn, involves the development and use of new technological capabilities for producing them. Product innovation builds on technological innovation.

Formulation of a product innovation strategy in, and by, a company may be seen to involve four sequential domains of decision-making. These domains of decisions, and their indicated sequence, may be outlined as follows:

- Identifying, assessing, and prioritizing the promising product platforms in terms of potential market opportunities and competitive contexts.

- Decisions concerning investment of, and in, technology resources towards the prioritized competitive platforms for new products.

- Assessing the impact of investments in, and of technology resources towards creation of superior technological capabilities or core competences, (Hamel & Prahalad, 1990) for creating new competitive space for the firm.

- Deciding on, and developing action plans and entry strategies for areas of highest priority in the light of the above three domains.

These domains of decision are meant to delineate the following in appropriate disaggregated terms:

- Requirements of technological resources and capabilities to implement the product innovation strategy in terms of high priority product platforms.
- Products or systems that would be sold in, and through, the competitive platforms.
- Markets areas-existing and new, familiar and relatively unfamiliar, where the products and/or the systems would be sold.
- Singular or plural platforms, and whether a platform would be based on a single product and/or system, or would be designed for a family of products and/or systems.

The Spectrum of Risks

The above domains of decisions however, come into play only after the firm has taken into account the market and technical risks involved. The level of risk in both cases may be characterized as high, medium, and low depending on the new or existing market and technology being considered. Juxtaposition of both types of risks leads to a risk classification matrix as in Fig. 2.

In Fig. 2, cell numbers (1) to (9) represent progressively increasing levels of risk in new product development. Cell's (4) extension of existing technology is the major focus of product development efforts. Cell's (7) to (9) represent high and escalating levels of risk when new technology forms the major

basis of product innovation. Most firms may find the cell (9) level of risk as unmanageable, and prefer to operate at the level of cells (7) or (8). But what is new technology? In the context of a product innovation strategy, it is essential to understand the life cycles of technologies.

TECHNICAL RISK

MARKET RISK	Low	Medium	High
High	New Market, Existing Technology (3)	New Market, Existing Technology (6)	New Market, Existing Technology (9)
Medium	Market Extension, Existing Technology (2)	Market Extension of Technology (5)	Market Extension, New Technology (8)
Low	Existing Market, Existing Technology (1)	Existing Market, Extension of Technology (4)	Existing Market, New Technology (7)

Fig. 2. Classification of Risk in Product Development

Technologies & Product Innovation

A firm needs to understand the dynamics of the life cycles of various technologies it employs, or wants to employ, for its product development/innovation effort. The following typology shows the relative importance of various technologies to the firm, and their state of evolution:

- *New/Emerging Technologies*: The potential of these emerging technologies for changing the basis of competition is deemed to be high, but remains to be demonstrated.
- *Pacing Technologies:* These technologies are relatively recent and have demonstrated their potential for significant competitive advantage.
- *Key Technology:* They have major impact on value addition in terms of cost, performance, and quality, and allow proprietary/patented positions.
- *Base Technologies:* They are commonly available to all competitors, and have only a minor impact on value addition.

Over time, and through spread and diffusion, a new and emerging technology travesses the life cycle stages of progressively becoming a pacing, key, and base technology. In the context of product innovation, the new technology thus refers to an emerging and/or pacing technology in the given time frame.

Product innovation calls for development of the required technological foundation in advance. Toshiba, for example, develops technologies four or five years in advance of when they will be needed. When it innovates a product, it uses technologies that are already fully developed. If, on the other hand, a firm first decides upon a product, and then it develops the technologies, the chances of the project's failure are high. If any of the necessary new technologies do not work, the entire project is apt to be aborted. If a firm tries to gain a technical edge by reaching beyond its weak technology base, the effort will only cause costly delay, and hold up the product's introduction into the market. In the meanwhile, during the delay period, its competitor's technology may have advanced further. The firm may thus be trapped into a vicious cycle of delays, costs, and loss of opportunity.

Successful firms are therefore seen to use a new technology in product innovation only when the following criteria are met:

- New technology adds true value to the product or process.
- New technology is essential to world-class product status.
- New technology can be used by designers, manufacturers, and customers with relative ease.
- New technology is thoroughly proven over the full range of design constraint in the required environment.
- New technology meets specified performance and cost objectives.

In order to identify the need of, and prepare for, the development and use of new technology(ies) in product innovation, successful firms prepare a technology road map for their planning and guidance.

Technology Road Map

A technology road map enables a firm to integrate its technological base and capabilities with its product-market strategy. At Motorola, for example, such a map helps assess the future of the firm's core technologies. The map evaluates the technological trends along with competitive factors. The latter include the likely changes in the market, products that might be developed, and actions of the competition. Motorola uses a colour-coded

chart to summarize the analysis. The green code for a given technology indicates that the firm expects to be operationally and organisationally excellent in that technology in terms of its plans and personnel. Yellow and red indicate technologies in which the firm is moderately good, and inadequate, respectively. (Zangwill, 1993). To keep the important technologies green, Motorola strengthens its internal expertise, and interacts with top researchers in the field worldwide. It also forms strategic alliances with firms that are excellent in an important technology relevant to its product development.

A technology road map enables a firm to integrate its technological base and capabilities with its product-market strategy.

Motorola's technology road maps generally cover a period of next five years. But the firm plots crucial technologies – such as gallium arsenide, the replacement for silicon in certain high-speed semiconductors, for ten or more years ahead. The technological road maps are prepared or updated annually, and reviewed by the CEO personally. The CEO's review and appraisal help ensure additional funding if and as necessary, and/or if several parts of the firm need to cooperate on a particular product or technological capability (Zangwill, 1993). These and similar issues are addressed by successful firms in and through a proactive management of their technology base or foundations. In a broad sense, product development/innovation may be viewed as both a central theme, and a basic goal, of a firm's management of its technology.

Product Innovation & Technology Management

New product innovation is crucially bound up with the issues of marshalling and deploying the relevant and required technological skills and competences. The latter, in turn, are the outcomes of a firm's style and scope of technology management. The style and scope involve the creation of business goals based on the potential of new technology, and the creation of technology goals based on the business opportunities. Both are, however, moving targets. Management of technology in, and by a firm, is primarily oriented towards enabling the firm to gain and maintain a strong position in the technologies relevant to its business and competitive strategy (Rastogi, 1995). The two basic foci of technology management are:

- The company's perception, identification, and appraisal of the need for change and development in its technology base. Such a perception and appraisal are a part of the company's analysis of its competitive environment.
- The company's implementation of the identified requirements of change and development. The implementation may involve the modalities of external acquisition and/or internal development and innovation of technology(ies) in tandem. The focus of the implementation is towards the rapid commercialization of acquired and/or developed technologies.

In the context of the above foci, R&D work and engineering skills cannot be separated from the core decision-making concerning its competitive strategy by an enterprise (Erickson et al., 1990). New product innovation strategy involving the concept of competitive product platform, then emerges as a central subset of the company's competitive strategy.

Specification of competitive product platforms, helps crystallize the nature, objectives, and dimensions of the firm's technology management during a given period of time. Technological capabilities and skills assembled and provided by the firm's upgradation of its technology base, in turn, help specify the nature and positioning of the competitive product platforms. The relationship between the firm's product innovation efforts, and the management of technology, is thence interactive and mutually supportive. It is not a simple one-way cause-effect linkage.

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Technology Management & Organisational Learning

Two further major concerns of technology management in the present context relate to the quality and expertise of R&D, design, and production engineers; and the cumulation of gains in knowledge and experience from innovation projects. The quality and expertise of the technical personnel should not be limited to technological knowledge and skills only. They should also have an adequate understanding of the firm's strategic objectives, as well as, the nature and requirements of synergy in project management. The level of expertise rises as the firm's base of knowledge, skills, hardware, and experience advances.

In order to build up the base of knowledge and experience for use in new product development/innovation projects, firms utilize one or more of the following mechanisms for organisational learning:

(a) To have some of the team members of one project participate in the next project.

(b) At the end of each project, information about the problems encountered, and the solutions found, is entered into a database repository. The database enables the people working on a current project to benefit from past learning.

(c) Evaluating the requirements of skills needed, and planning for the availability of these skills when needed. For this purpose, training, experiments, and experience development schemes/programmes are imaginatively designed and utilized.

(d) Maintaining and developing a storehouse of people who are knowledgeable in key areas.

The purpose of (a) and (b) is to ensure that knowledge gained in developing one product is not lost, and may be used for help in developing the next product. The purpose of (c) and (d) is to develop and maintain key foundation capabilities that will foster the firm's strategic objectives.

Product Innovation Strategy Process

Designing a product innovation strategy is not a determinate rational-analytic process. The process usually consists of an iterative sequence of objectives setting, preliminary investigation, identification and assessment of potential competitive product platforms, prioritization of the platforms, and specification of entry strategies. During this iterative sequence, however, new information and emerging insights may lead to non-visualized important changes in the strategy formulation and implementation. New information and insights may relate to new techno-scientific developments, changes in the nature and understanding of markets, encountered obstacles, alternative perspectives/viewpoints, and so on. They tend to impart a more serendipitous i.e., an evolutionary and incremental approach to the product strategy development process.

Product innovation is an uncertain, high risk, and future-oriented process. But it cannot be left to chance. It has to be planned and steered in a proactive, open-minded, and flexible manner. The concept of competitive product platform is useful in this context. It relates the product innovation process to the firm's strategic objectives, provides a sense of focus and purpose, and lays out the requirements of who, what, why, and how. But innovative product platforms cannot be rigidly prescribed or tightly planned. They cannot be entirely surprise-free.

The concept of competitive product platform relates the product innovation process to the firm's strategic objectives, provides a sense of focus and purpose, and lays out the requirements of who, what, why, and how.

On the basis of numerous empirical researches and observations, certain 'lessons' or 'factors' for the success of new products have however, been identified. They need to be explicitly considered in the design and implementation of any product innovation strategy. They may be outlined in a summary form as follows:[2]

- The new product must be a differentiated product that delivers unique benefits and superior value to the customer.
- A market driven and customer-focussed new product process is critical to success.
- A global orientation in product design, development, and target marketing, provides the edge in product innovation.
- More predevelopment work must be done before product development project is initiated.
- Clear and early product definition is an essential requirement.
- A properly planned and executed launch, and a well-designed marketing plan, are central to new product success.
- Facilitative organisational structure, culture, and policies are important for success.
- Synergy of new product project with the firm's technological and marketing capabilities is of vital significance.
- Market attractiveness is a crucial factor in the selection of a new product development project.

2. Some writers provide a longer list of factors including project planning and manufacturing requirements. See, for example, Cooper, (1993).

- Speed or 'time to market' is a key success factor.
- The resources for product development must be in place, and deployed creatively, for successful outcomes.

These success factors or 'lessons' need to be appropriately factored into the formulation and implementation of a new product innovation strategy. They are useful as general guidelines.

Entry Strategies

Product innovation usually requires a wide array of technologies. These are often too many for a single firm to develop, manage, and master internally. It, therefore, becomes quite necessary to acquire the needed technologies from external sources, and partnerships with other firms may be required for this purpose. These partnerships or other modes of technology acquisition/development should be established early. It generally requires many months for two firms to learn about each other, and form a mutually beneficial relationship. The latter may be in the form of joint ventures for product development, collaborative R&D, strategic alliances, or merger and acquisition.

Positioning a new innovative product platform i.e., entering a new arena of business may be accomplished through diverse devices or means. They may range from internal development and licensing to joint ventures, investment of venture capital, or acquisition. Each of these devices makes different demands on the company (Betz, 1987).

An entry strategy selection framework based on market and technological dimensions has been proposed (Roberts & Berry, 1983) as follows:

- *Newness of Technology*: the degree to which that technology has not formerly been embodied within the products of the company.
- *Newness of a Market:* the degree to which the products of the company have not formerly been targeted at that particular market.
- *Familiarity with a Technology:* the degree to which knowledge of the technology exists within the company, but is not necessarily embodied in its current products.
- *Familiarity with a Market:* the degree to which a market is known by the company, but not necessarily as a result of selling into that market.

The market and the technology factors associated with the new business may be characterized as base, new familiar, or new unfamiliar in relation to a business in which the firm currently competes i.e., its base business. Various entry strategies are shown in Fig. 3 for different degrees of market and technological newness and unfamiliarity.

MARKET FACTORS	Base	New familiar	New unfamiliar
New unfamiliar	Joint Venture or Strategic Alliances	Venture Capital or Venture Nurturing or Acquisitions	Venture Capital or Venture Nurturing or Acquisitions
New Familiar	Internal Market Development or Acquisitions or Joint Ventures	Internal Ventures or Acquisitions or Licensing	Venture Capital or Venture Nurturing or Acquisitions
Base	Internal Base Development or Acquisitions	Internal Product Development or Acquisitions or Licensing	Joint Ventures or Strategic Alliances

TECHNOLOGIES EMBODIED IN THE PRODUCT

Fig. 3. Optimum Entry Strategies Matrix

Source : Adapted from Roberts & Berry (1983).

Each of the above entry strategies, or new business development mechanism possesses major advantages and disadvantages in relation to a company's situation, and the range and quality of options open and available to the company. (Betz, 1987; Cooper, 1993).

Approaches to Technology Management

Western and Japanese approaches to managing technology for product innovation, however, differ in a fundamental manner. Western approach is seen to be narrow, more sharply focussed, and oriented towards a short time horizon. The Japanese approach, on the other hand, is broader, more inclusive, and oriented towards long term considerations (Rastogi, 1995).

Western approach to technology management enjoins firms to focus primarily on developing a single core technology in order to achieve sustainable competitive advantage(s) based on excellence in that technology. This approach holds that, without a defensible core technology, the technological venture would typically have difficulty in assuming a leadership position in

its target markets. It would find itself playing catchup with competitors. In contrast, companies that develop a strong core technology, show the ability to generate new products faster, with greater reliability and quality, than unfocussed companies (Roberts, 1991). The best opportunities for rapid growth come form building an internal critical mass of engineering talent in a focussed technological area, yielding a distinctive core technology that might evolve overtime, to provide a foundation for the company's product development prowess. These products should be targeted at a focussed set of customer needs.

The best opportunities for rapid growth come form building an internal critical mass of engineering talent in a focussed technological area, yielding a distinctive core technology.

Japanese approach, in contrast, focuses on, and pursues, technological self-sufficiency. For this purpose, Japanese companies proceed towards mastering the relevant subtechnologies also. American firms, on the other hand, leave subtechnology(ies) specialization to their suppliers. They assess a new technology in terms of the risks of adopting it, and their R&D is focussed towards narrow, specific, and limited applications. Japanese companies, by contrast, assess a new technology in terms of their potential vulnerability, if they fail to adopt it. They approach R&D from the viewpoint of multiple applications, and the creation of technological capabilities from a relatively longterm perspective. This approach has led them to evolve a new paradigm of technological innovation – 'technology fusion'. The latter refers to development of new hybrid technologies by combining the technological capabilities of existing technologies (Kodama, 1992).

Product Innovation & the New R&D

'Technology fusion' as a new format of R&D "blends incremental technical improvements from several previously separate fields of technology to create products that revolutionize markets" (Kodama, 1992). Such new hybrid technologies are greater than the sum of their parts. The fusion of electronic and optical technologies, for example, gave birth to "opto-electronics". It enabled a company like Sharp to be a major player in products ranging from colour televisions to liquid crystal display panels, to customized integrated circuits. By fusing electronic, mechanical, and materials technologies ("mechatronics"), Fanuc created an economical numerical controller, and became a global market leader. Similarly a number of Japanese companies starting in the late 1960s fused glass, cable, and electronics technologies to produce fiber-optics. These companies included Nippon Sheet Glass, NEC, Nippon Telephone and Telegraph, and Sumitomo Electric Industries. These companies today occupy a leading position in the global fiber-optics equipment market.

Technology fusion represents a new style of R&D, and a new paradigm of managing technology, and innovating new products. Its dynamics render established technologies and products susceptible to displacement by radically different hybrid technologies and products coming from outside. Successful companies today are not necessarily those that create new technologies, but those that rapidly absorb, combine, and commercialize them. (Branscomb, 1992). This requires an organisational capacity to identify promising new technologies worldwide, and absorb and translate them into new innovative products and processes, quickly and effectively.

Successful companies are not necessarily those that create new technologies, but those that rapidly absorb, combine, and commercialize them.

A company's capacity to absorb and adopt technology is increasingly becoming the key to business strategy based on technology development and product innovation. As mature markets become saturated, Japanese companies are using their ability to apply new technologies to specific business needs to shift into new and more profitable markets through innovative products. Canon, for example, moved from cameras to office equipment such as laser printers, and facsimile machines. NEC moved beyond its original base in telecommunications switching and transmission equipment to mainframe computers, semiconductors, mobile telephones, and laptop computers (Branscomb, 1992). The new dynamics of product innovation by Japanese companies have led to a rewriting of the rules of competitive success in the global market place. The success of Japanese companies in coming up with a cascade of new innovative products, is a logical consequence of their imaginative and innovative management of technology.

Conclusion

Success of a firm's product innovation strategy is closely bound up with the effectiveness of its technology management. Deficiencies in the latter inevitably

weaken the viability of product development/innovation projects. Situations of product development failures stemming from a firm's ineffective management of its technology base may briefly be restated as follows:

Inordinate delays, loss of opportunity, or outright failures are caused when technical surprises or blockages emerge during product development. These surprises could have been avoided if the company had firmed up the relevant technologies as part of its proactive management of technology. Product development relies on proven technology(ies) whether internally developed, or externally acquired.

Product development relies on proven technology(ies) whether internally developed, or externally acquired.

A firm's ability to develop innovative products effectively and rapidly depends a great deal on its technological competences. The latter tend to deteriorate when the firm fails to invest in current and future technologies in a planned manner. For this purpose, the firm needs to manage its technology base proactively in terms of a technology roadmap. The firm's failure to do so depreciates the value of its technology assets and impedes their deployment and leverage.

Firms that overlook the management of technology(ies) underlying a new product, and focus exclusively on product development, may end up developing the required technology as a subproject within product development. This may involve escalated costs in terms of resources, time, and money; highly reduced chances of success owing to delayed launching of the product; and inability to assess and exploit fully the competitive potential of the new technology in time.

Timely access to fully usable technology(ies) for product development/innovation requires systematic identification of relevant present and future technologies well in advance. Developing technology and other approaches to access take time. This cannot be done by forcing the product innovation team to create the required technologies while they are developing the product. The degree of uncertainty in a project is that of its riskiest essential elements or parts. If that element/part is a basic technology or a sophisticated technological capability, the levels of risk, uncertainty, and delay involved may become unacceptable, and the project terminated.

Factors underlying the successful development of new innovative products are neither unique nor extraordinary. But what differentiates them, are the efficiency and effectiveness of their operation and interaction within the framework of the firm's management of technology and competitive strategy. Formulation and implementation of a new product innovation strategy may not be immune to human errors of interpretation and judgement. More importantly, however, it is the harmonious orchestration, and synergistic complementarities of the technological and marketing factors, that distinguish a successful new product innovation strategy, and effective management of technology of a company, from that of others. But, perhaps, the most crucial and the most pervasive factor in this context is the creativity, commitment, and teamwork of the members of the organisation. Behind the creativity, commitment, and teamwork of people, however, lie their shared values and vision of the organisation's future. The organisation itself needs to be transformed into a 'laboratory of learning' (Rastogi, 1995a) or 'knowledge creating company' (Nonaka, 1991) in this context.

Such an organisation moves up from being 'market-driven' to 'market-driving'. It not only anticipates customers' needs and fulfils them, but also anticipates demands that have yet to be expressed, and even creates entirely new demands!

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Feature

Strategic Marketing – The Case of Tata Refractories

M. Subrahamanya Sarma & D. Thiruvengala Chary

Business organisations should re-orient their planning towards the formulation of competitive strategies which would enhance their market position. Strategic plans and their issues are directly concerned with the relationship between the organisation and the external environment. Marketing of industrial goods should adopt the concept of strategic marketing. The article presents a SWOT analysis of Tata Refractories Limited marketing strategies.

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Strategic plans often fail in implementation due to the simple fact that they do not have market orientation. Hence business organisations should re-orient their planning methods towards the formulation of competitive strategies which would bring new opportunities for enhancing their market position. Marketing planners cannot pickup market share, revenue and cost projections out of thin air. They should be derived from and be based on the assumptions made above. Non-availability of competitive information for strategy formulation, lack of resource strengths to assess market opportunities and projections about environment render the planning premises complex and challenging. Marketing of industrial products requires different planning skills as their environment is more complex than that of consumer goods. The former is characterised by limited number of institutional buyers, unpredictable group/institutional buying behaviour, heavy unit price, engineered quality, derived demand, market search, product design, personal selling, mailing of product brochures, instruction manuals. After sales service, consumer counselling and training are the key marketing strategies in industrial marketing. Marketing of industrial goods should adopt the concept of strategic marketing for improving its efficiency. Strategic marketing helps the organisation to re-orient its marketing strategies to the changing environment in a planned manner.

Strategic marketing helps the organisation to re-orient its marketing strategies to the changing environment in a planned manner.

Strategic Marketing – A Planning & Control Model

Strategic plans and their issues are directly concerned with the relationship between the organisation

and the external environment. Strategic marketing is the process of analysis, choice, implementation and evaluation of environment, strategies and actions. It emphasises the need for reviewing corporate product, pricing, promotion and distribution strategies to explore the external opportunities inspite of the threats in the environment. Since strategic marketing is a sub-system of corporate strategic plan, strategic marketing plan presupposes the diagnosis of strengths and weaknesses of the corporate marketing strategies from the view point of organisational effectiveness. An illustrated model of strategic marketing is presented in Fig. 1.

Thus, the process of strategic marketing comprises four phases, viz.,

- Analysis and Investigation
- Choice Formulation
- Implementation
- Evaluation

Analysis & Investigation

Every organisation exists to accomplish something in the larger environment. Its broad intentions and commitments are reflected in the mission and statement of marketing goals. The marketing mission of industrial goods is shaped by four elements viz., organisation philosophy, technology, marketing structure and resource strength. Marketing research gathers and interprets the data supplied by marketing intelligence to respond quickly to environmental changes. Marketing research includes marketing analysis, sales analysis, consumer research and advertising research. It enables the planners to discharge their role and responsibility in building a more dynamic marketing system. It provides the inputs of information for a major growth strategy. It continuously scans the environment and identifies new potential opportunities. These opportunities act as a driving force for the strategic marketing plan.

The marketing mission of industrial goods is shaped by four elements viz., organisation philosophy, technology, marketing structure and resource strength.

Identification of new markets is a continuous process for the manufacturers of industrial products. The market is generally determined by the product group or the group of establishments that make use

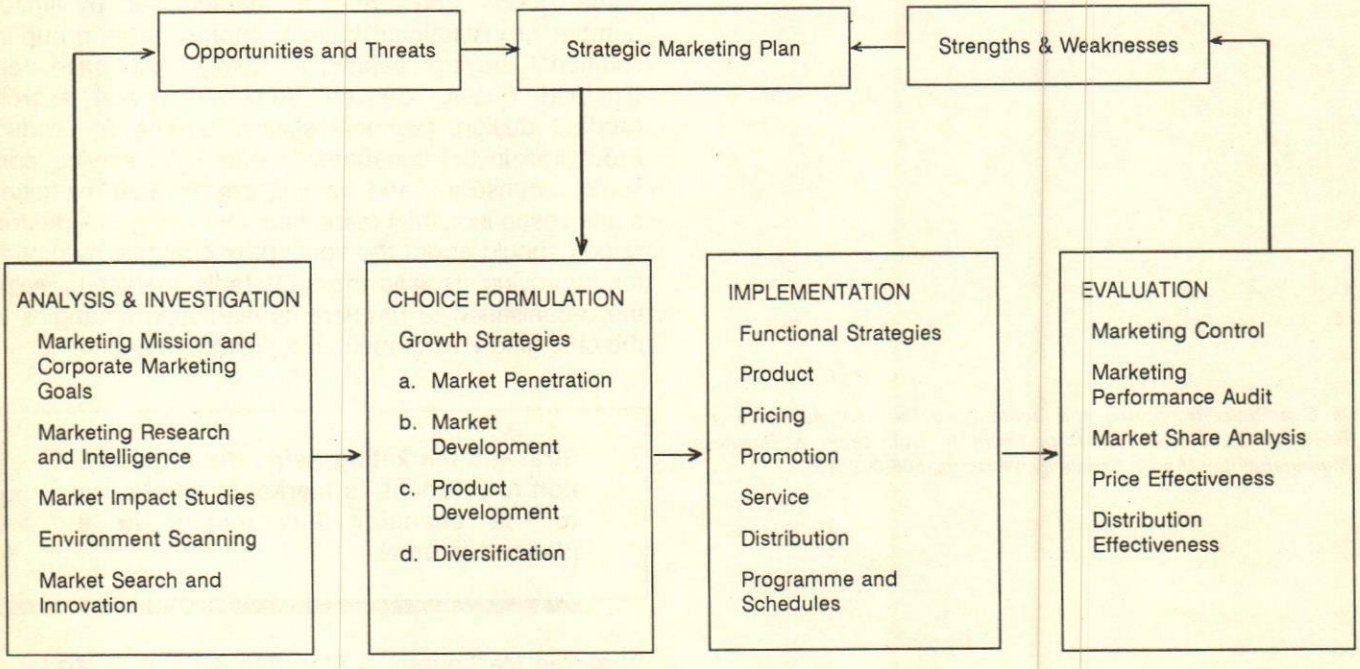

Fig. 1. Strategic Marketing—A Planning & Control Model

of the products or services. As such, the identification of product class and grouping of the customer establishments engaged in the similar line is an integral part of market search. Identifying new customers for an existing product line and grouping of customers is made with the help of the Standard Industrial Classification System. In the case of industrial products, product features should be designed and aligned keeping in view the customer requirements. Product development becomes a continuous effort for improving the market efficiency.

Choice Formulation

Strategic marketing plan reflects the managerial choice of a growth strategy. It is influenced by the managerial attitude towards risk, availability of resources, and volatility of market sector. Managerial perceptions of external dependence managerial awareness of competitive strategies and managerial power relationships also influence the choice, because choice is essentially a decision making process influenced by the situation. Conceptually choice is a function of targets to be met, technology, skills and other capabilities. Organisations involved in industrial marketing may consider market penetration, market development, product development and diversification strategies for their growth and expansion. Market penetration aims to increase the market share by encouraging the existing consumers to buy more. Market development strategy brings new consumers into its fold by introducing the existing product in the untapped market segments. Product development strategy considers the addition of a new product with a different quality and performance. Diversification strategy brings a new opportunity of marketing an entirely new product making use of its already existing resources and position in the market. In industrial marketing, product development and market search are the potential strategies. Any growth strategy should be translated into functional strategies for implementation.

In industrial marketing, product development and market search are the potential strategies. Any growth strategy should be translated into functional strategies for implementation.

Implementation

In order to implement the chosen strategy, the organisation should alter the past resource commitment policies and administrative systems. Sometimes, the strategy may call for a sea change in all the functions. As such, the marketing department should modify product, pricing, promotion and distribution strategies in tune with the requirements of the chosen growth strategy. Resources, tools, and programmes are the crucial factors in implementing the industrial marketing strategy, apart from the quality and behavioural considerations. Even if the firm has developed a clear strategy and well thought-out supporting programmes, it may fail in implementation due to lack of commitment, skills, value sharing and participation.

Implementation of marketing strategies relating to product, pricing and promotion involves the following considerations:

- Demand sensitivity to price changes
- Price and competition
- Price and cost
- Network of promotional activities and sequence of tasks
- A realistic programme schedule and time estimate
- A competent executive at the helm
- Technology and skill requirements for implementation
- Legal considerations.

The product strategies should be implemented with due consideration to the quality, versatality and performance requirements of the user organisations. Personal selling and campaigning through product brochures are vital aspects in marketing industrial goods. After sales service is an indispensable strategy to retain the customers. Periodical maintenance and service plans are to be implemented for ensuring product performance effectiveness. Institutional buyers often tend to repeat the buying decision and continue the same product choice on the basis of the product performance feedback. Counselling and servicing sometimes extend their scope to pre-sale engineering studies, technical consultation, performance testing in warranty period, operator training, installation and maintenance instructions etc.

Evaluation

Any marketing strategy which has been implemented is subject to periodical review and appraisal. In this regard the marketing department should build up

a system of marketing control and apply it at all levels. Marketing control is a process of appraising the marketing performance against the targets for each product, region and executive. It investigates the deviations and suggests a corrective action for improving the market performance. Market share analysis and market expenditure analysis are the integral parts of marketing control. Marketing control is thus based on MBO which interprets the objectives (ends) in terms of strategic choice and the achievement against them. Evaluation of marketing strategy is also made by a comparative analysis of price, production, distribution changes. It is reflected in price effectiveness, proportional effectiveness and distribution effectiveness. The evaluation process identifies the strengths and weaknesses in the Company's marketing strategy. It provides clues for the formulation of choice and the strategic marketing plan inturn.

Marketing control is a process of appraising the marketing performance against the targets for each product, region and executive. Market share analysis and market expenditure analysis are the integral parts of marketing control.

A Case Study

Tata Refractories Limited (TRL) Belphar plant is a sophisticated modern refractory unit with an installed capacity of 1,23,000 tonnes per annum. It has manufactured 89,874 tonnes of steel refractories in the year 1990-91. The turnover of the company has recorded a significant increase of over 90 per cent in the last four years ending with 1992-93. But in the year 1993-94 it experienced an unprecedented decline of 20 per cent in the turnover. This has been attributed to the continued recession in the steel industry and increased competition due to the new entrants. However the profitability was not impaired as the company concentrated its marketing efforts on the sale of more value added items. In this background an attempt was made to study the strategic marketing practices of TRL by applying the planning and control model envisaged above.

Analysis & Investigation

The mission of TRL is identified in quality engineering with a synergistic group of TISCO, TRL, IRL and AML and total quality assurance. The group provides a basic thrust to research and development in the field of refractories quality and offers technical services. The marketing goals as stated by the TRL are:

- To achieve a dominant market share in the refractories
- To face the competition more efficiently with the help of technological edge
- To generate adequate and timely market intelligence
- To improve the distribution effectiveness
- To reduce the marketing costs.

TRL does not conduct an elaborate marketing research, but it undertakes stray market studies to elicit customers opinions on the company products, their relative rating and product position in the market with that of the competitors.

The refractory industry is inextricably woven with the steel and sophisticated technology. The needs of refractories are increasing with the pace of industrialisation. But government policy and the recession in steel industry emphasise the need for diversification and product line expansion.

Choice Formulation

TRL has chosen market search, market penetration and product line diversification as its growth strategies. As a part of its market expansion strategies it has made a modest beginning in the export market also. Intensive efforts are said to have been made to bag impressive export assignments from the industrialised nations. Product development is a continuous efforts of the R & D Division equipped by modern equipment.

The R & D centre has developed a number of new products like longer period gas purging refractories magnesia, different qualities of Zircon and superduty silica bricks for glass tank furnaces which have been commercially produced and marketed subsequently.

Implementation

A study of the functional strategies of TRL revealed the following:

Product: The product strategies are constantly reviewed and updated with sophisticated technology. The product range of TRL includes conventional magnesia carbon bricks, dalmite bricks, slide grade refractories,

Silica bricks, blast furnace etc. These products have been classified into five groups viz, Basic, Specialities, Silica, Fireclay and High alumina and Monolithics. Of these five groups, basic refractories has reached maturity stage in the product life cycle, silica refractories have reached the declining stage and the other groups are in the introductory stage. As such, TRL has been concentrating on the market penetration strategy.

Price: The price of refractories is charged on the basis of the quality requirements of the consumer, which widely vary. However, cost and market price are also taken into consideration in deciding the price. TRL is not in a position to consider the competitors' price as the consumer firms invite sealed tender quotations for the supply of refractories. In a few cases, technology is also an important consideration in the pricing decisions of refractories.

Promotion: TRL's promotion strategies are identified with the following tasks:

- Free trials, mailing of product brochures, personnel selling and institutional contacts with consumer firms.

Since product failure will be costly, running into Rs. five to six crores for the consumer, performance guarantee is given for conducting trials of the products. For example, once a coke oven battery is aligned with refractory bricks, it should work for a minimum period of 15 to 20 years. Any premature failure would result in expensive process failure. As a part of the overall customer services, TRL has instituted a technical service wing. It is entrusted with the tasks of matching the operating parameters and optimisation of performance. It also provides effective service support to customers in the selection of the right refractories for any given application, installation, guidance, and trouble shooting. It also acts as a vital link between the customers and R & D Division. It has a wide marketing network to ensure that customer requirements are effectively met. The technical service centres cover all the important places in the country like Bombay, Jamshedpur, Bhilai, Rourkela etc.

Packing and Distribution: TRL follows the strategy of direct distribution to the institutional buyers on order basis. The choice of packing the refractories has been made with reference to the following factors:

- Type of material
- Type of transportation and destination
- Unloading facilities at the destination.

Automatic weighing, bagging and stitching machine is used for safety and precision. Mostly cardboard box packing and polythene bag and straw bundling are the means of packing to ensure safety, and convenience in

Environmental Scanning		Corporate Marketing Strategies	
Opportunities	Threats	Strengths	Weaknesses
1. Sophisticated technology technical collaboration with the leading manufacturers	1. Decline in customs duty both on imported and finished product has resulted in increased competition from substitutes and imports	1. Qualitative and sophisticated equipment in the plant and R&D	1. Huge overheads
2. Monopoly right in producing the dolomite bricks.	2. Delicencing of industries and relaxation of foreign investment stipulations as a result foreign companies would introduce international cost structure, access to global raw materials services.,	2. Close link with TISCO both as customer and partner in R&D.	2. Inadequate organisational procedures for marketing performance appraisal.
3. Liberal exchange regulations, customs and excise duty relaxations.	3. Recession in steel Industry.	3. Cost effective process design.	3. Lack of an integrated marketing intelligence and product profitability analysis.
4. Increased export potential.	4. Risk due to political instability.	4. Established marketing network and technical service wing.	
		5. Skilled and qualified manpower.	
		6. Market position and brand image.	

Fig. 2. Application of Strategic Marketing through Swot Analysis in TRL

handling. TRL transports the bulk packings on road through owned and hired trucks.

Evaluation

TRL has no set organisational procedures for marketing control. However they attempt product performance analysis through customer visits and reports. The analysis brings out the product's technical strengths, weaknesses and performance records. There is a system of total quality management which sets the quality parameters down to the lowest worker level through systematic on-going programmes, consisting of task forces, quality circles, value engineering, training and development, constant vigilance.

A close examination of the business environment and marketing strategies of the company revealed the following opportunities, threats, strengths, and weaknesses presented in Fig. 2.

Product performance analysis brings out the product's technical strengths, weaknesses and performance records.

It is obvious from the analysis that TRL has adopted strategic marketing concept only partially. The evaluation and choice are not given serious thought. Its marketing strategies are more product oriented rather than oriented toward pricing, promotion, and distribution. While the freedom in pricing is limited with the competitively lower quotations, promotion and distribution in case of industrial products like refractories has only supporting role in the total marketing concept. The company should concentrate on product line expansion and diversification to optimise the corporate efficiency. □

Feature

Quality Management Self Assessment – Approach for Quality Improvement

S.K. Agrawal, Prem Vrat & S. Karunes

The organisational system includes all stakeholders – the suppliers, employees, customers and shareholders. The relationship of various stakeholders to each other and to the outside world is a complex set of human relationships interacting in limitless ways. Thus, the behaviour of an organisation in response to any internal or external intervention is dependent upon the Organisation System and human behaviour. Change in one part of a system affects all other parts. Further, the system encompasses both external and internal environment. Therefore, the top management should have a real picture of the organisation. Self assessment is the method to get this correct picture, elaborates the article.

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In today's dynamic business scenario, concentrating only on product quality is no longer an economical proposition. An organisation has to produce products and services that are competitive and are of better perceived quality. In this context Quality Management Self Assessment (QMSA) is being increasingly viewed by the quality fraternity, worldwide, as the latest panacea. After ISO:9000 and TQM the self-assessment of quality system of an organisation against a recognised quality award model is considered a more useful tool for identifying areas for quality improvement. The Quality award models such as the European Quality Award (EQA), Malcolm Baldrige National Quality Award (MBNQA) and Deming award serve as guidelines for application of QMSA in a way which enables the management to address the areas for quality improvement.

Quality improvement is a top driven activity and requires sincere efforts by the management. The management has to assess and appreciate not only total quality concepts, but also the existing culture, habits, norms and values of the employees. QMSA method is a tool to assist the management in this direction. However, "Most quality programmes fail for one or two reasons. They have system without passion, or passion without system." (Peter & Waterman, 1982; Peter & Sustin, 1992; Peter, 1989) To be successful in any quality initiative one must have both. Self assessment helps, measure the effect of small improvements on the global performance of the organisation. It allows for a structured, orderly, logical representation of intuition. Continuous quality improvement requires customer focus, systems thinking, continuous improvement and team work. To find out the exact status of the efforts made in this regard QMSA method is promising.

What is QMSA?

Quality Management Self-Assessment (QMSA) is a periodic, comprehensive, systematic and regular review

of organisations systems, procedures and results against recognised TQM models like European Quality Award (EQA), Malcolm Baldrige National Quality Award (MBNQA) and Deming Award culminating in planned improvement actions.

Quality Management Self-Assessment (QMSA) is a periodic, comprehensive, systematic and regular review of organisations systems, procedures and results against recognised TQM models.

QMSA comprises advanced and sophisticated quality improvement techniques used by organisations for achieving desired tangible results. Quality professionals advocate the concept of Self- Assessment with the ultimate objective of sustained quality improvement as it:

- Provides a link between TQM and business objectives.
- Generates ownership for quality improvement among the senior leadership in the organisation.
- Encourages the top management to objectively evaluate their own areas of responsibility.
- Helps develop specific time bound quality improvement action plans, thereby setting out the improvement agenda within a well defined time.
- Stimulates mutual discussions so as to find out ways and means to improve the present situation.

Understanding Various Quality Award Models

The Deming Prize, Malcolm Baldrige Award and European Quality Award are the three main TQM models which play a key role in quality revolution and effectively raise the quality performance standards throughout the world.

The Deming Prize: The Deming Prize was established in Japan by the Union of Japanese Scientists and Engineers (JUSE) in 1951.

The Deming Prize was established to reward those who achieve good results through the successful implementation of companywide quality control activities. Its framework is centered on the implementation of a set of principles and techniques such as process analysis, statistical methods, and quality circles. The Deming Prize evaluates the operations of a firm against 10 criteria (Fig. 1), but unlike the Baldrige Award and EQA, all criteria have equal scoring weights. The Deming Prize introduced examination characteristics such as visiting teams and scoring methods, the award ceremony, and the obligation of the winners to disseminate the quality techniques they have developed. These features inspired similar characteristics in the Baldrige Award and EQA. An organisation can use the criteria for this prize and assess where they stand. Self assessment in this way will help the organisations to improve their performance.

Deming Prize	Baldrige Award	European Quality Award
Company Policy and Planning	Leadership	Leadership
Organisation and its Management	Information and Analysis	Policy and strategy
Quality control education and dissemination	Strategic Planning	People management
Collection, transmission and management	Human Resource Development	Resources
Analysis	Process Management	Processes
Standardization	Business results	Customer satisfaction
Control	Customer focus and satisfaction	People satisfaction
Quality assurance		Impact on Society
Effects		Business results
Future plans		

Fig. 1. The Deming, Baldrige and European Quality Awards Criteria

The Malcolm Baldridge National Quality Award (MBNQA): The Baldridge Award was established in 1987 to promote quality awareness, understand the requirement for business excellence, and share information about successful quality strategies and the benefits. The award criteria are built upon a set of core values and concepts (Fig. 1). These values and concepts are the foundation for integrating customer expectations and performance requirements. Improvement in these seven result areas contribute to the overall performance of the organisation, including financial performance. The MBNQA Award model is a very effective TQM model which a large number of American organisations are using as a written self-assessment tool.

The European Quality Award (EQA): In 1988, responding to the quick success of MBNQA award, 14

large European MNCs formed the European Foundation for Quality Management (EFQM) to promote TQM concepts in Europe. In 1991, EFQM with the support of the European organisation for quality (EOQ) established the European Quality Award (EQA). The rationale of EQA quality award models is that customer satisfaction, people satisfaction and impact on society – the results – are achieved through leadership driving policy and strategy, people management, resources and process – the enablers – leading ultimately to excellence in business (Fig. 1). In EQA model, impact on society criterion is a new element. This criterion focuses on the perceptions of the company by the community at large and the company's approach to the quality of life, the environment and the preservation of global resources. The EQA model represents radically broader guidelines for addressing total quality issues.

The three award criteria place a different focus on the TQM approach. The overall approach of the Deming prize is the control of processes, the MBNQA model places emphasis on customer satisfaction and business results. The EQA model on the other hand, broadens the notion of quality even further and includes corporate social responsibility/environmental considerations as an important criterion for excellence in performance. Anyone of these TQM model guidelines can be used for self-assessment.

The overall approach of the Deming prize is the control of processes, the MBNQA model places emphasis on customer satisfaction and business results. The EQA model broadens the notion of quality even further and includes corporate social responsibility/ environmental considerations.

Objectives

A large number of European, American and Japanese organisations are performing self assessment of their quality management system and procedures. Main reasons for organisations starting QMSA are, to:

- Find areas for improvement
- Focus on an acceptable of TQM based on a well recognised award criteria
- Direct the improvement process
- Provide new motivation for the quality improvement process
- Manage the business more effectively.

The Process

Self-assessment of quality management practices (QMSA) in European and American organisations is based on the criteria of EQA award model and MBNQA award model. These organisations develop a quality improvement plan and then self-assessment is planned and carried out, the objective being that the outcome will be integrated in the overall business strategy planning process. The assessors present their evaluation report to the Management team. Based on the report, senior management develops improvement targets and monitors performance against these. The process is iterative in nature and results in continuous incremental quality improvement.

Japanese method of QMSA is by carrying out Internal quality audits by top management. In Japan the top management personnel lead and promote quality sincerely. They periodically evaluate their policy for quality and a long-term plan is drawn out to achieve the quality policy by carrying out self-assessment. They further evaluate whether the quality policy and the plans are being realised on schedule and whether any corrective action is required to be taken. These activities are termed as Internal quality audits by the top management as against QMSA by European organisations. The objective is to stimulate mutual discussions in order to find out ways and means to improve the present situation. This is educational in character, and results in effective on-the-job training. It also enables systematic investigation and analysis of the hidden causes of those quality problems that cannot be detected by normal systems and procedures. It offers the best method to systematically understand those facts that require corrective action by the top management without offending anybody. The actual methods followed vary slightly in detail. For example in some companies the CEO and the board members carry out this assessment separately and then the findings are discussed and corrective action plans finalised. In other companies it is done by a top management team that may or may not include the CEO. The frequency is normally once or twice a year and it precedes the annual or semi-annual planning of the company. Thus the basic approach for QMSA remains almost the same. Only the way one understands it varies.

Impact of QMSA

The performance of an organisation can be evaluated in terms effectiveness, efficiency, quality, productivity, quality of work life, innovation, throughput

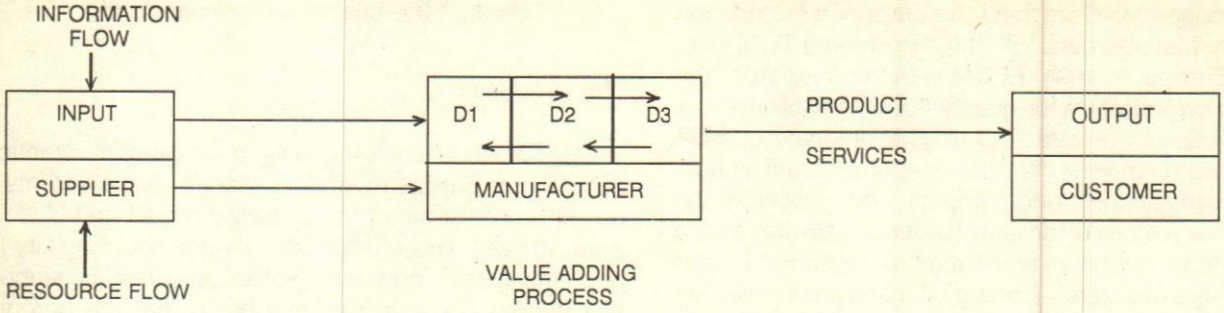

Fig. 2. Value Addition Relationship in Organisation System

and profitability. The requirements for these objectives do vary. To meet these changing and sometimes conflicting requirements the company strategy needs a balanced composite of performance indicators as a means to communicate the requirements, to monitor actual performance and to marshal support for improving results. Self-assessment is one such tool.

Typically, a system in its simplest form, is depicted as an interrelated group of processes that receive inputs from the external environment, act on them in some way, and produce an output that is supposed to be of greater value than the sum of the inputs and goes back to the external environment. The performance of the organisation as a system is affected by each of its components. That is, every department influences the company's overall performance. Self-assessment helps increase efficiency at each stage resulting in overall efficiency enhancement.

Interactions occur as the product flows from one person to another for value addition eventually reaching the customer. QMSA closes the feedback loop and increases efficiency. Fig. 2 shows the value addition relationship in an organisation. As the figure illustrates the parts of an organisation system are interdependent. How one part affects the whole system depends, to some extent, on at least one other part in the system (Detterner, 1955). Further, if parts of a system are grouped together in any way, they form subgroups that are subject to the first two principles.

Goldraft (1992) maintains that if the performance of each part of a system is individually maximized the system as a whole will not be optimized. Conversely, if a system is performing as well as it can, not more than one of its parts will be. If one considers the idea in the context of today's business world, it's somewhat revolutionary. Much effort and expense is devoted to maximizing efficiency at every level and in every sector of a company, without regard for the effect on the company's overall performance. In most cases, companies can't quantify what effect suboptimal decisions will have on the organisation's overall performance, but they continue to make them anyway. This working culture and ethos of the people affects the systems and procedures and shows in business results. By self-assessment, this fallacy will become more glaring to the top management and they will be interested in improving the present situation which will eventually culminate in better business results.

Socio cultural Issues

Indian organisations require competitive excellence as they have to catch up with global levels of efficiency, product quality and innovation (Agarwal, 1984). It is far easier to build organisational and managerial excellence using indigenous examples than through borrowed foreign models. For successful implementation of QMSA movement also, we need to develop our own indigenous models. We have to devise a mechanism for achieving excellence in the context of the existing poverty, inequality, and rapid socio economic change.

We have to launch a nationwide campaign to change the work culture and improve quality, it needs the same will with which the Japanese changed their work methods towards "quality". It has to be a people's movement for changing soft work culture to a culture where discipline, hard work, precise work standards and performance, effective implementation of laid down systems and procedures and credibility are respected and maintained. Large scale state patronized education and training efforts are to be undertaken to upgrade the existing skills and to change work attitudes.

The socio cultural issues are important and should be addressed. While developing strategy for

self assessment for Indian organisations, one should consider the following:

* Nature of the Indian work force, their historical background, personality traits, attitudes, beliefs and values
* Inter-personal and intra-personal behaviour of the Indian work force in work situations
* People's socializing behaviour pattern and its impact on the organisation's effectiveness
* Strength and weaknesses of Indian work force
* People's ability to think and act in terms of system as a whole rather than on part basis (Senge, 1990).

In order to initiate self-assessment in Indian industry, we should start the process of culture change, considering the socio cultural behaviour of Indian work force. Issues to be addressed in this regard are as follows:

The Can-Do Attitude: QMSA helps in identifying potential trends of potential problem areas and requires the 'can do' attitude which means more openness, freedom to act and reduced bureaucracy, whereas our culture is of evasiveness. The success of QMSA movements requires 'can do' culture. The managements have to make sure that everyone is a part of the 'Can Do' culture.

The Cost of Controlling Quality and People: Most organisations spend a large amount on poor quality products unconsciously. Instead of developing the skills and confidence of the employees to deal with quality problems, they end up spending more in tackling these quality problems later. QMSA approach helps in generating awareness about quality cost in the top management. Phillip Crosby (1980) has stated "Quality is free". However, in the opinion of authors "Quality is free but it is not a gift, one has to work for it." QMSA is the tool to do it.

Responsibility and Ownership for Quality: It is said that the employees should own responsibility for quality, and the management should facilitate. However, to put this percept into practice and make the atmosphere congenial is difficult. This is where QMSA is helpful. Most companies employ people to work for them, but expect them to hang up their brains before they start and collect them while leaving each day. In the self-assessment approach, when the top management initiates the evaluation process, awareness and interest are immediately generated. Now the management appreciates the problem and works hard to improve the situation.

Teamwork: To achieve revolutionary instead of evolutionary quality improvement, teamwork is absolutely essential. In self assessment, the management gets to know the "critical mass" of enablers within the organisation. Now they can direct the efforts of the people to perform better. The QMSA movement encourages participation by all as it provides stimulus and a continuous learning environment. In QMSA movement, ignorance about ideas and concepts should be accepted and discussions to solve the problems should be encouraged. By discussions the cross fertilization of ideas takes place enabling better and more effective solutions to problems. Thus effective teamwork can be achieved.

Positive Mental Attitude: QMSA requires that employees get the right signals and adopt positive mental attitude. A positive attitude is necessary to understand the existence of quality problems and the necessity for continuous quality improvement. This awareness is generated by QMSA.

Action based plans: Nothing can be done by thinking or talking alone. To reach the goal one has to start moving. The eyes and ears can sense a problem, but the senses must be substantiated by data for which self-assessment is of immense use.

Review standards/performance norms: The available standards, norms may be either too high or vague. High Standards mean more cost. Vague standards mean more quality problems. One has to check the adequacy and sufficiency of the same considering the objective of exceeding the customer requirement. Self-assessment helps in finding out the gray areas.

System improvement: QMSA is an organisation-wide intervention. It requires integration, co-ordination, communication and conflict management. In the organisation all existing systems, procedures and controls get reviewed by self-assessment and then may be amended if necessary to facilitate expeditious quality improvement.

QMSA is an organisationwide intervention. It requires integration, co-ordination, communication and conflict management.

Long term view: People tend to get carried away by immediate [relatively minor] problems due to visible gains and forget more critical ones. QMSA helps review

achievement frequently and thus ensures that long term objectives are always kept in mind.

QMSA Interlinks Goals & Results

The route to quality for most organisations begins with emphasis on systems approach to quality. The simple objective is to have efficient and effective, customer-focussed processes which everyone can understand and implement. For most companies in India today, the journey for TQM movements started with redefining systems and initiating action for ISO: 9000 certification. The second route is increased use of statistical tools and techniques. Any of these tools will give benefit, but the maximum benefits accrue only when they are practised in the right environment. Are we in the right environment? To find out the answer to this question, self-assessment is required. Self-assessment by the top management helps build a climate in which people are motivated, work together productively, and become more effective and result oriented individuals.

Maximum benefits accrue only when they are practised in the right environment. Are we in the right environment? To find out the answer to this question, self-assessment is required.

Conclusion

QMSA is a win-win approach. It creates a system in which human, organisational and societal objectives are met simultaneously. People find more satisfaction in work when there is cooperation and team work and when they are learning, growing and contributing. The organisation also is more successful because it operates more effectively. Quality is better and costs are reduced. Perhaps the greatest beneficiary of the reward system is society itself, because it has better products and services, better citizens, and a climate of cooperation and progress. Thus there is a win-win situation with no losers.

Organisation design for effective implementation of QMSA and achieving competitive excellence requires a number of changes in the present policies, structure, management style and administrative practices of organisations. These changes in turn require multi-disciplinary collaborative approach and a correlated set of moral values for their successful implementation, consolidation and steady development. Considering the soft work culture of Indian organisations, Quality improvement and innovation, excellence and achievement should be the watchword throughout the organisation. In our country today, we are ignoring the challenges ahead and fighting the crisis rather than leading the organisations to greater heights. In order to ensure effective QMSA in Indian Organisations, a radical change in the environment, culture and attitude of our people has to take place.

Are we willing to take the leap? Are we ready to change existing role models of soft work culture by self-introspection. If yes, how fast can we change? There are the questions answers to which the future of Indian organisation lies.

Acknowledgement

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Feature

Quality Engineering Using Taguchi Techniques—A Case Study

I.P. Keswani & R.R. Lakhe

Improvement in quality by reducing the number of defectives is a goal every organization likes to pursue. However, the reduction of defectives requires an additional investment in procuring suitable technology and training of employees. Small scale industries with their resource crunch are at a disadvantage because of this. Taguchi technique is a simplified way to overcome this problem.

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Recent years have witnessed an increased emphasis on quality with a large number of organizations both from developing and developed nations aspiring for and working toward TQM/ISO-9000. The main objectives are to increase customer satisfaction, build quality culture, develop systematic procedures and reduce quality costs. The small scale industries however, are faced with a problem as they can not go in for high investments in technology. Taguchi techniques provide an ideal solution in this respect as they aim to reduce the defectives and improve the quality without any additional investment.

Taguchi techniques aim to reduce the defectives and improve the quality without any additional investment.

Taguchi Techniques

Taguchi Techniques have a great impact on the quality of the process design. Based on the feedback from the pioneering applications, on field data, these methods appear to have the potential to provide industry the largest pay offs among all known quality assurance methods, though they use the same well established theories of statistics to design and develop high performance products and reliable processes that would cost less to use and operate through out their life time.

According to Taguchi "A product has the ideal quality when it delivers on target performance each time its user uses the product under all intended operating conditions and throughout its intended life". This ideal quality serves as a reference point even though it may not be possible to produce a product with ideal quality.

A product has the ideal quality when it delivers on target performance each time its user uses the product under all intended operating conditions and throughout its intended life.

Loss Functions & Manufacturing Tolerances

Taguchi defines the quality of the product on the basis of the loss caused by the product to the society from the time the product is shipped. Loss function is a quantitative statement developed by Taguchi which shows the economic effect of off-target production on customers and manufacturers. Quality loss function measures the quality loss due to deviation of a quality characteristic from the target value. Loss functions provide the justification missing in conventional Quality Analysis about why a manufacturer should minimize the variability in the performance of a product or a process. Loss function also guides the setting of manufacturing tolerances and the allocation of part tolerances between interacting work centers in a factory, and between suppliers and the consumer. According to Taguchi, loss occurs not only when the product is outside the specifications but also when it fits within specifications. This loss may be in the form of inconvenience, repair replacement and dissatisfaction with the product to the customer. The manufacturer experiences this in the form of warranty costs, customer complaints, poor reputation and eventual loss of market share. So merely meeting the specification is not enough. The performance is ideal or most desired when it is on target. Customers are sensitive to the variation around a target value even when a product characteristic is within engineering specifications.

Quality loss function measures the quality loss due to deviation of a quality characteristic from the target value.

Quality Loss Function (QLF)

Taguchi proposed that manufacturers approach ideal quality by examining the total loss a product causes because of its functional variations from the ideal quality and any harmful side effects that the product causes. Taguchi found that a quadratic representation of QLF is an efficient approximation that allows us to realistically assess loss due to poor quality. It is performance characteristic measured on a continuous scale where ideal or target performance is 'M' and if 'L' is the loss then, Taguchi's Quality loss function is given by $L(y) = K(y-m)^2$. The QLF is represented diagrammatical as in Fig. 1, where

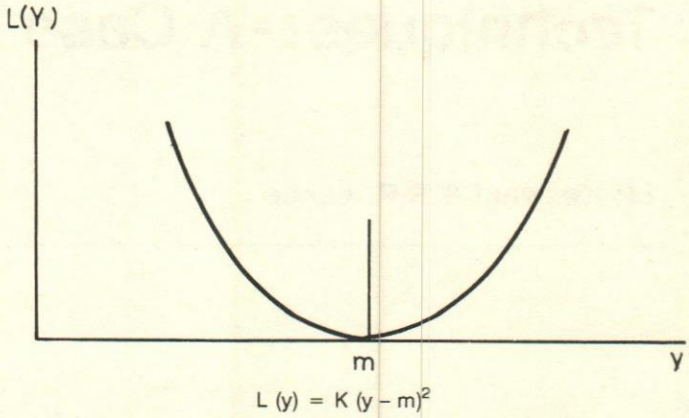

Fig. 1. Quality Loss Function

- K is constant.
- Y-m is deviation from nominal
- Loss is proportional to square of the deviation from nominal value.

Planning a Taguchi Project

Taguchi Techniques are a broad strategy for seeking quality through continuous and incremental quality improvement. These studies are easier for companies with a high level of Quality Consciousness and active use of quality circles (QC), Quality Function Deployment (QFD), and other quality management innovations. Experience shared by enterprises which have successfully used Taguchi Techniques suggests that it is unrealistic to expect overnight answers from cash projects styled after robust design experiments.

A programme to initiate the use of Taguchi Techniques in an enterprise consists of the following steps in training and orientation:

- A simple explanation of quality loss
- A sound explanation of statistical experiments and orthogonal arrays
- A first hand example of an application by someone who has run a designed experiment
- Identification of the performance criteria for the process one plans to study or optimize.

The application of Taguchi technique requires the adoption of the following procedure:

- Selection of the desired outcome, control, adjustment, and noise factors for the process under study
- Choice of the appropriate range for both the external and internal factors involved
- Selection of appropriate orthogonal arrays to study the effect of the above factors, including their interaction
- Conduct of necessary experiments as defined by the orthogonal arrays, conducting each experiment more than once if necessary to increase accuracy
- Calculation of the proper S/N (Single to Noise) ratio for each factor for each level (treatment) selected.
- For each factor, selecting the level that maximizes the S/N ratio and hence reduces variability and optimizes the process
- Using the factors (possibly more than one) that do not increase the variability (i.e. have a flat S/N response) to adjust the mean performance to the desired target.

Case Study

Problem Identification

An organization engaged in manufacturing bolts, nails and rivets, situated at Nagpur was selected for study. The major product being manufactured by the company is a Bolt of size 3". The monthly production is 5 tons. The material used for manufacturing the bolt is mild steel wire rod which is purchased from the Bhilai Steel Plant. The products are sold to the various wholesalers in Nagpur city.

The rejections in the bolts being manufactured are mainly due to variations in length and formation of cracks in the head, the latter being the major problem. A crack is a clean fracture passing through or across the grain boundaries and may possibly follow inclusions of foreign elements. The cracks are formed during the circular head formation. About 500 kgs of material is scrapped due to cracks. In order to overcome this problem, high precision machines for the various operations could be used. However, the management was not willing to make the additional investment required for the procurement of these

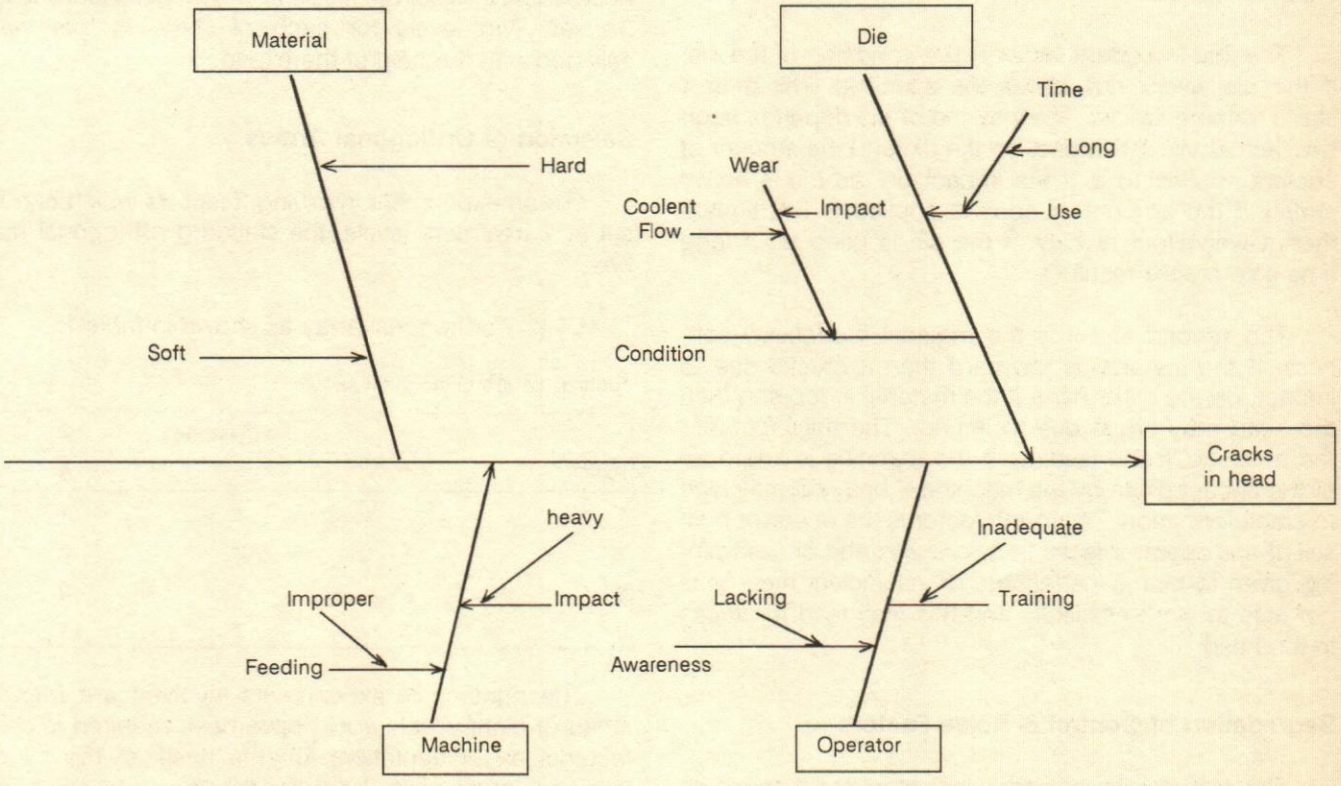

Fig. 2. Cause-effect diagram

machines. Therefore, the concept of "Taguchi Techniques" which aims at giving high quality at a low cost was used.

Quality Loss Function for Bolt was Calculated as Follows:

Performance Characteristic	:	Length
Target Value (")	:	3"
Functional Tolerance ( )	:	+/- .25 "
Sale Price	:	Rs. 20/KG
Scraped Price	:	Rs. 3/KG
Customer's Loss (A)	:	Rs. 17/KG

$K = A/\delta^2 = 272$

$L(Y) = 272\ (Y-3)^2$

Identifying the Factors Causing Cracks

To evaluate the crack formation, an Ishikawa Cause Effect Diagram' was constructed as shown in Fig. 2. It can be seen that there are 4 main causes that lead to crack formation.

The first important factor is the condition of the die. If the die wears out above the specified limit then it starts forming cracks. The wearing of die depends upon two factors viz. the impact on the die and the amount of coolant applied to it. If the impact on the die is heavy and/or if the amount of coolant applied is inadequate then it wears out quickly. If the die is used for a long time also cracks result.

The second factor is the material hardness / softness. If the material is too hard then it cracks due to impact; on the other hand if the material is too soft then the head may crush due to impact. The third factor is the machine. If the feeding in the machine is improper or the impact given by the machine is heavy, it may lead to crack formation. The fourth factor is the operator himself. If the operator lacks in awareness and/or the training given to him is inadequate or insufficient then he is not able to work efficiently and this may lead to cracks in the head.

Segregation of Control & Noise Factors

Out of the various factors, indicated in the cause-effect diagram, some control factors (which are considered to be controllable) and some noise factors (considered to be uncontrollable or on which the present manufacturer has no control) were identified:

Control Factors

- Impact of punch
- Replacement of die
- Use of coolant

Noise Factors

- Incoming materials : softness, hardness
- Die wear
- Operator performance

Selection of Levels of factors

The design parameters are:

- Impact of punch
- Replacement interval of die
- Coolant flow

In order to choose a standard orthogonal array, it is necessary to select the levels at which these factors can be set. Two levels for each of these factors were selected with the help of the expert.

Selection of Orthogonal Arrays

For an experiment involving 3 factors which can be set at 2 treatment levels, the standard orthogonal may be:

L4 (2^3) orthogonal array as shown in table 1.

Table 1: L4 (2^3) Orthogonal Array

	Columns		
EXPT	1	2	3
1	1	1	1
2	1	2	2
3	2	1	2
4	2	2	1

The number of experiments involved are four instead of eight which would have been required in a full factorial experimentation. On the basis of the L4 orthogonal array, control orthogonal array and noise factor array were constructed as shown in tables 2 and 3 respectively.

Table 2: Control Orthogonal Array

	Control Factors		
EXPT.	Impact	Replacement	Coolant
1	High	2400	1.75
2	High	1920	2.0
3	Low	2400	2.0
4	Low	1920	1.75

Table 3: Noise Factor Array

	Noise Factors		
EXPT.	Material	Diewear	Operator
1	40	50	1
2	40	100	2
3	45	50	2
4	45	100	1

Parametric Experimental Plan

The parameter experimental plan involves the combination of the inner array consisting of control factors and an outer array consisting of noise factors. The combination of various factors was as shown in table 4. A sample size of 400 bolts which corresponds to half day production was selected for the experiments.

Table 4: Parametric EXPT. Plan

Inner Array			Outer Array				
Impact	Repl.	Coolant	40	40	45	45	Matl
of	Int		50	100	50	100	Die Wear
Punch			1	2	2	1	Operator
High	2400	1.75	19	16	18	15	
High	1920	2.0	14.5	18	16.5	19	
Low	2400	2.0	13.0	13.5	10	12.5	
Low	1920	1.75	18.6	16.5	18.5	14.5	

Determination of Signal to Noise Ratio

In the experiment at plan, the data involved is attribute in nature. The S/N ratio to be used is

$$S/N = 10 \text{ Log10 } (P/ (1-p))$$

where P = proportion of good products.

The value corresponding to the maximum S/N ratio is selected which is the third combination.

Table 5: S/N Ratio : On Basis Of S/N 10 Logic (P/(1–p))

Experiment No	S/N Ratio
1.	6.88
2.	6.02
3.	8.65
4.	7.04

Table 6: Optimum Setting

Design Factors	Optimum Setting
Impact of Punch	Low
Replacement Interval	2400
Coolant	2.0

Optimization of Settings of Design Parameters

The values of various factors at this setting are shown in table 6. This is the optimum setting obtained from Taguchi Techniques. The use of this optimum setting has helped the company reduce the defectives from 18 per cent to 12 per cent.

Conclusion

Taguchi Techniques aim at obtaining and maintaining quality at lowest possible cost. They lead to excellence in the selection and setting of design parameters and hence their application helps in reducing the defectives produced. The reduction in the number of defectives is possible by judiciously exploiting the interaction between the design parameters and the noise factors. The burden of inconvenience due to the defectives is therefore reduced substantially. No additional investment is required in the procurement of any special machinery or material for the production processes. As a result of this, the attainment of high quality is possible at low cost. □

Focus

Flexible Systems Methodology for Studying Corporate Problems

Neeraj & Sushil

In this paper, the authors have tried to extend the use of 'Flexible Systems Methodology' for studying the corporate problem. Based on the various steps of the methodology namely, problem conceptualisation, fuzzy clustering, matching attributes, selection of best techniques, integration and innovation, implementation and finally the dynamic shift, a study design divided into three phases (Pilot study, micro study and macro study) has been evolved.

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There is no dearth of literature on research methodology explaining the research process in different steps. One common approach found in literature is dealing quantitative issues in a crisp way using different tools for data collection. For example, responding to a questionnaire in binary way by choosing 'Yes' or 'No'. How far the research questions in the problems – answered by employing the research tools, are able to capture the reality? If there is a mismatch between the attributes of the research problem and the choice of research tools then the research design will become faulty. There has been obvious gaps in the methodology (tools and techniques) adopted to examine the problem identified for any research question.

It is the responsibility of the researcher to handle the research design to adapt to the changes and dynamic shifts in the attributes of the problem. Research design should be more open and, at the same time, the realistic data should be captured. The research design is prepared as a research plan with a clear indication of problem objectives, scope of the study, and the strategies to accomplish the objectives. "Research design is the plan, structure, and strategy of investigation conceived so as to answer to research question and to control variance" (Kerlinger, 1983). "A research design is the logical and systematic planning and directing a piece of research. The design results from translating a general scientific model into varied research procedures" (Young, 1988). "Research design addresses the planning of scientific enquiry-designing a strategy for finding out something. The two major aspects of research design are specifying precisely what you want to find out, second, you must determine the best way to do that" (Babbie, 1989). Research design is a process of deciding what aspects we shall observe, of whom, and for what purpose.

"To design is to plan; that is design is the process of making decisions before the situation arises in which the decision has to be carried out. It is a process of

deliberate anticipation directed towards bringing an expected situation under control" (Ackoff, 1953). The plan is the overall scheme of the research. It includes an outline of what the investigator will do from writing hypotheses and their operational implications to the final analysis of data. The structure of research is more specific. It is an outline, and the paradigm of operation of the variables. It gives direction for the execution of the entire project though it has been prepared as an overview. Research design is primarily used for strategy formulation for executing the research plan for scientific enquiry.

Research design is primarily used for strategy formulation for executing the research plan for scientific enquiry.

The process of research design has been dealt by Babbie in the context of clarity over the problem attributes. In the process of providing answers to the research question the understanding of the problem as a whole is critical. "Ultimately, the research process needs to be seen as a whole, and you need to grasp it as a whole in order to create a research design" (Babbie, 1989).

Limitations of Existing Research Process and Design

(i) A research process is seen in terms of sequential parts rather than as a whole.

(ii) In making a choice of research methods in research design the techniques discussed are limited to an extent. For example system based techniques for management research are usually not seriously considered for a research design.

(iii) The literature on research methodology gives steps for conducting the research but very little discussion on process of research design is deduced.

(iv) Moreover, consideration of research techniques is for individual phases of design and not for the "whole" problem.

Flexible Research Design

Suchman (1954) states that "... there is no such thing as a single correct design. Research design represents a compromise dictated by the many practical considerations that go into social research. (Also) A research design is not a highly scientific plan to be followed without deviations, but rather a series of guide posts to keep one headed in the right direction". As the study progresses, new aspects, new conditions, and new connecting links in the data come to light, and it is necessary to change the plan as circumstances demand.

A flexible research design is recommended in this regard. "Research design is a tentative, flexible plan for research that may be altered as the research actually proceeds and unforeseen problems or insights come to light" (Ferman and Levin,1975). To overcome the limitations and to make the research process (design part) more comprehensive and concrete, Sushil (1994) formulated a methodology known as "Flexible Systems Methodology".

An Application

Problem Conceptualisation

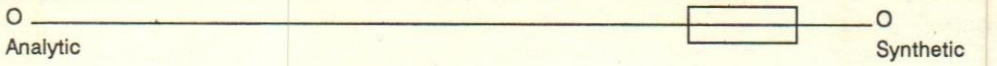
The basic aim of the study for which the flexible systems methodology is applied is to ultimately formulate a strategy for quality and productivity. It is inevitable in the process that efforts should be made to understand the nature of the flexible strategy for quality and productivity. The final topic, thus, is defined as "Flexibility in Strategy for Quality and Productivity".

As stated, the first study would be to find out what is the present prevailing strategy for quality and productivity. This is again decided through a brief application of Flexible Systems Methodology in a very preliminary form (Neeraj,1994). Since the question is more of qualitative nature and unstructured, it can be studied through semi-structured interviews and an open ended questionnaire. This becomes the pilot study to guide the problem further.

The authors have already found through a pilot study that, so far the strategy for quality and productivity has been understood to be the TQM and apart form this there exists no explicitly defined strategy for quality and productivity. As per the needs of ISO 9000, Quality Policies were formulated. A case study was cited illustrating that it was not understood by the

There exists no explicitly defined strategy for quality and productivity.

A. System Approach



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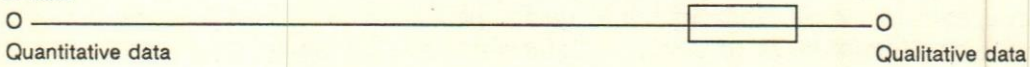
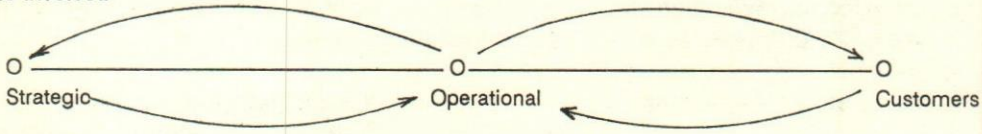
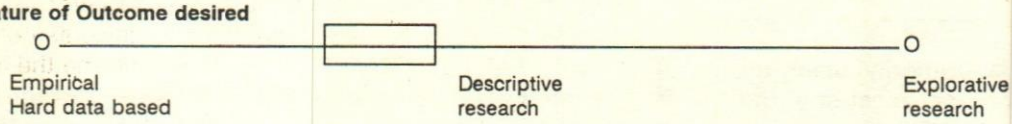


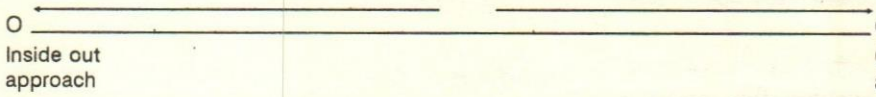
C. People Involved



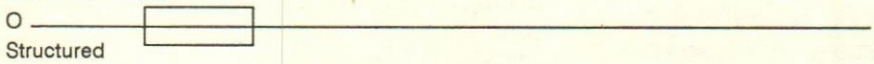
D. Nature of Outcome desired



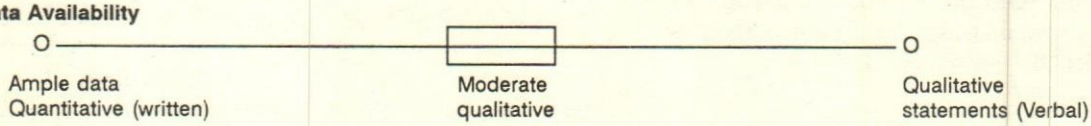
E. Clarity



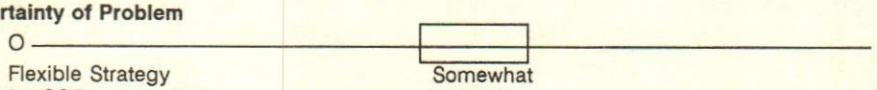
F. Attributes of structure



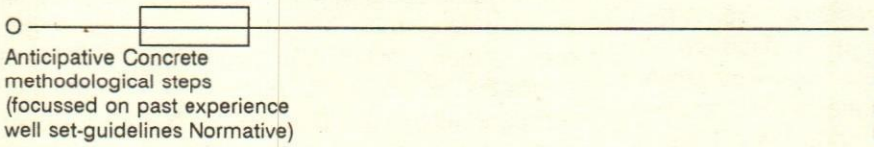
G. Data Availability



H. Uncertainty of Problem

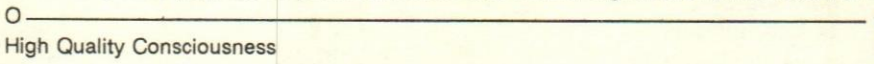


I. Methodological Outcome desired (Methodology Wise)

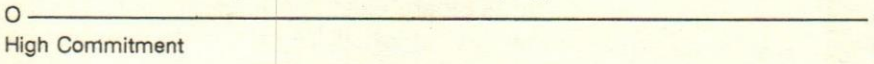


J. Situation Specific Characteristics

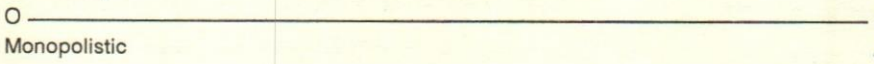
J1. Organisational Culture (aspiring for perfection values and beliefs. Organisation's motivation for quality)



J2. Organisational Commitment (Identification with the Company)



J3. Product Maturity



J4. Market Status

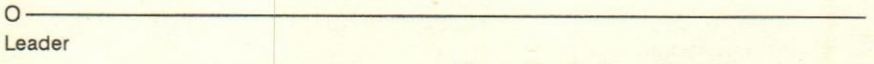


Fig. 1. The Problem Mapping

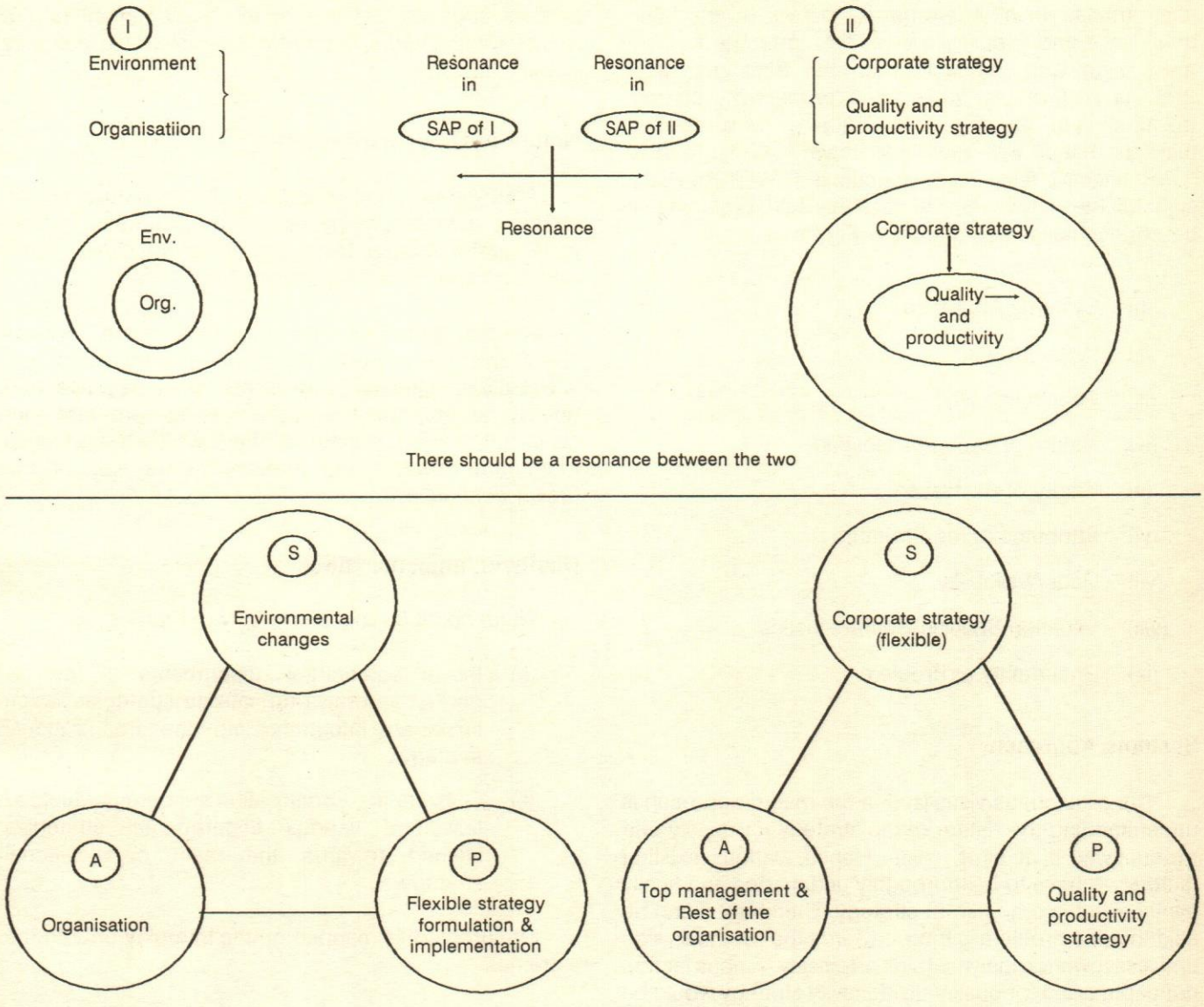


Fig. 2. Proposed model of resonance at two different levels of strategy

grass root level functionaries. Another notable factor was regarding the coherence of facts when strategy was articulated by different senior executives of a few large companies (Neeraj and Sushil, 1995). In this light the problem as conceptualised may be mapped as shown in Figure 1. The identified problem "Flexibility in Strategy for Quality and Productivity" requires two different kinds of resonance:

(i) Resonance between the environment and the organisation for the issues of strategy in quality and productivity.

(ii) Resonance between corporate strategy and the issues of quality and productivity.

For any organisation to be successful, it has to work in the existing environment. Therefore the environment and the organisation's corporate strategy has to be aligned to each other or in other words there has to be a resonance between the two. Resonance between the organisation and environment may be more objectively studied by analysing the SAP (Situation, Actor, Process) of the two. More the resonance, better would be the organisational success.

Similarly the corporate strategy has to be supported by the various functional strategies like quality and productivity strategy, technology strategy, marketing strategy etc. There has to be a resonance between the functional strategy and the corporate

strategy on these three fronts namely Situation, Actor and Process. In other words the factors on the Situation, Actor and Process part of the corporate strategy must align with the factors on the Situation, Actor, Process part of the quality and productivity strategy (a functional strategy). The authors have conceptualised that it will contribute towards the organisational effectiveness for its functioning. With the basic sight of these two resonances, the said problem can be conceptualised as shown in Figure 2.

(i) Systems Approach

(ii) Type of Data

(iii) People Involved

(iv) Nature of Outcome Desired

(v) Clarity of the Issues

(vi) Attributes of the Structure

(vii) Data Availability

(viii) Situation Specific Characteristics

(ix) Uncertainty of Problem

Systems Approach

The problem as visualised in the macro approach is understanding the nature of the strategy for quality and productivity, if at all it exists. Hence, various existing factors will have to be thoroughly understood and finally synthesised into a uniform strategy. Therefore, it can be said that the problem is more towards the synthesis side and less towards analytical side. Precisely, various factors conceptualised for quality-productivity strategy would be integrated into a uniform strategy.

Type of Data

Since the issue addressed is qualitative, the chances of obtaining data would be more of qualitative nature as the strategies spelt would be in the form of statements-written (oral displays) notices etc.

People Involved

The actors identified for the present problem are top management, rest of the management and also the customers. The present decade of TQM declares' Quality as the "Satisfied Customer", hence customers consideration may be an integral part of the strategy. The strategy has to be finally formulated by top management. But formulation alone won't lead to the desired level of success, the rest of the management or the actual implementors (operational people) also naturally comes into play.

Nature of Outcome Desired

After proper understanding of the nature of the strategy, a methodology has to be proposed for formulating the strategy for quality and productivity as the desired outcome of the problem.

As the trends of the management are towards "flexibility in management" it is conceptualised that "flexibility in strategy" would be an appropriate and one of the important ways of achieving corporate success, but this factor may be of a low key level. Hence it is more towards the non-anticipative side of the drawn continuum.

Clarity in Implementation

There could be the following two approaches

(i) Inside out-integral departments of the organisation draws up satellite strategies which finally are integrated into one organisational strategy.

(ii) Outside in—Organisational strategy decided first and various departmental strategies aligned towards the main organisational strategy.

The problem is mapped on the interplay of both the extremes.

Attributes of the Structure

S-A-P analysis of issues of quality and productivity has been done and found to be more towards the structured type i.e. more structured and somewhat unstructured.

Data Availability

Neeraj and Sushil (1995) in a survey found that any strategy for quality and productivity does not seem to exist explicitly. In the name of corporate strategy for quality and productivity, everything has been left to TQM paradigm. ISO certification—an approach towards TQM has been adopted by many of the surveyed companies and hence they all have a Quality Policy. But this (Quality Policy) also has not been understood by grass root level

functionaries of the organisation. In this light, the problem bends more towards moderate level of data available on the drawn continuum.

Uncertainty of the Problem

Literature survey till date has not yielded any result when flexible strategy has led to an increase in quality and productivity parameters. But quality and productivity issues are gaining importance in the current decade and TQM has been one of the most successful strategies to bring about improvements. The trends also have been aptly summarized towards flexibility. It can be said that flexible strategy for quality and productivity may help the organisations.

Methodological Nature of Outcome Desired

The attempt is to crystalise a method for formulating a flexible strategy for quality and productivity. The continuum may be varying from fluid methodology wherein most of the factors are planned for that particular period, culture, requirement, philosophy, environment, etc. On the other hand, the methodology can consist of a well defined set pattern or steps thereby being concrete in its nature. In other words a strategy formulation may be fluid or concrete in nature. This study aims to develop a concrete methodology.

Situation Specific Characteristics

Organisational Culture Strategic issues for quality and productivity or the implementation part also depends upon the following sub factors:

(a) employees aspiring for perfection

(b) employee values and beliefs

(c) organisation's maturity in quality

Organisational Commitment: The level of identification of employees with the company also has a bearing on the quality and productivity strategy's implementation part.

Product Maturity

Market Share

Fuzzy Clustering

The problem attributes are defined in different continua of the situation, actor and process. The mapping of the nature of the problem in the research process i.e., research design using a set of eligible techniques is done. A list of 33 techniques is given in Figure 3 in different clusters for the appropriateness.

I. Managerial/Empirical
1. Management Techniques (SWOT, Portfolio Analysis)
2. Behavioural Analysis (Games, Role Playing)
3. Empirical Study (Questionnaire, Interview)
4. Field Studies
5. Field Experiments
6. Laboratory Experiments
7. Observation
8. Longitudinal Studies
9. Case Study Approach

II. Qualitative
10. Soft Systems Methodology
11. ISM and MICMAC
12. Program Planning
13. Analytic Hierarchy Process
14. Idea Generation Techniques
15. Options Field/Profile Methodology
16. Scenario Building
17. Delphi
18. Content Analysis

III. Semi Quantitative
19. Interactive Planning
20. System Dynamics
21. Fuzzy Techniques

IV. Quantitative
22. Physical System Theory
23. Statistical Techniques
24. Optimisation Techniques

V. Stochastic
25. Stochastic Analysis
26. Queing Theory
27. Markov Chain

VI. Simulation
28. Simulation of the Model

VII. Functional
29. Project Management Techniques
30. Operations Management Techniques
31. Financial Management Techniques

VIII. Intelligence System (AI)
32. Neural Nets
33. Knowledge Based System.

Fig. 3. List of Techniques.

Upto this stage, various dimensions related to the problems have been studied, and various techniques

Case Study	5.3
Management Techniques (S-A-P analysis)	5.2
Field Study	4.4
Idea Generation	3.9
Delphi Technique	3.4

- To capture the ambiguity through mutual discussions and to develop an insight in the futuristic view.
- To clarify the issues at the evolutionary stage (Pilot Study).

Table 1: Matching Attributes

Problem Attributes	Mgmt Tech.	Behave Anal.	Empiri-cal Study	Field Study	Field Expt.	Lab Expt.	Obs.	Long Study	Case Study	Ideal genera-tion
Synthesing quality, productivity and strategy into a unified strategy	0.5	0.1	0.9	0.4	0.2	0.0	0.1	0.2	0.5	0.4
Qualitative data to be dealt with	0.4	0.1	0.8	0.5	0.2	0.0	0.0	0.1	0.4	0.5

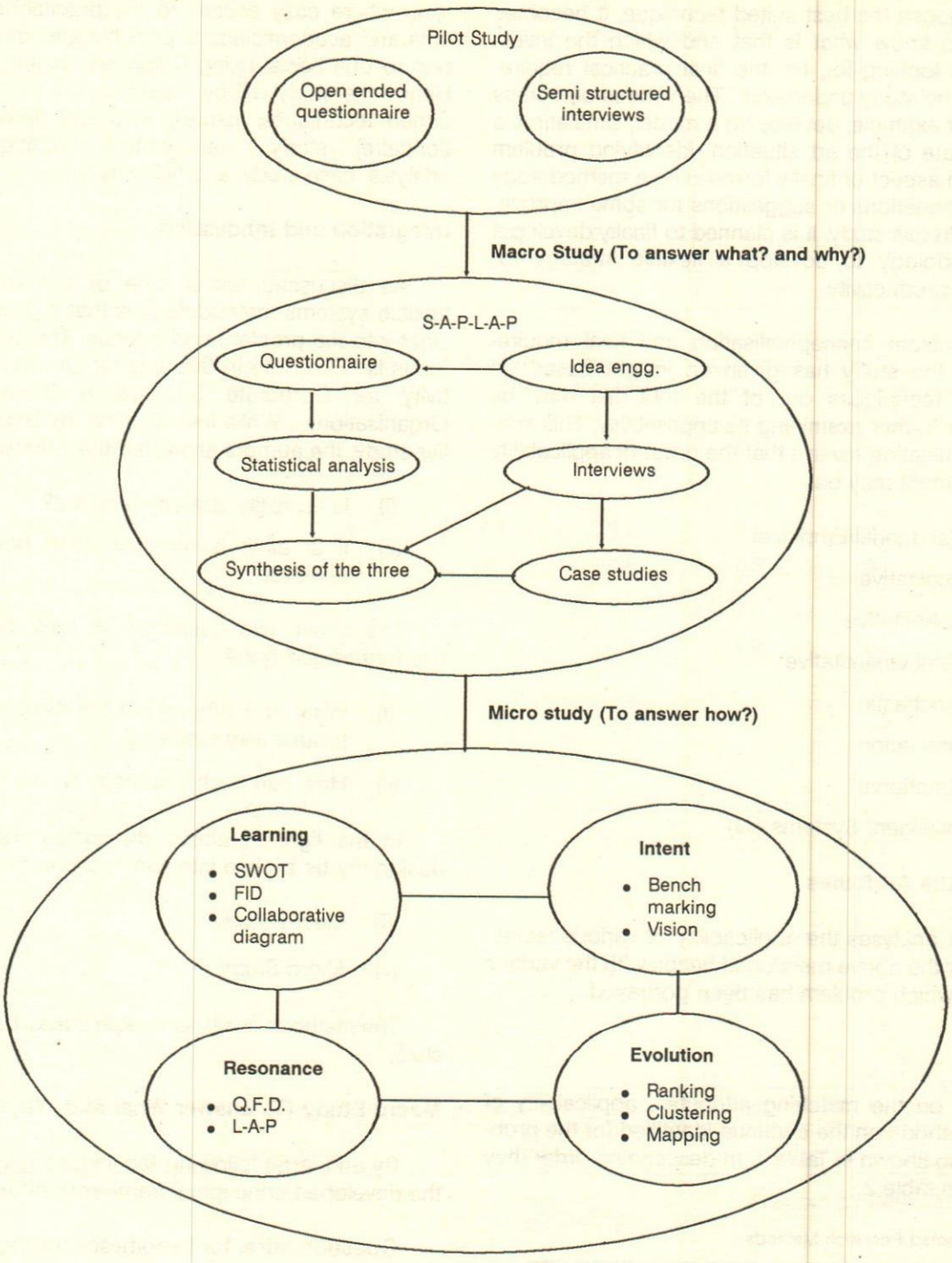


Fig. 4: Study Design

Case Studies: To see a holistic view of the problem, its probable solutions or the related aspects, and its impact on various solutions.

Application of SAP model: Final evolution of 'flexible strategy' will be based on the application of SAP paradigm in the given context.

Micro Study (To answer Why?)

Under this part, efforts are made to finally evolve a flexible strategy. The authors have conceptualised the flexible strategy having four attributes namely.

(i) Learning

(ii) Intent

(iii) Evolution

(iv) Resonance

The distinct techniques fitting into the four phases may be applied.

Learning

Application of SWOT analysis, Flexibility Influence diagrams and collaborative diagrams may be examined.

Intent

For formulating, Intent-Benchmarking or vision may be applied.

Evolution

For development of this phase techniques like Ranking, Clustering, Mapping, etc, may be tried.

Resonance

The final phase of the study may be planned through Quality Function Deployment, or Learning-Action-Performance Paradigm.

Synthesis of all the techniques applied will be used at the end to conclude the results as shown in Figure 4.

Concluding Remarks

To bridge the existing gap between the problem under consideration and the techniques used to study the problem, a methodology has been developed. So far the methodology has been used in the area of systems research. The methodology has been extended to the area of management research. The traditional subjective way of choosing the techniques have been replaced by objectively studying the attributes of the problem and final requirement of the study. The methodology has been designed for the problem "Flexibility in Quality and Productivity Strategy – A Study of Indian Organisations" which has been depicted in figure 4. Source steps of the proposed study design have been implemented, which are showing satisfactory results.

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Feature

Inventory System Analysis – A Case Study From Coal Industry

A.M. Agrawal & N.K. Purohit

Inventory management in mining industry in our country has not been given its due attention. Heavy industrialisation and the growing demand of coal from the power sector, have resulted in big investments in machines in the mining industry. This in turn has resulted in huge inventory requirement of spares etc. Improper planning has led to heavy build up of non-moving inventory. Here, an attempt has been made to develop a concept of service level based on various inventory analysis techniques. The Combined Analysis Technique (CAT) takes into account relative weightage and it is expected that if implemented properly the inventory level will come down considerably, releasing scarce money for alternate use.

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In mining industry since natural resources are being exploited, no raw material is required to be processed. So, inventory consists mainly iof spare parts of machineries and other consumables. Mining projects are located in remote areas where sources of material supply are not available nearby. Projects are scattered over a large area. These features make communication more difficult. Machines used in mining industry are typical and so, spare-parts may not be easily available.

Inventory Management in Mining Industry

Due to heavy industrialization and growing power demand the coal industry was nationalized in 1972. Prior to that the industry was labour oriented and mechanization was almost absent. But due to rapid growth in the demand for coal, the mining industry was forced towards mechanization and large opencast mines. Coal production has increased from 79 MT/year in 1974 to 246 MT/year in 1993-94. When the industry was labour oriented, the major factor contributing to cost of production was wages; inventory/stores cost practically negligible. Due to the heavy mechanization of mining projects and opening up of new large mechanized opencast projects, the share of inventory/store cost has gone up considerably and today it is around 27-30 per cent of the total cost of production in opencast mines and 20-22 per cent at the company level. In opencast mines, it is the highest cost component and at the company level it is the second largest.

Due to heavy mechanization of mining projects and opening up of new large mechanized opencast projects, the share of inventory/store cost has gone up considerably.

To fulfill the growing coal demand, big opencast mines have been opened and they bring with them big and costly heavy earth moving machinery. The latter being capital intensive and having a high rate of depreciation coupled with heavy production pressure, the coal companies are forced to maintain heavy stocks of spare parts. This has led to a heavy build up of huge non-moving items.

Inventory management in mining industry has not been getting adequate attention. Today the inventory worth of a typical mining company ranges from Rs. 20 crores to Rs. 300 crores and regional stores for opencast mines hold inventory upto Rs. 40 crores. Store cost ranks second highest at the company level and highest at the opencast project level. Inspite of these facts, the inventory management department is not properly organised in coal companies. This calls for radical changes in inventory management techniques, formulation of material policy at the corporate level and sincere attention of top management in decision making.

Combined Analysis Technique (CAT)

Various analyses like, ABC, XYZ, FSN, VED and SDE have been so far utilized either independently or in combination of two in deciding the level of control and ordering system i.e. fixed order quantity model or fixed interval model etc. But a combination of all these five analyses has a great potential. In mining industry, where the demand distribution pattern of the various inventory items is not very regular, simple models like fixed order quantity and fixed inventory models do not satisfy the needs of materials management system. Because of the unique characteristics of mining industry, inventory management policies decided solely on any single analysis shall not be able to provide a proper control. If ABC analysis (which is consumption value based) is adopted and control levels according to class of items are planned, a direct gain in reducing inventory carrying cost may be observed but loss (which may be intangible) due to vitality or scarce nature of the item (spares) may have a more severe impact than the visible gains.

So a control system has to be designed where proper representation/weightage of the various analysis is incorporated which together can, determine the Priority Index/Service Level Index, and based on this in addition to the demand pattern, safety stock and maximum stock level. Re-order level can be determined scientifically. This helps in evaluating the existing stock value of any equipment spares. In CAT system, firstly all analysis are to be done one by one and then combined together. After this, items falling in different classes according to various analyses are to be listed. Now, if proper weightages can be imparted to the different classes of an analysis and to the analysis itself, falling in line with the need of the industry system, a Priority Index or Service Level Index can be generated. The index thus obtained will be much more representative.

Control system has to be designed where proper representation/weightage of the various analysis is incorporated which can determine the Priority Index/ Service Level Index.

To elaborate the CAT for evolving the Priority Index/Service Level Index, a case study of the spare-parts/items of sampled (which is a representative machine of various makes) equipment used in a large opencast mine of the capacity of around 14 MT was undertaken. These 4 equipment are:

- EKG 4.6 Shovel (For loading operation)
- 785 – II dumper (For transporting operation)
- SBSH – 250 drill (For drilling operation)
- D – 155 A dozer (For preparatory/other operations)
- Each equipment has 700 to 1000 spare-parts.

In all, the regional store/area store deals with 30,000 inventory items including spares and consumables.

Practical Inventory Analysis

ABC Analysis: Since this is a consumption value based, relative and objective analysis, all items were analyzed in 3 classes i.e. A, B, and C. Due to the use of computer this analysis has become very easy; it calculates the percentage consumption value of each item in relation to the total consumption value and set the items in descending order. Then the cumulative percentage of consumption is calculated in a descending order and items are classified as A, B and C.

By giving a code number for a specific machine, ABC analysis status and consumption value of last 12 months are separated and a separate data base is formed. This system will give the correct ABC status of a part of a machine (i.e. in relation to the total consumption value of all inventory items).

XYZ Analysis: This is also an objective analysis based on the relative stock value of the inventory items

and hence all items are analyzed in 3 classes i.e. X, Y and Z. The rest of the procedure is the same as in ABC analysis. Here the percentage stock value of item in relation to total stock value is considered in deciding the analysis class. By applying the code for a specific machine, XYZ status of each part and stock value on data can be separated and merged in the database created previously.

FSN Analysis: This is basically a frequency analysis where the frequency of issue i.e. issue per unit time (year/month/quarter) is the sole criteria of analysis. These values are decided depending upon the number of issues in the previous few years and the peculiarity of an organisation.

For the purpose of our classification the following cut-off points have been decided:

- Fast – Two or more issues in a year
- Non-moving – No issue in last 3 years
- Slow – Other than the above 2 criteria (one issue in a 1/2/3 years).

Instead of non-moving class, 'other' category for the purpose of evolving CAT system and the following cut off points can be considered:

(F) Fast – Two or more issues in a year

(S) Slow – One issue in a year

(O) Other – No issue in the last one year.

Again by applying the code number for a specific machine F-S-O. The status of all spares can be separated from the main data base pool and merged in the database created as previously. A combined summary report machine-wise can be generated as shown in table 1.

VED & SDE Analyses: These are subjective and each and every item/part of each machine is examined subjectively. VED Analysis is very important particularly for spare-parts and has been conducted in consultation with field/workshop engineers and the foreman as they are the authority in deciding the vitality of spare-parts. Similarly, SDE Analysis is important because of the unique nature/geography of mining industry and has been conducted in consultation with the purchase department. Based on their past experience and being an interface with vendors/suppliers, purchase executives are found most suitable for determining the availability of items/spare-parts of equipment.

Both these analyses being subjective in nature, are entered against the name/code of each item in the respective columns of the data base generated as previously. A combined summary report of ABC, XYZ, VED, FSN and SDE analyses is shown in table 2.

After preparing main data base, items/spares in each combination are segregated machine wise. Since five analyses are considered for CAT, the total possible combinations are 3 5 = 243 e.g. A. X. F. V. S. So in effect the total items will be distributed in 243 combination groups, though it is possible that many of the combination groups may not be having any item. Then, the total issue value and stock value of the items falling in one group can be calculated very easily and displayed in descending order of either total consumption value (combination wise) or total stock value (combination wise) or in descending order of service level/protection level calculated from analyses discussed later on.

Table 1:

Description	No. of items	Consumption in rupees (% of Total Value)	Stock value in rupees (% of Total Value)
A	10	1,32,41,311.00 (43%)	24,44,300.00 (13.0%)
B	95	1,24,11,549.00 (40%)	44,37,741.00 (24%)
C	3174	49,52,995.00 (17%)	1,16,16,074.00 (63%)
X	30	1,08,89,025.00 (35%)	82,13,775.00 (44.4%)
Y	143	56,11,709.00 (18%)	65,95,987.00 (35.6%)
Z	3106	1,41,05,121.00 (47%)	36,88,443.00 (20%)
F	352	2,37,73,942.00 (78%)	72,95,467.00 (39.4%)
S	532	68,31,913.00 (22%)	31,51,069.00 (17%)
O	2395	00.00 (0%)	80,51,579.00 (43.6%)
Total	3279	3,06,05,855.00 (100%)	1,84,98,115.00 (100%)

Table 2:

Description	No. of items	Consumption in rupees (% of Total Value)	Stock value in rupees (% of Total Value)
A	10	1,32,41,311.00 (43%)	24,44,300.00 (13.0%)
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F	352	2,37,73,942.00 (78%)	72,95,467.00 (39.4%)
S	532	68,31,913.00 (22%)	31,51,069.00 (17%)
O	2395	00.00 (0%)	80,51,579.00 (43.6%)
V	1069	59,22,733.00 (19.35%)	60,51,487.00 (32.7%)
E	2162	2,44,60,127.00 (80%)	1,23,70,820.00 (66.8%)
D	48	2,22,995.00 (0.65%)	75,808.00 (0.5%)
S	6	1,09,600.00 (0.35%)	62,100.00 (0.34%)
D	1331	2,73,64,957.00 (89.4%)	1,50,57,502.00 (81.4%)
E	1942	31,31,298.00 (10.25%)	33,78,513.00 (18.26%)
Total	3279	3,06,05,855.00 (100%)	1,84,98,115.00 (100%)

Now the main idea behind CAT is to generate some priority index/service level index which is representative of all analyses for mining industry where machine down time is probably the costliest affair and machine spare-parts have very high nuisance value (stock out cost). But it is so complex a system that the stock out cost can be decided only subjectively before assigning weightage to each class of analysis and the analysis itself; the impact of weightage on the inventory cost and nuisance value should be justified.

Weightage Distribution

Weightage to the classes of various analyses and to the analysis itself should be distributed such that the total Service Level Index/Priority Index is between 0 and 1.

ABC Analysis: If the policy for consumables is to be decided total weightage can be set as 0.4/1.0 but for spare-parts of the machinery 0.2/1.0 weightage can be justified.

A Class items	:	0.60
B Class items	:	0.80
C Class items	:	0.95

Since annual inventory cost is directly proportional to the annual consumption value. Higher weightage will mean higher Service Level Index/Priority Index which further means higher safety stock.

VED Analysis: This is a very important analysis for spare-parts inventory management. Among all analyses, this should carry more weight/representation relatively. So 0.4/1.0 weight is justified for spare-parts management. But for consumables, this weightage may be reduced to 0.2/1.0.

Vital Items	:	0.95
Essential Items	:	0.80
Desirable Items	:	0.50

Since spares are of immense importance in mining industry, their high weightage level can be justified because of high stockout cost/nuisance value of such items. Importance of some spares of certain equipment (machine) is so great that non-availability of the same would render a number of equipment in a process line completely inoperative. This means that vital spares of a shovel loading machine carrying higher weightage than dumper spares is justified because 4 to 5 dumpers are dependent on shovel for their operation. So, if the shovel is down, a number of

dumpers dependent on it will also become idle. Same is the case with the drill machine. So, for this kind of machines, 100 per cent weightage is justified for vital items i.e. 1.0/1.0 Weightage of V Class items can be varied depending on their impact on the whole production process. 0.5 weightage to desirable items can very well be justified.

FSN (O) Analysis: This movement analysis can be imparted with 0.2/1.0 weightage.

For fast moving items	0.95	(≥ 2/year)
For slow moving items	0.80	(1/year)
For 'other' items	0.50	(none/year)

Weightage of slow and 'others' category is due to practical difficulties faced and limitations of this particular case study. If real slow (one issue in 1, 2 or 3 years) and real non moving items (no issue in last 3 years) are considered, the weightage may be redistributed as follows:

Fast items 0.95 (≥ 2 in a year)

Slow items 0.65 (Once in 1, 2, 3 years)

Non moving items 0.00 (none in last 3 years)

It has been observed that the lead time demand pattern of fast moving items is close to normal distribution and for slow moving items it is close to poisson distribution. Since fast movers have high usage frequency, higher weightage is justified; for slow movers low weightage and lower Service Level is acceptable because of their infrequent usage. Service Level will drop when demand is very high/frequency increases and will rise when demand/frequency slows. If later conditions are considered (for slow-one issue in 1, 2 or 3 years, and for non moving-one in last 3 years) still lower weightage will be justified because the frequency rate is reduced. For "other" category (non issue in last 12 months) minimum weightage 0.5 is justified where there exist 50:50 chances. But when the item falls in non-moving category (no issue in last 3 years) weightage should be made zero and the total service level also zero, irrespective of any other weightage which will mean quick disposal of the non-moving items are in addition to complete stoppage of new procurement excepting insurance and imported items.

If we refer to the summary report of the four equipment viz. EKG 4.6 shovel, 785-II dumper D-155 A dozer and SBSH - 250 drill shown in table 2, the following can be concluded:

Total stock value of 'other' category items (not moved in 1993) is Rs. 80.51 lakhs out of a total stock worth Rs. 184.98 lakhs.

Overall view for the above mentioned four equipment is as follows:

	Stock value (Rs.)	% share
Fast items	72,95,467.00	39.40%
Slow items	31,51,069.00	17.00%
Other items	80,51,579.00	43.60%
	1,84,98.115.00	

This kind of alarming situation has arisen because of not analyzing the spare items according to the frequency issue and not providing relative weightage to them for determining the service level. At any point of time, the stock value of 'other' category items should be minimum and fast items maximum. It is clear that if only FSN analysis had been considered, a potential amount of unnecessary inventory could have been curtailed.

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SDE Analysis: This analysis takes care of the availability of the inventory items/spare parts in the market and has direct impact on the itemwise service level to be provided. Their representation factor (weightage) 0.2/1.0 can be justified because of non-standardized equipment and their spare-parts, very few manufacturers, and most being imported equipment. Since this analysis divides total items in 3 categories, namely scarce, difficult and easily available, based on very long lead time to practically zero lead time, the following weightage can be given to derive the desired service level:

Scarce items	:	0.95
Difficult items	:	0.80
Easily available items	:	0.50

Now, since exposure to stockout for a specific item is directly proportional to the lead time of an item,

higher weightage level for scarce items/items having very high lead time, and lower weightage level for easily available items having practically, zero lead time can very well be justified. Depot agreements with the original equipment manufacturers should be utilized more intelligently to cut huge downtime costs and inventory carrying costs. To increase the service level of scarce items/spares, the number of orders should be reduced and order quantity increased. Whereas for easily available category, items can be ordered more frequently in less quantity.

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Service Level Protection Level

Total Service Level/Protection Level =

[Weightage of ABC Analysis × Wt. of A/B/C] + [Wt. of FSN analysis × Wt. of F/S/N] + [Wt. of VED analysis × Wt. of V/E/D] + [Wt. of SDE analysis × Wt. of S/D/E]

$= 0.2 \times ABCWT + 0.2 \times FSNWT$

$0.4 \times VEDWT + 0.2 \times SDEWT$

where values of ABCWT, VEDWT and SDEWT will depend upon the class of item. Total value of service level/protection level will be between 0.0 and 1.0. But practically the values will be between 0.5 and 1.0 because 0.5 service level means nil safety stock and chances of stockout are 50:50. Only in case of non-moving items i.e. FSN = N, the service level can be put to zero i.e. which means no-lead time stock is to be maintained but procurement to be made only when requirement is projected.

In reality, the analysis cannot be treated as water tight compartments and service level determined based on that. Depending on the practical problems and characteristics of a particular industry exceptions can be incorporated to partially amend the above formula for the determination of the service level/protection level. Few exceptions keeping in view the particular problem related to mining projects are derived as follows: If ABC = C AND VED = V AND FSN = F, then total service level = 0.95 irrespective of the value derived by the above formula, can be justified i.e. this means items having low annual consumption value which are fast moving items and vital.

If ABC = C AND SDE = S AND FSN # 0, then service level = 0.95 can be justified i.e. this means items which have moved in last 12 months and which are C Class and scarce items.

If FSN = N (i.e. items which have not moved since last 3 years) then total service level imparted to these items should be zero; this further means that if non moving items are there in the stock, action should be taken to dispose them off.

Table 3 illustrates the proforma and a few items (spares) of EKG 4.6 shovels alongwith their combined analyses and calculated protection level/service level. The service level/protection level determined in such a way should represent the overall/total/annual service level/protection level from which the service level during lead time/re-order cycle can be calculated as discussed later on.

Effect of order size

$$(Z_l)\ T \text{ Annual Service/protection level} = 1 - \frac{[L \times N \times (1 - Z_l)]}{52}$$

L = Lead time in weeks

N = No. of orders in a year, and

Z_l = Service level in a re-order cycle

LxN = Total time exposed to stockout.

It is clear from the above equation that the total time exposed to stockout is proportional to the number of orders in a year. And, the number of order depends purely on order quantity. So, in effect, larger orders provide exposure to risk less often and will result in lower annual expected quantities short for the same service/protection level.

If a typical case of spare-parts/maintenance parts which are demanded/issued at relatively infrequent intervals and having low consumption value is considered, single order quantity (number of order is once a year) may provide high annual service level.

Table 3:

ERIAL	MTCODE	ABC	XYZ	FSN	VED	SDE	STVALCOMBW	ISVALCOMBW	PROTELEVEL
129	25501981244	C	Z	F	V	E	110846.29	144024.17	0.95
452	25501995321	C	Z	F	V	E	110846.29	144024.17	0.95
301	25501983014	C	Z	F	V	E	110846.29	144024.17	0.95
771	25501999187	C	Z	F	V	E	110846.29	144024.17	0.95
304	25501983046	C	Z	F	V	E	110846.29	144024.17	0.95
171	25501981679	C	Z	F	V	E	110846.29	144024.17	0.95
446	25501995262	C	Z	F	V	E	11046.29	144024.17	0.95
769	25501999163	C	Z	F	V	E	110846.29	144024.17	0.95
448	25501995286	C	Z	F	V	E	110846.29	144024.17	0.95
479	25501995594	C	Z	F	V	E	110846.29	144024.17	0.95
807	25501999562	C	Z	F	V	E	110846.29	144024.17	0.95
447	25501995274	C	Z	F	V	E	110846.29	144024.17	0.95
749	25501998958	C	Z	F	V	E	110846.29	144024.17	0.95
450	25501995306	C	Z	F	V	E	110846.29	144024.17	0.95
104	25501980995	C	Z	F	V	D	111645.14	334833.96	0.95
716	25501998574	C	Z	F	V	D	111645.14	334833.96	0.95
608	25501997397	C	Z	F	V	E	110846.29	144024.17	0.95
728	25501998679	C	Z	F	V	E	110846.29	144024.17	0.95
444	25501995242	C	Z	F	V	E	110846.29	144024.17	0.95
420	25501990063	C	Z	F	V	D	111645.14	334833.96	0.95
273	25501982714	C	Z	F	V	D	111645.14	334833.96	0.95
167	25501981631	C	Z	F	V	D	111645.14	334833.96	0.95
595	25501997262	C	Z	F	V	D	111645.14	334833.96	0.95
679	25501998183	C	Z	F	V	D	111645.14	334833.96	0.95
839	25554990233	C	Z	F	V	D	111645.14	334833.96	0.95
166	25501981623	C	Z	F	V	D	111645.14	334833.96	0.95
440	25501995203	C	Y	F	V	D	46369.49	66047.75	0.95
294	25501982931	C	Y	F	V	D	46369.49	66047.75	0.95
121	25501981165	C	Z	F	V	E	110846.29	144024.17	0.95
22	25501980153	C	Z	F	V	E	110846.29	144024.17	0.95
449	25501995298	C	Z	F	V	E	110846.29	144024.17	0.95
808	25501999574	C	Z	F	V	E	110846.29	144024.17	0.95
837	25554990218	C	Z	F	V	D	111645.14	334833.96	0.95
418	25501990043	C	Z	F	V	D	111645.14	334833.96	0.95
587	25501997208	C	Z	F	V	D	111645.14	334833.96	0.95
810	25501999598	C	Z	F	V	D	111645.14	334833.96	0.95
439	25501995195	C	Z	F	V	D	111645.14	334833.96	0.95
654	25501997875	C	Z	F	V	D	111645.14	334833.96	0.95
55	25501980493	C	Z	F	V	D	111645.14	334833.96	0.95
742	25501998882	C	Z	F	V	D	111645.14	334833.96	0.95
794	25501999424	C	Z	F	V	D	111645.14	334833.96	0.95
170	25501981667	C	Z	F	V	D	111645.14	334833.96	0.95

* MTCODE = Material code
** STVALCOMBW = Total stock value combination wise
* ISVALCOMBW = Total Issue value combination wise
* PROTELEVEL = Protection level/service level

Service levels/Protection level and Buffer Stocks

Even though a disruption of production activities may be extremely costly, it is equally costly to carry a large buffer stock which is used only on rare occasions. The objective should be to arrive at a reasonable balance between the costs of carrying the stock and the protection obtained against inventory exhaustion. Since exhaustion becomes less likely as the buffer inventory increases, each additional amount of buffer inventory characteristically buys less protection. The return/gain from increasing inventory balances, therefore, diminishes rapidly. So, the question is how much additional inventory as buffer stock can be economically justified?

The objective is to arrive at a reasonable balance between the costs of carrying the stock and the protection obtained against inventory exhaustion.

The management is concerned with the total cost made up of 2 elements:

- Inventory carrying cost for buffer stock, and
- Stockout cost (arising from production disruption, failure to fulfill order/delay in dispatch etc.)

Theoretically, the ideal solution involves the minimization of the sum of these two costs. But, in an industry like mining, the organisation does not know its stockout costs as the exercise is too time consuming and cumbersome. Under these conditions, the management should set the service level from which the buffer inventory can be calculated. Service level should be set such that it will represent the function of stockout cost. For mining industry it should be set in terms of percentage of time that a stockout will not occur. The establishment of service levels has normally, been a subjective management decision till now. But here an attempt to establish the service level/protection level based on scientific justification and the management's convenience depending upon the various analyses like ABC analysis, FSN, VED and SDE, has been made. So, the protection it provides is a function of annual consumption, movement (frequency), vitality and market availability of inventory items and that decides the service level and hence stockout cost (indirectly). It is apparent that such policies provide an unequal degree of protection for different items.

The size of the buffer stock, B, is expressed as:

$B = D_{max} - \overline{D}$

B = Buffer stock required because of non-uniform demand (and non-uniform lead time)

where, D_{max} = Maximum reasonable demand, and

$\overline{D}$ = Average demand during lead time.

Computations are simplified if we can justify the assumption that the demand distribution follows some particular mathematical function such as the Normal, Poisson or Negative Exponential Distributions.

$D_{max} = \overline{D} + K\sigma_D$

where,

K = Safety factor, and

σ_D = Standard deviation of demand during lead time.

So, buffer stock $= D + K\sigma_D - D = K\sigma_D$

So, if we know the mathematical form of the demand distribution, the buffer stock can be determined easily. Safety factor K can be determined from the service level and type of distribution. For the same service level, value of K will be different for different types of distribution. So, in fact the safety factor K (which is decided by protection level) will determine the amount of buffer stock.

Normal Distribution

When demand is treated as continuous, the most frequently used distribution is Normal Distribution. It has two defining parameters – mean demand $\overline{D}$ and standard deviation σ_D.

Then for $\overline{D} + \sigma_D$ = 65% protection level can be obtained i.e. 65% of the times, demand will not exceed this limit.

For $\overline{D} + 2\sigma_D$ = 95.5% protection level can be obtained i.e. demand will exceed only 4.5% of time.

For $\overline{D} + 3\sigma_D$ = 99.8% protection level can be obtained i.e. demand will exceed only 0.2% of the time.

So, if service level/protection level is calculated from the CAT, the value of safety factor K can be determined from the normal distribution table for any value of service level/protection level.

Poisson Distribution

For items of low and infrequent demands, Poisson Distribution is most suitable. Probably, the demand of spare-parts inventory can be fitted to this type of distribution. The Poisson Distribution is defined by a single parameter, the mean demand. The standard deviation of the Poisson Distribution is simply the square root of the mean.

Then, the value of buffer stock can be calculated straightaway from the Cumulative Poisson Distribution table corresponding to the required protection level (or stockout probability i.e. 1- Protection level) and average demand. The Poisson Distribution is not commonly applicable to distributions with mean values above 20. As a general rule, smaller the mean, greater is the degree of skewness in the distribution. Smaller buffer stock is required for smaller values of mean demand ($\sigma_D = \bar{D}$) even for the same service level. So, this is helpful where demand is sporadic, discontinuous and not particularly symmetrical.

It should be made clear that lesser value of the safety factor K i.e. lesser buffer inventory, will be required to buy the same level of protection/service in case of poisson distribution than normal distribution. From this, the importance of the type of demand distribution can be understood. If all inventory items are considered to be having normally distributed lead time demand, then inventories will be substantially higher than what is required actually; on the otherhand, if all calculations are based on Poisson distribution assumption, there will too many stockouts.

Exponential Distribution

$\bar{D} + \sigma_D$ gives 87% of service level/protection level (i.e. 13% of the time demand may exceed this range.)

$\bar{D} + 2\sigma_D$ gives 95% of service level/protection level (i.e. 5% of the time, demand may exceed this range)

$\bar{D} + 3\sigma_D$ gives 98.2% of service level/protection level (i.e. 1.8% of the time, demand may exceed this range).

Uniform Distribution

$\bar{D} + \sigma_D$ gives 78.9% of service level/protection level (i.e. 21.1% of the time, demand may exceed the range)

$\bar{D} + 1.5\,\sigma_D$ gives 93.3% of service level/protection level (i.e. 6.7% of the time, demand may exceed the range)

$\bar{D} + 3\,\sigma_D$ gives 100% protection level/service level (i.e. no chance of stockout.)

Relation of buffer stock with service level when μ is considered

Using the definition of service level, we can evaluate buffer stock as determined by:

Service level $= 1 - \mu F_x$

where $\mu = \sigma_D/\bar{D}$, is the co-efficient of variation, and

F_x = "Shortage factor" whose value depends upon the form of the demand distribution.

For Uniform Distribution

Service level $= Z_x = 1 - \mu\,(\sqrt{3} - k)^2/4\sqrt{3}$

For Normal Distribution

Protection level $Z_x = 1 - \mu\,[\theta\,(K) - K\,\Phi\,(K)]$

where $\theta\,(K)$ and $\Phi\,(K)$ are well tabulated functions.

For Exponential Distribution

$Z_x = 1 - \mu \exp\,[-(1 - K)]$

where $\mu = 1$, safety factor K is defined by

$K = (I - \bar{D})/\sigma_D$ where I is inventory level.

Figure 1 is a graph of service level Z_x against K for all three distributions with $\mu = 1$ when $K = 1$ and $K = 1.5$ (i.e. I exceeds D by σ_D and $1.5\,\sigma_D$ or Buffer inventory is equal to σ_D and $1.5\,\sigma_D$) the service levels are as follows:

Demand distribution	Service level/protection level for (when $\mu = 1$)	
	$K = 1$ and	$K = 1.5$
Normal	92	97
Uniform	92	99
Exponential	86.5	92

It can be seen easily that high service levels are achieved considering that the standard deviation is equal to the mean demand and that even for the normal distribution 97% service can be achieved with only 1.5 σ_D protection.

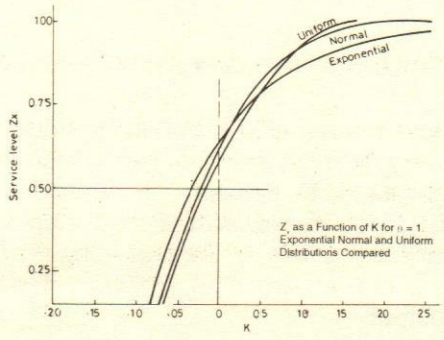

Fig. 1.

Figure 2 is a graph of Z_x against safety factor K for the normal distribution for three values of coefficient of variation μ (= 0.1, 0.5 and 1.0). It can be observed that for the smallest coefficient of variation, buffer inventory of only $\bar{D}$ (K = 0) can provide service level/protection level upto 96%. This shows that as the co-efficient of variation μ diminishes (and hence the demand becomes less variable), the level of buffer inventory also diminishes. Even for coefficient of variation μ = 0.5, a service level/protection level of 80% can be attained without carrying any buffer stock (K = 0). When K = 1 and K = 1.5, the service levels are as follows:

Normal distribution	Service level/protection level for	
Coefficient of variation	K = 1	K = 1.5
μ = 0.1	99	99.5
μ = 0.5	96	98.5
μ = 1.0	92	97.0

Thus larger the value of coefficient of variation μ, more the protection we can obtain from each marginal unit of buffer stock.

In the case of a constant lead time, the length of time that the inventory 'I' must last is fixed, and a direct transference of the results is possible. But if the lead time itself is variable. D is to be the mean demand during a lead time period of variable duration and σ_D to be the standard deviations of demand during the lead time period of variable duration. The

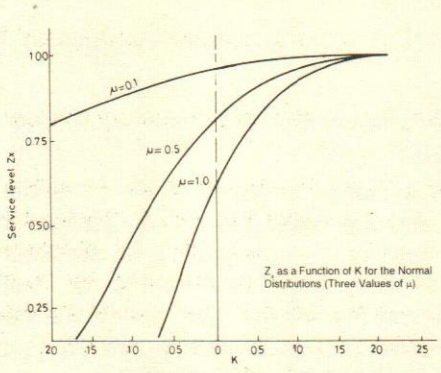

Fig. 2

data, in such case, must be collected more carefully but, once these data are available, the same formulation will hold true. It is highly likely that, when lead time variations are included, the demand distributions will have a different shape.

Relationship Between Overall Service Level Protection Level and Protection Level During Lead Time

$$(Z_x) \text{ total} = (Z_x)\, T = 1 - \mu \times F_x \cdot (N.L)/52$$

Since we are exposed to stock outs only during a lead time, we are exposed N times a year (i.e. N = No. of orders in a year) each time for the duration of the lead time L and thus for a total period = $N.L$. Therefore, the fraction of exposure time to total time is $N.L./52$ if L is measured in weeks.

Normally, it is (Z_x) Total and not Z_x, which should be management's main concern; the one that is evaluated based on five the analyses should be considered as (Z_x) Total. After evaluating $(Z_x)\, T$ and lead time L. Z_x can be calculated and buffer stock to be maintained can be determined as follows:

$$Z_I = \frac{52}{NL} \times \left[(Z_x)\, T - 1 + \frac{NL}{52} \right]$$

Determination of Reorder point and maximum inventory level

Fixed order quantity model/perpetual inventory system:

After deciding the service level/protection level and calculating corresponding buffer stock depending on the demand distribution type, the next important parameter to be determined in this model is Re-order point.

Re-order Point $= \overline{D} +$ Buffer Inv. $= \overline{D} + K\sigma_D$

Where $\overline{D}$ is average demand during lead time

Fixed order Interval/Periodic Inventory System

In this system the buffer stock is needed for the lead time and the order interval. A stockout in a given period enhances the probability of stockout in subsequent periods. After determining the buffer stock level based on the service level policy, the next important parameter of this inventory system to be determined is maximum inventory level E.

$$E = \overline{D} + \text{Buffer Inventory} = \overline{D} + K\sigma_D$$
$$= (\overline{R}T + \overline{R}L) + K\sigma_D$$

Where $\overline{R}$ = Annual Average demand

T = Order interval in years

L = Lead time in years

In this system, since there is risk of stockout during the lead time period as well as during the order interval, service level per order cycle during lead time will be the same annual/total/overall service level/protections i.e. $Z_x = (Z_x)$ Total.

Updating demand distributing and service level

Every year the demand distribution should be updated with the preceding year's demand data and mean demand and standard deviation of demand must be determined. Service level/protection level should also be updated every year based on the preceding year's data. If updating is not implemented seriously, it may give erroneous output. □

Feature

Critical Analysis in JIT Purchasing in Indian Context

Dixit Garg, S.G. Deshmukh & O.N. Kaul

Just-in-Time (JIT) manufacturing has attracted interest through out the world and the number of applications is steadily increasing. This paper critically examines JIT purchasing in the Indian context, as it has maximum cost saving potential. An analysis of a questionnaire supplied to various industries is carried out with the help of statistical tests. The paper identifies existing problems and benefits that can be achieved by implementing JIT purchasing. Some research directions have also been identified.

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Since the seminal work by Schonberger (1982) on Japanese manufacturing techniques and the important conceptual additions by a number of contributors including Bockerstette (1988) etc., Just-in-Time (JIT) manufacturing has attracted interest throughout the global industry. However, when companies rushed into JIT, several misconceptions were observed concerning its implementation. Bockerstette (1988) identified some of these as JIT is a supplier's programme, JIT is a set up reduction programme. JIT is just a project, and JIT is implemented quickly. Walleigh (Mittal & Tyagi, 1992) stated that "JIT is not just a way to reduce inventory in order to get a better return on assets; it is a means of solving the problems that block the building of an excellent manufacturing organisation". Schonberger (1982) described JIT systems as those that "produce and deliver finished goods just in time to be sold, subassemblies just in time to be assembled into finished goods, and purchased materials just in time to be transformed in to fabricated parts". JIT is not confined to a set of techniques for improving the production defined in the narrowest way as material conversion. It is a way of visualising the physical operations of the company from raw material to the customer delivery. According to Prem Vrat et. al (1993), JIT is a complex, highly integrated system of methods, techniques and philosophies which must be understood in a holistic sense. Many researchers including Bartezzaghi et. al (1992), Gilbert (1990), Schonberger (1983), and Voss & Robinson (1987) have studied the benefits which can be achieved after successful JIT implementation. They are reduction of work-in-process, raw materials/parts, space requirements, overheads, set up and labour costs, batch size, lead time; increased flexibility, quality, productivity, simplicity, output, machine availability; improved work environment, employees contribution towards safety, production and quality problems, business/financial performance;elimination of waste; team work and continuous improvement etc. Stamm and Golhar (1993) reviewed the complete literature on JIT pur-

chasing and classified it as per attributes as conceptual articles, case studies, surveys, modelling framework etc.

JIT in Indian Context

Manufacturing is no longer a local matter with the development of communication, computer and transportation systems. In order to become competitive, the Indian industry can't ignore the idea of JIT. The Delphi study carried out by Prem Vrat et. al (1993) indicated the JIT index to be 23.38 on a 40 point scale (0-40), implying that though difficult, JIT implementation in India is quite possible. It may take 10-20 years before JIT can be fully implemented in Indian industries. The study indicated that attention must be focussed on 100 per cent quality of incoming material, and delivery by vendor of the exact quantity at the exact time to achieve the results. Worker motivation and literacy need to be increased. JIT as a philosophy has to be ingrained in a company's work culture. Garg et. al (1994) also have discussed some issues in JIT purchasing in Indian context on the basis of preliminary insights from a questionnaire received from 24 Indian industries. This paper is an extension of that work with statistically (Walpole, 1969) verified results.

Importance of Purchasing

Every organisation needs materials and supplies. In most of the industries, material cost is more than 60 per cent of the total cost, while in some industries like textiles, it accounts for more than 80 per cent of the total cost. Usually, the purchasing department is expected to procure the right quantity of material of right quality at the right time, from the right source, and at the right cost (Ansari & Modarress, 1988). The purchasing function in the earlier organisational structure was placed at a fairly low level with its primary functions being strictly clerical in nature, and was limited to sourcing, pricing, and delivery. But, now the role and responsibility of purchasing has increased as a result of significant changes in the business environment. Shortage of raw materials, long lead time, inflation, a decline in product quality and productivity, and introduction of Japanese 'Just-in-Time Purchasing' system prompted the realisation of the importance of purchasing in the organisational structures of many manufacturing firms.

JIT purchasing may be defined as an uninterrupted flow of 10 per cent accepted materials delivered on due dates, at optimal cost, 100 per cent of the time. Ansari (1986) stated that in JIT purchasing environment, purchase is carried out in small lots with frequent deliveries in small standard containers used to hold exact quantity and to the required specifications from a nearby local single supplier with a long term contract. The company relies more on performance specifications than on product design. The supplier is evaluated by consistence in quality and delivery performance under the varying operating conditions, and the price. It was confirmed that this philosophy can be applied in all types of industries with a cost saving potential.

A Survey of Indian Industries

A questionnaire on JIT implementation in purchasing in India was prepared and sent to 80 different Indian industries. The questions were on the company's profile, JIT implementation, and JIT purchasing and a professional view about the feasibility of JIT purchasing implementation in their respective companies. Twenty eight responses (Response rate = 35%) to this questionnaire were obtained. Majority of these respondents are around Delhi and Chandigarh because of logistical constraints. Out of the 28 companies surveyed; 8 are automobiles, 6 heavy machines and 14 other companies pertaining to textile, cable, chemical, electronics, aeronautical, refrigerator etc. The general profile of these companies is tabulated in table 1. Thirteen companies indicated that the purchasing function is being looked after by a middle management level person and 8 companies did not respond. Majority of the companies is not able to meet their daily production schedule because of machine breakdowns, shortage of raw materials/parts, non-availability of power etc. A good number of companies are implementing manufacturing systems such as materials requirement planning (MRP-I), materials resource planning (MRP-II), database management system (DBMS), production planning system and preventive maintenance. Table 2 illustrates that Indian industries are giving good weightage to multi-skilled workers, stock to dock delivery, standard container, and buyer control over delivery schedule. The companies select, develop, and evaluate their suppliers on the basis of their past performance, quality, delivery time, cost, financial health, and service level. Mostly the companies use ABC system for their inventory control. Majority of the companies do not use any method to estimate ordering cost, (18 companies have not responded to the question). Out of 28 companies, 27 are aware of JIT, and 14 are applying JIT to some extent. Table 1 indicates that the professionals are not very optimistic about the scope of JIT implementation in India. Table 3 indicates the degree of various problems being faced by the companies. Table 4 indicates that the professionals generally agree that all the elements in their companies will be benefitted if JIT purchasing is fully implemented. The values of mean scores in tables 3 and 4 give the degree of problems faced and percent-

age of benefits that can be achieved by the different companies.

The companies select, develop, and evaluate their suppliers on the basis of their past performance, quality, delivery time, cost, financial health, and service level.

Analysis of Responses

Statistical tests were applied to check the validity of responses at 5 per cent level of significance.

A goodness of fit (chi-square) test was applied to explore the dependence of the scope of JIT implementation in India on different parameters. The JIT index obtained under various conditions is tabulated in table 5. The results regarding the views on the scope of JIT implementation in India are as follows:

- Professionals of automobile, heavy machines, other companies have similar views.
- Companies of high, medium, and low turnover do not have similar views. However, the opinions of high and low turnover industries are not statistically different.
- Companies of different layouts have similar views.

Table 1: General profile of companies

Type of Companies	Automobile (8), Heavy machines (6), Others (14)
Annual turnovers in crores	Maximum (3747), Minimum (1.75), Average (537.87), Median (53.5)
Number of employees	Maximum (22000), Minimum (80), Average (3303.64), Median (775)
Position of incharge Purchasing	Top Management (7), Middle Management (13), No response (8)
Type of Layout	Production (9), Product (10), Mixed (8), Cellular(1)
Ability to meet daily Production Schedule	Very Good (3), Good (20), Fair (3), Poor (1), No response (1)
Value of Purchased Items in crores	Maximum (2000), Minimum (0.6), Average (141.67), Median (12.5)
Number of Purchased Items	Maximum (100000), Minimum (10), Average (6903.86), Median (900)
Percentage of Purchased Items to Total input	Maximum (100), Minimum (15), Average (64.22), Median (60)
Lead Time for Purchasing in days	Maximum (240), Minimum (1), Average (49.51), Median (27.5)
Number of Employees in Purchase Department	Maximum (250), Minimum (1), Average (44.56), Median (18)
Awareness of JIT	Yes (27), No (1)
Scope of JIT	Very Good (2), Good (11), Fair (5), Little (7)
Implementation in India	Not at all (1), No response (2)
Training Time required (Executives) in days	Maximum (45), Minimum (1), Average (14.27), Median (15)
(Employees)	Maximum (90), Minimum (1), Average (29.28), Median (25)

Table 2: Importance of JIT attributes as perceived by the respondents

Attributes	Importance								
	Very good	Good	Average	Below average	No response	Mean score	$t_{calculated}$	Remark	
Score	4	3	2	1	0			Let H_0 = 2.5	
Multiskilled Worker	11	11	6	–	–	3.18	1.232	H_0 rejected	H_a = 3.0 accepted
Stock to Dock Delivery	7	12	4	2	3	2.96	–0.238	H_0 rejected	H_a = 3.0 accepted
Standard Container	7	10	9	1	1	2.85	–0.885	H_0 rejected	H_a = 3.0 accepted
Buyer Control over Schedule	8	12	6	–	2	3.08	0.548	H_0 rejected	H_a = 3.0 accepted

Table 3: Problems in implementing JIT attributes

Problems Score	Not at all	Little	Fair amount	A great deal	No response	Mean score	t calculated	Remark Let $H_0 = 2.5$	
Lack of Management Support	18	5	2	2	1	3.544	–0.334	H_0 rejected	$H_a = 3.5$ accepted
Lack of Management Participation	17	5	1	4	1	3.3	1.417	H_0 rejected	$H_a = 3.0$ accepted
Lack of Middle Management Support	14	3	8	2	1	3.07	0.34	H_0 rejected	$H_a = 3.0$ accepted
Poor Forecasting	7	11	2	6	2	2.71	0.96	H_0 accepted	
Performance Measurement	3	11	5	5	4	2.5	0	H_0 accepted	
Response to Innovation and Change	5	9	7	5	2	2.54	0.198	H_0 accepted	
Lack of Training to Employees	8	5	9	5	1	2.59	0.418	H_0 accepted	
Lack of Support from Employees	10	8	7	2	1	2.96	0.212	H_0 rejected	$H_a = 3.0$ accepted
Employees Lack of Knowledge about JIT	2	12	4	9	1	2.26	–1.219	H_0 accepted	
Lack of Multifunctional Workers	6	10	4	7	1	2.56	0.278	H_0 accepted	
Response to innovation and change by Employees	5	11	7	3	2	2.69	1.044	H_0 accepted	
Lack of Support from Suppliers	9	11	2	5	1	2.89	–0.526	H_0 rejected	$H_a = 3.0$ accepted
Suppliers' Lack of Knowledge about JIT	3	5	8	10	2	2.04	0.192	H_0 rejected	$H_a = 3.0$ accepted
Availability of Local/nearby Suppliers	9	5	11	2	1	2.78	1.436	H_0 accepted	
Timely deliveries	4	4	11	7	2	2.19	–1.55	H_0 accepted	
Lack of Communication within Company	8	12	3	4	1	2.89	0.564	H_0 rejected	$H_a = 3.0$ accepted
Lack of Communication with the Suppliers	7	13	7	–	1	3	0	H_0 rejected	$H_a = 3.0$ accepted
Inferior Quality of incoming Material	8	11	5	3	1	2.89	–0.587	H_0 rejected	$H_a = 3.0$ accepted
Transportation Reliability	5	4	13	5	1	2.33	0.906	H_0 accepted	
Reliability of Machinery/equipment	6	11	8	2	1	2.78	1.633	H_0 accepted	
Availability of accurate data	3	11	11	2	1	2.56	0.39	H_0 accepted	
Availability of Power	7	6	8	5	2	2.58	0.37	H_0 accepted	
Lead Time Reduction	6	8	11	2	1	2.67	0.96	H_0 accepted	
Interface with MRP System	7	12	4	3	2	2.88	–0.651	H_0 rejected	$H_a = 3.0$ accepted
Availability of Time with Purchasing Personnel	4	10	7	4	3	2.56	0.312	H_0 accepted	
Environmental Problems	11	7	5	2	3	3.08	0.412	H_0 rejected,	$H_a = 3.0$ accepted

Grand mean score = 2.72

Table 4: Expected benefits of JIT purchasing implementations as perceived by respondents

Benefit	Percentage of benefit										
	1-25	26-50	51-75	76-100	101-150	More than 150	No response	Mean Score	t calculated	Remark Let H_0 = 3.5	
Score	1	2	3	4	5	6	0				
Information flow between management and Purchasing Personnel	10	7	3	3	1	2	2	2.3	0.968	H_0 rejected	H_a = 2.0 accepted
Information flow between departments	7	8	6	1	2	2	2	2.58	–1.40	H_0 rejected	H_a = 3.0 accepted
Information flow between Purchasing Staff and Suppliers	5	6	7	2	3	3	2	3.04	–1.43	H_0 accepted	
Information flow between Buyer and Supplier	4	5	6	4	4	3	2	3.31	–0.598	H_0 accepted	
Production Scheduling	4	4	9	2	1	6	2	3.38	–0.35	H_0 accepted	
Reduction in Inventory	1	9	5	4	–	4	4	3.22	–0.872	H_0 accepted	
Reduction in Production Lead time	2	8	9	4	2	1	2	2.96	–0.167	H_0 rejected	H_a = 3.0 accepted
Product Quality	10	6	2	4	–	3	3	2.48	1.403	H_0 rejected	H_a = 2.5 accepted
Reduction in Scrap	13	7	3	2	–	1	2	1.92	–0.324	H_0 rejected	H_a = 2.0 accepted
Reduction of Rework	17	4	1	2	1	1	2	1.81	–0.687	H_0 rejected	H_a = 2.0 accepted
Reduction of Returned Items	15	4	5	1	–	1	2	1.85	–0.607	H_0 rejected	H_a = 2.0 accepted
Reduction of Inspection of incoming parts	7	7	6	1	1	1	5	2.35	1.076	H_0 rejected	Ha = 2.0 accepted
Reduction of Inspection of work-in-process	9	4	5	15	1	–	4	2.38	1.08	H_0 rejected	H_a = 2.0 accepted
Reduction of Inspection of Finished Products	11	3	4	4	–	4	2	2.69	–0.975	H_0 rejected	H_a = 3.0 accepted
Improvement in Mutual Trust and relationship with Supplier	4	5	9	2	–	4	4	3.04	–1.41	H_0 rejected	H_a = 3.0 accepted
Reduction in Geographical barrier between Supplier and Company	6	7	6	3	–	3	3	2.72	–0.892	H_0 rejected	H_a = 3.0 accepted
Improvement in on-time delivery	3	9	2	5	3	4	2	3.31	–0.573	H_0 accepted	
Reduction in Purchasing Paper work	3	8	7	4	1	3	2	3.04	–1.585	H_0 accepted	
Improvement in Worker Motivation	4	5	5	6	2	3	3	3.24	–0.812	H_0 accepted	
Improvement in Labour Utilization	5	2	6	8	1	3	3	3.28	–0.702	H_0 accepted	
Improvement in Team Work	2	3	8	7	2	3	3	3.52	0.072	H_0 accepted	
Improvement in Customer Satisfaction	3	7	2	10	–	3	3	3.24	–0.861	H_0 accepted	
Improvement in Overall Productivity	2	6	4	8	1	4	3	3.48	–0.065	H_0 accepted	
Improvement in company's competitiveness	4	6	5	5	1	4	3	3.2	–0.904	H_0 accepted	
Increase in Profit	2	7	3	8	3	3	2	3.46	–0.136	H_0 accepted	

- Companies of different ranges of number of employees in purchasing departments have similar views.

A test of significance (t-test) was applied for the importance of JIT attributes, problems in implementing JIT attributes, and expected percentage benefits of JIT purchasing implementation. The findings have been tabulated in tables 2, 3, and 4. [Mean scores for these were obtained as 3.02 (in scale 1-4), 2.72 (in scale 1-4), and 2.872 (in scale 1-6)]. There is an indication that Indian industries are giving importance to JIT attributes, facing some problems in implementing JIT, and expecting an overall benefit on an average 59.8 per cent if JIT purchasing is fully implemented.

Table 5: JIT index

Company's profile	JIT index on a scale 0-4
Type	
Automobile	2.13
Heavy machines	2.33
Others	2.25
Turnover	
High	2.14
Medium	1.88
Low	2.18
Layout	
Production	2.25
Product	2.2
Mixed	2.14
Number of Employees	
Above 50	2.25
20 - 50	2.13
10 - 19	2.33
Less than 10	2.29

Concluding Remarks

The survey results for western and developing countries including US, UK, Italy, Korea and India (Prem Vrat et. al 1993; Gilbert, 1990; Schonberger & Gilbert 1983; Ansari & Modaress 1988, Ansari, 1986; Crowford et. al 1988) show a promising trend and a growing concern for the adoption of JIT. Statistical tests confirm that the scope of JIT implementation in India is fair and it is independent of the type of industries, layout and number of employees. Small industries are more optimistic than large and medium scale industries about JIT implementation. Concerted efforts are required to sort out problems in companies whose mean score is low as indicated in table 3. Human factors are likely to get the maximum benefit with the implementation of JIT purchasing. However, there are wide variations of parameters pertaining to environmental and other aspects in different industries.

Small industries are more optimistic than large and medium scale industries about JIT implementation.

* Research is required in designing a comprehensive performance measurement system comprising effective indices for JIT implementation in purchasing as suggested by Willis et. al 1993 and as evident by the present analysis also.
* Macbeth (1987) suggested a research programme in supplier management includes: the nature of supplier/buyer relation; organisational structure; work organisation; financial health of organisation etc. All of these elements require close attention.
* Empirical models must be developed to modify the basic inventory models in JIT context to resolve purchasing issues in economic order quantity, order splitting, optimised transportation system etc. as pointed out by some researchers (Ramasesh, 1990, 1993; Pan & Liao, 1989). Expertise of a single supplier for many parts may be explored. Well designed systems for vendor selection, development, and evaluation must be established.

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Feature

Implementation of Voluntary Retirement Scheme – Some Issues

K.P. Muraleedharan

Indian public sector has long been plagued by inefficiency, waste, idle capacity and mounting losses. Labour padding is one of the major reasons for the poor performance. This has tempted the government to introduce VRS in 1989 as a labour adjustment strategy to weedout inefficiency and make these organisations competitive and cost effective. But the experience form the study shows that it has become counter productive to its objectives. The organisations have not only spent huge amounts of money as compensation but also lost a good number of highly efficient people. This affected the concerns in terms of production and productivity. If this trend continues, it will end up in a problem of greater dimension than the present one of excess labour force.

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Ever since the economic reform programme started in India, increased attention has been paid to restructuring the country's public sector undertakings. In the last four decades of our economic planning, state enterprises were considered as the back bone of the industrial economy of the nation and a substantial share of the funds was pumped into this sector. But unfortunately the growth of this sector has been accompanied by increased inefficiency, waste, idle capacity and mounting losses. Instead of becoming a contributor to Government finance, they are now being viewed as a big drain on the exchequer.

One of the major reasons identified for the poor performance of our public sector is labour padding. Over manning is a very serious disease of our public undertakings. It is estimated that out of the 23 lakhs employees in 246 Central Government Public Sector Undertakings, about half a million are surplus. This has raised the wages and personnel cost and adversely affected their profitability. Under these circumstances, top priority was accorded in the reform programme to reduce the excess manpower in state undertakings through the introduction of the Voluntary Retirement Scheme (VRS) popularly known as Golden Shake Hand. This has now become a basic component of the labour adjustment strategy of both public and private sector undertakings to weed out inefficiencies and make the industry more competitive and cost effective under the new economic set-up.

The Voluntary Retirement Scheme has now become a basic component of the labour adjustment strategy of both public and private sector undertakings to weed out inefficiencies and make the industry more competitive and cost effective under the new economic set-up.

In the last six years since the introduction of the scheme, a number of industries have implemented it with varying degrees of success. To address some of the important aspects of the implementation of VRS in state enterprises, a study was conducted in the Cochin unit of one of the biggest Central Government Undertakings in India. This unit started operation in 1964 and employs about 3000 people, half of whom are technical experts. VRS was introduced in the unit to tackle the problem of redundant manpower.

Trend in the Adoption of VRS

In the initial years, the employee response was lukewarm. However, since 1993 the trend has changed significantly. In the last five years, about 305 employees (113 officers and 192 workers) have opted for the s heme. This constitutes about 10 per cent of the total manpower of the organisation. Of the total employees who opted for the scheme, 246 employees were retired in 1993 and 1994. The mean age of the people retired under the scheme is 51.5 years. On an average these employees have put in 30 years of service in the organisation. The average basic pay of the retired employees comes to Rs. 2840 p.m.

VRS compensation

The company had paid an amount of Rs. 4.06 crores as VRS ex-gratia since the introduction of the scheme. Of this, Rs. 2.06 crores was distributed to 113 officers and Rs. 3 crores to 103 workers. The average compensation per employee comes to Rs. 1.33 lakhs.

Performance level of retired employees

The basic aim of VRS as enlisted in the policy statement is allowing less efficient employees to retire under the scheme thereby promoting efficiency and economy in human operation. As against this, the majority of the people retired are either outstanding or very good or good performers according to the company's own rating. About 75 per cent of the employees who opted for the scheme belong to these three categories (table 1), only 4 per cent of the people retired are rated by the company as poor performers whose existence in the organisation was considered a burden. 21 per cent of those who opted for the scheme belong to marginal performers and did not contribute toward the profitability of the organisation.

Table 1: Performance level of employees who opted for VRS (in percentage)

Performance level	Officers	Workers	Aggregate
Poor		7	4.00
Marginal	8	31	21.00
Good	42	23	31.00
Very good	50	11	27.50
Out standing		28	16.50
Total	100	100	100.00

Reasons for adopting VRS

Lack of proper incentives to the employees (40 per cent) is considered to be the major reason for adopting the VRS. This is especially relevant as most of the retired employees are high performers. About 18 per cent of the employees considered VRS as the easiest way of improving liquidity to meet their sudden financial requirements. Family problems like children's marriage, education etc. are the reasons for another 11 per cent employees (table 2).

Table 2: Reason for adopting VRS

Reasons	Percentage
Lack of proper incentive	40
Sudden financial need	18
Family problem	11
Medical ground	9
Corporate policy change	9
Fear of victimisation	7
Others	6
Total	100

The basic aim of VRS is allowing less efficient employees to retire under the scheme thereby promoting efficiency and economy in human operation. As against this, the majority of the people retired are either outstanding or very good performers.

Trend in Production & Productivity

In the last two years a decreasing trend has been seen in the actual value of goods produced by the company and the productivity of employees. In 1992-93 and 1993-94, the actual achievement in production was hardly 42 per cent and 33 per cent respectively of the

target. Productivity per employee has also decreased considerably. General recession in the industry is cited as one of the reasons for the decrease in production and productivity. But this has to be viewed seriously in the context of the fact that 81 per cent of the total employees who sought the VRS were retired during these two years. The exit of a good number of highly efficient employees under VRS has obviously had an adverse impact (table 3).

Table 3: Trend in production and productivity (Rs. in lakhs)

Years	Targeted production	Actual production	% of actual to target	Productivity per employee
1989-90	4200	3852	92	1.305
1990-91	5643	5017	89	1.725
1991-92	6555	6061	92	2.118
1992-93	7675	3247	43	1.156
1993-94	6055	2012	33	0.793

Post retirement activities

An enquiry into the post retirement activities of those who opted for VRS shows that 38 per cent of them have been re-employed in similar organisations elsewhere. Of this, some of them have been absorbed by private sector organisations competing with the company in the market. A few others have taken up overseas employment. Another 12 per cent of them have started new business ventures. 33 per cent are enjoying retired life (table 4).

Table 4: Post retirement activities of the employees

Activity	percentage of employees
Employed elsewhere	38
Started business	12
Enjoying retired life	33
Engaged in agriculture	12
Other activities	5
Total	100

Conclusion

From the above observations, it is clear that the organisation has lost the service of a good number of highly efficient people through this scheme since its introduction. This has affected the organisation in terms of production and productivity of its employees. Apart from this, about 20 per cent of the employees who availed the benefits of the scheme are at present using their expertise against it by being employed in organisations competing with it. As matters stand, the scheme has become counter productive to its basic objective. If this trend continues, it will end up in a problem of greater dimension than the present one of excess labour force. □

About 20 per cent of the employees who availed the benefits of the scheme are at present using their expertise against it by being employed in organisations competing with it.

Feature

HRD Strategies in Power Sector —A Case Study

Suresh Kumar & Jai Singh Parmar

It had been observed that government undertakings so far have not realized the significance and bearing which a scientific management of human resources has on the overall performance of an organisation. This lackadaisical approach towards managing personnel and the absence of professionally qualified personnel experts have led to the deterioration of the human face of organisation which have led to under performance and lack of motivation on the part of employees. The focus of the study is on the inherent defects in the human resources management and its impact on the organisational performance.

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Human resources are assuming increasing significance in modern organisations as, obviously, majority of the problems in organisational settings are human and social rather than physical, technical and economic. The failure to recognise this fact causes immense loss to the nation, enterprise and the individual. Human resource development is a pre-condition for modern economic growth. Manpower is essential in every country including developed countries—the set up of capital equipment alone can not accomplish everything and a certain amount of human capital is necessary for the successful use of physical capital. In a developing economy like India where manpower is available in abundance to meet any conceivable increase in labour demand the real policy problem is efficient use of this untapped vast reservoir of energy.

In a developing economy like India where manpower is available in abundance to meet any conceivable increase in labour demand the real policy problem is efficient use of this untapped vast reservoir of energy.

Power today is one of the top priorities of the nation. It has generally been seen that while planning for capacity additions and preparing feasibility reports and detailed project reports, all related inputs such as coal linkage, financial resources and related technology inputs etc., are very well tied-up. But, when it comes to the question of planning for the human resources, generally qualitative statements with very broad and general quantitative presentation, in a few paragraphs are considered sufficient for the purpose of project reports; no care is taken to quantify human resource requirements into various categories, types of skill, degree of experience etc. In view of this a study of the

HRD strategies employed in Himachal Pradesh State Electricity Board was undertaken.

Himachal Pradesh State Electricity Board (henceforth referred as HPSEB), was constituted on the first day of September, 1971 in accordance with the Electricity (Supply) Act, 1948. Like other State Electricity Boards in the country, HPSEB is responsible for promoting the co-ordinated development of power potential, generation, transmission and distribution of electricity within the state in the most efficient and economical manner. The organisation under study is the largest public undertaking in the state employing the highest number of employees at different levels of the organisational hierarchy.

In a vast organisation like the Electricity Board with a large number of employees, it becomes all the more essential to adopt more scientific and well planned human resource strategies. To achieve the desired objectives the various processes of human resource development i.e. recruitment, training, placement and promotion etc. require careful attention however.

The Study

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Widespread adhocism and lack of professionalism prevail in the government undertakings with regard to the management of human resources, consequently adversely affecting the efficiency and performance of these undertakings.

The study was undertaken keeping in view the following objectives:

- To focus attention on the structure and functions of the personnel unit of the state Electricity Board.
- To explore whether any scientific personnel management structure exists and whether it has all the attributes of a professional organisation.
- To study the defects in the recruitment system and its impact on the quality of engineers who are entrusted with the jobs of framing and achieving organisational objectives.
- To measure the impact of the promotion policy on the performance and motivation of the employees.
- To study the transfer and placement policy with regard to engineers in detail and to measure its impact on the morale and performance of the engineers.
- Job satisfaction and morale are two very important aspects which affect the performance. It was to be ascertained whether the required level of job satisfaction and morale exist and if it not, then what are its consequences and how the required level can be achieved.

The major hypotheses were that:

- The unscientific and lopsided recruitment practices have restricted the entry of talented manpower in HPSEB
- Inconsistent promotional policies have bred stagnation which has resulted in low level of morale of employees
- Poor perception on the part of management about training needs has left the employees disoriented and unidentified with the objectives of the organisation

Irrational placement practices have resulted in low morale amongst the employees.

Methodology

For the purpose of conducting the present study, primary and secondary data were used. The primary data was collected through a well designed questionnaire from a sample of respondents; the secondary data was collected through the published material of the organisation by personally visiting the different offices. The questionnaire was administered to 100 respondents out of which 70 responses were received. The sampled respondents were personally contacted and informal interviews were taken in order to supplement and authenticate the already collected data. The detailed information so gathered was tabulated and analysed through statistical methods.

The study was confined to the Class-I Engineers of the Board. The technique of stratified sampling was used for the purpose of selecting respondents from the different categories of such engineers. Random sampling

technique was used. A total sample of Class I Engineers was chosen because they form the core group of real participants in the formulation of planning and also in achieving the organisational objectives. As a matter of fact, this core group is responsible for the implementation of organisational policies and programmes.

Results & Discussion

The study was conducted in order to examine the existing methods of human resource development undertaken by the Board in order to enrich its manpower. Human resource development is confined not only to recruitment, training and promotion but it also aims at creating a climate in the organisation where every worker is able to exploit his full potential for participating in the organisational objectives. However, in HPSEB, the techniques of human resource development were found to be obsolete, unscientific and tradition bound. No leeway efforts were being made to update the existing manpower inspite of the tremendous necessity in such a type of commercial organisation whose success depends upon the quality of human resources.

The scientific method of empiricism was applied to collect data to substantiate or reject the hypotheses. The analysis of primary data has corroborated the major hypothesis i.e., the poor management of human resources and lack of professionalized personnel management resulted in low level of productivity and performance of its employees. Hydro power generation in the State has been accorded top priority from the Sixth Plan onwards because it will not only meet the increasing demand of power within the State but also to bridge the gap in the demand and supply in the northern region as a whole. Although the total potential in Himachal Pradesh is estimated at about 25,000 MW only 3,347 MW has been exploited so far and there had hardly been substantial increase in the production of electricity if we compare the figures from 1989-1990 to 1993-94.

The maximum number of respondents have found the existing recruitment procedure unfair and partial. They found that in the absence of written competitive examination, the political and official clout of the candidates restrict the entry of meritorious and talented candidates. The respondents favoured an All-India examination to broaden the recruitment base.

The hypothesis that unscientific and lopsided recruitment practices have restricted the entry of talented manpower in HPSEB is established as true.

Table 1: Recruitment component

Statement	Respondents Opinion (N=70)	
	Yes	No
Do you think that the existing recruitment procedure is fair and impartial?	22 (31.43)	48 (68.57)
Do you think that the recruitment should be made on the basis of some competitive written examination on the pattern of all India Service?	64 (91.43)	6 (8.57)
Will you favour an all India Competitive examination to broaden the recruitment source?	38 (54.29)	32 (45.71)
Are you satisfied with the existing recruitment policy of the HPSEB. If not,please elaborate.	16 (22.86)	54 (77.14)

Note: Figures in parentheses are percentages

The above facts clearly corroborate that the existing recruitment procedure is devoid of elements of competitiveness. Hence, the hypothesis that unscientific and lopsided recruitment practices have restricted the entry of talented manpower in HPSEB is established as true.

Table 2: Training component

Statement	Respondents opinion (N=70)	
	Yes	No
Are you clear about the objectives of your organisation?	58 (82.86)	12 (17.14)
Do you think that training is useful for the organisational orientation of the employees?	68 (97.14)	2 (2.86)
Has the training programme which you attended made some difference in your knowledge and skills?	66 (94.28)	4 (5.72)
Do you think that training leads to improvement in job performance?	68 (97.14)	2 (2.86)

Note: Figures in brackets are percentages

The sub hypothesis that the Board is following inconsistent promotional policy is proven true but the other part of the sub-hypothesis which stated that it has resulted in low morale is only partially proven as more than sixty eight per cent respondents opined that they remain in a high state of morale.

It can be concluded that promotion is not the sole factor which influences the morale of the engineers but there are some other factors which deserve equal importance like professional satisfaction, hike in salary,

good working environment and cordial superior-subordinate relationship. However, one third of respondents confessed that inconsistent promotional policy leads to low morale.

It was observed that in the past years there has been a spurt in the promotion of engineers which means that new incumbents will have to face stagnation. The respondents were sore over the existing stagnation in the promotional avenues. There is no system of career planning in the Electricity Board which is an essential part of the human resource development programme. The majority of respondents were found to be dissatisfied with the procedures adopted for judging the suitability of the candidate for promotion. The respondents found promotion as the most important incentive for motivating the employees.

Table 3: Promotion component

Statement	Respondents opinions (N=70)	
	Yes	No
Are you ready to serve anywhere in the organisation, geographically and functionally?	52 (74.28)	18 (25.72)
Do you feel that your colleagues manage their posting at places which are convenient geographically and functionally?	66 (94.28)	4 (5.72)
Does there exist any rational placement policy based on experience and merit?	8 (11.43)	62 (88.57)
Do you subscribe to the existing placement policy,if not,please write reasons and suggest some measures?	8 (11.43)	62 (88.57)

Note: Figures in brackets are percentages

The empirical investigation also revealed that the condition of training programmes was quite grim. There is no systematic application of techniques of human resource development in the State Electricity Board. It was also found that there was no orientation training programme which is so necessary for familiarizing the entrants with the organisational environment and objectives.

Hence, the sub hypothesis that poor perception on the part of management regarding the training needs of Engineers has left the employees dis-oriented and unidentified with the objectives of organisation has been proven true.

Table 4: Placement component

Statement	Respondents opinions (N=70)	
	Yes	No
Are you ready to serve anywhere in the organisation,geographically and functionally?	52 (74.28)	18 (25.72)
Do you feel that your colleagues manage their posting at places which are covenient geographically and functionally?	66 (94.28)	4 (5.72)
Does there exist any rational placement policy based on experience and merit?	8 (11.43)	62 (88.57)
Do you subscribe to the existing placement policy,if not,please write reasons and suggest some measures?	8 (11.43)	62 (88.57)

Note: Figures in parentheses are percentages

This malaise of neglect of employee training is common in all the Government run undertakings. There exist no systematic method and unit for identifying the training needs of the employees in order to improve their efficiency and capability in the wake of the fast changing scientific and technological environment.

Table 5: Miscellaneous component

Statement	Respondents opinions (N=70)	
	Yes	No
Do you remain in a high state of morale?	48 (68.57)	22 (31.43)
Does your job provide you complete job satisfaction?	22 (31.43)	48 (68.57)
Do you think that complete functional and decision making authority will improve the performance of the Electricity board?	68 (97.14)	9 (2.86)
Do you think that the organisation enjoys complete autonomy as is expected in a commercial organisation like yours?	16 (22.86)	54 (77.14)

Note: Figures in parentheses are percentages

A major chunk of respondents revealed that postings to geographically and functionally important assignments are managed by their colleagues by using political and official clout and patronage. Respondents also affirmed that rationalism in the placement policy is non-existent as performance appraisal is not taken into

account while posting engineers. Hence, the sub-hypothesis that irrational placement practices have resulted in low morale amongst the employees has been proven true although the phenomenon of low morale was found in only one third of the sample respondents. (As already mentioned, the reasons for high morale have been attributed to higher pay structure, good working environment etc.)

Recruitment, Placement & Promotion Policies

In the matter of selection, placement, promotion etc. adhocism rules the roost. Cases of promotion on adhoc basis at various levels in the Board is a rule rather than an exception. Recruitment and promotion rules, inherently lacking in objectivity, continue to be subject to endless changes. It has been observed that every change is in the direction of dilution of qualification etc. With promotion quotas perpetually increasing and direct recruitment quotas decreasing or in some cases even being eliminated altogether, the situation on the technical side is even worse. To cite only two telling examples: when Himachal Pradesh was a Union Territory, about 92 per cent posts at the level of Assistant Engineers were meant to be filled by engineering graduates when engineering graduates were not available. Now with a very large number of engineering graduates being on the road, only 40 per cent posts are set apart for being filled up by such graduates. Even here, quite often, recruitment is not made and under-qualified persons are promoted against direct recruits quota. Since the last decade, no recruitment in case of Engineer has taken place in the Electricity Board. In view of the fast changing technological scenario and rapid advancement in the field of high-tech management systems, it becomes all the more imperative for an organisation to do the career planning so that recruitment is done from time to time to fill in the technological gap.

Career Planning

The structure of cadres, particularly of engineering services has a very broad base and therefore requires a systematic and well structured career planning. At one point of time, there were rapid promotions but once that phase was over, saturation has led to stagnation affecting the morale and motivation of engineers. Restricted promotion opportunities lead to rampant stagnation which again leads to frustration and dissatisfaction. Cadre reviews are not made which is a very important requirement from the point of view of morale and job satisfaction. Even against limited promotion opportunities, practically no weightage is given to qualification as against the length of service. Likewise, performance also does not play any significant role. Once the person is in the line he has to wait for his turn, irrespective of his higher qualification or quality of performance. This non-recognition of merit acts as a disincentive and promotes mediocrity. Cadre reviews which are considered very important by modern progressive management seem to hold no importance so far as the HPSEB management is concerned.

Lack of Integrated Approach

Even a casual look reveals that HPSEB management has not evolved an integral approach to the growth of the organisation. The following vital areas have simply not attracted management attention:

It is understood that a very large amount would be available for setting up State Load Despatch Centre (SLDC) in the State to monitor and transmit information regarding generation of power and regular load flows within the state and into and from the Inter-state grid. On adhoc basis, some Junior Executives were sent for training for this work but as of now, no Cell has been created for this purpose and Electronics Engineering Graduates are being assigned general system maintenance duties in the field. For all intents and purposes they are being treated at par with the electrical engineering graduates.

It is not only a question of setting-up SLDC but also of maintaining and operating carrier communication statewide. This activity is already in bad shape.

- There is no arrangement within the organisation for imparting induction and in-service training. No talks or discussions are organised.
- The inadequate Maintenance and Testing (M&T) set-up is headed by executives not trained or qualified for the job.

There is a pronounced lack of co-ordination. Over lapping is also visible in certain areas. The Board is functioning in a grossly unprofessional manner open to political interference. There is confusion over areas of priority. There is lack of clarity in identifying the fields fully matured for commercial exploitation. Instead of concentrating on the purpose of activity the emphasis is on psychophancy. The working, instead of oriented to objectives revolves around individuals.

The concept of management by objectives should be introduced. This involves fixing of goals and emphasis on the purpose of activity rather than the activity itself. Superiors and subordinates should jointly identify their common goals. This makes utilisation of all levels of

personnel resulting in maximum output. Responsibility should be defined and used as a measure of each individual's contribution. This type of management promotes commitment and efficiency.

The concept of management by objectives should be introduced. This involves fixing of goals and emphasis on the purpose of activity rather than the activity itself.

Conclusions & Implications

It was established by empirical evidence that in the existing organisational environment where not much heed has been paid to the human component, the engineers have found themselves trapped in an abyss of frustration. This flippant attitude of the management must be changed so far as the application of Human Resource Development techniques is concerned.

There is a vital need to restructure the present traditional, obsolete recruitment system which smacks of ill conceived practices. The present system of recruitment which is confined only to the interview of the candidate should be replaced by an open competitive examination based on the pattern of Civil Service examination in India. In a state government run undertaking, the strict principles of autonomy are thrown to the high winds which facilitating political and bureaucratic intervention in the recruitment of candidates. A written competitive examination and an independent interview board constituted of by outside experts can weed out the dubious elements of favourtism, nepotism, political and official interference in the selection of the candidates. There is a strong need to create an independent recruitment board consisting of outside experts who should be in majority to manage the different processes involved in the recruitment of candidates. An open competitive examination will also help in broadening the recruitment base which will improve the quality of manpower.

The interview system which has been adopted in India for various services, whether civil or engineering is defective. It is totally inadequate to explore the intellectual traits and professional competence of the candidates. An interview lasting for 30 minutes is too short a span to judge the aptitude, competence and practical ability of a candidate to accomplish various jobs.

The existing interview system must be replaced by an extended interview system lasting for two days for the purposes of recruitment. The candidates and the selection board members may stay together for two days at a suitable place where a series of interviews may be conducted and group discussions organised to examine the complete personality of the candidate. practical problems should be given and the candidate asked to write solutions for such problems. A candidate appearing for an engineering job must be tested for his professional competence by exposing him to various technical problems which he is likely to face in the organisation. This method of interview will ensure the entry of only those candidates who possess a high degree of professional competence rather than those who are only theoretically strong.

At present, the manpower planning is not done by the management which has resulted in lopsided recruitment which does not take into account the qualitative and quantitative aspects of manpower. There is a strong need to introduce manpower planning which will help in forecasting the future qualitative and quantitative recruitment of manpower and bring regularity in the recruitment spans. With the fast changing scientific and technological environment and progress in the management techniques there is a greater need to introduce manpower planning in order to locate the manpower in newly identified areas. Further it can be suggested that the existing recruitment procedure and agency should be replaced with an open competitive examination conducted by an independent agency, not independent in letters but in spirit and action also.

Training forms an important ingredient of Human Resources Development strategy. There is a strong need to create a Training Institute within the organisation which should have a blend of permanent members and faculty to manage the training programmes and cater to training needs of the engineers. It is suggested that the neighbouring electricity boards should endeavour to create an academy in collaboration with each other to have a comprehensive network to meet the training requirement needs of the engineers.

The basic purpose of performance appraisal is to detect the deficiencies of the concerned employee and to take remedial steps to improve the level of employee's performance through counselling by the superiors. parameters should be determined to measure the qualitative aspect of the performance of the engineers as quality is of utmost importance in the tasks related with the generation and transmission of electricity. Even the performance of operational engineers can be determined qualitatively. Hence, there is greater need to create a comprehensive method for determining the merit and suitability of engineers for the purpose of granting promotion. It can be further suggested that the performance of an engineer should not

be exalted by informal relationship. Promotion is the sole incentive available to the engineers in this organisation. Promotion based on merit and performance is a great motivating factor, provided there is a well developed scientific promotion policy. There is a strong need to restructure the existing promotion policy and procedures followed in the Board. Time bound promotion system should be introduced subject to performance and fitness in order to eradicate the existing stagnation in the Electricity Board.

It has been already established that no rational placement policy has been framed by the management which is necessary to achieve the optimal level of efficiency in any organisation. It is suggested that placement of engineers to different assignments should be based on their past experience, aptitude and level of performance. There should be a rotatory system of placement so that an engineer could get exposure to all the three wings i.e. generation, transmission and operation of the Electricity Board. For this purpose a tenure based placement policy should be adopted and implemented in an honest manner. There is the utmost necessity to introduce a system of career planning and management in order to bring rationality in the placement policy.

The composition of the so-called autonomous organisation's Management Board gives it a look of an appendix of the government department. The Electricity Board has been stuffed with bureaucrats who represent the Government in decision making which dilutes the decision making autonomy of the Board.

There is a need to scuttle the political tinkering in matters relating to human resource development. The spineless attitude of the management has sacrificed autonomy at the altar of political will and bureaucratic dominance.

There is a need to scuttle the political tinkering in matters relating to human resource development.

Indeed the personnel administration of the Board is plagued with politicization and bureaucratization. There is a need to create a Human Resource Development Department staffed with adequately qualified and professional experts who can introduce the concept of Human Resource Development and implement it with vigour and zeal as is happening in private sector organisations. Even the engineers who are functioning as supervisors need to be, trained in Human Resource Development techniques.

It can be concluded that the concept of Human Resource Development is totally alien to the Electricity Board management. Human Resource Development strategy consists of a variety of tools which are applied for enriching the human resources in order to attain the optimal level of efficiency. In the case of Himachal Pradesh Electricity Board, all the ingredients of Human Resource Development programme were found missing. □

Feature

Dynamic Personnel Scheduling – Key to Improving Hospital Performance

M. Kakati

Though the number of health care centres has increased substantially, the problems for the patients in particular and society in general remain the same. The service quality has not improved, costs are skyrocketing, and the waiting time is increasing in most of the well equipped hospitals. This article suggests dynamic personnel scheduling to smooth out the workload and schedule the professional staff and illustrates the successful application of the same in the Institute of Neurological Sciences (INS), Guwahati.

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In hospitals, like in other service industries (restaurants, mass transit industries, repair shops etc.), the demand for service tends to fluctuate widely both in the short and long run. The demand profile varies by the hour, the day, the week and the month. While the demand profile fluctuates every hour, the supply profile does not; the latter (service facilities, service persons) in most of the hospitals is more of less fixed – fixed office hours, fixed number of personnel, fixed working time etc. This undesirable mismatch results in a large number of patients waiting for services for a long period with the physicians, nurses, staff and hospital facilities sometimes idling sometimes overworking long after closing time.

Hospital Service : Problems Encountered

These problems automatically disappear when customer convenience is not critical, when waiting time has no cost, and when human effort (by doctors and staff) can be inventories. But unlike in manufacturing sectors, the operation/production plan in hospitals can not flatten the fluctuations in demand by building and depleting inventories of human effort. Moreover, with competition growing rapidly, customer convenience and the reduction of waiting time are becoming increasingly critical. Three separate surveys conducted by the author in the last three years confirm waiting time as the third most important attribute which patients look for next to the doctor's competence and cost of service. The matching of the demand and supply profile through dynamic person-

With competition growing rapidly, customer convenience and the reduction of waiting time are becoming increasingly critical.

nel scheduling is the only way to avoid these two problems and to improve a hospital's performance in terms of better service quality, cost and waiting time reduction.

Institute of Neurological Sciences (INS) is a premier institute in the North Eastern Region which treats neurological patients who generally come from various parts of the region. The date and timing of treatment, till recently, were finalized through an advanced appointment system. Patients coming from distant places generally do not have access to this appointment system. As such, they arrive randomly (hence they are referred as 'walk-in' patients) and require to wait for two/three days just to get an appointment and in the process, spend Rs. 400 to Rs. 600 per day extra for lodging and boarding. Due to the high growth in the inflow of patients (25 per cent compound growth rate per annum), there has been an unfavourable increase in the average waiting time, and in the ratio of walk-in patients over the appointment patients.

As the walk-in patients have gradually outnumbered the appointment patients, the top management felt that a new system should be evolved to accommodate the former giving the present appointment system a complementary status. The two types of dynamic personnel scheduling (one for outdoor patients (OPD) and ancilliary services, and the other one for inpatients) recently being practised in INS are the fall out of this decision/effort of the top management.

Dynamic Personnel Scheduling

Dynamic personnel scheduling is a step-wise iterative process which involves the following steps.

- Gather data relating to arrival times and service times
- Calculate interarrival times, arrival rates, service times and service rates. Conduct Chisqare tests to see if these times fit the known queuing assumptions of negative exponential interarrival times and service times
- Using past data, determine weekly, daily and hourly variation factors
- Develop three predictive models to forecast weekly daily and hourly arrivals respectively
- Combine the first two predictive models to smoothout the load between the days of the week and then combine the third model to smooth out hourly variation
- Set target/goal for each of the system efficiency parameters—waiting time, number of patients in the queue, doctor's/staff's idle time
- Within the goal set in the previous step, determine the size of doctors/staff/machines using queuing theory models for the parallel servers.

Validate the predictive power of the forecasting models from actual data. If the variances between forecasted and actual are within the management's tolerance limit, put the models in use; otherwise go back to the third step and redesign the models till they satisfy the management's tolerance limit.

Scheduling for OPD & Ancillary Services

INS is endowed with all modern hospital facilities like MRI, CT Scan, ICU, sophisticated O.T. etc. However patients had to wait for a long period to get services (mean waiting time was 182 minutes for appointment patients and 2/3 days for walk-in patients). To mitigate this problem, a policy decision was taken in 1994 to treat walk-in patients on the same day preferably within an hour of their arrival, and to treat appointment patients within the same week i.e. Monday to Friday. Policy decision was also made not to treat appointment patients on Saturdays and Sundays. To implement these policies, dynamic personnel scheduling system was worked out for outdoor patients (OPD) and ancilliary services (MRI, CT scan, X-ray, Laboratory, EGM, ECG etc.).

The detailed workings of the systems are as follows:

* Gathering data relating to arrival times and service times was accomplished by means of the patient arrival form/requisition slip used to get the necessary initial information when the patient enters the system. Receptionists/personal assistants of doctors/temporary clerks were stationed at the entrance to the various service areas. This data collection activity was continued for two months without any break.
* Interarrival time, arrival rate, mean service time and service rate were calculated separately for each service centre. Doctor's service time and walk-in patients arrival rate for OPD are shown in Fig. 1 and table 1 respectively.
* An analysis of week-of-the-year effects was conducted to see if the work load varied from week to week. The analysis of three years data revealed that weekly variations were too wide

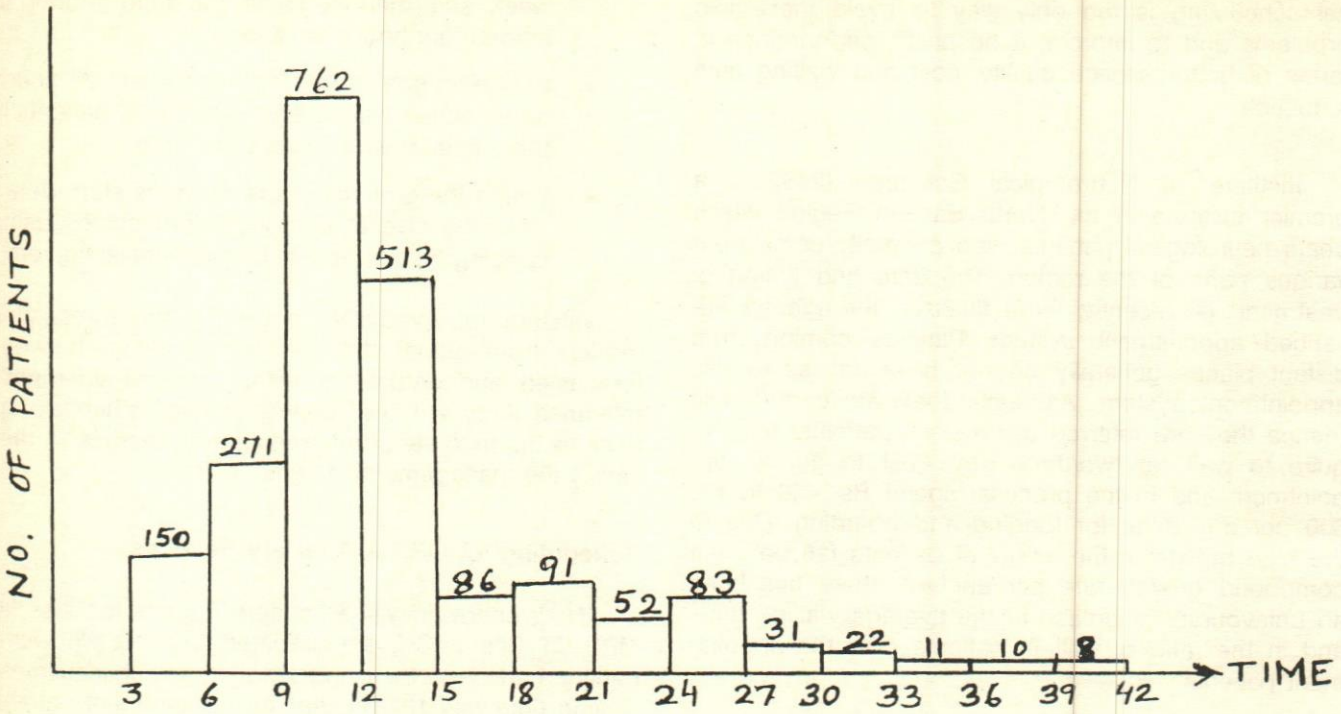

Fig. 1. Doctor's service time Mean service time = 12.9m

Table 1 : Walk-in patients arrival rate per hour

Time	7-8 A.M.	8-9 A.M.	9-10 A.M.	10-11 A.M.	11-12 A.M.	12-1 P.M.	1-2 P.M.	2-3 P.M.
Arrival rate (No.)	0	5	12	18	16	9	4	3

both for the walk-in patients and appointment patients. The highest patient visits had occurred during May to August each year (i.e. 18th week to 34th week) and the lowest during January, February, November and December (i.e. First 9 weeks and last 9 weeks). Weekly variation factor for each week of the year was calculated by using the following formulae :

$$WWFi = \frac{Wi}{(TW/52)} \qquad \text{(Eq. 1)}$$

$$WAFi = \frac{Ai}{(TA/52)} = \qquad \text{(Eq. 2)}$$

Where *WWFi* = *weekly walk-in patient variation factor for ith week*

Wi = Total number of walk-in patients in the ith week

TW = Total annual walk-in patients

WAFi = Weekly appointment patients variation factor for the ith week.

Ai = Total number of appointment patients in the ith week

TA = Total annual appointment patients

i = 1 to 52

Three weekly variation factors – one for each week of the year 1992, 93, 94 were calculated and they were then combined by giving 0.5 weight to the figure of 1994, 0.3 to the figure of 1993 and 0.2 to the figure of 1992. For example, if the weekly variation factors for the 1st week of 1994, 1993, 1992 are 0.8, 0.7 and 0.9 respectively, then the weighted variation factor for the first week is 0.79 ($0.8 \times 0.5 + 0.7 \times 0.3 + 0.9 \times 0.2$).

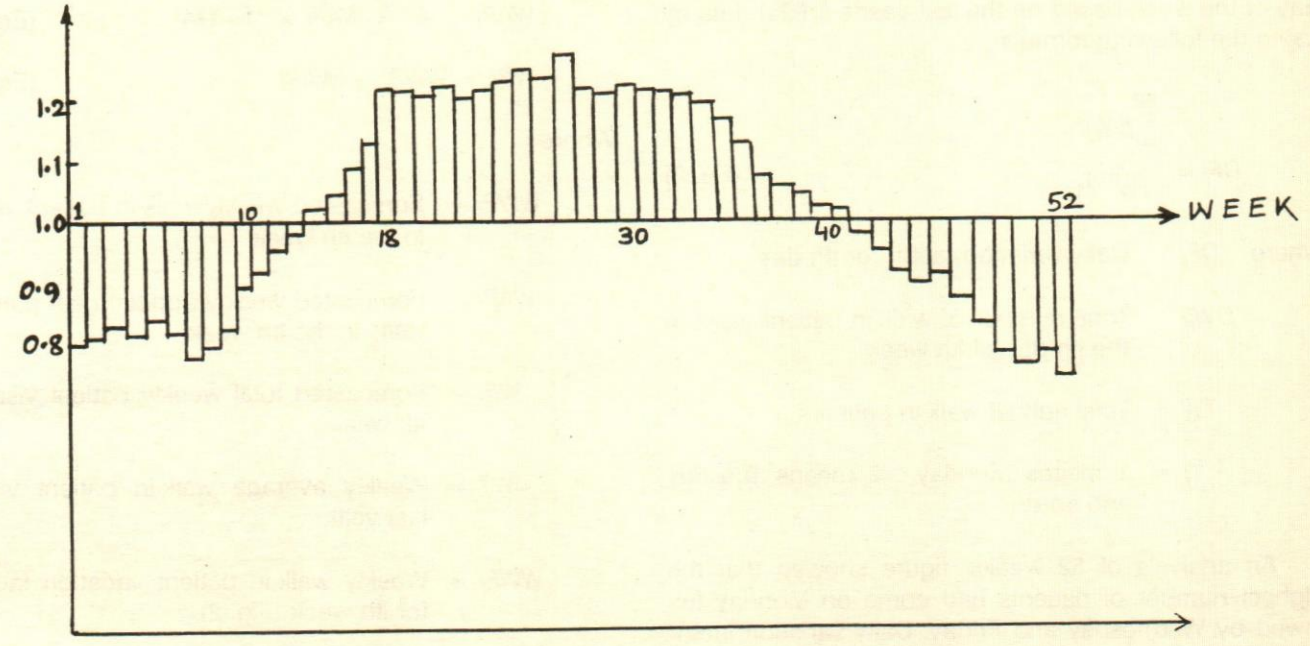

Fig. 2. Weekly variation factor for walk-in patients

1 = Average weekly walk-in patients

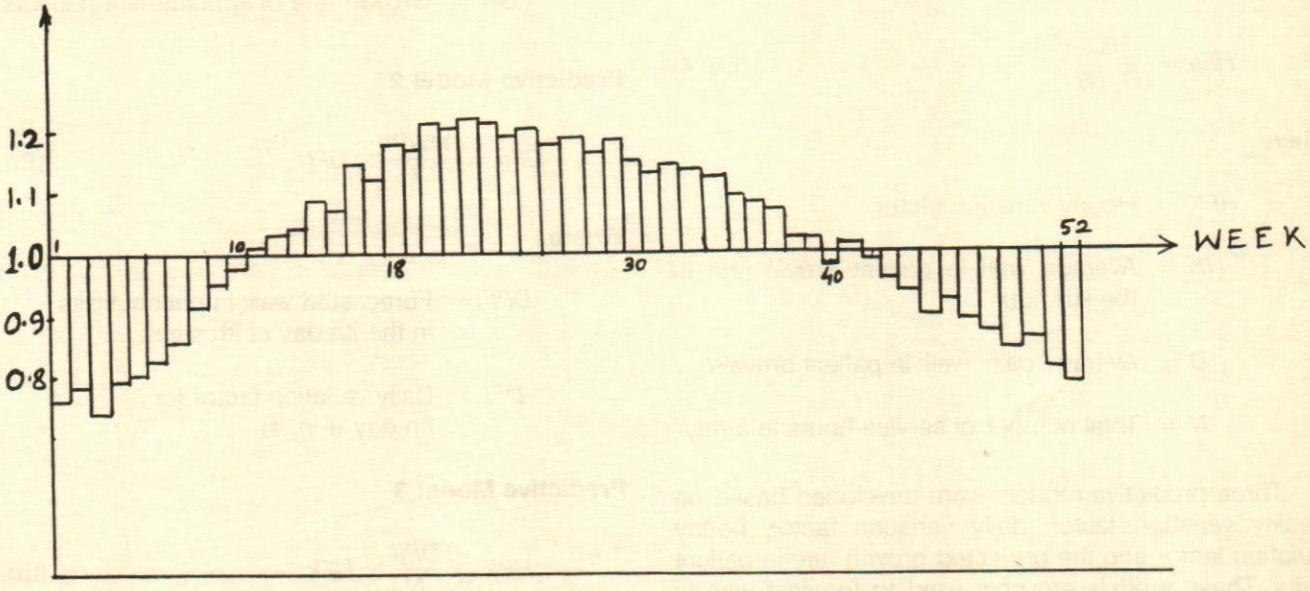

Fig. 3. Weekly variation factor for appointment patients

The weighted variation factors for all the 52 weeks of year are shown in Figs. 2 & 3.

Daily variation factor was also worked out for each day of the week based on the last year's (1994) data by using the following formula :

$$DFj = \frac{\sum_{1=1}^{52} DWji}{(TW/7)} \qquad \text{(Eq. 3)}$$

where DFj = Daily variation factor for jth day

$DWji$ = Total number of walk-in patient visits in the jth day of ith week

TW = Total annual walk-in patients

j = 1 means Monday : 2 means Tuesday and so on.

An analysis of 52 weeks' figure showed that the highest number of patients had come on Monday followed by Wednesday and Friday. Daily variation factor for walk-in patient is shown in Fig. 4. It should be noted that calculation of daily variation factor for appointment patients is not needed since the day of their arrivals will be controlled by the appointment system.

By breaking down two months worth of data collected in the first step, hourly variation factor for walk in-patient was estimated and plotted against the time of day (Fig. 5).

$$HF_k = \frac{Hk}{(D/N)} \qquad \text{(Eq. 4)}$$

where

HFK = Hourly variation factor

HK = Average walk-in patient arrival rate in the kth hour

D = Average daily walk-in patient arrivals

N = Total number of service hours in a day.

Three predictive models were developed based on weekly variation factor, daily variation factor, hourly variation factor and the projected growth rate in patient visits. These models are now used to forecast weekly patient visits, (model 1) daily patient visits (model 2) and hourly patient visits (model 3).

Predictive Model 1

$$WWPi = WT \times WWFi \times (1+Gw) \qquad \text{(Eq. 5)}$$

$$WAPi = AT \times WAFi \times (1+GA) \qquad \text{(Eq. 6)}$$

$$WPi = WWPi + WAPi \qquad \text{(Eq. 7)}$$

Where

$WWPi$ = Forecasted weekly walk-in patient visits in the ith week

$WAPi$ = Forecasted weekly appointment patient visits in the ith week

WPi = Forecasted total weekly patient visit in ith week

WT = Weekly average walk-in patient visits last year

$WWFi$ = Weekly walk-in patient variation factor for ith week (Fig. 2)

Gw = Growth rate of walk-in patient

AT = Average weekly appointment patient visits last year

$WAFi$ = Weekly appointment patient variation factor for the ith week (Fig. 3)

GA = Growth rate of appointment patients.

Predictive Model 2

$$DPij = \frac{WWPi}{7} \times DFj \qquad \text{(Eq. 8)}$$

Where

$DPji$ = Forecasted walk-in patient visits in the jth day of ith week

DFj = Daily variation factor for jth day (Fig. 4)

Predictive Model 3

$$HPk = \frac{DPji}{N} \times HFk \qquad \text{(Eq. 9)}$$

Where

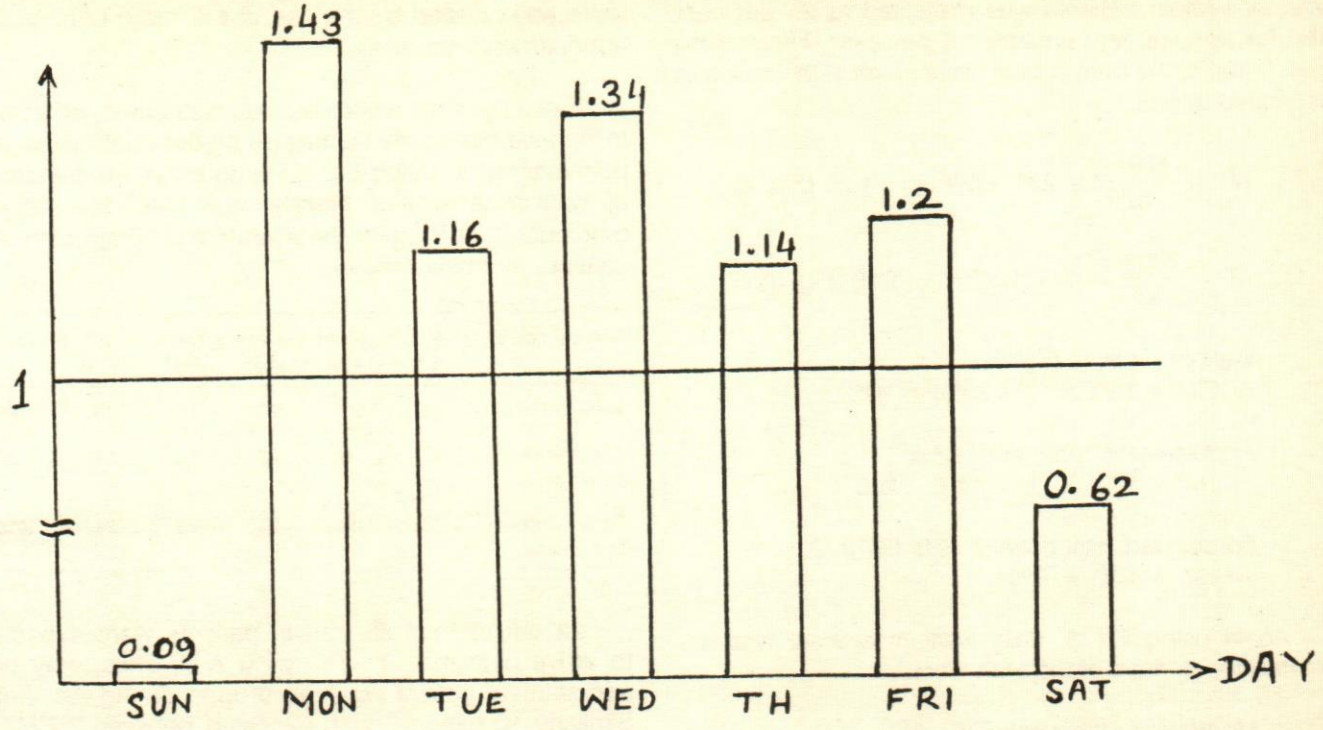

Fig. 4. Daily variation factor for walk-in patients

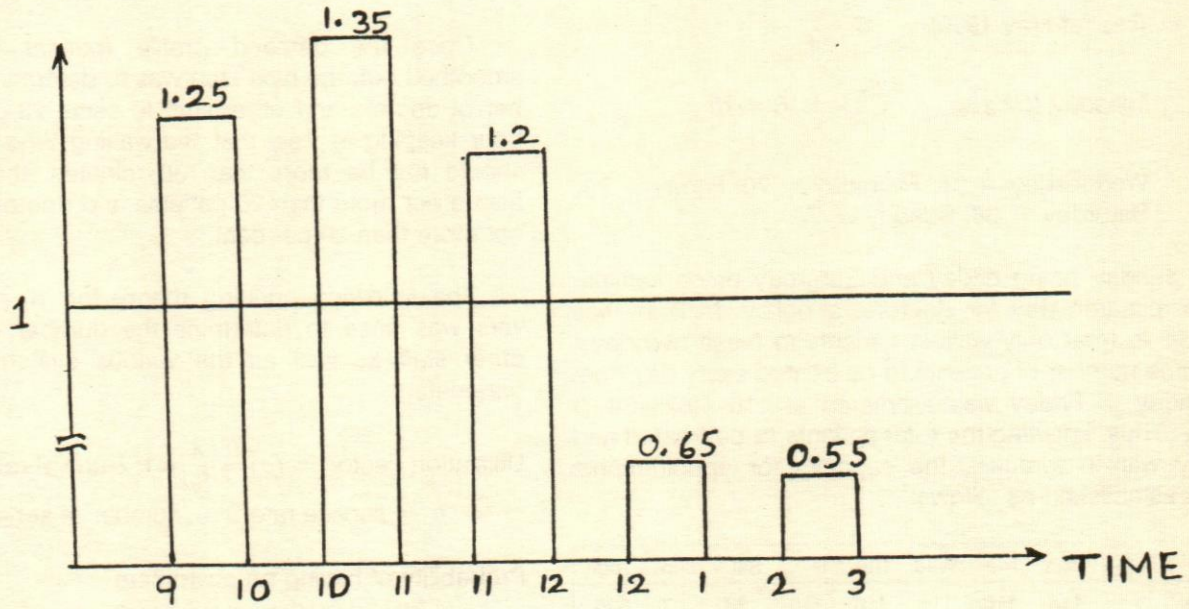

Fig. 5. Hourly variation factor for walk-in patients

HPk = Forecasted walk-in patient visits in the *k*th hour of a day

HFk = Hourly variation factor for *k*th hour (Fig. 5)

N = Total number of service hours in a day.

Using these three predictive models in combination, it is now possible for INS to plan the patient loads so as to distribute the load between days of the week and between hours of the day. The following illustrates how patient loads were distributed in the 18th week of 1995:

The total walk-in and appointment patients in the year 1994 was 14611 and 7663 respectively. The growth

rate for walk-in patients was projected at 25 per cent and for appointment patients 15 per cent. Thus, using Eqs. 5 and 6, the total patient visits in the 18th week was estimated at 625.

$$WT = \frac{14611}{52} = 281,\ WWF_{18} = 1.21 \text{ (Fig. 2)}$$

$$AT = \frac{7663}{52} = 147,\ WAF_{18} = 1.18 \text{ (Fig. 3)}$$

Walk-in patients (WWP_{18})
$= 281 \times 1.21 \times (1+25\%) = 425$

Appointment patients (WAP_{18})
$= 147 \times 1.18 \times (1+15\%) = 200$

Forecasted total patient visits (WPi)
$= 425 + 200 = 625$

Again using Eq. 8, daily walk-in forecast was estimated for all days of the 18th week.

Monday of 18th week ($DP_{1,18}$)
$= \frac{425}{7} \times 1.43$ (Fig. 4)

(i.e. 1st May 1995) = 86

Tuesday ($DP_{2,18}$) $= \frac{425}{7} \times 1.16 = 70$

Wednesday = 81; Thursday = 70; Friday = 73; Saturday = 38; Sunday = 7.

Sunday being offday and Saturday being seminar and research day for doctors, a policy decision was made to treat only walk-in patients in these two days. So, the number of patients to be treated every day from Monday to Friday was estimated at 116 {(625–38–7) ÷5}. Thus, knowing the total patients to be treated and daily walk-in forecast, the capacity for appointments was established as follows:

Day ——→	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
Total patients to be treated	116	116	116	116	116	38	7	625
Walk-in Patients	86	70	81	70	73	38	7	425
Appointment	30	46	35	46	43	–	–	200

Advance appointments were given to 30 patients for treatment on Monday, to 46 patients on Tuesday and so on. In this fashion, the daily variation in walk-in patient visits was levelled by the use of the more controllable appointments schedule.

Once the daily work load was distributed, effort was to remove the hourly fluctuation by the controllable appointment time. Using Eq. 9, the hourly arrival pattern of 86 walk-in patients on Monday was predicted and accordingly, the timing for the treatment of 30 appointment patients was determined.

Service hours	9-10 A.M.	10-11 A.M.	11-12 A.M.	12-1 P.M.	2-3 P.M.	Total
Walk-in Patients	22	23	20	11	10	86
Appointment patients	1	0	3	12	14	30
Total number of patients	23	23	23	23	24	116

22 out of total 86 walk-in patients were expected to arrive between 9 A.M. to 10 A.M. Thus, only one appointment patient was called upon during that hour. Similarly 10 patients were expected between 2 P.M. to 3 P.M. from walk-in patients, so 14 patients were called upon during 2 P.M. to 3 P.M. through advanced appointment system.

Once the demand profile (patient visits) was smoothed out, the next step was to determine the number of doctors and other staff to serve 23 patients per hour keeping in view that the waiting time per patient should not be more than 30 minutes, the length of queue not more than 20 patients and doctors' idle time not more than 20 per cent.

The following queuing theory for 'n' parallel servers was used to determine the number of doctors/ other staff as well as the various system efficiency parameters:

Utilization Factor $= (\rho) = \frac{\lambda}{S\mu} < 1$; λ arrival rate,

μ = service rate S = number of servers.

Probability of having on customers

$$(P_o) = \left[\sum_{n=0}^{S-1} \frac{(\lambda/\mu)^n}{\lfloor n} + \frac{(\lambda/\mu)^S}{\lfloor S} \left(\frac{1}{1-\rho}\right)\right]^{-1}$$

Length of queue $(Lq) + \frac{P_o\,(\lambda/\mu)^s\,\rho}{S\,(1-\rho)^2}$

Waiting time $(Wq) = \frac{Lq}{\lambda}$

Idle time (I) $\sum_{n=0}^{S-1} Pn$; $Pn = \frac{(\lambda/\mu)^n}{\lfloor n} P_o$

If five doctors are appointed for an arrival rate of 23 patients per hour and a service rate of 5 patients per hour, then waiting time per patient is 23 minutes, only 9 patients are in the queue waiting for service and the doctor's idle time is 20 per cent. So 5 doctors were engaged on Monday of the 18th week of 1995. In this manner, personnel scheduling was worked out for the remaining days of the 18th week of 1995.

The new system was put into use from April, 1995 on adhoc basis. Initially for two months, the predictive power of the forecasting models was closely examined every day. Since the predictive power was found to be within10 per cent tolerance limit, the new system is now adopted permanently for scheduling doctors, staff and other facilities.

Scheduling for In-patient Services

In-patient service requires personnel scheduling fundamentally different from the system for OPD because it is the 'Care level' rather than the absolute number of patients that determines resource requirements. Moreover, an inpatient occupies a hospital bed for a few days. Waiting time, therefore is not that critical.

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Amongst the human resources required for treating inpatient the most expensive is the nursing staff which accounts for more than 50 per cent of the total salary expenses. It is therefore, essential to optimise nursing resources.

Like most of other hospitals, INS also allocates nursing staff strictly on bed counts (1 nurse for every three beds per shift). consequently, the number of nurses per shift remain fixed irrespective of the care level needs of the patients. Since care level needs vary significantly (between 2297 to 3923 points with a mean value of 3120 points) the nurses are sometime overworked, sometimes idle and too often pay visits to the patients unnecessarily.

There are many instances where the nurses used to pay as many as 20 visits per shift of 6 hours to the patients whose care level need was minimum. On the other hand, patient requiring high care level often do not get a adequate attention. All these signaled a clear need for a new system which can schedule nurses strictly on the basis of carelevel needs. The new system recently worked out in INS is known as patient classification system (PCS). This system is just evolved and is yet to be put into use.

Under this system, each patient will be evaluated by his/her condition and assigned to a carelevel ranging from 'Minimum care' to 'Intensive care'. Towards the end of each shift, Metron/senior nurses/resident doctors will evaluate each area's patients and determine the number of patients under each carelevel. The number of patients will be then multiplied by a predetermined standard time to obtain the total nursing time required for each shift. The total nursing time will be then divided by the time available per nurse per shift to arrive at the number of nurses required in that shift. Table 2 explains the methodology.

Table 2: Estimation of number of nurses

Care level	No. of patients under each care level	Standard nursing time	Total time required in minutes
Minimum Care	8	20	160
Low Care	13	40	520
Medium Care	25	60	1500
High Care	8	120	960
Intensive Care	4	240	960
		Grand Total =	4100 minutes

Time available per nurse = 6 × 60 = 360 m

Personal allowance = 11%

Net time available per nurse - 320 m

Number of nurses needed per shift

$= \frac{4100}{320} = 12.8 = 13$

Once this new system is put into use, only 46 nurses will be needed to serve 58 beds against the present nursing strength of 62.

These two types of dynamic personnel scheduling are currently being practised in INS. The initial results achieved from the system are truly startling. Mean

waiting time has reduced to less than 30 minutes from the previous mean of 182 minutes. Walk-in patients need not stayback for two/three days to get appointment. The service quality as well as cost element are expected to improve substantially once the new system stabilizes.

This is, however, not the end to the endeavour currently being initiated in INS. Many research agendas are already underway. Efforts are on to reduce senior doctors' service time per patient during peak hours through assistance from junior doctors and the computer system. An attempt is also being made to introduce variable office timing, variable lunch and tea break timings. A plan is also being made to have extensive job rotation amongst the employees so that employees may be drawn from other parts of the organisation to work for a few hours in the department where the workload is more.

Conclusion

In poor countries like India, the success of the health maintenance programme depends on the ability of health care centres to provide quality services at low cost. The suggested dynamic scheduling techniques will help the health care centres to achieve these twin objectives. With dynamic personnel schedulings, the good quality hospitals will be in a position to accommodate more patients without affecting the quality of treatment. Further, with dynamic personnel scheduling, all the patients are likely to get treatment on the day of their first visit, which means a large savings to the patients in respect of money, time and physical hardship. An article of Assam Tribune of dated 14th of June, 1995 cited few instances where needy patients just to get an X-ray (whose service charges is Rs. 50 in GMCH) had ultimately ended up paying over Rs. 200 in the process of shuttling between their villages and the city as many as 4/5 times. Dynamic personnel scheduling will surely put an end to this hardship.

With Dynamic personnel schedulings, the good quality hospitals will be in a position to accommodate more patients without affecting the quality of treatment.

The history of research into dynamic personnel scheduling is still quite young. The methodology presented in this paper is not the final answer, there is ample scope for improvement. □

Feature

Tripartism & Bipartism on Environmental Issues

C.S. Venkata Ratnam

Cooperation among social partners is essential for evolving and implementing policies and programmes relating to environmental issues. The author discusses the various mechanisms for cooperation between workers and the management, and involving the government.

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Economic development has brought in its wake environmental destruction too. Ironically, environmental degradation is caused by poverty in the South and by affluence in the North (UNDP, 1991). The need to pursue sustainable development can hardly be exaggerated. When voluntary action to meet the environmental threats of development process is inadequate, regulation and legal sanctions are often imposed. It could well be that environmental regulation is impeding economic development whether or not it is contributing to environmental preservation. But, in the absence of adequate and sufficient response from workers and employers, government and other national and international agencies and other interest groups would mount pressure, and justifiably so.

Workers and management often find dilemmas in facing the environmental issues that are both complex and competing. Concern for environment may have real and potential trade offs with jobs, incomes, costs, volume, trade (domestic and foreign), profits, etc. There is a need and scope to resolve these dilemmas and trade offs through joint consultation and cooperation.

The report of the World Commission on Environment and Development (1987) – also known as the Brundtland Report – delienated the relationship between environment and economic development and defines sustainable development as: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs...A process of change in which exploitation of resources, the direction of investments, the orientation of technology development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations (WCED, 1987)."

Tripartite & Bipartite Cooperation on Environmental Issues

Consultation and co-operation among the social partners is essential for evolving and implementing

policies and programmes relating to environmental issues. Awareness and understanding of global effects of environmental destruction such as acid rain, global warming, greenhouse effect, ozone depletion has now become a necessity. Similarly, awareness and understanding of local issues concerning the effects of low social and human development on the health and safety and clean environment is equally necessary. Greedy exploitation of natural resources and destruction of bio diversity have long-term consequences. Newer, dangerous chemicals, solid wastes and sewage and garbage from the communities where we live are adversely affecting our health and the environment. Urbanisation, motorisation and energisation of our lives are not without adverse effects on the pollution of the water we drink, the air we breath and the food we eat. From the Bhopal disaster of 1984 to the Plague episode in Surat of 1994, the myriad incidents point to glaring weaknesses in our corporate governance as well as governance of our communities by the local self government. Both in corporate and in civil life, we, as people, are affected by the omissions and commissions of all concerned in paying attention to the problems of sustainable social and economic development that is *sine qua non* for safe, healthy and clean environment.

The importance of consensual processes to obtain the commitment of the stakeholders with regard to the network of rules and regulations, be they legislations, standards or voluntary codes of practical guidelines, can hardly be exaggerated.

The importance of consensual processes to obtain the commitment of the stakeholders with regard to the network of rules and regulations, be they legislations, standards or voluntary codes of practical guidelines, can hardly be exaggerated.

Environmental Legislation: The ILO Conventions and international treaties provide useful framework and guidance. Both workers and managements need to be consulted in framing legislation or suggestive amendments to the existing legislations.

Environmental Standards: Workers being closer to the scene of action would be in a better position to contribute to defining and determining standards. Workers should be seen more as part of the solution, than the problem itself.

Information-Sharing and Awareness Building: A two-way interactive communication and information-sharing is essential. The ILO convention on occupational safety and health concedes the worker the right to refuse to work if a work place is considered unsafe.

Training for Safe and Environmentally Sound Work Systems and Work Practices: Joint effort by both labour and management to undertake training in safe and environmentally sound work place, systems, and practice is considered both desirable and feasible.

Environmental Impact Assessment: Among others, the following aspects could be jointly taken up by labour and management at enterprise/plant level:

- Project Planning and Management
- Inputs
- Technology/Methods
- Outputs
- Financial Management: How to make Pollution Prevention Pay.

Labour Inspection: Tripartite system of labour inspection in regard to environmental issues.

The Mechanisms

The following are among the various mechanisms for consultation and cooperation between workers and management on environmental issues:

Company Mission Statement: To reflect the enterprise concern for improving the working environment and the general environment. Ideally trade unions and employees should also have their inputs in reflecting environmental concerns as part of Company Mission statement.

Suggestion Schemes: Organisations which have suggestion schemes encourage workers to offer suggestions on safe and better work practices, waste reduction, energy conservation, etc. which go a long way in improving environment.

Incentive Schemes: Can be extended to provide for Scanlon Plan type profit sharing systems to cover savings accruing through waste minimisation, energy conservation, etc.

Works Councils/Committees: These could be either statutory or voluntary or both.

'Green' clauses in Collective Bargaining Agreements: Industrywide agreements in steel and coal sectors in India provided for some clauses on occupational safety and health and also on environment. The model green clause agreement entered into in one of the industries in the U.K., however, is one of the most comprehensive ones that trade unions may like to examine.

Quality Circles/Total Quality Control and Management: This is more commonly used in Japan and Singapore than in India on matters relating to improvement of occupational safety and health and environment.

Training: Assistance to workers and worker and management representatives to acquire competence and confidence for assessing environmental impacts and taking curative and preventive steps.

Community Work/Services: To harmonize between working and general environment and show concern for community impact.

Environmental Concerns & Tripartitism in India

As elsewhere, in India, too environmental problems arise largely due to the negative effects of the very process of development and partly due to conditions of poverty and under-development. The former results from indiscriminate exploitation of natural and other resources in the name of development; and the latter, in the cause of survival to fulfill basic human needs such as food, fuel, shelter, etc.

India is home for even those pesticides and chemicals which are banned in industrialised countries—all in the name of modern agriculture to feed the teeming millions. Most cities are not connected with sewers and the civic facilities for dealing with solid waste are far too inadequate. River stretches are critically polluted across the country, the glaring example being the Gangetic belt. The proliferation of vintage motor vehicles on the road using unleaded petrol add to the problem of air pollution caused by factories. 17 industrial sectors have been identified as major polluters and over a dozen areas along various river stretches in the country are considered critically polluted.

For the first time, during the 1970s, the Government of India began to enact legislations aimed at wildlife protection (1972) and prevention and control of water pollution (1974 and 1977). In the early 1980s, the legislative measures extended to forest conservation (1980) and prevention and control of atmospheric pollution (1981).

It was the Bhopal tragedy, which shook an otherwise indifferent government to pay attention to the problem of environment. The Environment Protection Act (EPA), 1986 is in many ways identical to similar legislation in the US. As with most other legislations, the intent is excellent, implementation is weak. Control over air and water pollution, despite stringent legislations is equally alarming. The Central Pollution Control Board and the State Pollution Control Boards have filed over 5,000 cases. In recent years, despite deregulation in economic ministries, environmental clearances entail huge delays in project approvals. Some of the irrigation projects like the Narmada dam were damned and condemned and multinationals like Thapar-Dupont plant in Goa met with stiff opposition from environmentalists. Both the Supreme Court and the High Courts have been ordering several thousand enterprises located in metros to be either closed or shifted out to neighbouring places. In Uttar Pradesh, leather units in Kanpur and foundries in Agra have been ordered to be either closed or shifted out. The adverse affects of pollution on the Taj Mahal is being debated for over a decade.

Over 9,000 units have been asked to move out of Delhi. Gujarat High Court has threatened to close several hundred units in and around Ahmedabad. Given the perceived short-term trade off between environment and jobs, there is an argument from a section of employers that the environmental control should be more strictly applied prospectively than retrospectively. Actually, during the short-term also paying attention to environment may create job displacement than net jobloss. It is true, however, that some may lose their jobs, while others may find new opportunities.

During the 1990s most legislations were amended and new legislations on public liability insurance (1991) was brought to deal with the problem arising out of settlement of claims of victims in industrial and other disasters. As in the case of labour legislation, in environmental legislations the government should consult the organisations of workers and employers.

In the Bhopal tragedy involving Union Carbide where several thousands died and where the after effects are expected to last for several generations, the legal process is so tardy that the victims neither got justice nor compensation till date. But in the light of Bhopal and other disasters in Delhi and Bombay, the Factories Act was amended incorporating several tough provisions in Chapter IV-A relating to hazardous process. A Safety committee consisting of equal representation for both workers and management has been made statutory and the members and the committee

are vested with rights. Even workers' right to information is explicitly mentioned in the amended Act.

The problem with the far reaching amendments concerns enforcement. Some of the provisions are so stringent that strict and absolute adherence to them may mean that over 99 per cent of the factories should be closed. India has also used economic instruments to promote the cause of sustainable development. There is no assessment, as yet on how effective these instruments and incentives are (Annexure 1).

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Tripartism in India

India has a record of over 50 years in tripartite consultations on social and economic matters which dates back to the years before its Independence. The Indian Labour Conference and the Standing Labour Conference are the major fora, besides 50-odd tripartite committees on various subjects allied to social, labour and economic matters (APPOT, 1994; Venkata Ratnam, 1995a). These include a tripartite committee on safety as well as the National Safety Council which is governed by representatives from government and organisations of employers and workers.

The Factories Act deals with health and safety inside the workplace and labour inspection under the Act is mainly limited to this aspect. The Environment Protection Act deals mostly with environment outside the workplace. This artificial division creates problems in tripartite and bipartite consultations. So far tripartite consultations have been restricted mostly to matters concerning the health and safety of workers at the workplace than the larger environmental issues. On environmental issues non-governmental organisations are in forefront in taking up causes which trade unions have only rarely been able to take up due to dilemmas concerning the interests of workers in polluting companies whose jobs are threatened vis-a-vis the larger interests of the community. The dominant view among the trade unions and workers is that it is the responsibility of the management to keep the environment clean and safe. They feel that they can make a contribution, but attribute their limited involvement to management apathy than their own.

The dominant view among the trade unions and workers is that it is the responsibility of the management to keep the environment clean and safe.

Though trade unions and victims in mass disaster cases have not often been able to protest or petition, largely due to the efforts of lawyers like M.C. Mehta, public interest litigations spread to environmental matters also. With the result, more than 4,000 cases of prosecution are pending in different courts of India which relate to air and water pollution, rights over natural resources, the environmental impact of development and right to information on the state of the environment (Down to Earth, December 31, 1994). The Supreme Court has awarded several landmark judgements on environmental issues (Annexure 2).

Employers in India, by and large, consider their responsibility limited to initiating formal measures aimed at meeting the legal obligations including the provision of protective equipment, etc. Employers generally seem to have a condescending view regarding the attitudes and ability of workers to participate on environmental issues. Consultations in participative fora are usually confined to matters relating to safe work practices, training in safety, safety awards, good house keeping practices, etc., rather than on subjects like pollution control and prevention. In recent years, the pressure on competition is making employers take initiatives to involve workers in searching ways and means to reduce costs through reduction of waste, better utilisation of inputs (including energy), etc., which directly or otherwise manifest the concern for better environment.

In recent years occupational health and safety and environmental concerns have begun to feature in collective agreements. There is, as yet, no systematic study on the subject. However, an on-going study of 150 collective agreements (Venkata Ratnam, 1995b) reveals that only few have specific provisions concerning the need for research and measures that employers should take on environmental and hazard control as well as occupational health. In quite a few cases, safety and health issues can be negotiated in return for a cash compensation or allowance. Though the government of India has set up 16 laboratories throughout the country to study the link between work and health, there is no reliable data base on the subject. Though 34.12 per cent of its 4.13 crore population in Gujarat are industrial workers, not a single worker has been paid compensation for disability or death caused by an occupational

disease under the Workmen's Compensation Act, 1923. The Chief Inspector of Factories has not been notified about the incidence of any of the 29 notifiable diseases under the Factories Act, 1948. The situation is not much better in the other states. Neither the management, the workers nor the government is interested in reporting the cases. To the management, it means higher 'costs', for the workers so afflicted have to be paid compensation, the workers themselves tend to hide the ailment, fearing loss of the job and the authorities concerned are just indifferent.

Conclusion

The links between environment and economic growth and between workplace safety and community environment are gaining importance. The accelerated pace of deterioration in environment is leading to a plethora of legislations aimed at protection of environment. India has now most stringent and far reaching laws on health and safety at work. Yet, given the limitations of enforcement, they remain a dead letter. There is a great need and scope for voluntary arrangements and bipartite cooperation between employers and workers organisations at enterprise and economy level. So far, in India, tripartite consultation is largely restricted to matters concerning occupational health and safety than the larger issues of environment. The government should consult organisations of workers and employers while framing laws, developing standards and evolving mechanisms for improving the environment. At the bipartite level, collective bargaining is beginning to address itself to issues concerning occupational safety, health and workplace and community environment. While there is merit in negotiating green clauses, there is need for restraint in treating health, safety and environmental issues as bargaining points. In developing countries the trade off between environment and jobs, occupational health and safeguarding employment which is a source of livelihood may, in the short run apply breaks to efforts at making the workplace and working and community environment clean and safe.

The government should consult organisations of workers and employers while framing laws, developing standards and evolving mechanisms for improving the environment.

Alongside greater employee participation, citizen initiatives, community interest groups and consumer rights fora will put greater pressure on environmental conservation in a preventive rather than merely curative spirit. Employers and trade unions need to develop a spirit of cooperation than confrontation in the sphere of environmental protection. A beginning has been made with the five major national federations of trade unions joining hands in forming "Trade Union Partnership for Environmental Protection (TUPEP)" in 1995. At a conference organised by the International Labour Organisation TUPEP office-bearers agreed to take the initiative and organise bi-partite dialogue with employers on environmental issues.

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a political background of parliamentary democracy, the corresponding programme of action has to rest on sequencing the commodities-to-be produced and technologies-to-be associated. The process of this uplift thus has to incorporate a time-phased ordering of consumer-goods consistent with capital-goods-cum-technology ordering, each of which has to be planned in an ascending order – from lower order (socially higher priority) to higher order (socially lower priority) – priority of commodity basket at any particular stage determined by planning (Majumder, 1992). A hierarchy of products, thus embedded in the time-sequence of development, determines in sequence the pattern of distribution and consumption in any economy. In other words, the upward movement in consumption structure has to rest on a process of generation of new production possibilities. Thus, we take neither a static (often supposed-to-be price-determined) demand (market) nor a given state of technology (Rosenberg, 1982). The cultural corollary of material standard is rooted in the potentials and manifestations of manpower in a society.

This situation is not without its latent problems. Planning for development aims to wipe out anarchic economic principles and social set up in favour of the formation of new ones (Gurley, 1975). This effort at reformation brings about new types of contradictions because the initial norms of a civil society in which the social groups work, specifically with national and international economic order in existence, dictates how the individuals and groups should participate in activities. The contradictions are derived also from the sponsorship of planning (Bagchi, 1982). Thus comes the rationalization of the state as a promoter and protector of civil society.

We consider the state in a society passing through capitalist transition, as a decision-making authority trying, in principle, to ensure mutuality of interests of antagonistic social groups and individuals. Alternative interpretations of this concept are available elsewhere (Kurien, 1987; Bardhan, 1984; Patnaik 1984; Alavi, 1982; Altvater, 1978; Wilken, 1982). State is then the visible hand which directs the course of development. In the global context, the use of power by the nation states of the Third World is conditioned by the hegemonic control – basically by possession of technology – of industrialized countries (Bhambhari, 1994; Griffin, 1981). The problems related to the formation of market for commodities and associated technologies thus are not confined to a pure techno-economic boundary as is often supposed (UN, 1975).

In the global context, the use of power by the nation states of the Third World is conditioned by the hegemonic control – basically by possession of technology – of industrialized countries.

The capacity of a small power to withstand pressure – military in the first instance, but economic, political and psychological too – must be seen as the acid test of its viability as an independent state.

The problems become political questions at the national and international levels. At the national level, "the mechanism through which the economic policy is formulated and the role of the ballot box in the economic policy formulation become major conditioning factors" (Eckstein, 1967). Role of the ballot box in the process of economic decision-making is relevant if it is a political system of Parliamentary Democracy, where people are 'guided' to exercise their maximum political power, often in a state of concealed coercion or hegemony of the elite. In a military government, on the other hand, the ballot box is irrelevant in a state of revealed coercion. At the international level, the "states form their characteristic economic, social and political structure" and hence consolidate or disintegrate themselves conditioned by an international context of competition (Braunmuhl, 1978). The countries in the Third World, whatever be the degree of their heterogeneity, today confront the ideological battle on the role of the state, a battle latent or declared against the ruling apparatus of the West, the institutions propagating Western ideology and the carriers of this ideology at home. In this context, "the capacity of a small power to withstand pressure – military in the first instance, but economic, political and psychological too – must be seen as the acid test of its viability as an independent state" (Vital, 1972).

All economic decisions are manifestations of interactions in power-structure (Singh, 1985). whatever be the nature of polity in a nation state and ideas implicit in the process of globalization, the historical complementarity between market and state today raises no question (World Banks, 1991; Pieterse, 1994; Roth, 1987). Often it appears that the degree of development of a civil society under capitalism is synonymous with the degree of development of the market.

We stress on the formation of the market, the home market being the focus at the starting point (Majumder, 1990). This is because—any policy that relies on aid or ad-hocism fails, e.g., the late 18th Century British economy opted for institutionalization of the Speenhamland system that ensured 'aid-in-wages'. But its failure seen from the system's retrogression forced all social strata to consider any policy preferable to the 'official policy of pauperism' (Kharkhordin, 1994); "Given the enormous latent demand in the developing countries, the potential for expansion, if living standards could be raised even by a small degree, is vast" (Wright, 1982). The formation of the market, if taken as a condition for development, is dependent on the growth of money-based exchange in commodities, growth of employment based on wage-labour, and a developed money (credit) market. While nature came on its own independent of any human effort, man came to own a portion of nature by the inescapable power of technology or by accident (Nell, 1979). While it shows the source of privatization of market power, isolated individuals may not have the desire or ability to expand the frontier of the market (Mcbean & Balasubramanyan, 1978). To be specific, the state has to operate, subject to self-imposed constraints, on its actions aiming at development by consensus (Hasley, 1994, Sengupta, 1994; Wilken, 1982). After all, the State cannot rely solely on coercion, even in an implicit condition of binding membership of the state by birth; it has to rely on consensus for arriving at a solution affecting the economy and society (Dandekar, 1990). To explain, beyond production and trade lies ownership over resources. This ownership confers the owners the legal right to exclude the non-owners from the process of utilization and appropriation of resources. State is the institution which recognizes and rationalizes this social relation based on the plank of private property (Cahan, 1994-95, whynes & Bowles, 1981). In reality, thus, it is the state which initially accepts the market principle viz., inclusion of people with power at the cost of exclusion of paupers or what we call 'state recognition' of market power. But then for the market to exist, expand and ensure macroeconomic growth, the state has to step in. If market power is recognized and accepted in principle by the state by guaranteeing security of private property, then accumulation by the powerful, becomes a logical corollary. The existence of the powerful, keeping the corollary in mind, is conditional upon state action via expansion of market or inclusion of more people with non-reducing market power. Such a path is logical-historical (World Bank, 1978; ILO, 1974; Griffin & Khan, 1978). This may, however, invite new contradictions, because—the process of capitalist industrialization is by nature based on the principle of exclusion and exit, people inside jobs may try to obstruct the entry of the outsiders. This is the context in which the task of formation and expansion of market cannot be considered in isolation from the state.

Rationale for the Formation of a 'Global Man'

We accept that the economic power of a nation state is directly proportional to its manpower (Denison, 1967, Nayudamma, 1980). The quality embedded in manpower is ultimately reflected in rising and hence higher labour productivity. Let us consider manpower in the distribution of population (Fig. 1).

The economic power of a nation State is directly proportional to its manpower.

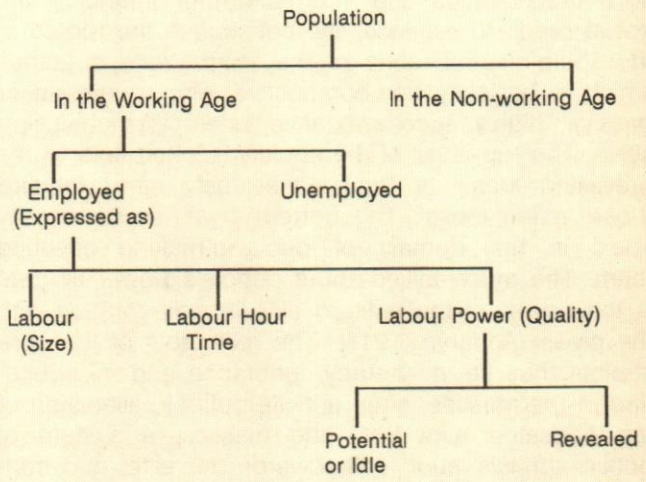

Fig. 1. Manpower Location

Manpower that concerns a market the most is captured in labour power. Labour-hour is the time-expression of labour-power applied in the area of production by a labourer. The quality of a labourer, it seems, is a transformation inside the body of a labourer raising his power to produce per hour and, in a favourable environment, gets reflected in higher productivity. In essence, in a dynamic frame, productivity in each period and hence productivity-differential is conditioned by the initial level of technology and its change (Oshima, 1994). Man, on the technology front, thus is heterogeneous (Thurow, 1970). This brings us to the question of forming a 'global man'.

Each nation has to move on the trajectory of development from where it is, i.e., each is subject to its own initial conditions, and thus each is differentiated

from the other, invalidating any generalization of prescription for the wealth generation of a nation (Nayudamma, 1980). Keeping in mind the factors and forces, cardinal and non-cardinal, initial and changing for countries having closely identical objective functions, it can be said that the formation and development of skill expressed in high and rising productivity of a labourer at any time is a derivation from the injection of education at different levels and forms through—academic institutions (technical and non-technical, industry-related or not), learning-by-doing (Myrdal, 1982). In this context, the post-war U.S. experience of 'Job Redesign' and 'Work-Study Programme' as two pillars of MUST (Maximum Utilization of Skills and Training) seems relevant (Iverson, 1969).

Occasionally we talk about initial conditions imposing constraints on the development of late-starters. Apparently these initial conditions manifest themselves in the lack of power of people to generate and absorb technologies and information for changing the social order. In essence, the constraints are rooted in the socio-cultural fabric of the Third World countries which is basically non-competitive, non-aggressive or passive, highly accommodative, unemployment-insensitive. The top layer of the society is often sold to the prevailing ideas or they consciously carry forward those 'ruling ideas'. The bottom layer is without any voice in the domain of decision-making affecting them. The much talked-about people's power till date is the power of the political elite in collaboration with the press (Acharya, 1947). The real roots of the constraints thus lie in illiteracy, ignorance and miseducation of the masses, often anti-life outlook, alienation of the educated elite from the masses, a system of public administration soft towards the elite, and concealed vulnerability of the elite in the shape of acute, dependence on and collusion with foreign rulers and powers (Myrdal, 1982; Mahalanobis, 1985). This is where and why the task of forming an 'internationally acceptable man' seems relevant.

The much talked-about people's power till date is the power of the political elite in collaboration with the press

A global man is judged by his participation in production anywhere in the globe. Globalization of production depends on, among others, the competence and creativity of man depending on his acquiring education and training. The quality of the product/service is a reflection of this productivity. It is the strength of manpower as a team, responsive to market and technology (Zairi, 1994). In an era of high-technology globalization, labourers in the Third World are prone to self-destruction because of, among others—the rapid disappearance of the requirement for traditional skills (Hunter, 1970; Oshima, 1984); Changing location of production and obstructed mobility of labourers (Majumder, 1995); non renewal of previously acquired specialization by labourers; abrupt effort by the decision-makers for plant/firm rationalization to accommodate the entry of global capital; managerial inefficiency in diversification of products to compensate the probable contraction in market faced by the firm; managerial apathy towards R & D and training for skill formation of labourers (Ghosh, 1991); application of capital-deepening technical progress. In addition to these basically managerial technological questions, "if people have to be laid off at one time or another to adjust to a demand change in the market place, most likely they will not participate in the (quality control) programme" (Arai, 1984). Herein comes the conflict between the development of 'corporate community culture' and the 'threat of being thrown out'.

Thus manpower restructuring for the countries in the Third World has to rest on a national plan that has to lay the cultural basis for effective participation of the corporate community for the success of the programme of restructuring. If the success story of Japan is kept in mind, productivity has to rest on the 'quality of work life', where the total quality control programme means organising a company "so that members of the corporate community are in constant communication irrespective of their position (Arai, 1984). The new technology determined exit of manpower has to be rehabilitated to socially useful old technology based lower-wage jobs, which is, however, overburdened by the efforts of the men outside the boundary of economic jobs for entry. This brings us to the problem of manpower planning in a nation state in the perspective of normative economic development.

Manpower Planning & Economic Development

We have accepted globalization as a compulsion for the countries in the Third World of late 20th Century. Since scientific and technological revolution in the globe has embraced production spheres for almost all existing commodities and commodities in pregnancy (in research laboratories), and the countries in the back-seat are to be a part, by consent or by victimization, of this process of techno-globalization, adequate and appropriate home preparation of the agents of change, viz., manpower planning at home, has become a compulsion today for these countries.

In his fourfold logic of economic development, Mahalanobis ranks the four steps as (i) an increasing supply of consumer goods, based on (ii) an increasing supply of capital-goods, both (i) and (ii) based on (iii) an increasing supply of engineers, technologists and technical personnel, based on (iv) an increasing volume of applied and basic research (Mahalanobis, 1985).

In this perspective, manpower planning in these countries has to take care of ensuring education and training for the workforce inside the job; initiating programmes in the sphere of production for ensuring the flow of required machinery and equipment; making people inside the plant understand the complementarity between machine and man, and also the initial labour-displacing effect of the machine, which requires responsible trade unionism; ensuring training for labourers facing exit by some autonomous institutions and financed by those responding to globalization; initiating educational planning for people out of jobs to make them employable; job guarantee for the employable. "Where workers have confidence in the ability of governments to provide alternative jobs, resistance to change will be substantially reduced" (Wright, 1982). Since production is a reflection of social cooperation, reflected in the plant between labourers of varying skills, in the consensus between people inside the plant and those outside, the state has to initiate the above minimum dimensions of manpower planning. The social structure is always vulnerable, threatened by non-cooperation by people whose stake is the least. Education is a first check to this threat.

Where workers have confidence in the ability of governments to provide alternative jobs, resistance to change will be substantially reduced.

Development of scientific outlook of people and acceptance of high-speed technology by people cannot be ensured by application of force since it involves acceptance of 'new values' (Goldsmith, 1984). What is more difficult is the change in the idea of the elite or the 'ruling idea', because it involves questioning their existing privileges and the legal structure supporting those privileges. The much talked-about 'consensus' in these countries among unequal partners in the distribution of population is a camouflage, an idea circulated by the social strata in power. And the much talked-about empowerment of the people at the bottom layer of the society by 'trickle down' mechanism or 'quota system' is a concealment of their non-participation in the power-structure. If the real intention of the state is not to treat the bottom majority of the people as a group of beneficiaries bracketed in the appendix of the divisible power enjoyed by the elite, educational planning is to be ensured by the state. It involves time. Let us accept time as a vital input in the development of mass culture and improving quality of life to ensure social cooperation and real consensus in the process of decision-making.

While universalization of education is a precondition for the success of globalization, an equitable distribution of education in different phases in ascending order is a utopia.

In general, independent of any global-liberal environment, if a small segment of manpower moves much ahead of the rest of the society, the problem of obsolescence and relative degradation of the larger segment of labourers gets manifested. "In principle, therefore, continuous reeducation is required to offset both deterioration and obsolescence" (Joll, 1983). While universalization of education is a precondition for the success of globalization, an equitable distribution of education in different phases in ascending order is a utopia. Thus emerges the time-space dependent power-differential.

There are two mutually supporting ways to welcome global competitive environment: creating conditions in the national economy today, most effectively by educational planning, to face the global competition tomorrow; incorporating global competition today in the national economy by direct foreign investment or transfer of technology aimed at ensuring competitive environment tomorrow. Techno-globalization incorporating the above rules out minimizing, and at the extreme eliminating, government intervention. This is confirmed by historical experience of countries like U.S., Japan, S. Korea, Taiwan, Singapore, among others (Rosenberg, 1982; Gordon, 1988; Kim et. al 1990).

To conclude then, manpower planning as a prime mover of normative economic development will have to have dual manifestations:

Planning for man: The aim here is to prepare a global man, a man suited to the industrial requirements by the productivity criterion; a man in himself acquiring the power to develop logic that enables him to derive principles from reality.

Planning for industrialization: The aim here is to ensure industrial growth by social consensus, the consensus being derived where man is not disassociated from the process of development.

The principle of economic development by social consensus can be accepted and ensured by the countries in the Third World only when manpower planning in these countries ensures a positive degree of 'State Power' in the process of globalization.

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Feature

Reliability of Liberalisation Policy – A Productivity Oriented Analysis

Sowmyendra Kishore Datta & Utpal Kumar Dey

The Indian economy has since 1947, undergone diverse changes in terms of its economic and industrial policies. The recent trend has been towards rapid liberalisation and relaxation of the various controls and regulations that so long bound the economy to planned efforts and targets. There had been huge outcry that regulated planned economy dominated by the public sector had failed to achieve the desired goals. While this cannot be denied, there also remains doubt as to the desirability of an outright liberalisation policy which seeks to boost up the private sector. This is sought to be analysed in this article by comparing the economic performance of the private as well as the public sector during the last decade and onwards.

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Indian economy, since the dawn of independence in 1947, has progressed a long way, thus crossing over nearly half a century in the current of time. The experiences of the economy during this period has been rather varied and divergent, with different stresses and trends undergone at different times. After centuries of alien domination and subjugation, free India in 1947 inherited almost a fragile industrial base which needed immediate planned efforts to set it in proper order. Hence commensurate with this necessity, Government of India enunciated an industrial policy in 1948 demarcating areas of action to be taken by the public sector as well as the private sector. The public sector was to enter the core sectors with full vigour, the remaining spheres were expected to be covered by the private sector, but under supervision and regulation by the state authority. In matters of foreign collaboration also strict rules and regulations were imposed. Extending the mainstrings of this policy, the Government announced another policy in 1956 which sought to place a major role for the public sector. It was felt that none other than the public sector, could undertake the colossal responsibility of boosting the economy to high scale economic performance. Private sector was not altogether ignored. It was expected that the public sector would play a complementary role not competitive to private sector. However the private sector was still not given full autonomy beyond the restrictive and regulatory measures of the state authority. The main tenets of the 1956 policy was in operation for nearly two decades, before some visible changes in operation for nearly two decades, had to be introduced in 1975. A glance at the relative growth rates during the plan periods till 1975 may help explain the aforesaid changes in the industrial policy. The growth rates in first three plans were 6 per cent, 7.25 per cent and 8 per cent per annum respectively, somewhat below the plan targets. Since then these growth rates have fallen sharply and have also been greatly below the targets of the plans. Manufacturing expanded at an average rate of 6.2 per cent per annum between 1955 to 1965. However the average growth rate

The most important amongst which is the glaring failure of public sector to generate adequate surpluses for reinvestment and a devilish lack of competition due to too many restrictions and controls.

in the following decade (1965 to 1975) was only 3.3 per cent. This marked a sharp deceleration in industrial growth since mid 1960's. A number of hypotheses had been advanced to explain this process of declaration, the most important amongst which is the glaring failure of public sector to generate adequate surpluses for reinvestment and a devilish lack of competition due to too many restrictions and controls. The Company Act of 1951 was so long in vogue and the licensing policy enunciated therein stood as a great hindrance towards full scale mobilisation of private entrepreneurship and expertise. Innovative spirit eventually vanished from the scene and the spectre of unnecessary bureaucratic restrictions and controls loomed large over the potential of the unbridled action of the private sector. Besides these chains of regulations, the managers of public enterprises were left with little innovative spirit and drive. In fact in a developing country like India with a large public sector, managing directors were hardly allowed full autonomy in decision making. Bureaucratic control at every step resulted in redtapism, inordinate delays, leading to inefficiency, lack of capacity utilisation and consequent low productivity.

The trends of deceleration continued unabated until 1975 when some relaxations in controls and major changes liberalising the industrial licensing policy were contemplated. Some 21 industries were delicensed and it also permitted unlimited expansion, beyond the licensed capacity, to foreign companies and monopoly houses and 30 other important industries.

Developments in 1970s

However, the impacts of this new liberalisation policy was short lived since only two years later the central government faced a dramatic change in the shift of power, when in 1977 the Janata Government came to the scene defeating the erstwhile long ruling Congress (I) Government. As a result the economic policies also underwent substantial changes relegating the 1975 policy prescriptions to the background. Any liberalisation policy has a tendency to boost up the growth of the big and large houses and that also mostly in the private sector. It tends to regularise their excess capacity, thus enhancing the economies of scale and creating scopes for modernisation with latest technology and in the process hampering the growth of small and cottage industries. The 1977 industrial policy wanted to reverse this trend when it stated in unequivocal terms,"The growth of large houses has been disproportionate to the size of their internally generated resources and has been largely based on borrowed funds from public financial institutions and banks. This process must be reversed". To check dominance or monopolistic power by any industrial group it was suggested that large houses would in the future have to rely on their own internally generated resources for financing their new projects or expanding existing ones. Contrary to the trends of liberalisation as set out in the 1975 policy, the basic thrust of Janata Government policy was to impose certain restrictions delimiting the spheres of enterprises for large scale and big industries in order to boost up the morale of the small scale sector.

Among the restrictive measures taken for their promotion were (i) Reservation or demarcation of spheres of production, (ii) non-expansion of the capacity of large scale industry and (iii) imposition of a cess on large scale industry. All these measures were listed in the industrial policy of 1956. All that the Janata Government did, was to expand the list of 180 items listed earlier to 807 items. These were intended to be achieved by assigning increasing role to the public sector and enacting restrictive measures to check the growth of monopoly capital.

Industrial Policy during 1980s

However, the changes contemplated in this policy , could only be short lived since another major dramatic change in the political scene shifted the balance of power to the Congress (I) Government in 1980 when the Janata Government suffered a serious set back in the mid term election. Commensurate with this changes in power another industrial policy was announced in 1980 in consonance with the lines of action that were sought to be introduced in 1975 policy. It was necessary at that time to clearly delineate areas of action of small scale and large scale units for achieving production and employment objectives. Instead the Industrial Policy (1980) strengthened the big business and regularised the illegally created excess capacity installed over and above the licensed capacity. Besides that the government also proposed to allow the privilege of automatic expansion of capacity to industries in the first schedule of Indian Industries Act. These were sought to be justified in the name of full utilisation of capacity and maximisation of production. Obviously this trend of liberalisation of capacity was in line with the expectations of the big business houses.

The basic objective of this liberalisation trend was to unshackle the Indian industrial economy from the fetters of unnecessary bureaucratic control,

It can be said that the 1980 policy marked a major change in view towards strengthening the aspects of privatisation, patterns of which were given a boost in the packages of liberalisation enunciated in the 1985 policy by Rajiv Gandhi Government. Particular favour were shown to the large houses in terms of making them free from the provisions of MRTP and FERA. In order to boost up the activities of the private sector, a number of policy changes were introduced by way of relaxation in industrial licensing, export-import policy, technology upgradation, fiscal policy, foreign equity capital, eradication of controls and restrictions, rationalising and simplifying the system of fiscal & administrative regulation. These waves of deregulation and privatisation introduced since the beginning of the last decade, were further strengthened in the enunciation of 1991 Industrial Policy. The decontrolling measures were strengthened in order to ensure a smooth growth of the private entrepreneur and to promote smooth international rapport of our economy. As a result industrial licensing except for a list of 18 industries related to security got completely abolished, MRTP Act was substantially relaxed, automatic approval for direct foreign investment up to 51% foreign equity ownership in a wide range of industries set and in the trade sector a number of protective means were abolished with a view to generating a vibrant export sphere. The basic objective of this liberalisation trend was to unshackle the Indian industrial economy from the fetters of unnecessary bureaucratic control, to introduce liberalisation with a view to integrating the Indian economy with the world economy, to boost up the rate of output growth, to allay the inefficiencies connected with the concept of public sector and to provide major role to private management and workers' initiative and enterprise.

Hence it necessary to bring out a comparative analysis of the functioning of the public sector and private sector in the last decade in order to make an assessment of the trends of liberalisation that has steadily set in since 1980's.

The reliability of liberalisation measures aimed at privatising the economy comes to doubt when we attempt to analyse the domestic economic performance in terms of combined role of both the public and the private sectors and their interconnections.

For this purpose we consider gross domestic product as well as capital formation split into two components – one emerging from the public sector and the other from the private.

Thus let $Y = Y_{pri} + Y_{pub}$

$C_f = C_{f_{pri}} + C_{f_{pub}}$

where Y = Gross domestic product

and C_f = Gross domestic capital formation

Now we know that

$$\Delta Y_{pub} = \frac{\Delta C_f pub}{b} \qquad \text{(i)}$$

where $\frac{1}{b'}$ stands for the multiplier operating in the public sector

$$\text{Similarly } \Delta Y_{pri} = \frac{\Delta C_f pri}{d'} \qquad \text{(ii)}$$

Where $\frac{1}{d'}$ is the multiplier operating in the private sector

But (i) & (ii) can be written as

$$\frac{\Delta Y_{pub}}{\Delta T} = \frac{\Delta C_{f\, pub/\Delta T}}{b'}$$

$$\text{and } \frac{\Delta Y_{pri}}{\Delta T} = \frac{\Delta C_{f\, pri/\Delta T}}{d'}$$

In order to find b and d we consider first two simple regressions in the form –

$$Y_{pub} = A + B\,T \;;\; Y_{pri} = C + D\,T$$

Similarly to find the value of the numerators on the R.H.S. of (1) and (11), we consider

$$C_f\ pub = A' + B'T$$

$$C_f\ pub = C' + D'T$$

$$\text{Now considering } \Delta Y = \Delta Y_{pri} + \Delta Y_{pub}$$

$$= \frac{\Delta C_f pri}{d'} + \frac{\Delta C_f pub}{b'} \qquad \text{(iii)}$$

We can write

$$\frac{\Delta Y}{\Delta C_{f\,pub}} = \frac{\Delta y/\Delta T}{\frac{\Delta C_{f\,pub}}{\Delta T}} = \frac{\frac{\Delta C_{f\,pri/\Delta T}}{\Delta C_{f\,pub/\Delta T}}}{d'} + \frac{1}{b'}$$

$$\text{and } \frac{\Delta Y}{\Delta C_{f\,pri}} = \frac{\Delta Y}{\Delta C_{f\,pri/\Delta T}} = \frac{1}{d'} + \frac{\frac{\Delta C_{f\,pub/\Delta T}}{\Delta C_{f\,pri/\Delta T}}}{b'} + \qquad \text{(iv)}$$

Based on the national income data for the period 1981/82 – 1992/93, the calculated values are found as

$$\Delta Y_{pub/\Delta T} = 2092.372, \quad \frac{\Delta C_{f\,pub}}{\Delta T} = 665.974$$

$$\Delta Y_{pri\,/\Delta T} = 4148.716, \quad \frac{\Delta C_{f\,pri}}{\Delta T} = 779.878$$

So that $b' = .3132$ and $d' = .1879$

putting these values in (iii) and (iv) we get

$$\frac{\Delta Y}{\Delta C_{f\,pub}} = 9.3748 \text{ and } \frac{\Delta Y}{\Delta C_{f\,pri}} = 8.0055$$

The implication is that the total multiplier effect on GDP from a unit rise in capital formation in the public sector is greater than the corresponding effect on GDP from a unit rise in capital formation in the private sector. Thus the direct effect and indirect linkage effect on the counterpart sector in the former case outstrips that in the latter case – implying the balance of efficacy of performance originating from the public sector itself. Hence doubt rises when attempts are made to readily privatise the economy by liberalising the system in lieu of strengthening the functioning of the public sector.

We can also throw light on the efficacy of liberalisation measures in view of relative performance of the private and the public sector on the basis of movements of some other parameters. For instance the trend rates of growth of average productivity of labour, average productivity of capital, capital intensity as well as the labour employed in these two sectors help illuminate us on the necessity of bringing about liberalisation aimed at privatising the economy.

The following Tables illustrates the relative functioning of these two sectors in terms of the aforesaid categories.

Table 1: Public Sector

Categories	Trend rate of growth	Value of t10	
1. Labour Productivity(Y/L)	.032	18.47	significant
2. Capital Productivity(Y/K)	.0189	10.92	significant
3. Capital Intensity(K/L)	.0185	131.75	significant
4. Employment(L)	.0095	17.78	significant

Table 2: Private Sector

Categories	Trend rate of growth	Value of t10	
1. Labour Productivity(Y/L)	.025	30.34	significant
2. Capital Productivity(Y/K)	.0103	6.637	significant
3. Capital Intensity(K/L)	.016	18.88	significant
4. Employment (L)	.0016	2.13	non-significant

Source: Complied from National Statistics Accounts. (various issues)

The above Tables lucidly clarify the superiority of the performance of the public sector in comparison to the private sector. In terms of the growth rates of labour productivities and capital productivities the public sector goes ahead of the private sector. Whereas the productivity of labour and capital rose by 3.2% and 1.9% per annum respectively for the public sector, the corresponding figures for the private sector had been only 2.5% and 1% per annum, thus indicating that the performance of the private sector had not been commensurate with the expectations generated by the policies of liberalisation. In terms of employment characteristics also private sector performed badly where growth rate of employment overtime was at the rate of a meagre .16% per annum. In a labour surplus economy like ours (India), liberalisation measures should never be taken such as would hamper the prospects of generation of employment opportunities. Public sector however served as the area of absorbing part of pressure of the excess population at a steady rate of almost 1% per annum.

So far we tried to shed light on the relative inefficiencies of the liberalisation measures as evinced in the comparative performance of the public and private sector. In matters of foreign trade also, liberalisation policy has not so far been able to make any commendable impact. Trade deficit continued to rise since 1980-81 and despite the fact that imports of POL declined from Rs. 5267 crores in 1980-81 to Rs. 4830 crores in 1983-84 as a sequel to a fall in the international prices of oil and jacking up of the domestic production of crude oil by the ONGC, trade deficit was of the order of Rs. 5891 crores in 1983-84. This is explained by the fact that

the decline in POL imports was more than counterbalanced by a big hike in non-POL imports as a consequence of the policy of import liberalisation. The trend of trade deficit that set in the 6th plan showed hardly any sign of decline during the 7th plan. Policies of indiscriminate liberalisation led to average annual import of amount Rs. 28874 crores, whereas exports averaged to Rs. 18033 crores. This resulted in unprecedented annual average trade deficit of the order of Rs. 10841 crores during the last decade. However although this deficit figures declined somewhat in 1992-93 (Rs. 9687 crores) and further to Rs. 3259 crores (provisional estimates) in 1993-94, there is not much room for complacency, since the provisional estimates are based on DGCI and S data and do not account for the defence imports. Hence, when the RBI figures based on actual shipment of bills would be available, the trade deficit would be a further larger figure. This amounts to underestimating the actual trade gap. Besides this, the lessening of the trade deficit figures during the aforesaid period was largely contributed by two-step devaluation undertaken in 1991. It is not a spontaneous phenomenon. And devaluation is only a short term curative factor – not a permanent solution to evergrowing deficit problem. This necessitates stronger control on the rise of prices in India to avoid the problem of overvaluation of rupees. Again the policy of liberal imports on the pretext of export promotion resulted in increase in imports not only of essential items but also of non-essential imports like colour T.V., VCP etc. thus generating a drain on scarce foreign exchange reserves. Unbridled steps to liberalise industrial as well as import licences should therefore be put on a check keeping in mind the relative inefficient performances of the private sector as well as dismal scenario on trade deficit front. Parities of income distribution are also likely to get disturbed by imprudent and rash policies of liberalisation. For instance most of the benefits of relaxation in taxation and custom duties are likely to be in favour of salaried, middle and high income earners most of whom indulge in consumption of frivolous luxuries. Again the relaxation on MRTP and FERA acts is likely to invite the sucking tentacles of multi-national companies in the domestic periphery which in the ultimate sense help foster neo-colonialist tendencies. The companies goaded by their rapacoius profit motive, bring in capital intensive technologies in their wake, indulge in production of luxury item to cater to the tastes of rich enclaves in the society, thus draining away much of the needed resources that might otherwise have been employed to turn out necessary items commensurate with the need of the majority of the poorer sections in the society. The handful who are fortunate enough to get employment in these companies earn fabulous amounts turning the income distribution to further skewed form. So a labour surplus country can hardly bear the brunts of such outrageous impacts of a wholesale liberalisation policy. Again there remains doubt as to the efficiency of relaxation in the form of withdrawal of subsidies in the fertilizer industry. Many are of the view that this is likely to curtail the purchasing capacity of adequate fertilizer on the part of small farmers and this in turn may have adverse impacts on agricultural production.

So in many ways drastic and hectic step towards liberalisation policy in all major lines of economic sphere is likely to put the engine of the economy off the track of proper and sound all round development. One major argument against this is that rapid step towards liberalisation and privatisation would foster capital intensive development, thus limiting employment prospects and throwing many out of present employment status. This aspect is highly contradictory to the goals of the 8th plan which stresses on creating employment possibilities. Unbridled import liberalisation is also likely to lead the domestic small scale and cottage labour intensive industries to the abyss of closure. This also gives free rein to the multinational companies to import the spare parts and other necessary accessories for their manufacturing from the mother countries, thus discouraging completely the middle order industrialisation processes that might be fostered in the native lands. Liberalisation and privatisation processes cannot be opted out because of their associated benefits but they should be implemented in a phased manner keeping in view the creation of alternative employment opportunities, time to time close monitoring of the processes of changes of major economic parameters, judging the desirability of such changes and if required resorting to the adjustment of these policies in accordance with the needed changes in the parameters.

□

Feature

Perceived Motivational Climate in An Agricultural University

R.K. Talukdar, J. Kalita & A.K. Bhattacharyya

The study conducted with 115 scientists (Faculty of Agriculture) of an Agricultural University in India attempts to measure the perceived motivational climate (both existing and desired) in the University. The six motivational climate considered were achievement, extension, expert power, control, affiliation and dependency. As much as 30.43, and 27.83 per cent of the scientists perceived the climate to be dominated by 'control' and 'dependency' respectively though they desired that the climate should be dominated by 'expert power' and 'affiliation' and 'achievement'. The gap between 'actual' and 'desired' was highest in control, achievement and extension respectively.

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Organisations are social units deliberately constructed and reconstructed to seek specific goals and in turn fulfilling a greater variety of social and personal needs of the employees working in the organisation. As such organisations are attributed with certain physical and socio-psychological characteristics which influence their members and differentiate one organisation from the others. The success of any organisation in getting its employees work towards the fulfilment of the organisational goals depends upon their perception about the organisational environment. This perception may vary from a situation where hard work is recognized and encouraged to a condition where creativity is suppressed and power is worshipped. Amongst different factors, motivation is the most dominant which affects the performance of an individual in the organisation (Litwin & Stringer, 1968; White, 1972; Pareek & Rao, 1981; Jain, 1984). Motivation is that set of attitudes which predisposes a person to act in a specific, goal directed way (Glueck, 1977). There are a number of distinct motivations some dominating or others just existing in the total organisational environment. A study was undertaken to identify the specific type of motivation which is actually dominating the work environment of a university and also what the scientists there really expect.

Methodology

The study was conducted in an agricultural university in India (the name has not been mentioned here for obvious reasons). Which was about 22 years old at the time of data collection. It had earlier been a College of agriculture established just after the Independence. The sample was drawn from amongst the teachers of the teaching, research and extension wings of the university, from both the main station with the post-graduate programme and out-stations. The out-stations consist of different Regional Agricultural Research Stations, Krishi

Vigyan Kendras, training institutes, other research stations and sub stations. However, the study was confined to the Faculty of Agriculture only.

Separate lists of teachers from both the main station and out-stations were prepared along with the date of their entry in the university service. There were altogether 194 teachers in the main station and 97 in the out-stations. A final list was prepared with the names of the teachers who fulfilled the following two criteria:

- Experience of minimum two years in the University.
- Experience of minimum one year in the present place of posting.

The names of the heads of the department, chief scientists, station incharges or administrative heads of different units were deleted and in all 226 teachers constituted this list. Out of these, 206 were contacted randomly for final data collection. Only 140 filled up the questionnaire and 25 questionnaires had to be deleted from coding and tabulation as these were either incomplete or had been filled in incorrectly. The final sample constituted 115 respondents, responses of whom were put to further analysis and interpretation.

Motivational Climate

A motive is an inner state that energizes, activates or moves (hence motivation) and directs or channels behaviour towards a goal. It is also defined as a set of 'attitude's which predisposes a person to act in a specific, goal directed way (Glueck, 1977). Climate is the mental, morale environment or prevailing temper, outlook, set of attitudes of a body of people in respect of some aspects of life policy etc. (New International Dictionary, Vol. I, 1971). Different features of an organisation provide a characteristic pattern to the organisation—a set of measurable properties of work environment, perceived directly or indirectly by the people who live and work in it. According to Litwin and Stringer (1968) perceived organisational climate arouses motivation causing the emergence of behaviour which results in various consequences for the organisation.

A motive is an inner state that energizes, activates and directs or channels behaviour towards a goal.

Motivational climate in the present study, is defined as the general culture of the organisation characterised by the dominant psychological needs which was measured by the motivational climate questionnaire (Pareek & Rao, 1981). The questionnaire consisted of six different motives viz. achievement, affiliation, extension, dependency, control and expert power, and eleven organisational dimensions, viz, orientation, interpersonal relation, supervision, communication, decision making, trust, managing problems, managing mistakes, managing conflict, managing rewards and risk taking. A brief description of different motives and motivational climate is as follows:

Achievement or concern for excellence is emphasis on achieving goals (Pareek & Rao, 1981). Mc. Clelland (1953) defined achievement in terms of "effect in connection with evaluated performance" in which competition with a standard of excellence was paramount. Murray (1938) conceived achievement as the desire to accomplish something difficult, to attain a high standard, and to excel over others. A high need achiever is viewed as ambitious and competitive. Thus, the need for achievement involves a concern over competition and a desire to live upto a standard of excellence. According to Singh and Chand (1989) in achievement climate, excellence in performance is appreciated, seniors supervise the work of juniors with the intent of improving the performance and not fault finding.

Affiliation is concern for friendly, warm, affectionate and personal relationship (Pareek & Rao, 1981). Affiliation is the need to be with others, to please others, and to make close friends. A person high in this need is perceived as being friendly, sociable, affectionate goodnatured. Such an individual performs better in groups than alone.

Extension is a concern for other persons, groups and the society, and helping people in times of need (Pareek & Rao, 1981). Singh and Chand (1989) concluded that extension climate it concerned with the growth of people. In this climate, the employers maintain good relations and treat the individuals as human beings and not as role players. Employees try to help each other and seniors help juniors so that they grow and advance.

Dependency is an orientation to look for suggestions, help and solutions from seniors, and to refer matters to them rather than attempting on one's own (Pareek & Rao, 1981). According to Singh and Chand (1989), in this type of climate people are dependent upon the directives or instructions from the higher authority. Employees here perform their duties and

devote their entire time to completing routine tasks. They lack initiative and dynamism.

Control or need for personal aggrandisement and consolidation of one's own power (Pareek & Rao, 1981) is the desire to control and influence other people. Individuals high in this need are perceived as forceful, assertive, decisive, and authoritative (Murray, 1938). According to Singh and Chand (1989), in control climate, people enjoy status, power and authority. The powerful people dominate over others. In this climate, colleagues lack mutual trust and are less concerned with the accomplishment of organisational goals.

Expert power is a concern for achieving goals or organisational good through expertise and its influence on the system (Pareek & Rao, 1981). According to Singh and Chand (1989) in expert power climate, experts get more respect from the individuals of the organisation. This type of climate provides encouragement to an individual for his knowledge and skills. Experts are supposed to be influential in decision making, resolving conflicts and solving problems.

The independent variables selected for the study were age, education, level of aspiration, job involvement and attitude towards the university. Age was the chronological age of the respondents rounded off to the nearest years. Education was possession of M.Sc. or Ph.D. degree in the concerned discipline. Scores given were '1' for M.Sc. and '2' for Ph.D. degree. Level of aspiration was the goal statements for future attainment (Muthaya, 1971) and was measured with the help of Kilpatrick and Cantrill's (1960) "Pictorial self anchoring ladder scale". Job involvement was the degree to which a person is identified psychologically with his work or the importance of his work in his total self image (Lodahl & Kejner 1965). It was measured with the scale developed by Lodahl and Kejner, (1965). Out of 20 items in the scale, only 17 with 't' 1.25 were selected for the final job involvement scale after items analysis by Summated Rating Method (Edward, 1957). Attitude towards the university was measured with the scale developed by Laharia and Talukdar (1986) with slight modifications to suit the organisation under study. The reliability was high (r_{tt} = 0.83).

The categorization of the variables was done by cumulative cube root frequency (cum 3 f) method.

Results & Discussion

Table 1 provides information on the distribution of teachers in different categories of motivational climate—prevailing and desired. The data shows that the respondents were nearly similarly distributed in all the three categories of achievement climate, both in actual and desired with the majority belonging to the medium

Table 1: Distribution of Respondents on Different Categories of Perceived Motivational Climate (actual and desired)

Motivational Climate	Categories	Actual		Desired	
		Number	Percentage	Number	Percentage
	Low	21	18.26	20	17.39
Achievement	Medium	73	63.48	69	60.00
	High	21	18.26	26	22.61
	Low	31	26.96	33	28.70
Affiliation	Medium	61	53.04	53	46.08
	High	23	20.00	29	25.22
	Low	21	18.26	15	13.04
Extension	Medium	76	66.09	87	75.65
	High	18	15.65	13	11.31
	Low	22	19.13	26	22.61
Dependency	Medium	61	53.04	64	55.65
	High	32	27.63	25	21.74
	Low	26	22.61	19	16.52
Control	Medium	54	46.96	67	68.26
	High	35	30.43	29	25.22
	Low	30	26.09	20	17.39
Expert power	Medium	69	60.00	62	53.91
	High	16	13.91	33	28.70

Table 2: Mean Scores on Different Motives (actual)

Sl. No.	Motives	Mean	Values					
			A	B	C	D	E	F
1.	Achievement (A)	3.14	–	4.25*	0.71^{NS}	7.74*	4.60*	5.60*
2.	Affiliation (B)	9.59	–	–	4.36*	3.69*	5.05	0.44^{NS}
3.	Extension (C)	3.10	–	–	–	8.14*	4.68*	5.51
4.	Dependency (D)	3.87	–	–	–	–	2.20*	4.25*
5.	Control (E)	3.66	–	–	–	–	–	4.34*
6.	Expert Power (F)	3.55	–	–	–	–	–	–

* Significant at P = 0.05
NS = Non-significant.

Table 3: Mean Scores on Different Motives (desired)

Sl. No.	Motives	Mean	Values					
			A	B	C	D	E	F
1.	Achievement (A)	4.18	–	11.85*	0.84*	7.92*	26.46*	2.67*
2.	Affiliation (B)	3.14	–	–	11.46	5.59*	9.40*	11.22*
3.	Extension (C)	4.12	–	–	–	7.77*	23.12*	4.30*
4.	Dependency (D)	3.54	–	–	–	–	25.96*	6.51*
5.	Control (E)	2.02	–	–	–	–	–	–26.93*
6.	Expert Power (F)	4.00	–	–	–	–	–	–

* Significant at P =0.05

category. There was a slightly higher proportion of respondents (22.61%) in high category (desired) against 18.26 percent (actual) in the same category. Similar trend was also observed in the case of affiliation climate. A majority of the respondents were in the medium category of extension climate (actual and desired). Against this only 11.31 per cent were in the high category of desired extension climate.

In case of dependency climate, majority were in the medium category, both actual and desired, with a slightly higher proportion (27.83%) in the high category of actual climate against 21.74 per cent in the same category of desired climate. The distribution of respondents in the low category of control climate (desired) was low (16.52%) against a slightly higher distribution (22.61%) in the actual control climate. Similar trend was observed in the high category also.

As regards expert power, majority were in the medium category, both in actual and desired climate. But a higher proportion of respondents (28.70%) were in the high category of desired climate against 13.91 per cent in the actual climate of the same category.

Mean Scores on Different Motives

Table 2 presents the mean scores on different motives (actual) and also the 't' values of mean differences between the motives.

It is observed that dependency was the most dominant motive ($\bar{x}$ = 3.87) followed by Control ($\bar{x}$ = 3.66), affiliation ($\bar{x}$ = 3.59), expert power ($\bar{x}$= 3.55) and extension ($\bar{x}$ = 3.19). Achievement was the least dominant motive ($\bar{x}$ = 3.14) prevailing amongst the respondents. Further, 't' test of significance of mean differences reveals that there were significant differences in teachers' perception between various motives except between 'achievement' and 'extension' and between 'affiliation' and "expert power".

Table 3 shows that achievement was the most dominant ($\bar{x}$ = 4.18) motive (desired) while Control was least dominant ($\bar{x}$ = 2.02) motive (desired). The mean scores of other motives (desired)were 4.12, 4.00, 3.54, and 3.14 for extension, expert power, dependency and affiliation respectively. All the 't' values were also significant except between achievement and extension.

Table 4: Gap Between the Mean Scores in Motivational Climate (actual and desired)

Sl. No.	Motives	Actual	Desired	Gap	Percent* increase decrease
1.	Achievement	3.14	4.18	1.04	33.12
2.	Extension	3.19	4.12	0.93	29.12
3.	Expert Power	3.55	4.00	0.45	12.68
4.	Dependency	3.66	2.02	–1.64	–44.81
5.	Control	3.59	3.14	–0.45	12.53
6.	Expert Power	3.87	3.54	–0.33	–8.53

* The negative value indicate a decrease in mean score of 'desired' from the 'actual'.
* The per cent increase or decrease of scores in 'desired' was calculated over the 'actual'.

It is clear from the above observations that the teachers expected a climate characterised strongly by dominance of achievement, extension and expert power in that order though in reality the climate was characterised by the dominance of dependency, control and affiliation in the given order.

The teachers expected a climate characterised strongly by dominance of achievement, extension and expert power though in reality the climate was characterised by the dominance of dependency, control and affiliation.

Gap Between 'Actual' & 'Desired' Motives

The gap between the mean scores on different motives was calculated by subtracting the scores of a particular motive (actual) from the desired scores of the same motive. When the 'desired' score was less than the actual score, it was accepted as a negative gap. The respondents' desire for a change in the intensity of motives prevailing in the climate was calculated by the per cent increase or decrease of scores in 'desired' over the 'actual'. The results are presented in table 4.

The data reveals a positive gap in achievement, extension and expert power motives. Negative gap was observed in case of control, affiliation and dependency motives. The findings clearly show that the respondents desired dominance of motives like achievement, extension and expert power at the same time emphasising less on control, affiliation and dependency. The gap was highest in case of control (–1.64) and lowest in dependency (–0.33).

The maximum decrease was observed in case of control motivational climate (–44.81%) followed by affiliation (–12.53%) and dependency (–8.53%). The respondents definitely perceived that conditions dominated by mistrust, lack of concern for achievement of organisational goals and domination of one group over other people's actions should no more exist. They also wanted that there should be less emphasis on friendly and personal relationship so far as achievement of organisational objectives are concerned and one should be allowed to attempt on one's own rather than the seniors always suggesting to the juniors about what to do even in simple matters.

The results show an increase in achievement (33.12%) motive. This reflects the respondents' desire for a climate where a person achieving excellence is appreciated and encouraged and superior officers stop findings faults, and supervise with the aim of bringing about improvement in the performance of the juniors. As regards extension motive, the increase was 29.15 per cent which stressed the need for improvement in mutual help for each other for the growth of the organisation. They also emphasised expert power (12.68% increase) revealing that the respondents desired a climate where expertise is recognised.

Summary & Conclusion

In the university under study, the percentages of scientists in the high category of desired climate in the motives of expert power, achievement and affiliation were higher compared to the same category under the actual climate. On the other hand, the percentages of scientists in low category (desired climate) in the three motives mentioned were lower than those in the actual climate. The mean scores of all the motives (actual) differed from one another except achievement and extension, and affiliation and expert power. In case of all the motives in

desired climate, the mean scores differed from one another. Dependency, control and affiliation were the most dominant motives in that order prevailing at the time of interview. But the scientists desired achievement, extension and expert power to be the dominant motives in the university environment. Their highest desire for change was observed in the case of control followed by achievement and extension. While they desired less stress on control they desired more stress on achievement and extension.

In a University, scientists' productivity is dependent on a number of factors – the most important of them being the environment. So, it is important for the administration to conduct periodic surveys to determine the type of motives which are dominant at a certain point of time and then take necessary steps either to encourage the growth of certain motives of discourage others detrimental to increased productivity. In the present case, the administration should take necessary steps to create an environment dominated by achievement, extension and expert power motives as desired by the scientists working there and discourage such activities which increase control or the degree of affiliation motive or the dependency tendency amongst scientists.

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Feature

Productivity & Economic Efficiency of Major Crops in Tamil Nadu

T.R. Shanmugam

Productivity and economic efficiency of crops differ across the production environments. The economic efficiency of irrigated crop production can be improved by technology and resources applied. The major crops considered for the present study are rice, sugarcane, groundnut and cotton. The results have shown that rice possibly fared well under canals and system tanks, sugarcane under wells inside surface command, groundnut under non-system tanks and cotton under wells outside surface command.

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Canals, tanks and wells are the principal sources of irrigation in Tamil Nadu. During the five year plans, the government focussed mainly on major and medium surface irrigation projects and groundwater development. Irrigated areas of major crops have responded to price policies complemented by other non-price measures such as irrigation investment, infrastructure, research and extension. Productivity and economic efficiency of major irrigated crops differ across the sources, influenced by the level of technology and resources applied in the production process. Progress in water resources development in the future will depend upon the utilization of the existing irrigation potential by way of increasing the productivity and economic efficiency of the major crops grown in these sources. Hence the focus of the present study will be to assess the productivity and economic efficiency of major irrigated crops viz., rice, sugarcane, groundnut and cotton under different irrigation sources.

Progress in water resources development in the future will depend upon the utilization of the existing irrigation potential by way of increasing the productivity and economic efficiency of the major crops grown in these sources.

Methodology

The present study was undertaken in Tamil Nadu covering all sources of irrigation. The sources considered in the present study are canals, system tanks, non-system tanks, wells inside surface command and wells outside surface command. System tanks are tanks which are linked to river basins. These tanks are supplied with continuous flow of water by the canals. Nonsystem tanks have their own catchment

areas and depend on monsoon rainfall for storage. These tanks are not linked to river basins. Wells inside surface command are recharged through percolation and seepage from surface irrigation. Wells outside surface command have to depend on monsoon rainfall for recharge.

Time series data on all the sources were collected for the period from 1960-61 to 1989-90. Productivity analysis was followed to estimate crop productivity by source and to measure the allocative efficiency of irrigation sources in producing major irrigated crops. This analysis also would find out the type of crops to be grown in a particular source. Because yields are available only by crops and not by source, the dependent variables in the productivity models are aggregate output by crops in the irrigated agriculture. The aggregate crop output is available from statistical records published by the state department of agriculture and depends on the composition of sourcewise irrigated acreages, chosen to produce each particular crop. The basic regression model is as follows:

$$Y_i = \beta_0 + \beta_1 \text{ canal} + \beta_2 \text{ system tank} + \beta_3 \text{ non system tank} + \beta_4 \text{ well inside command} + \beta_5 \text{ well outside command} + e_1$$

where Y_i stands for aggregate crop output that is available in the statistical records. The crops selected are rice, sugarcane, groundnut and cotton as these crops are major irrigated crops. Each crop will have a separate production function. Canal denotes area of crop under canal irrigation. It was likewise for the other sources. System tank and non system tank refer to area of crop under system tank and non system tank irrigation. Well inside and well outside denote crop area under these sources respectively. β_0 refers to constant term and β_1 to β_5 are the marginal productivity of the respective source. The units of measurement of marginal products are as follows:

Rice in terms of paddy tonnes per hectare
Sugarcane in terms of cane tonnes per hectare
Groundnut in terms of pods tonnes per hectare
Cotton in terms of lint quintals per hectare.

This model measures the source productivity directly. This estimated production function was converted into a deterministic and probabilistic frontier function using linear programming techniques. This probabilistic function was further used to measure the inter-source allocative efficiency for each crop.

Estimation of Productivity by Source

The estimated OLS function portrayed the average response and the frontier functions described the maximum possible productivity of crops in each source. The OLS estimates are given in table 1. In the case of rice, the marginal productivity was higher in system tank and was estimated at 3.87 tonnes per hectare. In the canal source, marginal productivity of rice ranked second (next only to system tank) which was 3.52 tonnes per hectare. The result confirmed the fact that system tanks have improved the water management practices for rice, resulting in higher yield. In the case of sugarcane, the marginal productivity was higher in wells inside the command and was estimated at 126.73 tonnes per hectare. Sugarcane performance which was higher under wells inside the command irrigation might be due to copious

System tanks have improved water management practices for rice, resulting in higher yield.

water supply at critical stages (protective role) and the complementary effect (productive and interactive roles) of well water along with other inputs. Total water requirement of sugarcane was higher (250 cm) than other crops and sugarcane required water throughout the year. Hence wells inside surface command suited sugarcane cultivation. The poor performance of other sources might be due to the scarcity of water particularly in the later stages of crop growth. In the case of groundnut, the estimated marginal productivity was higher under non-system tanks (1.95 tonnes of pods per hectare). As groundnut requires moderate water supply without salinity and water logging, non-system tanks and wells outside the command suited it better than the canal which was not so good due to drainage and water logging problems. The marginal productivity of groundnut was worked out to be 1.74 tonnes per hectare under wells outside the surface command. In the case of cotton, the marginal productivity was higher under wells outside the surface command with 4.26 quintals of lint per hectare. As this crop required

As groundnut requires moderate water supply without salinity and water logging, non-system tanks and wells outside the command suited it better than canal.

Table 1: Estimation of Productivity of Crops by Source

Crop	Analytical Approach (sample size)	Dependent Variable: Aggregate Crop Output						R-Square
		Constant	Canal	System tank	Non-system tank	Well Inside	Well Outside	
Rice	OLS (30)	245.3681	3.5246	3.8752	2.9413	3.0785	2.5418	0.6952
		(1.7459)	(4.1397)	(5.2463)	(2.6805)	(2.8461)	(1.3769)	
	(Deterministic (30)	253.5487	3.6152	3.9465	2.9508	3.2495	2.6351	
	Probabilistic (28)	254.6392	3.5748	3.9278	2.9647	3.2687	2.5783	
Sugarcane	OLS (30)	836.4207	108.2485	89.5632	76.8143	126.7259	83.5497	0.7234
		(0.8954)	(2.9374)	(2.5467)	(1.9657)	(3.5846)	(2.3681)	
	Deterministic (30)	845.2346	112.3596	91.7453	78.4206	134.6582	87.6346	
	Probabilistic (29)	843.6208	109.5684	92.8361	78.5134	135.4793	85.9452	
Groundnut	OLS (30)	964.5288	1.2397	1.5832	1.9547	1.3945	1.7356	0.6491
		(1.4273)	(0.8546)	(2.7614)	(4.2386)	(1.9836)	(3.4209)	
	Deterministic (30)	975.3124	1.2658	1.6245	1.9652	1.4369	1.7467	
	Probabilistic (28)	972.4358	1.2794	1.6379	1.9873	1.4205	1.7598	
Cotton	OLS (30)	457.6392	2.9453	3.4872	4.1642	3.O946	4.2579	0.5389
		(2.1034)	(1.8672)	(2.6391)	(2.9531)	(2.4257)	(3.8416)	
	Deterministic (30)	461.5487	2.9671	3.5806	4.2794	3.1789	4.3085	
	Probabilistic (29)	459.6302	2.9684	3.5274	4.2852	3.1502	4.3296	

Figures in parentheses below the OLS estimates are 't' statistics

moderate water supply (60 cm) without salinity and alkalinity, drainage and water logging, wells outside command suited cotton cultivation.

The OLS function has been transformed into a deterministic frontier using linear programming techniques. The deterministic function reflected the maximum possible productivity of crops in each source. In all the crops' equations, the constant term in the deterministic function was greater than that estimated by the OLS method. In addition, many of the slope coefficients in the deterministic function have also improved. Thus, compared with the OLS model, the deterministic function shifted vertically along with shifts in the intercept and slope of the production function. Since the outliers in the deterministic approach affected the results, it could be converted into a probabilistic frontier function. This approach ignored outliers (extreme observations) until the estimated coefficients were stabilised. Therefore the probabilistic model was further used to estimate economic efficiency.

Measurement of Economic Efficiency

Technical, allocative and economic efficiencies were calculated using probabilistic functions (table 2). The average technical efficiency had ranged from 0.73 in groundnut to 0.85 in rice. This indicated that there existed a 15 and 27 per cent potential for increasing the crop yield in rice and groundnut respectively at the existing level of their areas under different sources. The higher technical efficiencies for rice (0.85) and sugarcane (0.81) were due to technological developments in these two crops viz., high yielding varieties, and application of modern inputs such as manures and fertilizers which complement with water. Overall allocative efficiency was the highest in sugarcane followed by rice, groundnut and cotton. Allocative efficiency in canal irrigation had contributed more for the overall allocative efficiency in rice. This result confirmed the fact that rice would be more productive under canal irrigation. Allocative efficiency in the system tanks was also higher for rice than other crops. This fact might be attributed to the nature of the production environment, water management technologies and the copious water supply in the canals and system tanks meeting the water requirement for rice. Allocative efficiency in the wells inside command had been higher for sugarcane. This fact might be attributed to the controlled water supply in this mode to meet the water requirement of sugarcane throughout the year. Allocative efficiency in the non-system tanks was higher for groundnut. As this source depended on monsoon rains for catchment, groundnut could be cultivated with higher economic returns under the non-system tanks than other sources. Allocative inefficiency in non-system tank was higher for sugarcane and rice. This might be due to the rigidities implicit in

Table 2: Sourcewise Efficiency Coefficients for Selected Crops

Type of efficiency	Rice	Sugarcane	Groundnut	Cotton
Technical	0.8469	0.8107	0.7296	0.7634
	(0.1236)	(0.0974)	(0.0695)	(0.0942)
Allocative-overall	0.7034	0.7142	0.6985	0.6592
	(0.0513)	(0.0784)	(0.0892)	(0.0784)
Allocative-canal	0.7543	0.7396	0.6405	0.6219
	(0.0817)	(0.0961)	(0.0823)	(0.0935)
Allocative-system tank	0.7684	0.7149	0.7089	0.6831
	(0.0926)	(0.0762)	(0.0942)	(0.0592)
Allocative-non-system tank	0.6935	0.6836	0.7852	0.7163
	(0.1245)	(0.1157)	(0.1298)	(0.1085)
Allocative-well inside	0.7308	0.7452	0.6955	0.6749
	(0.0962)	(0.0951)	(0.0843)	(0.1203)
Allocative-well outside	0.6826	0.7265	0.7284	0.7598
	(0.1149)	(0.1392)	(0.1358)	(0.1247)
Economic	0.5957	0.5790	0.5096	0.5032
	(0.1386)	(0.1269)	(0.1478)	(0.1649)
Number of years	30	30	30	30

Figures in parentheses are standard errors

the non-system tanks to supply adequate quantity of water needed at critical stages. Allocative efficiency in the wells outside surface command had revealed the suitability of cotton under wells outside the command. This mode did not have the problems of salinity, water logging and drainage and so cotton would be ideally suitable for wells outside command.

Economic efficiency had ranged from 0.05 in cotton to 0.60 in rice. This means that there existed 50 per cent potential for increasing cotton yield in all sources of irrigation by removing technical and allocative inefficiencies. The allocative inefficiency of cotton was observed higher in canal and it needed proper attention in this mode. Possibly, canals have had the problems of water logging and poor drainage contributing to the lower allocative efficiency of cotton in canal systems. Also rice had been the main crop under canals as the water allocation pattern in the first season (July-Oct) coincided with the rainfall period.

There existed 50 per cent potential for increasing cotton yield in all sources of irrigation by removing technical and allocative inefficiencies.

Economic efficiency of groundnut had shown that productivity of groundnut could be increased by 49 per cent. Groundnut also needed proper attention in canals as this mode contributed more to allocative inefficiency. The poor performance of groundnut in canals might be due to the poor drainage, salinity, alkalinity and water logging in the canal environment. Economic efficiency of sugarcane had revealed that productivity of sugarcane could be increased by 42 per cent. Sugarcane needed proper water management in non-system tanks to remove the allocative inefficiencies since scarcity of water was higher in this mode particularly at the later stages of the crop growth. There existed a 40 per cent potential for increasing rice output. Allocative inefficiency of rice was highest in wells outside as well as under non-system tanks. Rice needs proper water management in these sources as these modes face the problems of water scarcity. The economic efficiency measures had confirmed the results of the productivity analysis about the suitability of rice in canals and system tanks, sugarcane in wells inside the command, groundnut in non-system tanks and cotton in wells outside the command.

Determinants of Economic Efficiency

Once the economic efficiency is determined using the frontier production function, it is important to study the

Table 3: Determinants of Economic Efficiency

Explanatory Variable	Dependent Variable: Economic Efficiency Measure			
	Rice	Sugarcane	Groundnut	Cotton
Technology				
Proportion of crop area irrigated by canals	0.0687**	0.3275**	0.0243	0.0357
	(3.2591)	(3.0641)	(1.5967)	(1.6275)
Proportion of crop area irrigated by system tanks	0.0295	0.0689	0.1261	0.1952
	(2.4082)	(1.7564)	(2.4314)	(2.6528)
Proportion of crop area irrigated by non-system tanks	0.0096	0.0047	0.5786**	04672**
	(1.2476)	(1.0742)	(4.6219)	(3.5294)
Proportion of crop area irrigated by wells inside command	0.0084	0.4396**	0.1524	0.1732
	(1.3615)	(3.7521)	(2.6541)	(2.5236)
Proportion of crop area irrigated by wells outside command	0.0069	0.0974	0.4162**	0.5391**
	(1.4257)	(1.8164)	(3.8239)	(4.6519)
Resources				
Fertilizer applied	0.0047**	0.0043	0.0032	0.0035
	(2.8673)	(2.1453)	(2.1345)	(1.9341)
Pesticide used	0.0035	0.0009	0.0042	0.0652**
	(1.2736)	(0.8530)	(2.5342)	(2.8345)
Intercept	0.0283	0.0691	0.0384	0.0185
R-Square	0.6897	0.7145	0.5917	0.5209
No. of years	30	30	30	30

Figures in parentheses are 't' statistics
** Significant at one per cent level

determinants of efficiency with which these crops are produced. The results of economic efficiency measures revealed that there existed a high production gap in all crops between frontier and average production. This gap could be explained by incorporating proper technology and resources used as explanatory variables. Sourcewise proportion of crop area irrigated had been included as technology variable to indicate the importance of the composition of techniques, chosen in the earlier planting decisions, in the determination of allocative and technical efficiency and thereby overall economic efficiency. Technical efficiency also had been influenced by the amount of fertilizer and pesticides used during the production period. Hence current fertilizer applied (NPK-kgs per hectare) and pesticide used in kgs per hectare were included as resources in the equation. As expected, given the high yielding modern varieties, fertilizer and pesticide application would shift the production function upward. The cropwise results of the OLS estimates are presented in table 3.

All equations have higher R-Square values and fitted the data well. In the rice equation, the proportion of rice area irrigated in canal as technology variable has higher impact on the economic efficiency. This might be due to the fact that the productivity of rice has been relatively greater in canal and the canal has also been allocatively efficient in rice cultivation. Given the high yielding varieties of rice and modern technology, fertilizer usage during the production process has shifted the production function of rice and increased the technical efficiency and thereby the economic efficiency.

In the case of the sugarcane equation, coefficient of the variables, proportion of the area irrigated in canal and proportion of the area irrigated in wells inside the command were positive and significant. These technology variables indicated the importance of the composition of the sources chosen for sugarcane planting in the determination of the overall output and economic efficiency of the crop. In the case of groundnut, the proportion of crop area irrigated in non-system tank and the proportion of area irrigated in wells outside the command were significant variables. As expected, the performance and productivity of groundnut were better in non-system tanks and wells outside the command and these sources were also allocatively efficient in groundnut cultivation. The economic efficiency of cotton had been influenced by the proportion of the area irrigated in non-system tanks and the pesticide used. It might be recalled that an increase in the availability of pesticide significantly increased the area allotted to cotton. Given the higher yields of modern varieties of cotton, the overall economic efficiency would increase as

more inputs were applied. Wells outside tanks command and non-system could have conducive production environment for cotton cultivation and so these sources were allocatively and technically efficient for cotton production.

To summarise, the results had shown that rice possibly suits canals and system tanks, sugarcane is good under wells inside the command, groundnut under non-system tanks and cotton under wells outside surface commands.

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Feature

The Role of Agricultural Extension: The Changing Strategies

C.P.O. Obinne

Extension services play a primary role in the dissemination of information on improved agricultural practices and innovations. The article traces the origin and development of agricultural extension and affirms the need for intensive farmer involvement for success.

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Food scarcity, low quantity and quality of food as well as fibre have continued to devastate many a nations' human resources. Malnutrition, underfeeding and associated conditions are causing the death of children and adults alike. The concern of governments, individuals and organisations are mounting daily as to the method of eliminating hunger and poverty among the teeming population. !n examining solutions to the problems of food and fibre production, Olayide (1975) lists the components of this effort to include the magnitude and ownership of agricultural resource inputs, the technology embodied in the inputs, credit distribution, the structure of marketing services, the dissemination of information on improved practices and/or innovations, and so on. The implications for an agricultural policy to address the food problems are improvement in the generation of knowledge relevant to agriculture and ensuring its effective dissemination.

Since the gravest and primary needs of rural communities are human capital and capital funds, closely followed by adapted technology, Olayide suggests that efforts have to be directed to how information flows to rural communities as well as how the societies can obtain useful information on new technology from the outside world in easily digestible forms. Agricultural extension services play a major role in this process.

Agricultural extension encompasses services which assist farm people, through educational procedures, in improving farming methods and practices, increasing production efficiency and income, bettering their levels of living, and lifting the social and educational standards of rural life (Bardsley, 1982).

Farmers have to be assisted to develop a frame of mind and attitude conducive to acceptance of new technology in addition to changing their knowledge and skills in farming. There is a pool of knowledge which resides in the farmer as a practitioner. The

Agricultural extension encompasses services which assist farm people, in improving farming methods and practices, increasing production efficiency and income and lifting the social and educational standards of rural life.

function of extension is to transfer and nurture this knowledge within the rural industry. Extension embraces all those who contribute knowledge or transfer it to farmers. The objectives of agricultural extension are to communicate to the social system advice and assistance on technical agriculture with due consideration to the social and economic conditions of the people.

History

The historical origin of agricultural extension dates back to the Renaissance when there was a movement to relate education to the needs of human life and the application of science to practical affairs (Swanson, 1984). Itinerant teachers were first employed to improve agriculture in North America in 1843 through public lectures. The actual use of the term "extension" originated in England in 1866 with a system of university extension which was taken up first by Cambridge and Oxford Universities. In 1873, Cambridge University used "Extension education" to describe this particular educational innovation, with the objective of taking the educational advantages of universities to ordinary people. Itinerant practical instructors were made to work among smallscale, peasant farmers in the areas worst affected by the potato famine which hit Ireland in the mid-19th century. In the Third World Countries, agricultural extension organisations were set up mainly after the Second World War. In Africa, extension started mostly in the 1960s and 1970s (Obinne, 1994).

The Hatch Act passed by the United States Congress in 1887 made funds available for the land-grant colleges to establish agricultural experiment stations. However, it was discovered that the results of the scientific investigations by these stations were not used by many farmers. With the passage of the Smith-Lever Act on May 8, 1914, the land-grant colleges were directed to aid in diffusing useful and practical information on agriculture and home economics. They were also to encourage the people to apply the information through publications and field demonstrations (Sanderson, 1942).

Philosophy of Extension

Today, all over the world, the policy and objectives of extension remain the same – achieving efficiency; conservation and wise use of natural resources; efficient farm management; family welfare; social and economic improvement of the community and extension per se. Extension bridges the yawning gap between the farmer and the research station.

Extension bridges the yawning gap between the farmer and the research station.

It cooperates with many other social organisations including educational, marketing and health services as well as government departments. Extension activities are also based on the principle of economic necessity. The farmer wants to make profit out of his farming activity so that he could finance his family and social commitments. It is through the adoption of improved techniques and practices that the farmer can increase his output and income.

Extension policy also concerns the belief that improvement can be made in the home by arousing the interest of the farmer's family in particular extension programmes such as nutritional requirements which would necessitate the growing of varied crops and animal raising. Extension education is based on democratic principles and anticipates changes because its objectives are believed not to be static.

Agricultural extension is a voluntary, democratic and cyclic process involving a heterogenous group but no fixed curriculum.

Characteristics of Extension Programmes

As an educational process, extension work involves:

- Working with rural people along the lines of their immediate and felt needs and interests
- Conducting worthwhile and acceptable activities in the spirit of cooperation and mutual respect between the extension worker and the rural people

- Utilizing supporting activities to bring extension work and extension staff up-to-date through training and conferences
- Utilizing selected teaching techniques in attaining the educational objectives of extension (Obibuaku, 1983).

Agricultural extension is a voluntary, democratic and cyclic process involving a heterogenous group but no fixed curriculum (Obinne, 1994). Extension education promotes the practical application of useful information to help farmers and their families analyze their problems. It is practical and fills a need recognized by the people it is designed to serve. No compulsion is involved in its acceptance. It is flexible and comprehensive in order to meet ever-changing conditions. It is future-oriented and forward-looking in addition to meeting the immediate needs of the rural people. Thus, extension programmes are designed to make a continuing contribution to rural development.

Extension programmes are designed to make a continuing contribution to rural development.

Role in National, Social & Economic Development

The primary objective of extension programming and teaching is to help each individual, each family and each community achieve the highest level of living that it is capable of, socially, economically, aesthetically and morally by means of aided self- help through education (Maunder, 1972). Agricultural extension services ensure a transformation of the national economy through the promotion of rapid acceptance and utilization of improved farm technologies. An effective agricultural extension system, (Olayide & Ogunfiditimi, 1980) will:

- Transform subsistence production to commercial and market-oriented production system
- Ensure an optimum combination of farm enterprises conducive to dynamic maximization of farm incomes
- Facilitate efficient allocation of farm and non-farm resources through better knowledge situations
- Necessitate effective decision-making and managerial efficiency
- Provide efficient and usable information and training systems that facilitate a meaningful organisation of farm production and distribution given the dynamics of the rural ecosystem.

The extension service helps rural farm families in the application of scientific and technological innovations to the daily routine of farm and non-farm as well as domestic operations.

In performing its numerous roles, there is need for a viable linkage between extension and farm families. The extension service, among others, communicates the results of agricultural researches to farmers and also refers farmers' operational problems to the researchers for solutions. No other agency is better equipped to ensure the effective application of research results related to agriculture than the extension service.

The job of extension is not an easy one. It has to convert the numerous scientific discoveries and technologies into production accomplishments and then use them as an instrument of economic growth and social change. It has been suggested that the desired change would depend to a great extent on the speed with which the innovations and technologies are made available from their sources to the ultimate unit of their utilization so that the users clearly understand, accept and apply the innovations in their daily practices (Singh, 1981). It must be stressed that a large number of innovations in farming are being released and are being communicated to farmers by different means and agencies. Yet, such efforts have not been as rewarding as they should be, given the continued insufficient knowledge or its lack, poor understanding, absence of skill, and sometimes negative attitude towards change or innovation.

The job of extension is not an easy one. It has to convert the numerous scientific discoveries and technologies into production accomplishments and then use them as an instrument of economic growth and social change.

Strategies utilized by the extension service to ensure effective delivery of messages operate within three distinct systems, namely the research, linking, and client systems (table 1).

The special place of the extension service can readily be noticed in the table which explains the communication patterns among the three systems.

Table 1: Methodology of Extension Services

Research System	Linking System	Client System
Universities Research institutes	Extension services other organisations	Members of social system, farmers, other members.
Inventors Scientists	Change agents input manufacturers, bankers, etc.	Input manufacturers, bankers, etc.
Basic and applied research produce and develop new knowledge, innovations, etc.	Processing, Communicating and promoting new innovations. Feedback of farmers' needs, problems	Adoption of innovations for economic and social change

Source: Singh (1981)

Need for a New Strategy

Traditionally, extension has been based on a model of knowledge delivery whose dominant methodology is aimed at individual clients. According to Oakley (1994), the services stress the organisation of the delivery system, the generation of technical messages and their communication to farmers. The objectives of extension are usually reflections of government policy.

In the past decade, national extension services have become heavily dependent on the Training-and-Visit (T&V) method as a basic operational mode. This method reinforces the traditional extension approach but does not allow genuine farmer participation to get in the way of achieving coverage or targets. Client (farmer) participation is not a routine practice in the majority of extension organisations. Popularized in the mid-1970s as a method of achieving rapid dissemination of Green Revolution technologies in the Third World during the 1970s, the Training-and-Visit (T&V) system was introduced in many developing countries with the help of massive donor funding. Though input-intensive, requiring significant increases in the number of extension staff and their re- training, Rouse (1994) observes that its systematic, and disciplined approach offers considerable improvements over traditional extension methods. T&V provides a mechanism for farmer involvement in the extension process, something traditional approaches lacked.

Rouse reports that dramatic increases in per capita cereal output in countries like the Philippines, India and Pakistan seemed to confirm T&V's effectiveness. But doubts soon arose as follow-up studies indicated that T&V was much better at channelling extension to large and middle-sized growers than reaching small-scale or tenant farmers. While T&V encouraged more farmer participation than other extension methods, critics have argued that it was too narrowly focussed on a small community. Another criticism is that the type of farmer participation T&V encouraged is unidirectional—from the top downward. While T&V is reasonably effective in getting farmers to test and adopt new technologies developed at research-stations, it is not particularly good at getting extensionists to listen and learn from farmers, especially small farmers. The small farmers are not involved directly in identifying research problems, setting research priorities or formulating extension strategies and methods.

Many organisations like FAO and World Bank have begun questioning long-established external, professional-led styles of project intervention and turning increasingly toward a more participatory, people-focussed approach. The change was motivated mainly by a desire to improve the distribution of the benefits of development, and devise better ways to reach the lowest income groups. "Participation", according to Oakley (1994), covers many interpretations:

- As *collaboration*, in which, through persuasion or incentives, local people agree to collaborate with an externally determined development project, often by contributing their labour or other resources in return for some perceived expected benefit.
- As *targeting*, in which previously excluded groups (such as smallholders, the landless women) are included in an on-going project by targeting benefits directly at them.
- As *organisation*, in cases where it is impossible for people, such as small farmers, to participate in a project unless they belong to an organisation which can both promote participation and represent their interests.
- As *empowering by*, developing skills and abilities that enable rural people to be better managers, with a say in existing development delivery systems and the ability to negotiate them.

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- Being more fundamentally political, by enabling rural people to decide upon and take actions they consider essential for their own development.

In rural development, people's participation refers to an active process of direct involvement in the political structures that govern national life, in the decision-making and implementation procedures of projects and, most important, in taking action by rural people to confront and tackle issues affecting their own livelihoods (Oakley, 1994). However, in most national systems, where farmer "participation" exists it effectively means collaboration with established policy, objectives and targets. It has yet to break into a less-controlled, more liberating connotation of the term.

Oakley quotes a University of Wageningen (in Holland) study of African extension services which identified five elements of extension which are at once production–oriented and participatory:

- Supplying *agricultural inputs*
- Giving appropriate and timely technical *advice*
- Underlining the basic *educational* role of all extension
- *Awareness-raising,* or developing rural people's abilities to explain and analyze their own problems
- Building up genuinely democratic, representative *organisation* of rural people.

Such an extension service, Oakley suggests, would be "demand-driven", as opposed to one which merely implements a series of predetermined goals or targets. Examples of solid steps being taken in this direction are the "farmer first" and "farmer participatory research in extension" concepts being strengthened in countries like Brazil, Indonesia and Mali. The strategies stress such factors as the importance of indigenous knowledge, the use of farmers' own land for crop trials and other research, and the reorientation of extension agents' attitudes to think more positively about involving small farmers. The fundamental difference a "farmer first" approach to extension practice is outlined in table 2.

Part of the re-orientation of change agent's attitude would be to make him appreciate the usefulness of the indigenous knowledge of farmers. Indigenous knowledge is unwritten, local knowledge, unique to a given culture and passed down from one generation to the next by word of mouth (Obinne, 1994). Extensionists could build on and strengthen the existing level of knowledge of the rural dwellers.

Table 2: A Comparison of "Technology-transfer" and "Farmer-first" Approaches to Extension

Indicator	Technology transfer	Farmer first
Main objective	Transfer of technology	Empowering farmers
Analysis of needs and Priorities by:	Outsiders	Farmers assisted by outsiders
Concepts transferred	Precepts, Messages, Packages of Practices	Principles, Methods, Basket of choices
The "menu"	Fixed	*A la carte*
Farmers' behaviour	Hear messages Accept precepts, Adopt, adapt or project package	Use methods, Apply principles, choose from basket and experiment
Outsiders' desired outcomes emphasize:	Widespread adoption of technology	Wider choices for farmers. Farmers' enhanced adaptability
Main mode of expression	Agent to farmer	Farmer-to-farmer
Roles of extension agent	Teacher Trainer	Facilitator, Searcher for and provider of choice

Source: Oakley (1994).

Successful extension workers always begin their work with farmers by finding out and using their interest and felt needs. When farmers gain satisfaction in these, they develop confidence in themselves and in the extension worker and will seek his advice in other problems (Obinne, 1991).

Implications & Conclusion

For the extension service to make positive impact, projects should be formulated at the grassroots, that is, in the communities which would benefit from the aid. To design a truly effective, appropriate project, the change agent (or the aid worker) must be in the field with the local people. This would ensure flexibility in project determination. The farmers need a bigger say in deciding which kind of help they need, and how it should be delivered.

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Consequently, as Oakley advises, the role of the extension agency would have to be transformed from one largely dominated by a mission to persuade and deliver, to one of much more general and open-ended support of local people's development initiatives. Similarly, the work of the extension agent needs to be transformed from being a mere implementer of policy and targets to being a more involved, committed and direct facilitator of local extension action. Extension should relate to people not as "extension client", but as members of groups, emphasizing the development of group structure and empowerment of members to take responsibility for extension activities. Finally, emphasis should be on the development of authentic people's organisations, to represent rural people's interests and serve as the vehicles of the participation process. There is truly a challenge to establish extension services.

For agricultural extension to continue to stand out as the only agency best equipped to ensure the virile development of the agricultural sector, there is need to revisit the present system with a view to maximizing the opportunity for increased farmer participation in extension research and delivery.

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Feature

Measuring Managerial Efficiency of Farmers—A Methodology

M. Anantharaman & G.T. Nair

The paper describes the methodology of development of a scale to measure the managerial efficiency of farmers. The scale development follows the functional approach, selecting scale items through judgement rating and item analysis. The items have been classified into various managerial components by factor analysis. The managerial components identified are planning, information management, finance management, market management, labour management, production management (practices) and production management (variety).

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Management input is a key factor for the farmers' productivity and hence the productivity of farmers is directly proportional to their managerial efficiency. However as Singh and Singh (1975) have pointed out, the management input, inspite of its importance and substantial contribution, has been overlooked due to the lack of a scientific criterion for its quantitative measurement. Past studies conducted in the area of the measurement of the management factor of farmers have come out neither with a measuring device for managerial efficiency on sound scientific procedures nor a device which can be commonly applied to measure the managerial efficiency of farmers in various crop enterprises.

Materials & Methods

Among the various approaches for measuring management, (Banerjee 1981, Koontz et al., 1986) the functional approach was resorted to develop the scale as it carries more objectiveness than the trait approach and is independent of external factors, unlike the goal approach. However, the scale items selected on the basis of the functional approach were tested against the goal approach, thereby incorporating the latter also in the scale development.

The first step in the scale development was items generation which was done by collection of items from various sources viz. Literature, discussion with experts and through critical incident technique. The items generated were initially screened through a relevancy rating by 100 judges, taking into consideration the mean score and the coefficient of variation of each item. The items thus screened were subjected to item analysis procedure (Guilford, 1971; Singh, 1986). This was carried out by administering the screened items to 60 paddy and 60 cassava farmers selected randomly from 4 villages each in Thiruvananthapuram (Kerala) and Salem (Tamil Nadu) districts. The responses were collected in five

Table 1: Item wise analysis indices

Item No.	Scale Item and Content	Discrimination index		Criterion 'r'		Total 'r'	
		Cassava	Paddy	Cassava	Paddy	Cassava	Paddy
1.	Profit objective	6.97	7.40	0.76	0.73	0.72	0.68
2.	Calender of operations	6.40	7.04	0.66	0.67	0.79	0.73
3.	Operationwise expenditure	5.01	6.72	0.59	0.63	0.64	0.71
4.	Labour requirement	6.35	5.36	0.59	0.49	0.75	0.64
5.	Finance requirement	8.45	5.45	0.65	0.48	0.83	6.58
6.	Finance Position	6.58	4.31	0.60	0.32	0.76	0.53
7.	Inputs position	7.36	4.50	0.61	0.42	0.76	0.54
8.	Marketing modes	7.27	4.96	0.59	0.42	0.72	0.55
9.	Labour efficiency	5.46	4.01	0.42	0.43	0.69	0.51
10.	Family labour use	5.08	3.26	0.39	0.37	0,62	0.49
11.	Fixing labourers	4.77	2.93	0.34	0.32	0.62	0.43
12.	Amenities to labourers	4.87	3.66	0.33	0.38	0.61	0.53
13.	Information on parctices and solution	6.39	4.39	0.46	0.41	0.57	0.54
14.	Discussion with extension agents	8.41	3.0	0.40	0.31	0.62	0.40
15.	Input cost information	4.72	5.19	0.27	0.38	0.52	0.56
16.	Produce price information	4.57	3.74	0.38	0.27	0.38	0.48
17.	Recording information	3.35	2.37	0.42	0.27	0.57	0.35
18.	Accounting expenditure	4.50	4.96	0.52	0.53	0.64	0.55
19.	Income recording	5.32	4.37	0.53	0.52	0.71	0.51
20.	Loss/profit calculation	2.94	8.7	0.25	0.36	0.50	0.44
21.	Wages quantum of work	3.53	3.97	0.44	0.33	0.64	0.44
22.	Reserve capital	4.33	6.1	0.36	0.36	0.60	0.49
23.	High yielding varieties adoption	5.07	3.54	0.51	0.47	0.57	0.35
24.	Recommended fertilizer dose	8.63	4.2	0.78	0.27	0.81	0.43
25.	Plant protection	5.36	4.8	0.64	0.26	0.82	0.43
26.	Critical periods of water requirement	11.11	4.67	0.71	0.59	0.73	0.56
27.	Timing the sales	5.66	0.54	0.68	0.67	0.67	0.71
28.	Terms of sales	6.03	6.21	0.69	0.57	0.73	0.65
29.	Fixing market price	6.47	6.52	0.70	0.58	0.75	0.62
30.	Price negotiations	6.30	4.86	0.66	0.47	0.77	0.52

point response categories of frequency rating with scoring of 1 to 5. The responses were analysed for discrimination index, item–criterion correlation (normalised standard scores of net returns taken as criterion) and item-total correlation. The items which were significant for these indices and common for both the crops were selected for final inclusion in the scale. The selected items were classified into various management components by factor analysis (Maximum - Likelihood) with varimax orthogonal rotation as suggested by Morrison (1976) and Chatfield and Collins (1980).

The inter-correlations of 30 items worked out were initially subjected to principal factor analysis to arrive at a minimum number of factors to start with. The factors whose Eigen values exceeding one were found out which formed the basis for maximum–likelihood factor analysis; the factors were extracted by Lawley's interactive scheme following ± 0.005 convergence criterion. Labelling of the factors (components) was done by taking into consideration the common content of the items grouped under a component.

Table 2: Rotated maximum-likelihood estimate of factor loadings (6 factor model)

Item No.	Factor loadings					
	1	2	3	4	5	6
1.	0.4827	0.4033	–0.1537	–0.0766	0.3161	0.3789
2.	0.5250	0.3611	–0.2034	–0.1074	0.3186	0.3628
3.	0.5979	0.3252	–0.1684	0.0208	0.2708	0.3418
4.	0.5191	0.3719	–0.2036	–0.0606	0.1943	0.4673
5.	0.6559	0.3316	–0.2097	–0.1204	0.2122	0.4928
6.	0.6624	0.2516	–0.1529	–0.1177	0.2022	0.5491
7.	0.6025	0.3069	–0.1559	–0.1395	0.2070	0.5078
8.	0.5085	0.2954	–0.2139	–0.2313	0.1766	0.4706
9.	0.1987	0.2349	–0.1052	0.7975	0.1935	0.0710
10.	0.0911	0.3203	–0.1577	0.8355	0.1381	0.0090
11.	0.0895	0.1969	–0.2634	0.8782	0.1302	0.0404
12.	0.0940	0.2918	–0.2309	0.8227	0.1659	0.0408
13.	0.1188	0.3247	0.8276	–0.0940	0.1516	–0.0306
14.	0.1971	0.1878	0.8324	–0.0083	0.1179	–0.0419
15.	0.0905	0.3168	0.8961	–0.0225	0.0925	–0.0422
16.	0.0149	0.3381	0.8282	–0.0436	0.1338	0.0034
17.	0.1748	0.1216	0.7388	–0.0350	0.1821	–0.0421
18.	0.7750	0.1940	–0.0632	–0.0781	0.1557	–0.4451
19.	0.7382	0.2122	–0.1115	–0.0742	0.1934	–0.4581
20.	0.7820	0.0963	–0.1169	–0.1127	0.1098	–0.4072
21.	0.7195	0.0864	–0.0836	–0.0674	0.1152	–0.4448
22.	0.7358	0.2249	–0.1257	–0.0727	0.0658	–0.2810
23.	0.2102	0.2008	–0.2137	–0.1433	0.4171	–0.1645
24.	0.1301	0.2078	0.0334	0.1002	0.9168	–0.0359
25.	0.1508	0.2276	0.0601	0.1404	0.8393	–0.0312
26.	0.1942	0.3307	–0.2489	–0.1950	0.5870	–0.0291
27.	0.2052	0.7455	–0.1991	–0.1042	0.2412	0.0236
28.	0.1279	0.8622	–0.1617	–0.0554	0.2569	0.0547
29.	0.1332	0.9567	–0.0622	–0.0578	0.2193	–0.0089
30.	0.0906	0.9131	–0.0509	–0.0898	0.1637	0.0098

Proportional variance by each factor, 0.1935, 0.1625, 0.1361, 0.1022, 0.1008, 0.0845

Results

Item analysis

The judgment rating has screened 93 managerial efficiency items from the originally collected 200 items. Subjecting the ninety three items to item analysis resulted in the selection of 30 items. The selected items with various indices are presented in table 1.

Factor analysis

Further examination of the 30 factors through principal factor analysis indicated that only 6 had shown Eigen values exceeding one and hence the maximum likelihood method of factor analysis initially started with 6 factors. The rotated estimates of factor loadings of items are presented in table 2. The following were the criteria considered for the classification of the items into

Table 3: Rotated maximum-likelihood estimate of factor loadings (7 factor model)

Item No.	Factor Loadings						
	1	2	3	4	5	6	7
1.	0.7068	–0.1554	0.1131	0.2659	0.2679	–0.0976	0.2467
2.	0.7082	–0.2064	0.1574	0.2216	0.2745	–0.1244	0.1526
3.	0.7300	–0.1765	0.2207	0.1791	0.2284	0.0080	0.0611
4.	0.7642	–0.2140	0.1029	0.2247	0.1352	–0.0851	–0.1409
5.	0.8516	–0.2214	0.1970	0.1621	0.1551	–0.1431	–0.0596
6.	0.8774	–0.1642	0.1698	0.0777	0.1327	–0.1461	–0.0682
7.	0.8170	–0.1660	0.1530	0.1438	0.1453	–0.1665	–0.0491
8.	0.7317	–0.2226	0.1089	0.1502	0.1191	–0.2579	0.1177
9.	0.2058	–0.1036	0.1632	0.1935	0.1825	0.7970	0.1076
10.	0.0984	–0.1571	0.1292	0.3029	0.1389	0.8303	–0.0732
11.	0.0936	–0.2616	0.1065	0.1775	0.1325	0.8784	0.0625
12.	0.1174	–0.2274	0.1050	0.2730	0.1651	0.8251	–0.1090
13.	0.1238	0.8202	0.0630	0.2969	0.2048	–0.0962	0.0653
14.	0.1242	0.8294	0.1390	0.1540	0.1747	–0.0147	0.0819
15.	0.0826	0.9004	0.0610	0.2963	0.1474	–0.0281	0.0602
16.	0.0785	0.8268	–0.0228	0.3236	0.1736	–0.0460	–0.1200
17.	0.1030	0.7331	0.1204	0.0930	0.2321	–0.0303	0.0972
18.	0.1891	–0.0852	0.8636	0.1306	0.2466	–0.0084	0.0295
19.	0.1652	–0.1310	0.8344	0.1554	0.2828	–0.0065	0.0289
20.	0.1905	–0.1412	0.8545	0.0296	0.1976	–0.0458	–0.0269
21.	0.1251	–0.1069	0.8278	0.0313	0.2083	0.0001	0.0120
22.	0.2779	–0.1532	0.7555	0.1484	0.1331	–0.0157	–0.2345
23.	0.0789	–0.2013	0.2283	0.1755	0.4612	–0.1302	0.4686
24.	0.1873	0.0159	0.0292	0.1795	0.9249	0.1095	–0.0601
25.	0.1962	0.0213	0.0586	0.1984	0.8299	0.1485	–0.1077
26.	0.2096	–0.2248	0.1223	0.2921	0.6035	–0.1970	0.1943
27.	0.3102	–0.2001	0.1435	0.6948	0.2458	–0.1019	0.3325
28.	0.3115	–0.1602	0.0652	0.8176	0.2490	–0.0589	0.1117
29.	0.2809	–0.0646	0.1201	0.9149	0.2169	–0.0550	0.0079
30.	0.2505	–0.0515	0.0842	0.8855	0.1560	–0.0890	–0.1869
Proportional variance by each factor	0.1865	0.1362	0.1284	0.1283	0.1042	0.1025	0.0231

various factors: the items should have minimum of 0.45 factor loading in absolute value (Maxwell, 1977; Kothari, 1985); overlapping of the items in various factors based on the factor loading value should be minimum; Items grouped under a factor should have the highest factor loading when compared to other factors (Bhaskaran, 1988).

The six factor model arrived at first did not permit a convenient classification based on the fixed criteria; the inadequacy of the number of factors to explain the dependence structure of managerial efficiency was further revealed by the test of significance. Hence, the factor analysis was extended to a seven factor model (table 3). This model allowed the classification of the items under seven components. The seven components were labelled based on the criteria as Planning, Information management, Finance management, Market management, Production management (Practices), Labour management, Production management (varieties), (table 4). The final format of the scale had thirty items grouped under seven managerial components. The response categories for each of the management scale items were Always, Frequently, Occasionally, Rarely and

Never. The responses were quantified by alloting scores of 5 to 1 in that order.

Table 4: Factor levels with grouped items

Factor No.	Label	Grouped item Nos.
1	Planning	1, 2, 3, 4, 5, 6, 7, 8
2	Information management	13, 14, 15, 16, 17
3	Finance management	18, 19, 20, 21, 22
4	Market management	27, 28, 29, 30
5	Production management (practices)	24, 25, 26
6	Labour management	9, 10, 11, 12
7	Production management (varieties)	23

Component score could be derived by the simple addition of the scores obtained by individuals on the items grouped into a component which can be denoted as:

$$\sum_{i=1}^{n} t_i = t_1 + t_2 + \ldots\ldots\ldots\ldots + t_n$$

Where t_1.....t_2 refer to the individual's score on the items. The managerial efficiency score is computed by summing the scores obtained by individuals on components, which can be denoted as

$$\sum_{i=1}^{n} C_i = C_1 + C_2 + \ldots\ldots\ldots\ldots + C_n$$

where $C_1 + \ldots\ldots\ldots\ldots + C_n$ refer to the individual score on components.

The standardisation of the scale was done by verifying its reliability and validity. Reliability of the scale was determined by best–retest method and found highly significant (0.81 for an 0.84 for cassava and paddy farmers). The validity of the scale was analysed through content validity, criterion related validity, construct validity and known group validity which were found significant.

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Real Wages in Indian Manufacturing Industries (1973-93)

NPC Research Division

In a previous study [Productivity 33(1), April-June, 1992], annual real wages per worker in the Indian manufacturing industries have been arrived at for years 1973-74 to 1987-88 based on the National Industrial Classification (NIC 1970). A total of 46 industry groups were selected based on their importance in terms of their contribution to the total value of output of the manufacturing sector. In the present study we update the figures incorporating the latest Annual Survey of Industries (ASI) Summary results for the Factory Sector untill 1992-93.

The term 'wages' is defined here to include all remuneration capable of being expressed in monetary terms and also payable more or less regularly in each pay period to workers as compensation for work done during the accounting year. It includes (a) direct wages and salary (i.e. basic wages/ salaries, payment of overtime, dearness, compensatory, house-rent and other allowances), (b) remuneration for the period not worked (i.e., basic wages, salaries and allowances payable for leave period, paid holiday, payments and compensation for unemployment, if not paid from sources other than employers), (c) bonuses and ex-gratia payment paid both at regular and less frequent intervals (i.e. incentive bonuses, good attendance bonuses etc.). It excludes lay off payment which are made from trust or other special funds set up exclusively for this purpose i.e. payments not made by the employer. It also excludes imputed value of benefits in kind, employer's contribution to old age benefits and other social security charges, direct expenditure or maternity benefits and creches and other group benefits. Travelling and other expenditure incurred for business purposes and reimbursed by the employer are excluded. The wages are expressed in terms of gross value i.e. before deduction for fines, damages, taxes, provident fund, employee's state insurance contribution etc.

By 'real wages' is meant wages at constant factor cost of 1980- 81, For this purpose, the money wage bill has been deflated/inflated to 1980-81 prices using the Index Number of Consumer Prices for industrial Workers. The Index at 1960-61 prices has been converted to a series with 1980-81 as the base year. Similaly, the revised index numbers for the later years with 1982 base also have been converted into 1980-81 prices for comparison purposes.

Workers in this study, are defined to include all persons employed directly or through any agency whether for wages or not and engaged in any manufacturing process or in cleaning any part of the machinery or premises used for manufacturing process or in any other kind of work incidental to or connected with the manufacturing procss or the subject of the manufacturing process. Labour engaged in the repair and maintenance or production of fixed assets for factory's own use or labour employed for generating electricity or producing coal, gas are included. However, persons holding positions of supervision or management or employed in administrative office, store keeping section and welfare section, sales department as also those engaged in the purchase or raw materials etc., and in production or the fixed assets for the factory and watch and ward staff, are excluded.

Since 1989-90 ASI started using new NIC 1987 instead of NIC 1970, for the industry groups. As per NIC 1987, at the two digit level, industrial groups of 30 and 31 are interchanged. This led to corresponding changes at three digit level too. Moreover, some more additional industrial groups were also included at the three digit level. For example, code no. 374 has been split into two as 373 and 374. However, for the purposes of comparison we follow NIC 1970 classification.

Compiled by
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Table 1: Real Wages in Indian Manufacturing Industries

	Food Products (20-21)			Refining of Sugar (206)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	2654	569536	13509	5375	95513	261
1974-75	1793	731162	13454	2489	179048	251
1975-76	2121	804118	14126	3112	209527	243
1976-77	2186	880142	15306	2701	253087	261
1977-78	2105	928795	15783	2630	249112	288
1978-79	2670	891924	16310	3931	221667	286
1979-80	2663	905820	16840	3576	242725	293
1980-81	2373	1001350	17067	2466	315655	304
1981-82	2401	1025111	18351	2837	300794	296
1982-83	2912	985289	17111	4651	245257	308
1983-84	3665	812467	17523	7378	160515	318
1984-85	3809	775914	17459	7861	138618	318
1985-86	3948	760089	17725	7979	126845	323
1986-87	4111	742996	17299	8399	126195	328
1987-88	4251	794920	18333	8723	144257	349
1988-89	4499	788777	18581	9107	152589	336
1989-90	4902	863825	19342	10260	157001	361
1990-91	5073	871935	19760	10379	168052	356
1991-92	5156	864225	19721	10657	167647	352
1992-93	5049	942390	21397	10639	171573	395

Table 1 Contd. .

	Hydrogenated Oils Vanaspathi (210)			Beverages Tobacco & Tobacco Products (22)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	5234	11272	65	2109	200317	2357
1974-75	4088	11204	71	1772	186913	2080
1975-76	4676	12212	75	2039	188303	2880
1976-77	4948	12228	79	2193	278890	6398
1977-78	5279	11269	69	2224	321172	7307
1978-79	6285	12760	69	2347	352095	8240
1979-80	6565	12734	83	2353	352764	9629
1980-81	7746	12367	82	2318	362867	8901
1981-82	6532	11069	76	2133	396227	9568
1982-83	7491	13469	90	2128	410584	8486
1983-84	7984	13214	109	2333	426445	8188
1984-85	7493	14213	102	2863	314933	7093
1985-86	8065	12400	88	3292	318759	8457
1986-87	8924	13122	97	2855	358553	7163
1987-88	8634	13378	99	2830	401183	7951
1988-89	8196	13550	104	3088	392594	7723
1989-90	8872	15490	123	3185	484181	9088
1990-91	9227	12542	103	3211	445548	8448
1991-92	8950	14061	119	3127	479181	8831
1992-93	9072	15329	203	3076	511131	8350

Table 1 Contd. .

	Cotton textiles (23)			Wool, Silk and man made Fibre textiles (24)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6044	865053	5719	5227	133955	2413
1974-75	5449	930212	5560	4808	126507	2368
1975-76	6062	945268	5968	5462	138698	2743
1976-77	6285	922453	6213	6030	149329	3090
1977-78	6134	936376	6508	5749	168042	3112
1978-79	6932	983920	6701	6699	158501	3216
1979-80	7012	992082	7207	6812	181729	3455
1980-81	7103	946679	7189	7142	180676	3743
1981-82	6734	887969	7141	7064	198355	4100
1982-83	6674	926193	6569	7064	209059	3267
1983-84	7216	915265	6731	7568	213596	3532
1984-85	7542	838074	6760	7478	226461	2955
1985-86	7433	781235	7073	7524	216174	3236
1986-87	7719	788740	6981	7562	218096	2986
1987-88	7628	734898	6844	7369	255858	3142
1988-89	7864	706499	6801	7923	222945	3250
1989-90	8010	753308	7021	8449	232787	3325
1990-91	8140	728334	7218	8743	237769	3368
1991-92	8003	684297	7252	8507	228713	3236
1992-93	8077	700657	8896	8561	239960	3400

Table 1 Contd. .

	Jute, hemp & Mesta textiles (25)			Textiles products (26)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	5638	246571	429	4201	54675	1642
1974-75	5118	222979	322	3503	58777	1652
1975-76	5903	241315	184	3894	62197	1979
1976-77	6443	223545	201	4443	73547	2192
1977-78	6173	237098	223	4263	79214	2347
1978-79	6383	239353	247	4896	79947	2577
1979-80	7264	263475	257	4612	84174	2907
1980-81	7519	248685	265	4807	80523	2889
1981-82	7089	218955	297	4654	82101	2943
1982-83	6767	235076	219	4749	81525	2491
1983-84	6518	200906	236	4662	87104	2621
1984-85	7317	264986	215	4675	91202	3063
1985-86	8487	193528	204	4858	93700	2835
1986-87	8803	191436	184	4952	85997	2821
1987-88	7891	179372	236	4923	105382	3141
1988-89	8643	191345	187	5249	110771	3159
1989-90	8846	191790	327	5270	135712	3186
1990-91	9360	183995	326	5587	141542	3537
1991-92	8490	184338	352	5142	146933	3772
1992-93	9089	187189	420	5418	165391	4104

Table 1 Contd. .

	Wood & wood products furniture & fixture (27)			Paper paper product printing (28)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	2959	60744	2932	5758	194685	3779
1974-75	2524	61528	3158	5396	188423	3820
1975-76	2775	60100	3431	5786	180684	3936
1976-77	3109	57774	3573	6370	188372	4506
1977-78	3135	60440	3676	6175	199269	4439
1978-79	3459	60658	3788	6995	198719	4901
1979-80	3399	67384	3978	7148	210366	4743
1980-81	3326	64078	4033	7224	211068	4798
1981-82	3354	63531	4094	7393	221681	4890
1982-83	3676	64471	3618	7255	231722	4571
1983-84	3629	62464	3591	7445	226586	4710
1984-85	3724	61546	3847	8061	219958	4808
1985-86	3776	60114	3580	8078	211357	4870
1986-87	3989	57132	3873	8299	206383	4921
1987-88	4180	57965	3407	8602	217837	5096
1988-89	4553	58460	3355	8631	204400	4960
1989-90	4304	58825	3521	9688	204432	5098
1990-91	4201	53018	3419	9530	213729	5299
1991-92	4180	51244	3421	9369	218330	5222
1992-93	4229	56244	3608	9496	226269	5565

Table 1 Contd. .

	Pulp paper & boards (280)			Leather & fur products (29)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	5968	56649	560	5246	37133	594
1974-75	5541	59106	490	4711	37427	667
1975-76	5815	59738	424	4497	25373	670
1976-77	6338	62304	449	5614	41023	727
1977-78	6196	73730	538	5297	41306	762
1978-79	7693	70443	500	5553	48804	797
1979-80	7505	78798	587	6334	48720	862
1980-81	7627	81518	585	5882	48603	886
1981-82	7378	84593	672	5663	51065	899
1982-83	6601	92498	637	5547	52249	880
1983-84	7061	84851	734	5927	52458	942
1984-85	7486	83956	696	5980	58760	929
1985-86	7859	78639	802	5735	60473	999
1986-87	8159	80284	779	5769	59686	976
1987-88	8063	82530	899	5975	64448	1074
1988-89	8315	77225	808	5211	77836	1195
1989-90	10044	81063	842	5759	87567	1238
1990-91	9817	87608	895	5862	86506	1398
1991-92	9563	90511	839	5829	90270	1545
1992-93	9866	93939	927	6093	91329	1581

Table 1 Contd. .

	Rubber & Plastics (30)			Chemicals & Products (31)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6677	87416	1794	6951	234905	3043
1974-75	5925	88182	1952	6154	233933	3221
1975-76	6893	104000	2496	7034	250177	3732
1976-77	7259	98064	2831	7481	263581	4152
1977-78	6819	109664	2881	7144	283382	4674
1978-79	8301	101131	2350	8806	294802	4881
1979-80	7121	129785	3302	8544	330553	5328
1980-81	7450	127644	3498	8690	334994	5479
1981-82	7391	130180	3864	8713	333099	6834
1982-83	8106	154632	3514	8761	344486	5350
1983-84	8253	139425	3778	9208	343175	5824
1984-85	8808	142501	3900	9949	346890	6032
1985-86	9110	141350	3958	9900	372407	6402
1986-87	9814	147819	4097	10431	357060	6335
1987-88	9175	155490	4412	10497	378178	6578
1988-89	9793	166321	4660	10758	393161	6946
1989-90	10309	175792	5047	11493	392121	6631
1990-91	10122	186661	5289	12127	379218	6914
1991-92	9459	188337	5627	11267	399771	7251
1992-93	9745	205199	5971	11719	434474	7886

Table 1 Contd. .

	Basic & Industrial Chemicals & Gases (310)			Fertiliser & Pesticides (311)		
	Annual Real wage perworker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	7296	34581	389	8593	34795	335
1974-75	8039	34080	543	7638	35980	344
1975-76	6463	41065	639	9637	37687	378
1976-77	8008	41310	701	9999	38411	440
1977-78	8039	38911	764	9501	39924	469
1978-79	9457	41164	874	12329	41885	493
1979-80	9481	42781	883	12001	49003	503
1980-81	9570	47470	917	11663	50195	447
1981-82	9657	47522	1223	12202	46951	618
1982-83	9938	49972	934	11716	48269	442
1983-84	9683	52350	978	13345	48489	495
1984-85	11059	56825	1320	13664	43853	469
1985-86	11175	59247	1040	13036	51741	546
1986-87	11446	57908	1017	15022	44342	474
1987-88	11559	57549	1049	15520	49387	515
1988-89	11729	53975	1119	14731	55773	594
1989-90	11924	58847	1264	15635	62535	556
1990-91	11519	62725	1377	18045	56903	569
1991-92	12073	62299	1405	17652	54335	509
1992-93	12260	65346	1444	16744	64309	633

Table 1 Contd. .

	Paints & Varnish (312)			Drugs & Medicines (313)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6907	20038	388	7370	55305	674
1974-75	6319	18656	372	6972	55303	682
1975-76	7050	15588	368	8176	56299	800
1976-77	7304	16443	403	8890	56950	865
1977-78	6900	18535	496	8447	63671	918
1978-79	9235	19806	498	10117	63318	958
1979-80	9247	22298	551	9952	66478	1070
1980-81	9723	22853	568	10304	64259	1121
1981-82	9621	21433	773	10129	70006	1434
1982-83	10947	20326	476	11541	70261	1131
1983-84	11068	22099	547	10964	72874	1187
1984-85	11915	21612	515	12033	73231	1265
1985-86	11606	21179	555	12075	71602	1358
1986-87	12463	18864	592	12436	72565	1374
1987-88	11447	22356	739	13022	78189	1479
1988-89	12463	22482	722	13176	78026	1554
1989-90	12870	24335	820	13206	82985	1699
1990-91	13290	24300	853	12882	79164	1794
1991-92	12779	29704	939	11897	88516	1886
1992-93	11143	29178	1021	12253	99772	2112

Table 1 Contd. .

	Non-metallic mineral products (32)			Structural clay products (320)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	3812	237812	3757	2767	76111	1182
1974-75	3543	233615	3890	2511	75712	1223
1975-76	4069	240268	4820	3035	78023	1533
1976-77	4417	241834	5309	3163	78395	1641
1977-78	4255	248020	5558	2947	78896	1666
1978-79	4929	259527	5639	3488	83555	1727
1979-80	4839	274292	6083	3548	92670	1899
1980-81	4709	293575	6440	3562	102252	2159
1981-82	4712	307640	7694	3551	107820	3048
1982-83	4767	337901	6667	3336	130449	2495
1983-84	4763	354378	7618	3033	151975	3117
1984-85	5199	342547	7841	3259	143987	3146
1985-86	5245	355259	8515	3307	148330	3421
1986-87	5376	343989	8267	3351	143128	3247
1987-88	5187	349525	8706	3200	143716	3445
1988-89	5468	352510	9025	3604	136514	3486
1989-90	5831	354790	9038	3613	138303	3515
1990-91	5630	353433	9441	3603	145183	3674
1991-92	5828	368487	9919	3785	146150	3976
1992-93	5996	369014	10365	3755	145464	4072

Table 1 Contd. .

	Glass & Glass Products (321)			Cement, Lime & Plaster (324)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	3966	46321	391	6507	35116	126
1974-75	3476	49057	932	6703	31984	126
1975-76	3851	47000	414	8131	35459	205
1976-77	4330	46443	448	8487	35124	226
1977-78	4301	42920	483	8113	35623	247
1978-79	4785	48043	560	9222	36371	232
1979-80	4656	48796	573	9133	39047	271
1980-81	4337	48972	590	8588	42875	261
1981-82	4598	52300	674	8348	44671	276
1982-83	4633	52105	607	9163	51077	276
1983-84	4828	48696	601	9956	50520	328
1984-85	5347	44233	567	10459	52830	366
1985-86	5738	46791	571	10355	57217	468
1986-87	6049	42006	556	10174	58598	448
1987-88	6143	41868	570	9326	59738	517
1988-89	6032	43372	596	9437	59911	558
1989-90	7889	45478	626	9458	61064	551
1990-91	6727	42715	598	9705	59929	612
1991-92	7273	49714	628	9859	60814	616
1992-93	6936	46237	590	10411	68027	687

Table 1 Contd. .

	Basic Metal & Alloys Industries (33)			Iron & Steel in Primary/ Self Finished forms (330)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	7747	349810	4132	9295	176120	942
1974-75	7853	307359	4215	10636	137941	1114
1975-76	8624	370132	4562	10873	186198	1150
1976-77	9424	360086	4988	11792	181152	1143
1977-78	8810	368428	5054	10985	192689	1299
1978-79	9566	399156	5259	11423	204169	1332
1979-80	10296	413233	5538	12932	215324	1471
1980-81	9706	437774	5779	11607	233658	1546
1981-82	9696	446839	6013	11359	244594	1714
1982-83	10210	454920	5509	12570	235799	1474
1983-84	10281	465592	5888	12423	245142	1686
1984-85	11484	499533	5901	13774	282368	1657
1985-86	10912	457770	6077	12784	256458	1764
1986-87	10627	480003	6191	12362	276799	1822
1987-88	10810	481243	6184	12635	282213	1754
1988-89	11779	476626	6203	14232	270567	1829
1989-90	12192	451162	5853	14767	243054	1597
1990-91	11792	466258	6014	13622	276579	1674
1991-92	9045	447654	6097	8952	234663	1682
1992-93	9442	497771	6247	9613	288758	1910

Table 1 Contd. .

	Foundry for casting & forging (331)			Ferro alloys (332)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6019	138118	2440	4545	3718	49
1974-75	5299	136472	2519	4713	3204	21
1975-76	6072	145558	2737	5070	4043	42
1976-77	6766	143191	3094	5225	4574	70
1977-78	6031	136910	2973	4969	5152	43
1978-79	7159	154797	3121	6395	4785	49
1979-80	6979	155248	3173	6446	4918	49
1980-81	7046	159632	3293	6949	5310	53
1981-82	7231	156907	3307	6593	4778	60
1982-83	7153	174585	3126	7377	5165	35
1983-84	7462	172587	3208	7251	7351	65
1984-85	7925	169414	3313	6966	7135	53
1985-86	7879	153832	3337	6759	7205	54
1986-87	7709	157199	3365	6417	9319	64
1987-88	7393	145373	3313	6797	10195	80
1988-89	7772	146315	3236	6950	9977	76
1989-90	8970	68055	1442	7597	10010	77
1990-91	8351	60123	1543	9057	9871	87
1991-92	8312	62641	1326	8225	14319	100
1992-93	8529	61409	1382	8748	16687	96

Table 1 Contd. .

	Copper manufacturing (333)			Aluminium manufacturing (335)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	5824	5735	92	8263	14099	161
1974-75	7071	5572	74	7590	13741	141
1975-76	7379	6627	111	8241	14767	200
1976-77	7141	6890	116	9624	13581	183
1977-78	7055	6478	117	9001	14909	232
1978-79	9308	6489	96	10721	16417	253
1979-80	8265	7913	119	10147	16615	280
1980-81	9967	7284	141	10236	19061	308
1981-82	8740	7151	164	10379	20128	317
1982-83	9928	5963	149	10624	19532	318
1983-84	10774	5968	143	9955	20713	364
1984-85	11483	6453	129	12009	20601	335
1985-86	13595	6723	144	11739	19431	331
1986-87	13359	5801	167	11404	17932	328
1987-88	13597	7053	175	11823	21838	335
1988-89	14352	7302	193	10929	27888	395
1989-90	14947	6996	187	12122	23479	342
1990-91	15880	6125	163	13066	24592	288
1991-92	15167	6735	166	13241	25304	319
1992-93	17020	7079	144	12113	27410	368

Table 1 Contd. .

	Zinc Manufacturing (336)			Metal products & parts (34)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	9281	1864	29	5146	138538	4434
1974-75	12664	1066	11	4543	130934	4412
1975-76	11211	1338	11	5125	132946	5260
1976-77	15152	1419	12	5790	138734	5590
1977-78	12188	1723	19	5629	148655	5657
1978-79	11745	2486	20	6212	141397	5818
1979-80	14338	2734	23	6841	154121	6230
1980-81	12734	2772	24	6765	151028	6457
1981-82	12419	2335	25	6557	150842	6563
1982-83	13248	3125	21	6254	153234	5884
1983-84	13689	3689	22	7272	144286	6054
1984-85	14321	3687	21	7843	153528	6078
1985-86	12863	5173	46	7629	147512	6307
1986-87	11597	4820	33	7807	134038	5978
1987-88	12166	5096	43	7689	155180	6390
1988-89	14221	4237	45	8524	165939	6335
1989-90	17848	3866	29	7742	167855	6683
1990-91	16443	3241	37	8225	171793	6964
1991-92	16673	4891	44	7738	169759	6890
1992-93	20666	4483	34	8530	175413	7038

Table 1 Contd. .

	Machine tools & parts (35)			Agriculture machinery (350)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6402	239329	4713	5663	19514	799
1974-75	5754	244325	4808	5290	16995	707
1975-76	6691	244898	5449	5342	18813	637
1976-77	7377	247728	5881	6938	22642	621
1977-78	7100	265354	6203	6485	24457	718
1978-79	8112	267802	6387	7137	26539	703
1979-80	8157	286728	6826	7542	30006	789
1980-81	8210	285024	7011	7431	28853	786
1981-82	8143	293394	7876	7677	26077	797
1982-83	8658	302844	7207	9162	27089	717
1983-84	9058	310685	7138	8708	29088	794
1984-85	9296	302745	7168	8440	29858	734
1985-86	8942	306089	7648	9775	28440	802
1986-87	11161	276978	7524	9805	24457	700
1987-88	9594	298080	7584	10879	25894	830
1988-89	10557	290687	7711	11027	29597	775
1989-90	11422	295832	7753	11838	25997	859
1990-91	11341	297834	7738	13226	28577	824
1991-92	11442	555312	12771	11446	24704	739
1992-93	11582	572733	13434	13795	30402	802

Table 1 Contd. .

	Prime Movers, boilers (352)			Industrial Machinery for food & textiles (353)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	7090	41535	623	5465	49207	1003
1974-75	5760	45935	689	5013	48418	977
1975-76	6990	36182	732	5805	47587	1028
1976-77	7480	26112	776	6626	47435	1130
1977-78	7296	35624	757	4581	52539	1250
1978-79	8294	35361	719	7813	50685	1289
1979-80	8623	38990	782	7715	55180	1375
1980-81	8765	40082	800	12414	34928	1359
1981-82	8456	45000	1097	7462	49370	1565
1982-83	9241	45234	822	9133	54710	1250
1983-84	10182	49853	838	8295	58046	1448
1984-85	9323	47797	942	7966	53266	1266
1985-86	10862	55191	940	9399	47805	1296
1986-87	9650	45306	871	8439	40110	1240
1987-88	9419	50474	956	9080	44108	1206
1988-89	12330	47665	902	8230	45594	1272
1989-90	12043	45505	770	9693	42643	1217
1990-91	11129	38620	759	9706	43078	1241
1991-92	10986	40250	797	10091	42319	1289
1992-93	11862	36772	734	9645	44479	1336

Table 1 Contd. .

	Industrial Machinery other thanfor food & textiles (354)			Refrigeration & Ac (355)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6573	21544	402	6968	11710	128
1974-75	6490	24205	541	4726	12505	161
1975-76	8004	25999	437	6942	11697	121
1976-77	8411	27356	499	7301	12998	130
1977-78	7731	31134	642	7324	12002	151
1978-79	8495	31700	656	8330	13481	155
1979-80	8478	33110	740	8434	13896	162
1980-81	8722	26760	737	8177	14981	200
1981-82	8788	34810	768	7713	15350	259
1982-83	7071	35226	718	8517	15028	164
1983-84	9132	30379	725	9138	14938	167
1984-85	9817	29073	715	9288	14729	165
1985-86	9390	26263	829	9476	15323	159
1986-87	9742	27694	835	8733	12035	173
1987-88	9307	33211	940	9205	13091	199
1988-89	9796	31476	995	10471	9603	190
1989-90	10256	33221	1158	18073	18626	155
1990-91	10549	33848	1121	15531	25805	196
1991-92	10333	32133	1073	15459	26443	212
1992-93	10036	36801	1234	11186	18552	212

Table 1 Contd. .

	Machine tools & parts (357)			Electrical machinery (36)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6860	26897	590	6735	180454	2380
1974-75	5897	27319	586	6793	179753	2340
1975-76	7456	32631	827	7524	180273	2390
1976-77	7669	29796	847	8212	184367	2596
1977-78	7534	32504	934	8278	187236	2740
1978-79	8625	34399	910	9552	192769	2882
1979-80	8765	34240	949	9318	214247	3277
1980-81	8408	34992	1009	9283	214725	3406
1981-82	8378	36036	1011	8849	209646	4229
1982-83	9425	36900	1166	9926	231257	3641
1983-84	9249	34373	1075	10075	228855	3661
1984-85	8738	32560	1027	10543	238393	3831
1985-86	10148	40284	1076	10565	234367	4066
1986-87	10512	36872	1032	11060	221778	3888
1987-88	10247	30937	975	11070	244912	4241
1988-89	11814	28287	1051	11410	246523	4496
1989-90	11353	31998	1039	11672	247306	4790
1990-91	10991	28478	985	11744	259473	4995
1991-92	11381	29630	935	*	*	*
1992-93	11569	33047	1017	*	*	*

* Included in Industry Group 35

Table 1 Contd. .

	Electrical Industrial machinery (360)			Transport equipment (37)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	6479	74384	1141	7397	308380	1600
1974-75	7269	71858	998	6865	308998	1680
1975-76	8368	73173	843	7979	272563	2752
1976-77	8979	72662	837	8753	252210	2204
1977-78	9069	73372	915	8294	261651	2348
1978-79	10803	75793	955	9532	293650	2528
1979-80	10371	81165	1036	9295	365410	2867
1980-81	10721	82006	1046	9518	370531	2815
1981-82	10402	80492	1062	10037	380832	3339
1982-83	11317	82852	1138	10488	381508	2816
1983-84	11215	81685	1105	10478	374840	2815
1984-85	12440	86641	1148	10652	393709	3041
1985-86	12263	81952	1129	11366	361356	3267
1986-87	13672	76658	1071	11774	364671	3120
1987-88	13587	89187	1304	11925	365919	3318
1988-89	13369	83665	1378	12480	384509	3345
1989-90	14144	86319	1556	13347	354588	3637
1990-91	14638	96227	1655	12856	355876	3625
1991-92	14465	98575	1739	12956	365339	3704
1992-93	14893	99701	1863	12539	366459	3758

* Included in Industry Group 35

Table 1 Contd. .

	Locomotive parts (371)			Railway Wagons (372)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	7291	25002	25	6822	111182	109
1974-75	7600	22659	23	6825	101060	110
1975-76	8107	39063	24	8138	77005	102
1976-77	8995	30093	16	9330	62045	101
1977-78	8635	30585	19	8872	60327	139
1978-79	8409	30313	24	9309	77917	137
1979-80	9598	43677	36	9008	108237	173
1980- 81	9690	43467	41	8845	112497	145
1981-82	10675	45124	44	9136	114252	187
1982-83	10694	44286	37	9971	109551	153
1983-84	10196	48517	37	10465	106034	153
1984-85	10709	60582	42	9617	110232	149
1985-86	11000	32592	36	10817	110151	146
1986-87	11402	37747	42	11802	116390	134
1987-88	11544	39492	62	12547	101931	160
1988-89	14329	34310	54	12409	107374	145
1989-90	12424	27339	45	12405	87062	174
1990-91	11161	23219	39	12421	87986	204
1991-92	10353	34698	46	12602	89264	220
1992-93	11720	24767	43	11854	88365	202

Table 1 Contd. .

	Motor Vehicles (374)			Motorcycle, Scooter (375)		
	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)	Annual Real wage per worker (in Rs.)	Total No. of workers	Factories Covered (Nos.)
1973-74	8474	88468	523	6464	11231	114
1974-75	7778	90546	569	5934	11307	147
1975-76	8518	92190	990	6551	8869	110
1976-77	9364	92493	1021	6695	13980	146
1977-78	8852	94763	1023	6554	16874	201
1978-79	10702	100622	1113	8212	17974	215
1979-80	9648	116226	1205	7939	20569	270
1980-81	10109	118110	1297	7776	20125	235
1981-82	10928	123777	1565	8944	22127	293
1982-83	11519	130387	1334	8206	18693	255
1983-84	11726	118378	1302	9443	24875	257
1984-85	12280	122548	1529	10308	25096	287
1985-86	13704	127630	1594	10696	27197	295
1986-87	12954	127172	1567	10818	29008	348
1987-88	13440	120288	1463	10421	35993	432
1988-89	13941	131847	1498	10605	38894	460
1989-90	15850	129449	1569	12634	44054	550
1990-91	15099	135768	1609	12450	46759	481
1991-92	15379	135845	1586	12007	41592	518
1992-93	14558	140818	1654	11314	41769	488

Table 1 Contd. .

	Bicycle Parts (376)			Other Manufacturing Industry (38)			All Industrial Groups		
	Annual real wage per worker (in Rs.)	Total No. of Worker	Factories Covered (nos.)	Annual real wage per worker (in Rs.)	Total No. of Worker	Factories Covered (nos.)	Annual Real Wage per Worker (in Rs.)	Total No. of Workers	Factories Covered (Nos.)
1973-74	4911	21483	464	5642	53832	1662	5426	4659523	64133
1974-75	3904	20571	498	5066	49349	1566	4846	4762061	64217
1975-76	4469	20204	581	5797	45109	1473	5513	4996223	71705
1976-77	5047	19179	600	6582	44956	1871	5809	5210347	81277
1977-78	6110	21244	598	6245	50133	1897	5630	5541830	84924
1978-79	5190	20270	643	6858	48276	1799	6452	5666538	88077
1979-80	5908	24865	694	6742	52985	2047	6541	5962288	95126
1980-81	5570	20377	676	7291	51695	1956	6524	6046592	96503
1981-82	6070	24004	748	6472	50245	2383	6426	6105622	105037
1982-83	5831	23977	638	7382	52469	1475	6740	6312673	93166
1983-84	5595	26683	669	7461	52995	1871	7121	6158837	96706
1984-85	5658	27800	658	8022	50497	1509	7757	6091409	96947
1985-86	5556	27486	673	8140	53326	1725	7966	5819169	101016
1986-87	5665	23777	627	8993	54998	1573	8144	5806866	97957
1987-88	5744	29666	687	8895	57451	1742	8142	6061786	102596
1988-89	6410	29493	691	8592	64651	1792	8626	6026328	104077
1989-90	6686	29580	693	8407	65929	1795	8878	6326541	107992
1990-91	6653	32636	696	8550	67985	1758	8938	6307143	110179
1991-92	6713	30576	724	8025	71354	1843	8176	6269039	112286
1992-93	7217	31045	753	8522	74732	1870	8610	6649310	119494

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Book Reviews

Closing The Technology Gap: Technological Change In India's Computer Industry, by *Hans-Peter Brunner*. Sage Publications Pvt. Ltd., New Delhi, 1995, 219 p, Rs. 275.

There is a growing realisation of the importance of technology in economic development in general and as an instrument of socio- economic change in developing countries in particular. In the book under review, Dr. Brunner seeks to test the hypothesis that "economic performance is intimately related to the process of technological change, and by technological change we mean the acquisition, diffusion and creation of new technologies". He holds the view that technological change does nor follow directly or automatically from uncontrolled market competition and governmental practices which play various mediating roles.

Within the overall New-Shumpeterian framework,Dr. Brunner identifies and describes the roles played by institutions and organisations in easing the acquisition of know-how, in accelerating its diffusion and in stimulating innovation. In this context, he has traced the evolution of computer industry in India. It is found that unlike the United States where in the 1950s the computer was developed with heavy government support. India did not promote domestic research and production capacity. By the late 1960s India's computer industry was entirely in the hands of the emerging multinational firms. It was in early 1970s that the Indian government began to build computer research and production capabilities to acquire and assimilate new computer technologies.

Dr. Brunner has provided a reinterpretation of the history of India's computer industry using a novel method for measuring technological change in terms of price performance or quality gaps. Two important points emerge from his analysis; first, computer industry has narrowed its technology gap vis-a-vis the international technology leader, the United States and the second, this change occurred not steadily, but in waves. Dr. Brunner explains this pattern of change in terms of India's computer policies, and switch in international computer regimes.

The econometric models developed by the author for analysing the evolution of Indian computer industry are not only a contribution to the specific purpose but also applicable in general to the Indian economy in transition. For example, he analyses the price performance ratios of Indian computer firms to understand the competitive forces role of in the computer industry. Also the hedonic methodology used for measuring technological change in the US computer industry to develop reliable indicators of technology change is also applicable to the analysis of the industry in India and other developing countries. Though the data used for the study relate to the period 1977-1986, the findings and methodology used are of considerable significance to the policy makers and researchers alike.

In the context of globalisation and trade liberalisation, it is refreshing to note the advice of Dr. Brunner,"The Third World does not have to accept what is apparent (comparative) advantage as final; it must engage its people in the incessant human struggle for creative solutions in order to break through the shell of technological limitations". A sound advice and an interesting study indeed.

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A New Study of Technology Management by *T. Yamanouchi*, Asian Productivity Organisation, Tokyo, 1995, 308 p + xii.

The volume under review is the English translation of the one originally published in Japanese in 1992. It consists of eight chapters besides a prologue and an epilogue. It outlines the author's thinking about a new viewpoint that will influence technology management activities of the Japanese manufacturing industry in the

21st century. The author hopes that his thoughts "will provide intellectual stimulus to the leaders and managers of companies, the government officials who develop and administer industrial policy, and science and technology policy, and researchers and students with an interest in management theory and the strategic management of technology and innovation."

In the prologue, the author analyses the history of technology management in Japan, and follows Japanese manufacturers from their zenith to their current challenges in remaining competitive in the emerging global environment. This is followed by an elucidation of the nature of, and differences between, R&D management, engineering management, and technology management. The latter is viewed as "the management of creative and strategic innovation related to business management as it concerns technology." Its scope consists of eight domains viz., product innovation, business innovation, technology innovation, market innovation, human innovation, organisational innovation, global innovation, and information systems innovation. These domains also represent the scope of the book's next eight chapters. The "linkages between and the melding of these separate domains enable the realization of management reform of a high level".

In "Product Innovation" the author highlights an interesting notion of "concept creation" based on the idea of harmony between things and people. It is deemed to lead to "an approach to making things that unites the maker, seller, and user" and creation of meaning in the melding of 'hardware' and 'software'. He also describes the simultaneous engineering model of product development, and a behavioural science process for innovative new product development. The process consists of rather obvious guidelines like, 'Honest self-evaluation', 'Discovering unfulfilled dreams', 'Integrated team mission', 'Overcoming various obstacles' and the like. The most useful part of the chapter is a synoptic summary of Nonaka's and the author's model of the process of organisational knowledge creation within corporations.

Then the author proposes the creation of corporate technology and knowledge bases. These bases are essential to the continuous growth process and growth factors of technology. The author elaborates of technology strategies and companies' technological cultures underpinned by the technology and knowledge bases. Technology strategies involve the coordination of the long-term vision and business-sector strategies on the one hand, and the nature of corporate R&D orientation on the other, he states.

Then he questions the conventional nature of marketing, the market-based growth mechanism, and market-competition strategies, and emphasizes the integration of R&D and marketing. He also advances a new perspective on creativity – the concept of "The Creative Heart". The latter involves a perceptual orientation governed by the elements of love, beauty, joy, pleasure, and extraordinary dreams in and of things.

The author next deals with the concept of a company's shared vision in the context of its macro-environmental trends on the one hand, and classification of business diversification by technologies and markets on the other. Role of innovation leaders is crucial among the factors for successful business creation. Business diversification should be articulated in terms of synergistic and chaining effects transcending business-unit boundaries, and sharing of successful experiences across the business-units, he opines.

He then proposes five new qualities to be sought in technical people, and outlines the means for their discovery and development. These qualities are: concept creation, interest in and understanding of people, the desire to challenge limits, creative (heart and) knowledge, and entrepreneurship. These qualities call for the replacement of a company's personnel management system by an integrated human resources development system.

The author clarifies the relationship between innovation, and the characteristics desired of organisations. The latter include connectivity (across business units, divisions, functions, people, and outside organisations), transcendence or co-existence of universality and exceptionality, autonomy, sensitivity, and focus. This is followed by a perceptive discussion of internal organisation linkages and corporate linkage strategies. The latter should instill a shared desire to face challenges together toward fostering new business opportunities. Innovation management also calls for the simultaneous existence of "loose and tight" properties in the structure of organisations.

The author specifies the basic concepts of globalization, and the principles and viewpoints for the globalization of management. He also outlines a set of eleven benchmarks for evaluating the degree of a company's globalization. This is followed by a delineation of factors and elements affecting the globalization of technology and the strategic responses of companies. The latter include global scanning of technology, transnational strategic alliances, internationalization of R&D functions through the establishment of overseas R&D sites, and the transfer of management resources. The forms of overseas R&D activities, and plural pat-

terns in the establishment of R&D units, are also highlighted in this context.

The author discusses the growing importance of information and network technology in economic and social infrastructures, and outlines the wide-ranging technological advances in this context. This is followed by a discussion of the direction for constructing integrated management systems. Examples of integrated strategic information systems developed and being developed by some major Japanese firms are provided in this context. An interesting new concept of Computer Integrated Research (CIR) is also advanced by the author. CIR's basic elements are: research resource management, information flow, and research group integration.

This is a useful book as it provides new and rare insights into Japanese thinking and practice of managing technology and technovation.

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Glimpses of Industrial India by *Dr. Bharat Ram*. Manohar Publishers & Distributors, New Delhi, Pauls Press, 1994, 276 p, Rs. 295.

The author of this book, Dr. Bharat Ram is one of the most successful industrialists and an elderly statesman of India. He is well-known abroad also. By virtue of his eminent position, deep knowledge and rich experience of decades, he has been invited to address many national and international forums on wide ranging topics.

His speeches as the first elected President of the International Chamber of Commerce from a developing country, way back in 1969, became a landmark. These were published in 1971 as a book titled "From Istanbul To Vienna" which was widely acclaimed. Thus came his second book titled "Reminiscences and Reflections" containing even deeper thoughts—very practical and closer to one's heart—published in 1989. The present volume caps a trilogy and is a collection of specially selected speeches and articles published over three decades, 1963 to 1994. The first to feature is an address at the Administrative Staff College, Hyderabad on "The Role of Business in Shaping Government Policies" on 21 June, 1963 under the group "Dimensions of Development: Industry" in pages 136 to 142. The last one "Indian Euro Issues" is the inaugural address at a seminar on Euro Issues organized by the Institute of Company Secretaries of India, New Delhi on 29 April, 1994 (vide pages 126-130) under group "Dimensions of Development: The Economy". In between these, there are enlightened speeches and rich articles spread over a divergent range of topics of contemporary interests which are as much relevant today as they were then.

The book starts with "A tribute to the Maker of Modern India: Jawaharlal Nehru" and has a foreword by I.G. Patel, the wellknown economist wherein he analyses the author's ideas and contributions. To some extent this is an unusual book. "It is difficult not to think of the man first and his ideas latter in reading this collection of his speeches and articles", comments I.G. Patel.

Dr. Bharat Ram joined DCM Limited, Delhi as an apprentice in 1935 after his graduation and rose to the eminent position of th CMD in 1958. Later on, he handed over the controls to his sons and presently he is the "Chairman Emeritus". He became President of the FICCI is 1965. Because of his visionary ideas and rich contributions not only to the development and efficient management of industries but also in education and sports, he was awarded the Padma Bhusan and many other laurels. He was clearly ahead of his times in his works and views.

The author always emphasises on harmony and co-operation amongst all areas of activities and all sections of people. He sees no rational for despair as "the power of balanced judgement is bound to come". One may ask how soon? Only the future will show that. Dr. Bharat Ram, however, looks ahead to see the Indian industry surging ahead with latest technology in perfect harmony with enriched human resources managing them very efficiently.

The organisation of the speeches and articles have been done under the groups mentioned earlier. Eventhough under a group head, these are in time sequence, the overall presentation of the book as a whole is not in chronological order. Thus some speeches of earlier years appear towards the end. This prevents a keen reader from following the thought process of the learned author over the years. Some of the topics are not even dated e.g. address on "Dynamics of Industrial Growth in India" (pp. 132-135) at the Indian Chamber of Commerce, New York, address at a seminar at Vigyan Bhavan on "On The Concentration of Economic Power and the Role of the MRTP Act in Development" at pp. 161-166 etc. These may be made good by adding at least a chronological appendix of all the topics datewise in future editions of the book. There is also an index at the end of the book for quick reference of a large number of topics covered in the speeches/articles.

The publishers have otherwise done a neat job to bring out this valuable book nicely bound with an attractive jacket. This book will surely be a welcome addition to all libraries and personal collections. Bureaucrats in government and managers in industries will find that many of the ideas being talked about/implemented today had their origins decades ago!

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Management Information Systems by *David Kroenke* & *Richard Hatch*. Mitchell McGraw-Hill Watsonville, 1994, 813 p, Rs. 506.

The field of Management Information Systems (MIS) is undergoing a profound and exciting revolution. Explosive changes in information technology are upsetting the basic assumptions that have served MIS well over the past 40 years. MIS is the design and use of effective information systems in business that facilitate management control by producing structured, summarised reports on a regular and recurring basis. An information system is effective if it helps to accomplish the goals of the people and the organisation that uses it.

This text is divided into five parts. Part I provides a foundation and introduces fundamental concepts. Part II, III and IV implement the three-tiered spiral organisation described. Part V highlights two special information systems topics: decision support systems and knowledge system. The author describes the nature of MIS, identifies the three major themes of the book, and defines important terms. He paints the broad picture by surveying five basic types of information systems: transaction processing systems, management information systems, decision support systems, office automation systems, and executive support systems. He then introduces the fundamentals of information technology and discusses hardware, programs, and data. The concepts presented are the basis for subsequent discussions of technology throughout the text. Then he surveys the ways in which information systems add value to individuals and organisations. He builds a model that will be used to illustrate the benefits of information systems to organisations throughout the text.

In part II the author surveys personal information systems, applications and goals. He describes the five components of a personal information systems application and discusses a method of building personal information systems, focusing on the role that a future business professional should play.

Part III considers information systems that facilitate the activities of workgroups. These applications can add value to workgroup processes, products, and innovate and improve. He describes the five components of workgroup information systems and discusses their development.

Part IV considers information systems that support enterprise-wide activities. Such systems typically integrate the activities of several departments, facilitating the information flow from department to department. As enterprise information systems are assimilated into the organisation, they may instigate change in underlying business processes and even in the nature of the business. He describes the ways in which such systems add value and benefit the enterprise. He then describes the five components of enterprise information systems with particular attention to the data and procedure components, since these are the ones with which a business professional, will be most involved. Discussing the development of enterprise information systems he reviews the five stages of the systems development and shows the broad role of prototyping in that process. He also considers the role of computer-aided systems engineering in developing enterprise information systems.

Part V addresses two types of specialised information systems and comprises 14 and 15 chapters. Chapter 14 discusses decision support systems. Such systems facilitate the solution of problems that arise from semi-structured or unstructured domains. Chapter 15 describes knowledge representation and expert systems. These systems store representations of knowledge and provide advice, recommendations, and other assistance, primarily by making logical inference from the stored knowledge.

Thus the book emphasises solving business problems with spreadsheet and database software. Using a structured problem solving methodology, students can tackle and resolve real business issues such as MIS effectiveness and efficiency, aligning information technology to organisational objectives, analysing costs and benefits and business engineering. The book also provides practical applications of major concepts, emphasising student understanding of the business problems and issues that are raised by MIS activities. Thus the text addresses people in all strata: managers and non-managers, professionals and non-professionals, accountants, engineers, con-

sultants, advertising executives and delivery drivers, among others.

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The Cultural Context of Leadership and Power by *Jai B.P. Sinha*. Sage Publications, New Delhi, 1995, 252 p, Rs. 275.

An effective business management is a result of an effective leadership. The leaders at the top set the tone for the rest to follow and provide motivation to pursue corporate objectives. The leaders are instrumental in creating the work culture and shaping the future of the organisation. A successful organisation formulates strategies, builds systems, updates technology and takes care of its resources on a continuous basis. It fosters an environment conducive to change and builds strength in its human resources to meet emerging threats, change and competition. It is this context that needs of an effective leadership.

"The Cultural Context of Leadership and Power" by Jai B.P. Sinha attempts to throw light on various leadership styles, the evolution of leadership and the relationship between leadership and power. In the words of the author, 'the book attempts to provide historical and cultural perspectives on leadership and power and the aim has been to provide a framework to understand two of the most crucial aspects of organisational behaviour'.

The opening chapter 'The Backdrop' is rather long but provides an excellent retrospective view of leadership. The author traces the earlier studies on the formulation of various theories of leadership. 'The Greatman Theory' drawing strength from Darwins'. Theory of Evolution, assumed that leaders were born and leaders were biologically superior to others. 'The Trait Approach' attempted to search for personality characteristics which differentiated a leader from others. 'The Situational Approach' explained the leadership in terms of group dynamics. 'The Interactional Approach' postulated that different persons in a group 'reacted differently to the groups dynamics'. It led to emphasis that leadership effectiveness can be explored in depth more through the study of styles than traits. 'The Backdrop' builds up a rational framework for chapters that follow in the book.

In the next two chapters, Prof. Sinha deals with the styles of leaders at the top and the middle levels.

The top leaders set the pace for the rest of the leaders. The author refers to four styles of the leadership at the top. A 'Participative Leader' is a facilitator of group processes and activities. This style is better reflected in group decision making. The participative leader creates environment where 'ego supportive relationship' is created amongst members. In the 'Pioneering-Innovative (PI) style' top leaders pursue innovative strategies and work towards technologically sophisticated products and services. These leaders are fond of high technology and are willing to take risks. A leader with 'Charismatic Style' can 'emotionally charge his subordinates to do whatever he wants them to do'. Such leaders have a zeal and they create a committed band of followers. They possess a vision of the future, are sensitive to environment and are ready to take personal risks to pursue corporate objectives. The fourth style of leadership described by the author as 'The Transformational Style' includes 'skills and orientation of system building' besides the components of 'Charisma'. The leaders with this style tend to make changes in the structure and functions of the organisation. They are firm, fair, team builders, delegate powers and create an environment of confidence, trust and co-operation.

With the help of a number of cases and case studies, the author has tried to explain and illustrate different styles of leadership. In the Hospital case study the author successfully brings out that in participative style of functioning leaders can differ in many ways to resolve the conflicts, without sacrificing the ultimate goals or the objectives. Jamshetji Tata, Vikram Sarabhai, G.D. Birla and Walchand Hirachand are top leaders who fit in the mould of P.I. style of leadership. In another case study the author dwells at length as to how an ailing and losing Damodar Valley Corporation was nursed back to making profit by Luther, a Transformational leader. Luther had to face numerous challenges, hooliganism, indiscipline, threats and blackmail. He staked all his career and future, withstood grievous head injury but went ahead to transform DVC, through the enforcement of discipline, creating accountability at all levels and providing dynamic welfare. Luther case study should be an eye opening exercise to many a top executive at the helm of organisations, in both private and public sectors, who grope for answers to similar problems as existed at DVC. How many leaders for example, can accept and practice what Luther did to achieve punctuality: officers also should report at start of duty hours, 'regardless of how late he had worked the previous evening?' The author deserves compliments for quoting Luther and the DVC story quite extensively as this represents leadership in action rather than a mere textbook exercise.

Leadership at the middle level differs. The author points out, very rightly, that the middle level manager is to ensure that policy decisions are implemented within the structural and procedural constraints of the organisation. The middle level managers are therefore, generally called upon to use their skills largely to manage human resources. For these reasons the modes of middle level leadership are embedded in the surrounding culture. The western theories, for example, may not have any relevance in the Indian environment. The author refers to two non-western formulation of leadership styles: Performance Maintenance (PM) in Japan and Nurturant Task (NT) in India. In PM style, the leader excercises pressure on his subordinates to expedite their work and simultaneously encourages good interpersonal relations within the group. The emphasis is on performance as well as on maintenance of interpersonal relations. Depending upon the relative emphasis on P and M, this style of leadership can be visualised to have four sub-variations as (a) High on P and High on M (b) Predominantly M (c) Predominantly P (d) neither M nor P orientation.

The typical Indian subordinate has been considered, by the authors of NT theory, as one excessively dependent and who requires a constant and continued inducement to work hard. The subordinate has not been considered as ready and fit for a participative system, thus ruling out the effectiveness of authoritarian and participative styles. The NT theory authors also conclude that besides dependency, Indian sub-ordinate has the 'preference for hierarchy and personalised relationship'. In the NT style of leadership, an effective leader leads his subordinates towards a shared goal. He is task-oriented. The leader himself also works hard and becomes a role model to his subordinates. Simultaneously, he also caters to the needs and expectations of his subordinates. Nurturance generates a feeling of being comfortably dependent, secure and relaxed. With task orientations, nurturing takes the form of nurturing those of the subordinates 'who work hard and sincerely'. The task is achieved through expression of care and consideration, affection and interest in the growth and well being of the subordinates as long as the subordinate is receptive to accept the superior status of the leader and is willing to produce results. This part of the work is highly revealing. As the leadership styles described are from an Indian perspective, should help many a budding manager to develop or mould his style of operations to make it more meaningful. This part of the book is indeed very valuable.

The last two chapters (Summary excluded) are devoted to the study of power dynamics and the relationship of leadership with power and work culture.

The author rightly points out that no leadership style can be effective unless the leader can exercise sufficient amount of power over his subordinates. Power is the 'capacity to influence'. Leadership and power are closely related concepts. Styles of leadership are reflected in ways of expressing power. Participative leaders, for example will reason out with their subordinates while NT style leaders will lend a listening ear. Authoritarian styles were found more assertative in 'unfavourable climates'.

In the concluding pages of the chapter 'Leadership, Power and Work Culture' Prof. Sinha points out that leadership is the most critical factor in building organisational culture. There are no two opinions about the same. But one is not likely to agree with the author that organisational cultures are created entirely by leaders. Organisation culture is shaped by several factors including the value system, the external environment and the corporate objectives. This is evident from experiences of many sick companies and public sector undertakings. There are innumerable examples where many a top leader responsible for success stories in organisations in the private sector could neither create a change in culture nor generate a new success story in a public sector undertaking. Leadership can at best be cited as one factor responsible for creation of organisational culture.

The book is definitely a welcome addition to the existing literature on leadership. The work is informative and provides excellent case studies from the Indian context. The author has lived up to the observations contained in the Preface that the present work attempts to provide basic scientific knowledge on leadership and power without resorting to jargon and statistics! The Cultural context of this work is Indian and the author has taken pains to explain the theories of western origin in the Indian context, mercifully keeping the book small in 250 pages. The book should be widely read by practicing managers at all levels, top, middle and the firstline, administrators, and those involved in the management of organisations.

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The brave New Manager: A mind set for 21st Century by *Moid Siddiqui* published by Tata McGraw-Hill Publishing Co., New Delhi, 1995, 254 p, Rs. 185.

The present work—The brave New Manager authored by a seasoned Human Resource specialist with rich experience of managing change is a unique

contribution in the field of Management in general and improvement in the quality of human resources in particular, including patriarchal bosses. Mr. Siddiqui deserves high appreciation for presenting a full storehouse of ideas in a novel manner with unreserved use of multicultured stories, Chinese and Indian parables, corporate success stories along with his own vast experiences.

Mr. Abid Hussain, former Indian Ambassador to USA, in his forward supports the author's silent mutiny against patriarchal bosses who encourage bureaucratic rituals and spineless Managers, who just follow with "Yes Sir" to survive. Both have to change to keep their organisation competitive among global players. The reviewer confirms that Moid's work is altogether ground realities based on his experience in HMT, CCI, BHEL, NHPC etc. and emphasises that Patriarchal Bosses and environment do not provide fertility to growth and development. In reality, it harms and hamper the growth.

The entire work is presented in sixteen chapters: in simple, lucid and interesting manner. In these chapters the author equates the teacher with Patriarchal boss in the sense that he is always right and students and sub-ordinates should not question and follow them. This results in break on creativity, a journey from like to dislike, if questioned. A man right from his childhood is trained to become conformist with the myth that teacher-boss are infalliable, root of patriarchy. The teacher- teacher syndrome with the example of how earth looks, explains this phenomenon. He emphasises (Chapter II and III) parents-teachers are co-authors of life story of a child. With the help of an example of a baby sparrow, he argues parent, child, adult roles contaminate the thinking perception and action of a child. Unschooled wisdom of a child remains chaste and pure evenafter schooling. Mr. Siddiqui highlights (in Chapter V and VI) the need to involve the people, who are affected in decision making process. With the example of Prophet Mohmad, he has explained that CEO is required to create trust, demonstrate intellectual integrity towards organisation and people, managers will follow them. In fact the CEO should not lose his sense of direction (Chapter VII) and locate North star to guide his destiny of success.

Continuing his crusade against 20th century confirmist managers, Mr. Siddiqui has pointed out (Chapter VIII and IX) that Chocolate Cream Managers and Heroic Managers both sow the seeds for decline. Identification of heroic manager is as important as low performer for any HRD intervention. Former deserves priority over others. The author has also given tips on how to get rid of chocolate-cream syndrome. Using his creativity, Mr. Siddique has identified (Chapter X) that most managers have double standards of stone age managers who are loyal and submissive to bose but brutal with sub-ordinates. With the example of mother in law, he narrated the similar behaviour for daughter-in-law. He highlighted the strong likes and dislikes of stone age managers which can help today's managers to have self-interrogation to find SAM in himself. He has also discussed Zen approach (XI) which helps one to see the positive in the negative. Citing the example of Superintendent Engineer on Tissa Dam site, he argues that Zen approach emphasises on process adopted by managers to solve the problem rather than on result. One has to see invisible just as Dhyana in Hinduism. He focuses that executives to make sensible exception to general rule on behalf of superior and Boss should upheld the decision. Empowerment will bring gains to the organisation in many invisible ways. The managers in the organisation have to develop "spine" not arrogance (XII) and demonstrate to their juniors.

Discussing the importance of communication (XIII), he differentiates listening and writing with communication. The managers have to acquire and re-inforce effective communication practices with the help of modern communication technologies, to remove complications procedures, practices, systems, policies etc. It is essential to know (Chapter XIV) what we are. What works todays may be irrelevant tomorrow. Focus is on 'Knowledge is power'. As a problem solving HRD expert, Mr. Siddiqui is conscientious to put action programme for 'C' developing spine with courage and sobriety. According to him there are four keys to success i.e. Competence, Commitment, Courage and Courtesy. In concluding chapter, he described that student (manager) got guts to tell Teacher (CEO) that she was wrong, he (student-subordinate manager) will not allow any body to wrong him more. The reviewer feels that no manager should miss the opportunity to go through this excellent piece of work. In fact, every new management trainee should be given this book. It is strongly recommended to institutions conducting management programmes and business organisations to purchase this book for their libraries and ensure that it is scanned by the people.

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New Technology and the Workers' Response: Microelectronics, Labour and Society by *Amiya Kumar Bagchi* (ed.), New Delhi: Sage Publications, Nov. 1994. 361 p, Rs. 375.

The book under review concerns itself with the issues of coping with an apparently overwhelming technological change in today's competitive age. To a layperson, the challenge of change is formidable and the social risks unimaginable. However for policy makers, the change is an inescapable phenomenon. Lest we get carried away by the darker hues of technological change, it would be wise to put the issue in a balance and count the opportunities too that are offered in its wake. But first, what is the most important technological change that seems to have prompted us off in this mode of thinking! The most important technological change, according to Professor Bagchi, is the introduction and impact of microelectronics. The inventions and innovations induced by micro-electronics are momentous, and range from the most familiar computers to the most evocative imageries like information super-highway. In between, the change also includes the fast development of more and yet more powerful semiconductor chips that is the heart of the computer, and a host of other developments.

The book under review raises the "spectre of a semi-conductor society of our times" and, presses the need of appropriate business responses. Towards this direction, the editor, judiciously blends the wisdom, research and perspectives on behalf of all of us to meet the challenges of the micro-electronics governed business society. The book is the outcome of a seminar organised by the Centre for Studies in Social Sciences, Calcutta in 1991. The seminar sought to raise and discuss through invited research papers, the social and economic impact of micro electronics(ME) based technologies in different economies and sectors. Out of the papers, twelve key papers of the seminar form this book. Although the editor has contemplated no particular structure, the twelve papers or the chapters fall under four sections. Chapter one by Professor Bagchi is a backgrounder for the theme of the seminar and could constitute the first part of the book. In this chapter, Bagchi has summed up in a very scholarly manner, the rationale of the seminar, the issues raised by it and the work of the fellow contributors to the volume. Each contributor raises an important issue.

Chapters two to four analyse various factors like flexibility of organisational response, inter-firm and intra-firm cooperation; choice criteria of new production technologies like flexible manufacturing system or FMS, computer-aided design or CAD, computer numerically controlled (CNC) machines etc.. These three chapters respond to the effect of microelectronic technology on production methods, and may thus, be dubbed as the second part of the volume. In this section, Professor Lindberg (Chap.4) lists down the macro and micro economic requirements that will accelerate the diffusion of ME based technologies. For this reason, he argues that that there has been an extreme concentration of ME based advanced manufacturing technologies (AMT) in only seven countries. The countries are Sweden, Finland, France, Germany, Japan, UK and the USA.

Chapters five to nine focus specifically on the Indian scenario and can be clustered as the third section of the book. The section presents case studies of product (eg. electronic switching systems of India); of a State (eg. West Bengal) which has employed ME based technologies, and, finally of select newly industrialised countries or NICs of East Asia (eg. Taiwan and South Korea) as well as in the third world countries. The authors describe the experience of ME based work at all these levels and indicate common hardships. A feeling seems to develop here that not only ME based technological importation has been haphazard, but any effect to raise productivity too is hampered as there is no programme on skill development. In sum, the absorption of technological change has been far from satisfactory. The section also analyses the factors responsible for the amazing record of success of some east Asian countries in this respect. The success factors seem to be the institutional innovations and changes in social relations, and an effective role of the government.

The fourth and final section may consist of the final four papers of the volume. The researchers have examined in this section the response of the workers to the use of ME technologies in India. Prof. Tulpule and Dutta (Chap.10) illustrate the severe effects of labour being displaced by the introduction of ME technologies. They assert that such displaced labour has not been properly compensated. The issues raise concern particularly in view of the ongoing economic liberalization programme. Moreover, such aberrations unnecessarily make workers apprehensive and provide a lever in the hands of trade unions against introduction of technology at the work place. Professor D'souza brings out the enormous importance of the political and social context in assessing new technologies in Less Developed Countries (LDCs). Samaddar (chap.12) shows how the ME technology increased the possibility of fragmentation among the workers as a result of which several newspapers management in India were able to introduce ME technologies in their firms despite stiff opposition from the workers. Mamata Chaudhary as the final contributor to the volume, studies the modes and outcomes of collective bargaining over the introduction of ME technologies in organized banking sector in India.

She traces the history of technology bargaining in recent times and indicates the factors (such as managerial tradiness, inadequate supply of suitable equipments and trade unions' resistance) which have held up the speedy introduction of ME technology in the sector. She points out that decentralized bargaining and monetary compensation may be more effective in introducing the desired charges.

The book is a commendable effort in analyzing the various aspects of introducing ME technology, promoting industrialization and protecting workers' interest at the same time. It is rich in data. The case studies are vivid in their description. All the scholar contributors seem to agree that ME technology is neither a panacea nor a threat in itself to workers. They also suggest that a successful introduction of ME technology and its quick dissemination requires a set of entrepreneurs who are neither afraid to invest nor to take risks. Government policies should also be framed accordingly. Finally, workers interest is no less important and needs adequate protection and compensation.

The book must rank as an essential reading for policy-makers administrators and researchers. The text is highly referenced and enriched with comprehensive bibliographies and tables. References of actual case studies of different countries including different sectors of India will enable readers to relate the concepts and implications of introduction of ME technologies in multiple contexts. The price of the book is too high to avoid a mention. In any case, the book is a good value for money. The book certainly is one in the all-important area of electronics and human response.

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