Focus : Technical & Managerial Education

Guidelines for Contributors

Scope and Coverage

PRODUCTIVITY is the principal journal of the National Productivity Council of India. The Journal aims at disseminating information on concepts of and data on productivity and its growth in India and elsewhere. It also aims at disseminating knowledge on techniques and methods of productivity improvement through effective management of all types of resources. Thus, contributions from a large spectrum of disciplines are accepted for publication. Only those manuscripts that present the results of original research and analysis are acceptable to the Journal. The managerial/policy implications of the study should be highlighted separately towards the end of the paper.

Format of Manuscripts

Contributions should be of about 5,000 words length. Tables, illustrations, charts, figures, exhibits etc. should be serially numbered and typed in separate pages and should not be mixed with the main text. The text should be addressed to the Editor, **PRODUCTIVITY**, National Productivity Council, Utpadakta Bhawan, Lodi Road, New Delhi-110 003.

About the References

Only those references which are actually utilised in the text should be included in the reference list. In the text, references should be cited with the surname of the author(s) alongwith the year of publication and the page number, all in brackets. If there are more than one reference by the same author during any year, the year may be subscripted with 'a' or 'b'. For instance, reference may be given at the end of the sentence as: (Szendrovits, 1988a, p. 337). Sources of data need to be given below each table unless otherwise mentioned in the text. Reference list should be alphabetically arranged. Each reference should carry the surname of the author, followed by other names, the title of the paper in quotes, the name of the journal underlined, volume and issue numbers and the year of publication. In the event of a book, the title should be followed by the publisher's name and year of publication. In the event of a report from an organisation, the name of the organisation may be cited in the place of the author.

Accompanying Material

The manuscripts should be accompanied by:

1. An abstract of the paper not exceeding 100 words.

2. A declaration that the paper is original and has not been submitted elsewhere for publication.

3. A note about the author(s) not exceeding 50 words.

Productivity

Contents

Quality and Accreditation in Technical & Management Education

R. Natarajan

The notion and concept of Quality has evolved continuously from its first application to the manufacturing sector through the service sector and the software sector to the education sector. The essential features and characteristics of Quality Engineering Education have been identified. The possibility of quantification of academic quality has been hotly debated among the academics. The Accreditation initiatives of NBA of AICTE and of ABET (US) have been described and discussed. The Washington Accord is a multi-national consortium for establishing the equivalence of the accreditation systems in different countries. Over the years, several quality experts or 'gurus' have variously promoted the evolution and growth of Quality concepts and precepts, and these are briefly described. There are some intrinsic barriers to Quality in a developing country like ours, and these are enumerated.

R. Natarajan is Chairman, All India Council for Technical Education, (AICTE), New Delhi.

Concept of Quality

The concept of quality has evolved from the manufacturing sector during the past two decades, wherein they were associated with products such as air conditioners, cars, cellular phones, semiconductors, etc. In those industries, quality was about minimizing variance and ensuring that the manufactured products conformed to clear specifications so that customers could expect the product to perform reliably. This focus on minimizing variability prompted more and more companies to adopt quality control practices, exemplified by SQC. It is important to realize that customers develop new uses for products as novel features are added. Thus, continuous experimentation and the development of new and innovative features play an important role in shaping consumer perceptions of quality in software. A new view of quality is required to assess an organisation's IT infrastructure: the perspective consists of a synthesis of conformance, adaptability and innovation.

Quality Engineering Education

The US National Science Foundation (NSF) Task Force on TQM has come up with the following definition of Quality Engineering Education:

Quality Engineering Education is the development of intellectual skills and knowledge that will equip graduates to contribute to society through productive and satisfying engineering careers as innovators, decision-makers and leaders in the global economy of the twenty-first century.

Quality Engineering Education demands a process of continuous improvement of and dramatic innovation in, student, employer and societal satisfaction by systematically and collectively evaluating and refining the system, practices and culture of Engineering Education Institutions.

The Task Force points out that TQM is not a destination, but rather a journey to improvement. The Task Force has also examined the nature of the customer of Engineering Education. It preferred to deal with the concept of "Stakeholders", which could vary widely depending on an institution's mission, goals, strategies and tactics. The stakeholders include suppliers, such as high schools, and receivers, such as employers and students.

> **TQM is not a destination, but rather a journey to improvement.**

Is Academic Quality Quantifiable?

There have been several discussions on this fundamental question. There are several human activities where quality assessment is necessary and inevitable, but the techniques employed are quite subjective, and depend to a large extent on the human sensory perceptions:

Sight – Beauty contests

Sound – Music

Taste – Tea, wine

Touch – Comfort levels in air-conditioning

Smell – Perfumes

However, we do not have unequivocal measures for many important things in life:

Feelings – Love, compassion

Intellect – IQ is an attempt

Emotion – EQ is an attempt

It is widely believed that academic quality, like beauty, for example, is an elusive characteristic. Robert Pirsig has resorted to much verbal gymnastics in coming to terms with quality, "Quality.... you know what it is, yet you don't know what it is. But that is self-contradictory. But some things are better than others; that is, they have more quality. But when you try to say what the quality is, apart from the things that have it, it all goes poof".

A recent ad proclaimed: "Quality needs no definition, you recognize it when you see it". Quality is a complex, multi-dimensional entity, no doubt, but so are many other things of significance, such as development, growth, excellence, democracy, religion.

> **Quality is a complex, multi-dimensional entity.**

Two quotations which bring out the need for quantification, and simultaneously the limitations of this approach are: Lord Kelvin's "When you can measure what you are speaking about, and express it in numbers, you know something about it; and when you cannot measure it in numbers, your knowledge is of a meager and unsatisfactory kind". G.N. Lewis stated, "I have no patience with attempts to identify Science with measurements, which is but one of its tools, or with any definition which would exclude a Darwin, a Pasteur or a Kekule".

The Accreditation Initiatives of ABET

The ABET (Accreditation Board for Engineering and Technology) of the US has been the pioneer in designing and implementing accreditation for engineering and technology programmes in the US. ABET is a federation of about 30 professional societies; it is the sole agency for accreditation of engineering programmes in the US. It is the successor to the Engineering Council for Professional Development, ECPD, which functioned for 65 years. The official philosophy of ABET is to encourage innovation in engineering education.

Over the past few years, ABET has been looking inward; and the introspection has resulted in several corrective measures. For example, it was realised that over the years ABET evaluators became more dependent on rules and criteria, finding it easier and less time-consuming to evaluate a programme's compliance to these, than to evaluate innovative curriculum responses to a changing world. During this period, accreditation criteria grew from a few paragraphs to 30 pages of detailed course descriptions, credit-hour requirements, mandated faculty strength, etc.

ABET has now called for steps to lessen pre-occupation with quantitative criteria, and to respond to the fundamental challenges facing engineering education in the 21st century. Significant among these are new engineering design criteria, which moved away from the rigid 16 credit-hour requirement for engineering design. The innovative clause allowed institutions to submit innovative programmes that did not satisfy the quantitative aspects of the criteria, but met the spirit and intent of the criteria.

The Accreditation Process Review Committee, APRC, was established in 1992, to help outline "a quality-oriented, flexible accreditation system that en-

courages diversity, and does not inhibit innovations in Engineering Education". APRC identified three key issues to be resolved:

- excessive length and specificity of *the accreditation criteria.*

- difficulty in attracting mid-career professionals from industry and research universities to participate as leaders in the accreditation process.

- complexity and length of the accreditation process.

It is one thing to come up with reforms in several aspects of accreditation; it is another thing to persuade the several actors to accept them in good faith. The assessment of the then President of ASEE, Lyle Feisel, on the introduction and acceptance of "Engineering Criteria 2000", is interesting. He pointed out that EC 2000 represents the birth of something new—something most believe to be good—but it also will lead to the death of something old. He makes a telling comparison with what Elizabeth Kubler-Ross has characterized as the five stages of a grief a person undergoes upon learning of his impending death: denial, anger, bargaining, depression and, finally, acceptance. Feisel exhorts all the stakeholders to enthusiastically involve themselves in the new processes, since the real winners will be the students, the profession, and ultimately, society.

The NBA Framework

The National Board of Accreditation (NBA) was established in September 1994 by the All India Council for Technical Education, and was charged with the task of evolving a procedure for quality assessment in the technical education sector, and specifically to:

- articulate the criteria for assessment of quality

- identify parameters to quantitatively assess these criteria and assign appropriate programme-specific weightages for each

- validate the procedure by well-designed test runs, and

- establish appropriate benchmarks.

The NBA has carried out country-wide awareness workshops, training programmes and other essential activities, such as benchmarking and finalisation of the evaluation procedures and methodologies. The NBA is responsible for assessing the qualitative competence of educational institutions from the Diploma level to the Post-graduate level in Engineering and Technology, Architecture, Pharmacy, Town Planning, and Management. The NBA is also concerned with the assessment and quality assurance of the various constituent elements of these educational institutions, such as, the academic ambience, administrative infrastructure, physical resources, human resources, support services such as the library, computer centre, avenues for moulding and developing the student's personality and learning characteristics.

The major decision adopted by the NBA is to accord Accreditation, not to the Institutions as a whole, but at the Programme level, viz., the 4-year undergraduate engineering degree course after 10)2, and the 4-semester M.E./M.Tech programme after the Bachelor's degree. Initially, the Programmes were graded into categories A, B, C and NA, depending on the rating they achieve on a 1000 point scale. This was considered necessary for promoting healthy competition for Quality among the different degree Programmes of the same institutions, as well as among similar programmes in different institutions. Thus, in a given Institution, some degree programmes may be accredited with high grades, while some weak programmes may be rated low, or even denied Accreditation. However, recently this practice has been abandoned, and the programmes are just accredited/not accredited. This is to align the NBA system with internationally accepted practices.

> **The NBA is to accord Accreditation, not to the Institutions as a whole, but at the Programme level.**

The Board comprises a Chairman, and 15 other Members, drawn from Industry, R&D establishments, Professional Societies and MHRD, and eminent educationists. The term of office of the Chairman and Members, other than ex-officio Members of the Board, is three years. One-third of the Board continues for another term, to ensure continuity; however, no Member will continue for more than two terms.

The final decision is based on Information supplied by the Institution in 'The Accreditation Proforma', a three-day Visit by peer Assessors, and their Report, which is evaluated by a Sectorial Committee and recommendations made to the Board.

Table 1 shows the NBA Accreditation criteria, under 8 categories, amounting to a total of 1000 points.

Table 1: NBA Accreditation Criteria

Criterion	Weightages	
	U.G.	P.G.
I. Mission Goals and Organisation	100	70
II. Financial and Physical Resources and their utilization	100	80
III. Human Resources	200	200
IV. Students	100	100
V. Teaching — Learning Processes	350	250
VI. Supplementary Processes	50	50
VII. Industry — Institution Interaction	70	100
VIII. Research and Development	30	150
Total	1000	1000

A few hundred programmes have now been assessed and accredited, and the results published and disseminated by the NBA.

The majority of Accreditation systems in Engineering across the world are based on the ABET system of the US.

The Washington Accord

"The Washington Accord" is the recognition of equivalency of accredited Engineering Education programmes leading to the Engineering Degree, and was signed in 1988 in Washington. The signatories have not only exchanged information on, but have also examined, the respective processes, policies and procedures for granting accreditation to engineering academic programmes and have concluded that these are comparable.

The original signatories of the Washington Accord are Australia, Canada, USA, Hong-Kong, Ireland, New Zealand and United Kingdom. The Accord defines the policies and procedures concerning accreditation of engineering programmes, implying the 'substantial equivalence' of the degree; it does not concern itself with individual courses. It is a 'meta-evaluation', a verification of the comparability of the accreditation mechanisms of the Accord countries.

Ranking of Academic Quality

The question of what academic quality means has often been raised, but has never been satisfactorily or comprehensively answered. Most experts agree, however, that the top-class institutions invariably possess several common features. These include high-quality

faculty; excellent physical facilities, such as laboratories, adequate resources to maintain the operation; curriculum with variety and depth of courses; adequate number and mix of students, to enable students to learn from one another and maintain individualized learning; etc. The meaning of academic quality can also be distilled from less quantifiable attributes, such as "morale", "clarity of purpose".

There are implicit and cyclic relationships among institutions, faculty, students and their careers. Good faculty are attracted to good institutions and by good students, who respond to good reputations, which are based upon good faculty.

> **There are implicit and cyclic relationships among institutions, faculty, students and their careers.**

Whatever the deficiencies of ranking systems, decisions regarding the relative quality of different institutions are always made. A college education, in all countries, whether DCs or LDCs, is a passport to financial, social and intellectual success, and it is necessary to have some guidance in selecting institutions. Higher education has become "a game of brand names" in the U.S; and more often than not, the reputations are based on an aggregate of hard-to-measure subjective impressions. It is generally felt that academic reputations mirror academic quality.

It has been observed that changes in prestige rankings occur gradually over time. It takes time to build reputations, but once gained they tend to be self-perpetuating.

Ranking Lists

The Ranking lists and reports serve many purposes for many target groups;

Student: for choice of institution in which to pursue academic programme.

University administrators: as a basic of defending their budgets, for obtaining government assistance, for justifying new faculty and students, etc.

Faculty: for taking up faculty positions, inter-institutional mobility.

Parent: as the basis for deciding where to send their children in order to maximize return on investment.

Employers: as the basis for recruiting graduating students.

Government: as the basis for funding academic programmes.

Criticisms of the Ranking Reports

Many ranking reports do not clearly explain the criteria employed, nor the methodology used in arriving at numerical scores and other conclusions. There is also growing concern, especially among responsible academicians in higher education, about the recent trends for an increasing number of magazines to publish rankings of the colleges and universities. In some cases, the colleges indulge in unethical lobbying in order to get favourable treatment in the surveys. "It is better to be in than not in", says one of the administrators. There have been several criticisms about the accuracy of the data the colleges report and the appropriateness of the methodologies employed to collect them.

> **The colleges indulge in unethical lobbying in order to get favourable treatment in the surveys.**

The ranking methodologies are undergoing continual review and refinement in order to enhance the validity, reliability and credibility of the rankings. This, however, has led some university officials to complain that this only represents the lack of confidence in the prevalent data-gathering and analyzing techniques. "There is madness in trying to rank institutions", claims an administrator; "there are no data I know that can judge the culture of an institution". Other educators believe, however, that although the rankings are "not perfect", they reflect a sincere effort to publish comparative information about colleges that the institutions have been unwilling to publish themselves.

The surveys by magazines often present conflicting data; for example student/faculty ratios have been reported differently for many universities in two of the best-known surveys. The foreign applicants to US colleges are particularly affected by the inaccuracies and ambiguities in the ranking reports; they have little opportunity to verify the authenticity of the reports.

William Arrowsmith, a distinguished classics scholar believes that the effect of reputational rankings is "to reduce diversity, to reward conformity or respectability, to penalize genuine experiment or risk. There is .... an obvious tendency to promote the prevalence of disciplinary dogma and orthodoxy". It is contended by some that innovation is not rewarded in academic quality rankings, nor is it penalized; it is virtually ignored.

> **Innovation is not rewarded in academic quality rankings, nor is it penalized; it is virtually ignored.**

It is often found that once a department or institution reaches the highest levels, it seldom falls too far, leaving very few spots at the top available for others to reach. It is also found that images change with "agonizing slowness" for upwardly mobile schools whose reputations have not kept pace with their true academic qualities. Some college presidents estimate that it can take up to 20 years for a reputation to catch up with reality. Lagging perceptions also can protect schools that are moving down in quality.

The "halo effect" is a matter of concern in rankings. It is the tendency for raters to carry over a generalized impression from one rating to the next, to attempt to make the ratings consistent. For example, it was prevalent when undergraduate versus graduate departments within the same institution were compared. It is also present when alumni rank their own alma maters high.

Classification into Clusters rather than Ranking Lists

In view of the several uncertainties and ambiguities in data-gathering and analysis, it is surprising that most of the ranking reports have undertaken to publish serial ranking orders leading to controversies. "Multidimensional" rankings serve to classify colleges and universities into levels of quality rather than to form rank orders. Webseter reports that of the six multi-dimensional "rankings" that could be found, four of them stratified institutions into 5 to 8 levels of quality. In 1965, David Brown separated 1121 colleges and universities into six strata on the basis of what he termed "quality per student".

Most of these multi-dimensional rankings and stratifications are based on some combination, of three criteria, involving faculty, students, and institution-wide resources. These criteria are quite different from those typically used in the ranking of Ph.D.-granting departments, wherein faculty characteristics, such as, scholarly achievements as evidenced by publications, citations, awards, honours, and research reputation, count far more than any other criterion. In the rankings of under-

graduate institutions, however, less than half of the criteria are based on faculty characteristics; almost a third are based on student characteristics, and almost a quarter are based on institution-wide resources.

> **Multi-dimensional rankings and stratifications are combination of faculty, students, and institution-wide resources.**

Some ranking reports list clusters of high-ranking institutions in alphabetical but not rank order.

Quality Perceptions and Precepts of the "Gurus"

Bicheno and Gopalan have identified nine 'Gurus' who have had a significant influence on Quality:

Dr. W. Edwards Deming

Deming taught quality to the Japanese; he maintained that management must have an appreciation of statistical process control (SPC). Today Deming is mainly associated with Quality Management theories, particularly his "14 point plan", the "Deming Cycle" and his "Deadly Diseases".

He called for management to understand variation, and to realize that improving the process, not motivation, is critical for success. Deming's rule of thumb is that perhaps 80 per cent of improvement requires management effort, while only 20 per cent is actionable solely by frontline employees. Mere exhortations and incentives to produce better quality will have only limited results.

Deming's 14-point plan is a complete philosophy of management, not just quality management. Deming maintains that the PDCA (Plan, Do, Check, Act) cycle is a universal improvement methodology. The idea is to constantly improve so as to reduce the difference in the requirements of customers and the performance of the process. Several companies have evolved their own version of the Deming Cycle, for example, DRIVE (Define, Review, Investigate, Verify, Execute). The seven "deadly diseases" of Quality, according to Deming, amount to a severe criticism of Western management and organisational practices.

Dr. Joseph Juran

Juran is given credit, like Deming, for developing

Japanese quality in the 1950s. The best known Juran concepts are his definitions of Quality, the concepts of "breakthrough" and the "internal customer", and the "quality trilogy". Juran was also responsible for "Pareto analysis" as applied to problem solving for work on the costing of quality, and for the idea of a "Quality Council" within the organisation. According to him, without customer orientation, good quality is not possible.

Juran was the first to name the Pareto principle and to describe it as a universal problem-solving methodology. The Pareto Principle sets out to identify the "vital few" as opposed to the "trivial many" or the "useful many". It refers to the well-known phenomenon that there will always be a relatively few processes or people or defects or problems that somehow take up most of the time or effort or cost.

In tandem with the Deming Cycle, the Juran breakthrough sequence sees the improvement process as taking two "journeys": the "journey from symptom to cause", and the "journey from cause to remedy".

Phil Crosby

Crosby is best known for his "four absolutes" of Quality, his cliché "Quality is Free", and his 14 point-plan (different from Deming's 14 points). Crosby's "four absolutes" are:

- The definition of Quality is conformance to requirements.

- The system of Quality is prevention.

- The performance standard is zero defect.

- The measurement of quality is the price of non-conformance.

Crosby's "Quality Vaccine" is more closely related to the Deming 14-point plan than the Crosby 14-step process. Crosby's 'vaccine' is a preventive medicine for management against poor quality. The vaccine comprises practical advice on 21 areas, subdivided into five sections; and is a succinct summary of what is needed for TQM. Crosby has also proposed a "Quality Management Maturity Grid", passing through stages of uncertainty, awakening, enlightenment, and wisdom, and certainty.

Armand Feigenbaum

This American Engineer was the originator of "Total Quality Control" often referred to simply as total quality. Feigenbaum has proposed a 40-point plan for Quality. In general, he prescribes three steps to Quality: quality leadership, modern quality technology and organisational

commitment. He is also credited with the concept of the "hidden plant": in every factory a certain proportion of its capacity is wasted through not getting it right the first time.

Kaoru Ishikawa

Ishikawa is regarded as the leading Japanese contributor to Quality Management. He is best known for his development of the total quality viewpoint, his work on statistical quality control, his emphasis on the human side of quality, his invention of the Ishikawa diagram, and the use of the "7 tools". He is widely regarded as the father of Quality Circles.

Ishikawa insisted that "total quality" implies participation by everyone in the organisation, and is achieved through everyone participating in teams rather than as individuals. According to him:

- Quality is a "thought revolution".
- Quality is not a "miracle drug", but rather a "herb medicine".
- Quality is based on "respect for humanity".
- Quality begins with the customer.
- Customer complaints are a vital quality improvement opportunity.

David Garvin

This Professor of Harvard Business School identified eight "dimensions" of Quality: Performance, Features, Reliability, Conformance, Durability, Serviceability, Aesthetics and Perceived Quality.

Shigeo Shingo

Shingo is strongly associated with Just-in-Time manufacturing, and work on "fail-safe devices". A fail-safing device is a simple, often inexpensive device which literally prevents defects from occurring. According to Shingo, there are three types of fail-safing devices: "contact", "fixed value" and "motion step". Shingo distinguishes between "mistakes", which are inevitable, and "defects", which result when a mistake reaches a customer. Shingo considered Quality Control as a hierarchy of effectiveness from "judgement inspection" (where inspectors inspect), to "information inspection" (where information is used to control the process as in SPC), and finally to "source inspection" (which aims at checking operating conditions "before the fact").

Genichi Taguchi

This Japanese statistician and engineer developed concepts which began to make an impact in the West during the 1980s. He stressed "Quality through design". Taguchi introduced the notion of the "loss function", as representing the "loss to society" due to deviation from specs; the loss is approximately proportional to the square of the deviation from the target value. He postulated that there are "customer tolerance limits" rather than engineering or designer specified limits.

Taguchi has made significant contributions to experimental design: parameter design and control of experiments. In the Taguchi view, design is the principal determinant to the final product cost, over the lifetime. There is a close link between Taguchi methods and QFD, quality function deployment. The Taguchi view holds that inspecting the process (SPC) is superior to inspecting the product (SQC).

Dr. Noriaki Kano

The "Kano model" has emerged as one of the most useful and powerful aids available for product and service design. The model relates three factors:

- Basic (or "must be") factors,
- Performance (or "more is better") factors,
- Delighter (or "excitement") factors

to their degree or level of implementation, and of customer satisfaction, which ranges from "disgust" through "neutrality" to "delight".

Barriers to Quality (In Life and Work)

The barriers to achievement of quality, with particular reference to our country, are discussed in this section.

- A threshold value of standard of living is necessary before concerns for Quality become important. Just as, in order to enjoy the fine arts, such as music, sculpture, dance, etc. you need to have a threshold level of prosperity. One can't enjoy the fine arts on an empty stomach.
- Quality requires hard work; and, we're not particularly well-known for our work ethic.
- For too long, we have accepted two kinds of quality: quality for export and quality for domestic products. Export-quality products were,

either not available for local consumption, or were too expensive.

- *It is globalization, liberalization and the imperatives of international trade which have forced us to think about quality.*

- For a typical worker, in the industrialized countries, the conditions at work and at home involve only minor differences in quality (and safety); not so in the developing countries.

- Quality does not arrive spontaneously; it requires a great deal of planning, organisation, commitment and substantial effort.

- There is correlation between quality and excellence. In our country, we have individual excellence, but no organisational or institutional excellence; and so also with quality.

- Quality of products and services is also dependent on the 'Quality of Life' and HDI; our country is at the bottom of the list.

- Quality implies respect for the consumer or the customer. Even in the private sector, we are just beginning to respect the customer; for too long we have had sellers' markets.

Conclusions

Quality has assumed prime significance in the Education Sector in recent times. Perceptions of Quality vary among the different stakeholders, and different frameworks have evolved for assessing and promoting Quality over the years. Each has its own specific goals, objectives and roles. They may not be directly applicable to all types of institutions and contexts, but they provide guidelines for institutions and educational administrators to embark on the journey to excellence.

While there are uncertainties, inaccuracies and inherent difficulties in the evaluation of research, decisions relating to its quality and value have to be made, and are being made. Continuous analysis and refinements of methodologies are required in order to improve the reliability and validity of the results.

Another point to be kept in mind is that research is only one component of the functions of a university. Teaching quality and other features of university activity are also important. Research rating has no necessary implication for the quality of teaching.

Reference

Natarajan, R. (2002), "Quality Assurance in Teaching and Research", paper presented at the Indian Science Congress, Lucknow, January.

Natarajan, R. (2000), "The Role of Accreditation in promoting Quality Assurance in Technical Education", The International Journal of Engineering Education, Vol. 16, No. 2.

Prahlad, C.K. & Krishnan, M.S. (1999), "The New Meaning of Quality in the Information Age", Harvard Business Review, Vol. 77.

Bicheno, J. & Gopalan, M.R. (2000), "A Management Guide to Quality and Productivity", Wheeler Publications.

Pirsig, Robert "Zen and the Art of Motorcycle Maintenance".

Indian Concerns of Technical Education in The Current WTO Round

R.S. Sirohi

This article addresses issues pertaining to the opening of the education sector in India in view of the current WTO round of discussions. It also discusses means of improving the education sector through measures undertaken by the governement and by private institutions.

R.S. Sirohi is Director, Indian Institute of Technology, Delhi.

WTO literature explains General Agreement on Trade in Services (GATS) as the first multilateral agreement to 'provide legally enforceable rights to trade in all services'. It covers every possible means of supplying a service, including the right to set up a commercial presence in the export market. Any institution that requires the payment of fees (even a public one) would fall within the category of 'commercial activity' and would be covered by GATS. So, GATS rules would require that foreign educational service providers be guaranteed access to the domestic educational market. This includes the right to invest within the country, to provide services to Indians abroad and to send educators and their salespersons into India on a temporary basis.

– ET, June 09, 2003

Though India at present has no obligation to allow foreign education services under the 1995 GATS, the question of opening education services has to be addressed. Technically, WTO negotiations are mandated to cover the entire range of educational services - from primary education to higher education. Public educational services or those services provided by the government are practically out of these talks now. However, envisioning a future scenario leaves us no option but to treat the perceived threat into a life time opportunity to do something and bring India to the fore front as an education destination for foreign students.

Indian educational institutions do attract some foreign students and also have the potential to supply educational services to foreign markets, particularly to developing and neighbouring countries. At present about 1,500 students from the Gulf and South Asia come to India for higher education, which is a disappointing figure (The Economic Times, June 9, 2003). This reflects upon our ignorance of a vast opportunity where much could be done. Technical education system in India has the potential to respond to these demands and can become one of the largest hubs for international quality education.

What we need to do is to learn from the success-

ful model. Take the example of US, which has a flourishing education sector, particularly 'Higher Education' is the fifth largest service sector export. In export of educational and training services it has established itself a world leader generating $7.5bn in export. This generates a trade surplus of $6.6bn. Who is contributing maximum to this? Let us look at the latest statistics: according to the Open Doors 2002 report, published by the Institute of International Education, the leading not-for-profit educational and cultural exchange organisation in the United States, International students comprise over 4 per cent of America's total higher education population. The report says they contribute nearly $12 billion to the US economy in money spent on tuition, living expenses, and related costs. India is the largest sender of students to the US surpassing China. India's 66,836 students now represent 12 per cent of the total number of international students in the United States, with an increase of 22.3 per cent compared to last year. In the last two years, the number has gone up by almost 58 per cent. Graduate and postgraduate studies are more in demand with nearly 75 per cent of Indian students seeking admissions in various programmes while the remaining 25 per cent opt for undergraduate studies. About 30 per cent of them are women. The most popular fields of study for international students in the US are business and management (20 per cent) and engineering (15 per cent). Thirteen per cent of international students are studying mathematics and computer sciences, the fastest growing majors.

> **India's 66,836 students represent 12 per cent of the total number of international students in the United States.**

Given this scenario, does the present round of discussion of GATS under WTO pose any threat to the education system in US or Europe? The WTO round gives every nation a chance to be competitive, innovative and succeed. India should shed away from the old cry of being in league with the disadvantaged and so expect considerations or deferments. Indians have proven their worth world wide in the emerging knowledge society. Many of them have graduated from the Indian systems. World's brilliance counts a very respectable figure of Indians. The education system, therefore, must be regarded as a source of pride for us. What needs to be done is to review policy, law and infrastructure and identify weaknesses and convert them into strengths. We have a much richer legacy in education than any other country.

India: A preferred Destination for R&D

India is emerging as a preferred destination for R&D Investments. According to an article published in Business World, over 70 multinationals (MNCs) - including Delphi, Eli Lilly, General Electric (GE), Hewlett-Packard (HP), Heinz, DaimlerChrysler and AVL - have set up research and development (R&D) facilities in India in the last five years. For some, like the $12.6-billion Akzo Nobel's car refinishes business, the centre had come even before the company had begun selling its products in India. Together with the laboratories set up before 1997, the total number of MNC R&D facilities in India today is nudging the 100 mark. The trend is worth noticing as the world's largest R&D destination, the US, has R&D centres of 375 foreign companies. The other existing hubs are Japan (pharma, automobiles), Israel (pharma, agri-chemicals) and Western Europe (engineering, automobiles, telecom).

The big attraction is the vast pool of technically qualified manpower that India offers. With over 322 universities, 1,500 research institutions and 10,428 higher education institutes, India churns out 3.56 lakh engineering graduates from technical universities and another 3 lakh post-graduates from non-engineering colleges. Besides, 21 lakh other graduates also pass out in India every year. China produces even more - 7 lakh technical graduates. Similarly, though India produces 5,000 Ph.D.s every year, China offers nearly 9,000 doctoral degrees. But, for the moment, India has an edge because it produces English-speaking scientists, unlike China. Hence, it's easier for MNCs to integrate Indian engineers into their R&D teams. Now China has made English mandatory in primary education whose impact will be visible soon. On the other hand, universities in the US give out 25,000 Ph.D.s annually - almost 17,000 of them to non-US nationals.

> **The big attraction is the vast pool of technically qualified manpower that India offers.**

Investment in Education

Statistics apart, what is important is the quality of this manpower. Quality improvement is linked with the policy of investment in the education sector. India spends only 0.8% of its GDP on R&D. The new Science & Technology Policy announced in January 2003 commits raising investments to 2% of the GDP by 2007. India's total annual R&D spend of $3.15 billion is less

than the annual R&D budgets of corporations like Ford ($7.4 billion) and GM ($6.2 billion). The total investment in the 100-odd MNC research labs in India over the last five years has been $800 million-1 billion. (The annual expenditure on R&D of the US is $265 billion - equal to the combined total of the R&D expenditure of Japan, UK, Canada, France, Germany and Italy.). On the other hand, India's spending on education was 4.11% of its GDP during 2000-2001. Fig. 1 and Fig. 2 give the literacy rates and an idea of the level of public expenditure on education in India and its neighbouring countries.

Public expenditure on education as percentage of GNP (1996)

Country	Public expenditure on education as %age of GNP (1996)
Thailand	4.8
Sri Lanka	3.4
Pakistan	2.7
Nepal	3.2
Myanmar	1.2
Japan	3.6
Indonesia	1.4
India	3.2
China	2.3
Bangladesh	2.2
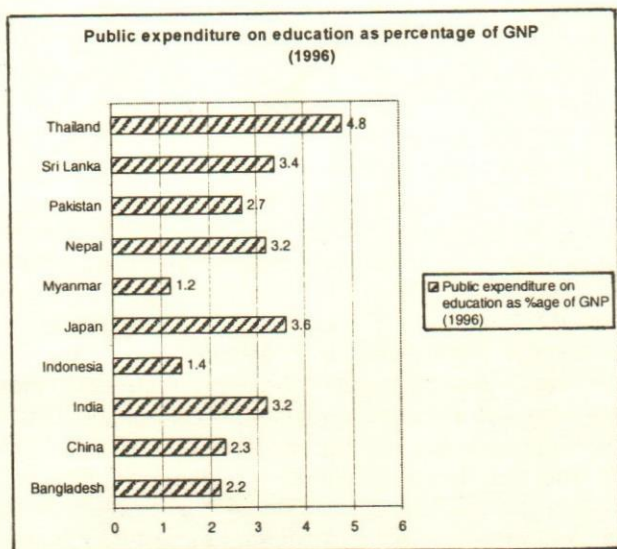
Fig. 1. Public Expenditure in India and some neighboring countries

Literacy Rates 1961-2001

Census Year	Percentage of Literates
1951	18.83
1961	28.3
1971	34.45
1981	43.57
1991	52.21
2001	65.38
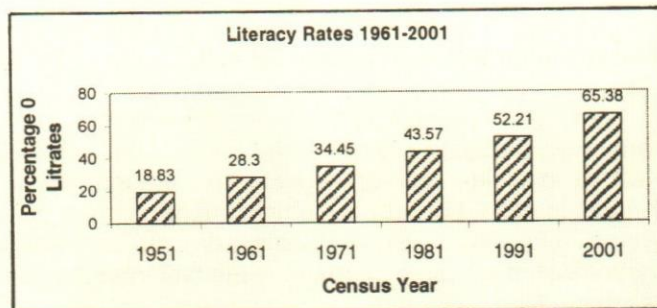
Source: Census of India

Fig. 2. Literacy rates

Figure 3 depicts the expenditure on education in India during the period 1951-52 to 2000-2001. Accord-

Percentage of Education Expenditure to GDP
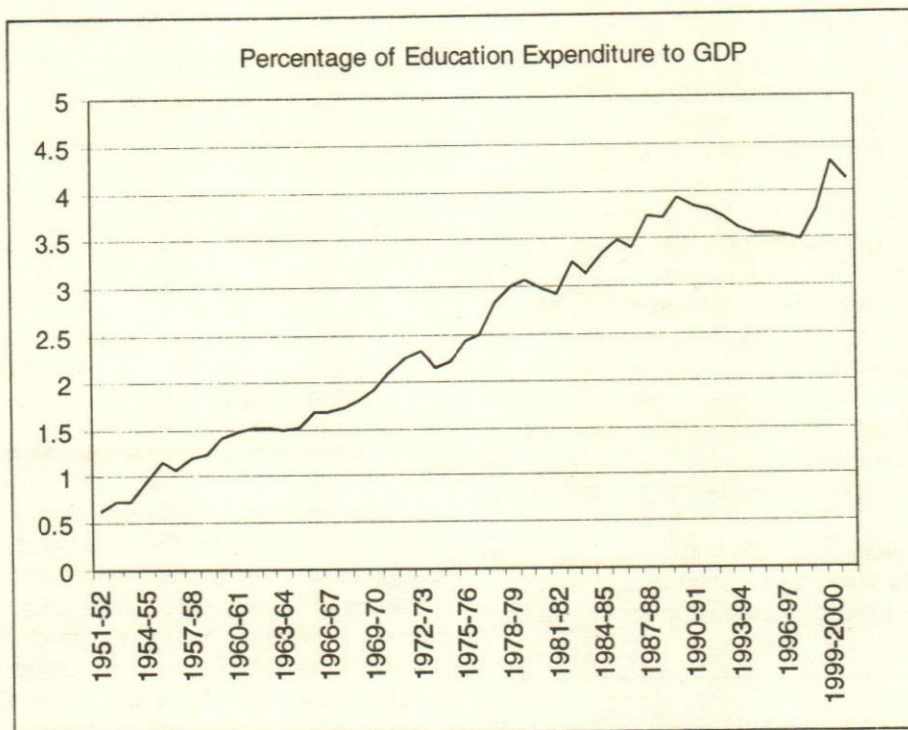
Data Source: 1. National Accounts statistics published by C.S.O

Fig. 3. Expenditure on Education in India (In crore)

ing to MHRD sources, the expenditure on the education sector was slightly less than 1% of the GDP in 1951-52. The percentage expenditure to GDP shows an irregular rise and fall. It rose to 2.33% in 1972-73 but in 1973-74 declined to 2.15%. It increased to 3.07% in 1979-80 and decreased to 2.83% in 1981-82. Finally, it reached a level of 4.11% in 2000-2001. Similarly, the percentage of expenditure on education and training to total expenditure of all sectors during the last five decades indicates that it has increased from 7.92% in 1951-52 to 13.55% in 2000-2001 i.e. by 6.37 percentage points during the last five decades. This translates to an annual growth rate of 0.13% during the period 1951-52 to 2000-2001.

Quality Manpower & Industrial Growth

Looking at the statistics of scientific and technical manpower graduating every year there is an urgent need to inculcate entrepreneurial skills among them. This would solve not only the employment problem but give a big boost to economic growth as well. Entrepreneurs are direct partners in the nation's effort of wealth creation.

Institutions/universities are often seen as a source of technology development that is useful to economic activity. Prior research has shown that commercially oriented university-activity, like patenting and licensing, has been important to the growth of scientific instruments, semiconductor, computer software, and biotechnology industries (Scott Shane, 2002). Moreover, economists have provided quantitative evidence of the beneficial effect on private sector activity of knowledge spillovers from university patenting. Evidence of the benefits of university patenting and licensing on economic growth has led many policy makers in the west to consider government policies to encourage university technology development and transfer as a way to encourage entrepreneurial activity in a region. At IIT Delhi initiatives have been taken to encourage students and faculty to work for R&D efforts viable to be commercialized through a start up company housed in IITD campus. Small budding entrepreneurs also are allowed space to incubate new business ideas where IITD faculty can provide support in technology innovation.

Research is a very valuable input to producing quality manpower as well as industrial growth of a nation. However, recent performance of India in research

> Research is a very valuable input to industrial growth of a nation.

is not encouraging despite having the third-largest scientific and technical manpower community. As per the latest statistics, India has slipped to the 21st place, from 13th in the year 2002 in research output in terms of the number of scientific papers. The percentage of science students in India has halved from 32% to 15% since 1950. The number of research papers has remained more or less static for two decades. According to the ISI Essential Science Indicators (Times News Network, 2003), between 1997 and 2001, India produced 76,970 papers as against 1,14,894 by China. The absence of a culture that actively promotes research is evident from the number of doctorates. In 1954, 164 doctorates in science were awarded, while 19 were awarded in engineering. However, nearly 50 years later, an exponential increase in the number of institutions offering research-level opportunities in science and engineering is not reflected in a commensurate rise in doctorates in either area. According to the All India Council for Technical Education (AICTE), in 1996, only 3,861 PhDs were awarded in science and 374 in engineering. The picture gets more dismal, in 1998, there were only 298 doctoral engineering degree holders in India. Compare this with figures from Taiwan, which had 477 doctoral degree holders, or 2,900 in China and 3,580 in Japan. The other side of the problem is the quality of research that is measured in part by the number of citations. A paper with higher number of citations is considered having the greater depth. As per the above reference, India ranks 119th among 149 countries in terms of citations per paper, with an average of 2.96 citations per paper. This however, may not be an accurate system of measurement as countries with fewer papers have a better average. Guineau Bissau heads the list if citations per paper is the criteria, Rwanda and lesser known Senegambia are up ahead with the US, which produces the maximum number of papers.

> Research in India is still concentrated to select institution such as IITs, IISc and CSIR labs

Research in India is still concentrated to select institution such as IITs, IISc and CSIR labs, despite a wide range of other technical institutions that include National Institute of Technologies (NITs), State governmental colleges, university colleges, aided colleges, and self-financing colleges; some are unitary institutions, some autonomous, and the majority are affiliated with universities. Administrative and management structures are archaic and rigid in most of these institutions leaving little scope for innovation, effectiveness, or efficiency. With over a billion people, time has come that every state

All India Growth

Year	Value
3-Feb	356258
2-Jan	293804
00-01	209115
99-00	179647
98-99	153151
97-98	134298

Regional Distribution: West 138947, Central 46886, Eastern 25515, North 22829, N-West 24549, South 31209, S-West 56923
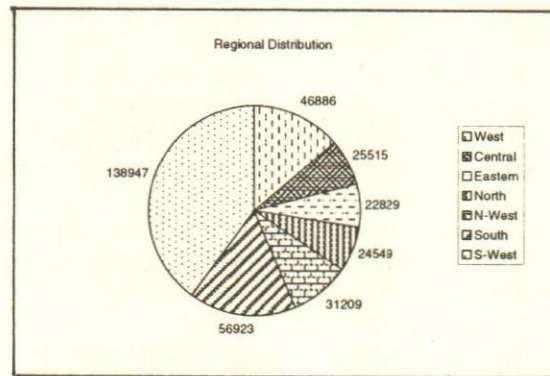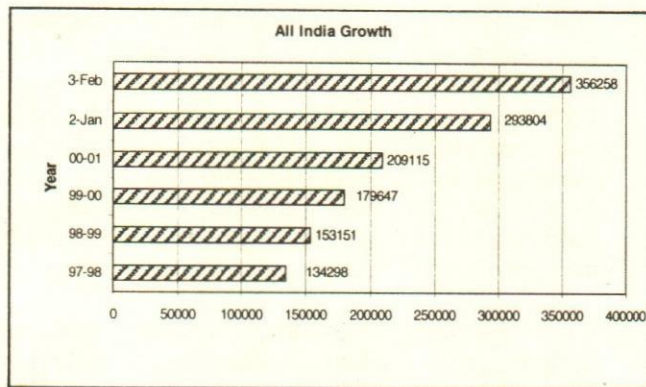
Source : MHRD

Fig. 4. Intake in Degree (Engg.) Institutions and their regional distribution

All India Growth

Year	Value
3-Feb	1195
2-Jan	1057
00-01	821
99-00	755
98-99	644
97-98	562

Regional Distribution: West 457, Central 154, Eastern 85, North 101, N-West 99, South 121, S-West 178
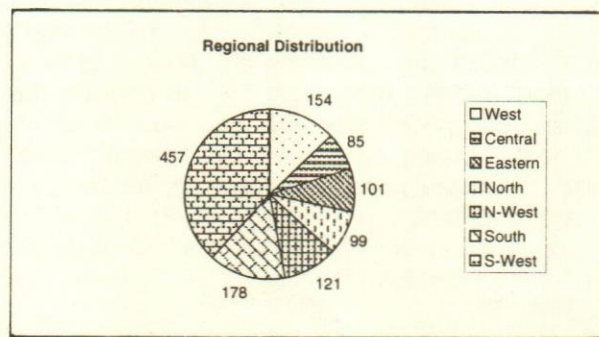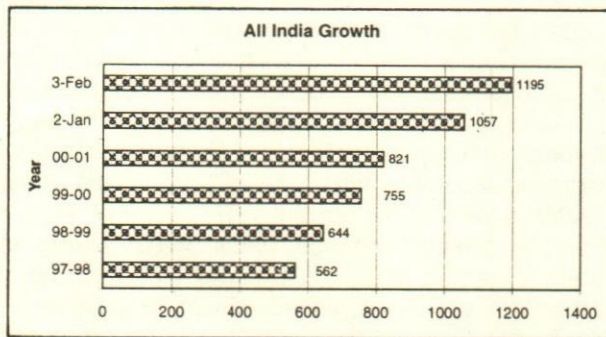
Source: MHRD

Fig. 5. Increase in number of Degree (Engg.) Institutions and their regional distribution

should have an IIT and established research labs. The private sector should be encouraged to be a partner in education and research but with strict vigil on quality under the umbrella of a national level institution. The practice of state government funding universities is not a sustainable option because of financial constraints.

Private Participation in Education

Chhatisgarh state has already taken the lead in opening university education to the private sector. It has brought out an Act to provide self financed Private Universities for imparting Higher Education and to regulate their functions. There are 11 objectives that include providing instructions, teaching and training in the University Higher Education and make provisions for research, advancement and dissemination of knowledge; create higher levels of intellectual abilities; establish state of the art facilities for education and training; carry out teaching and research and offer continuing education programmes; create centres of excellence for research and development and for sharing knowledge and its application; provide consultancy to the industry and public organizations; establish the main campus in Chhattisgarh and to have study centres at different

places in India and other countries; establish examination centres; institute degrees, diplomas, certificates and other academic distinctions on the basis of examination, or any other method of evaluation; pursue any other objective as may be approved by the State Government; ensure that the standard of the degrees, diplomas, certificates and other academic distinctions are not lower than those laid down by AICTE / NCTE / UGC/ MCI and Pharmacy Council etc.

Following the footsteps of Chhatisgarh, Orissa government also has brought a bill aimed at establishment of private, self-financing autonomous universities. Educational institutions of proven track records and international standards are encouraged to invest in higher education. They are supposed to be self-contained teaching and research universities. Many other states are expected to follow this trend. Some regular players in private sectors such as NIIT which was earlier known to have only been offering job and skill oriented courses have moved towards a deemed university status. NIIT has decided to offer degree programmes in association with universities in India and abroad. To ensure quality checks, the National Board of Accreditation (NBA) established in Septem-

ber 1994 by the All India Council for Technical Education (AICTE) organizes mandatory periodic evaluation of engineering institutions, known as the Accreditation process. It is a sort of quality assurance involving appraisal by groups of external peers similar to the ISO 9000 certification. Government is further examining the necessary steps required to encourage the establishment, by promoting initiatives for the creation of similar but autonomous mechanisms by the entrepreneurs offering training in professional courses by entrepreneurs in the training industry.

The ninth plan saw a phenomenal increase in the number of institutions in the technical and management education sector in the country. AICTE granted approval for setting up of about 1715 institutions across the country. These institutions offer programmes in engineering, technology, architecture, town planning, pharmacy, applied arts and crafts etc. According to a MHRD report, in 1947, there were only 46 engineering colleges and 53 polytechnics with an annual intake of 6240 students. During successive plan periods, care was taken to ensure private participation, resulting in AICTE approved technical institution rising upto 4791 with an annual intake of 677,728 students in 2001-2002. See the figures 4 and 5 for details.

While institutions are increasing in number with private sector participation, quality of infrastructure, curriculum, faculty and other factors leave much to be desired. Resources remain a constraint as most of these are derived from donations and tuition fees. Since they concentrate mostly on undergraduate education, opportunities for additional resource generation are very limited. It takes a considerable amount of time before competence, expertise, and infrastructure are assembled and developed to such an extent that industrial research and consultancy can be offered. Quality of technical education is directly linked with the quality of research environment. R&D efforts enriched the curriculum and delivery process resulting in better technical manpower. In times of WTO, the technical institutions in India should note that engineers will work in different countries, with different laws, cultures, procedures, and standards relating to the practice of engineering, placing additional responsibilities on the educational system.

In the government resolution on the National Policy on Education in 1968, an emphasis on quality improvement and a planned, more equitable expansion of educational facilities and the need to focus on the education of girls was stressed. This was reviewed in 1986 and a new National Policy on Education (NPE-1986) was formulated which was further updated in 1992. The NPE -1986 provided a comprehensive policy framework for the development of education up to the end of the century and a Plan of Action (POA) 1992, assigning specific responsibilities for organizing, implementing and financing its proposals. There were simultaneous developments Scientific Policy Resolution (1958), The Technology Policy Statement (1983) that was reviewed in 1995, and a series of Industrial Policy Resolution Statements including the New Economic Policy and the New Industrial Policy (of 1991) in response to the processes of globalization, privatization, and liberalization that started in the year 1991.

In February 2003 the Government constituted a Task Force to deliberate upon issues relating to improvements in the education sector, to examine various issues including those concerning technical education, also such as commercialization of education and ways of curbing the same through measures like rationalization of fee structure in various courses in the country; establishing women's universities and women's hostels in each district; and expansion of professional education and improving the quality of manpower produced through professional education. Further, it is prudent to examine separately the issues of opening the education sector in view of the current WTO round of discussion. For the present, change under WTO seems to be gradual as the countries like the US, Australia, New Zealand and Canada, where education services are already big, have shown considerations for a phased negotiation to begin with opening up of only private sector education services.

> While institutions are increasing in number with private sector participation, quality of infrastructure, curriculum, faculty and other factors leave much to be desired.

Pending approval, there is an application of the first foreign direct investment (FDI) in higher education by Nasdaq-listed Sylvan Learning Systems Inc for setting up a university in India. The announcement is like this

Called the South Asia International Institute, the Hyderabad-based university will offer degree programmes in telecommunications, electronics and computer science and engineering from this year..... campus spread across 125 acres, support 10,000 students.... have a campus in six countries, including France, Switzerland, Spain, Chile and Mexico, with more than 60,000 students in total..... Sylvan Learning Systems was founded in '79, as a provider of educational services to families and schools. It went public in '93 and has a market capitalisation of $700m (April '03), with $600m in revenue for '02..... Beginning '03, the company started focusing exclusively on post-secondary education. The company currently has 55% of its revenues originating

from North America, 10% in Latin America and 35% in Europe–Times News Network, Aug 02, 2003.

<div align="right">— Times News Network, Aug. 02, 2003</div>

Do we have any competing example of an Indian education system branding as a corporate house? It is a new culture. But the world is changing, we must adopt to the changes.

Acknowledgement

References

Business World, 17th Feb 2003, "India as a global R&D hub".

Education in India: An Overview, MHRD (GoI), 2003.

http://www.education.nic.in/htmlweb/edusta.htm

http://www.education.nic.in/htmlweb/edusta.htm

http://www.education.nic.in/htmlweb/natpol.htm#1

http://scholar.lib.vt.edu/ejournals/JTS/Winter-Spring-1998/natarajan.html

India as a global R&D hub, 17th Feb 2003, Business World

MHRD notification of the order No. V.11014/20/2002-CDN dated 26th February, 2003

MHRD notification of the order No. V.11014/20/2002-CDN dated 26th February, 2003

Scott Shane (2002), Encouraging university entrepreneurship? The effect of the Bayh-Dole Act on university patenting in the United States, Journal of Business Venturing, Volume 17, Issue 6, 537-552

The Economic Times, June 09, 2003, The world on Desi turf.

The Economic Times, June 09, 2003, The world on Desi turf.

Times News Network, May 20, 2003, "Out of cite: Research leaves no trail".

Times News Network, August 02, 2003, "First FDI in education awaits FIPB nod".

www.economictimes.com, July 28, 2003, When it comes to studies, US still the hottest for Indians.

> *Yesterday is a dream, tomorrow but a vision. But today well lived makes every yesterday a dream of happiness, and every tomorrow a vision of hope. Look well, therefore to this day.*
>
> **— Sanskrit Proverb**

WTO & Higher Education in India

Raj Agrawal

In WTO, the objective of General Agreement on Trade in Services (GATS) was to establish a multilateral framework for services similar to trade in goods involving reduction in tariff and non-tariff barriers. Out of the twelve basic and miscellaneous service sectors identified under GATS schedules, educational services constitute an important sector. The major challenge of all education is to develop an efficient and pro-active quality oriented education system, which fine-tunes itself regularly to meet changing demands of WTO. Thus, India must realize the impending threats of trade in education and try to convert these into opportunities. With many more countries waiting to tap this lucrative sector, India has to take the lead on behalf of the developing countries by using WTO (World Trade Organisation) as the forum and a world-class education sector as the weapon to demand its due share of the colossal education market. The education system put in place after independence–was meant to foster economic growth, social upliftment, and personal development as well as reduce inequality. Though private education was meant to coexist with public education reduce over the years, education here has become, to a large extent, a government function. The government's sluggish approach in regularly reviewing the education system as well as the inability to make it competitive in the global market has already taken a heavy toll.

Raj Agrawal is Professor at Institute for Integrating Learning in Management, New Delhi.

Trade in Education Under WTO Policy Regime: Implications for India

General Agreement on Trade in Services (GATS)

GATS provides an international as well as a multi-laterally accepted legal framework for the promotion of liberalization of trade in services. Trade in service has been defined under the GATS in terms of four modes of delivery viz.

- Cross border supply (e.g. International telephony)

- Consumption abroad (e.g. Tourism)

- Commercial presence (e.g. Opening of a consultancy firm on foreign soil)

- Movement of natural persons (MNP) (e.g. Persons working on foreign soil on a contract and time bound basis)

Principles of GATS

- Most favoured nation treatment: No discrimination amongst other members of the agreement in terms of treatment accorded to their service suppliers;

- National treatment: Foreign services and service suppliers to be treated no less favourably than nationals;

- Progressive liberalization: The process of liberalization is irreversible because of binding commitments on the negotiated levels of market access; and

- Transparency: All policies related to barriers to market access and discriminatory restrictions by the Members are to be notified.

The GATS is based on a "positive list" approach, i.e. no sector is covered unless it is specifically mentioned

in the Agreement, services sector has been classified into 12 categories, which are further subdivided into 160 subgroups.

Under the agreement each member has undertaken specific commitments in terms of market access (Article XVI) and national treatment (Article XVII). These are presented in the schedules of specific commitments on six service sector groups viz. business, communication, construction and related engineering, financial service, health and social service and tourism and travel related services.

Table 1: Classification of Services

a.	Business (including professional and computer service)
b.	Communication
c.	Construction & Engineering
d.	Distribution
e.	Education
f.	Environmental
g.	Finance
h.	Health
i.	Tourism and Travel
j.	Recreational
k.	Transport
l.	Other services not included elsewhere

The major groups where broad agreements have been made are telecommunications and financial services, with a special emphasis on banking and insurance.

Objective of GATS was to establish a multilateral framework for services similar to trade in goods involving reduction in tariff and non-tariff barriers to trade. The approach adopted was progressive rather than a one-short approach and covered all services through negotiated commitments and progressive liberalization. However, the scope of GATS was kept limited as the reduction of barriers and liberalisation of trade in services was left for a later date, which was to be reviewed in 2000 or afterwards. The number of countries making commitments for different types of services varied. For example, 76 countries offered commitments for financial services and 40 countries gave commitments for trade in education under different modes of supply.

Out of the twelve basic and miscellaneous service sectors identified under GATS schedules, educational services constitute an important sector. According to WTO estimates global public expenditure on education exceeded US $1000 billion and is expected to expand at

Table 2: Sample Schedule of GATS Commitments

Commit-ments	Mode of Supply	Conditions and limitations on market access	Conditions and qualifications on national treatment
Horizontal commit-ments (i.e. across all sectors)	Cross-border supply	"None"	Than tax measures that result in differences in treatment with respect to R&D Services
	Consumption abroad	"None"	"unbound" for subsidies, tax incentives, and tax credits
		"Maximum foreign equity stake of 49 percent"	"unbound" for subsidies. Approval required for equity stake over 25 percent.
	Temporary entry of natural persons	"unbound" except for the following: Intra- corporate transferees of executives and senior managers; specialist per-sonnel subject to economic needs test for stays longer than one year; service sellers for upto three months.	"Unbound" except for categories of natural persons referred to in the market access column.
Specific commit-ment	Cross-border supply	"Commercial presence is required"	"Unbound"
Archi-tectural services	Consumption abroad	"None"	"None"
	Commercial presence	"25 percent of senior management should be nationals.	"Unbound"

a faster rate. For commitments in education, trade in higher education is being seriously considered to be brought under WTO policy regime. Upto July 2001, 40 countries made commitments for education and 31 commitments were on higher education. While 16 countries made full commitments for cross-border supply and 18 for consumption abroad, only 17 countries made full commitments for commercial presence mode of supply in case of higher education to all WTO members in December.2000. Though India did not give commitments for trade in education the issue of trade in services, including education, will form a part of the agenda for the next round of talks.

The Proposal, while recognizing that governments would continue to play an important role as supplier of this service and not seek to displace public education systems, sought to supplement the system by making their services available to students in other countries. It was proposed that those members who have not yet made commitments on higher education, should formulate their commitments based on the list of identified obstacles. New Zealand demanded to strike a balance between pursuing domestic education priorities and exploring ways to further liberalise trade in education services. Thus the interest shown by the developed countries, particularly by the U.S.A., in the trade in higher education, indicates that the next round of talks, in all probability, is expected to include it under WTO policy regime. Therefore, the country must make preparations accordingly to present its case and also to meet the challenges of trade in higher education.

These trends are indicative of the rapid change that is sweeping the education system worldwide. Multiplicity of new teaching methods have replaced the traditional ways of learning and a wide spectrum of educational opportunity beckon the youth today. The United States, United Kingdom and Australia have been in India with their educational services for quite some time now. The United States, in fact, tops the list of leading exporters of educational services and India happens to be its fourth largest market.

Global Trade in Higher Education

The study of existing trade in higher education shows that approximately 50,000 students from India are enrolled through the modes of consumption abroad, virtual university and franchise and twining programmes. During the 1990s, 15 lakh students on an average were getting education under the mode of consumption abroad, out of which, the share of U.S.A. alone was 4.54 lakhs, followed by France (1.71 lakhs) and Germany (1.46 lakhs). More than 78000 students from China alone were getting higher education in U.S.A. and Germany. Higher education was the fifth largest export service in USA accounting for export income of $7.5 billion. France, Germany, U.K. and Australia were other major countries involved in the export of higher education services. In 1995 world market for higher education was estimated to be $27 billion and was expected to touch $50 billion within a decade. The student as a consumer has brought about a perceptional change of fundamental importance in the Indian educational scenario. With education topping the World Trade Organisation agenda and the World Bank's $14 billion investment in the sector, in 1995-96 more than 30,000 Indian students were getting education in USA alone.

The process speeded up after 1991 with the adoption of liberalisation policies. Delegates from foreign universities now generally visit India to market their education, Indian agencies and agents are also hired to recruit students. There is an increasing trend towards setting up franchisee and twining programmes especially in collaboration with American and British universities.

> **There is increasing trend towards setting up franchisee and twining programmes especially in collaboration with American and British universities.**

Of the four modes of supply, commercial presence, the trend for which is showing rapid increase has serious dimensions. Once India makes commitments for trade higher education under WTO policy regime, and allows market access, commercial presence mode will be further strengthened. More universities and institutes may set up their centres in India on their own or in collaboration. The provisions under MFN and NT may hold back policy measures to check the growth of these centres and Indian universities and institutes may not be able to compete with these centres. Given the craze of Indians for foreign education and middle class constituting the potential market, the commercial presence mode will have serious implications and challenges on the education system in the country.

As far as export of such services by India is concerned i.e., foreign students coming to India for study, the current prospects are not too bright. On the other hand, number of foreign students enrolled in Indian universities has been continuously falling from 6022 in 1994-95 to 2908 in 1996-97. Even though IGNOU programmes are offered in some Middle East Countries, the response is very limited. Moreover, getting students from developed countries, even from East European countries, would be very difficult, as the standards of campus facilities are very poor. As far as establishing institutions of higher education abroad is concerned, India's competitiveness is very much in doubt. The core issue being capital expenditure requirements. In fact, domestic higher education problems are to be addressed first to stay import-competitive. However, Central Institute of English and Foreign Languages (CIEFL), Hyderabad, is an exception and has successfully launched an English Language Teaching (ELT) Programme in Kirgizistan. The institute won the contract although there was strong competition from other countries. India must capitalize on such experiences and duplicate the efforts elsewhere.

One of the studies done by ICRIER shows India has a good prospect for trade in education services. However, this study was based on expectations and opinions of the key persons in the institutions. A quick survey done by NIEPA revealed a decline in the number of foreign students studying in India. This finding is corroborated by a recent publication brought out by AIU. The data compiled by AIU revealed that actual number of students enrolled has declined to almost half from 1994 to 2001. A detailed analysis of foreign students in India, Indian students abroad, Indian teachers abroad, professionals working abroad, is being attempted separately.

Once India makes commitments for trade in higher education under the WTO policy regime, and allows market access, commercial presence mode will be further strengthened. Thus, India must realise the impending threats in the education trade and try to convert these into opportunities. With many more countries waiting to tap this lucrative sector, India has to take the lead on behalf of the developing countries by using WTO (World Trade Organisation) as the forum and a world-class education sector as the weapon to demand its due share of the colossal education market.

Higher education as it prevails in India is not capable of heralding a new era. It cannot prepare India for a competitive world. Far reaching educational reforms without loosing on the noble, spiritual values of the country, is required for the purpose. India has the third largest scientific and technical manpower in the world. There are also more than 36 million educated unemployed. Consequently, it is felt that there is an excess supply of graduates and the university system can do with a reduction in size. The reality is that in India, per thousand of population, the number of graduates, engineers and doctors, etc, is one of the lowest in the world and also their average quality is suspect.

Institutions of Higher Education

At present, there are 273 university level institutions in India including 52 deemed universities. Of these 162 are traditional, 40 provide education in agriculture, 18 in medicine, 33 in engineering and technology, 3 in information technology, 1 in journalism, 6 in law and 10 are open universities. Specialised institutions include 9 Sanskrit universities, 5 women universities, 1 in population sciences, 7 in regional languages, 3 in music and fine arts and 1 each in statistics and yoga.

There are 3 types of colleges: Government colleges, university colleges and privately managed colleges, which may be aided/unaided by the government. Out of these 15 to 20 percent are government colleges managed by the state governments concerned. Privately managed trusts or societies have established 70 percent of colleges. More than one third of these colleges have been established in rural areas. During 1999-2000, there were 11,00,831 colleges including 1,520 women's colleges. Total enrollment of students is 77,33,612 including 27,41,612 women students. As per AICTE, the total number of postgraduate, degree and diploma institutions in engineering, pharmacy, management etc. come to 4145 during 2002-2003 and the total intake of students comes to 5,42,747. The number of autonomous colleges was 131 as on 31st March 2000.

Regulation of Institutions

The academic aspects of these colleges like course structure, course content, teaching hours, qualification for admission of students are under the purview of the respective university or any other body as the case may be. The affiliation, disaffiliation, admission policy and fees structure for universities, statutory bodies and government, regulate various courses. As per the recent Supreme Court judgment, the state regulation over unaided privately managed colleges has been diluted and brought down to a minimum.

> **The state regulation over unaided privately managed colleges has been diluted and brought down to a minimum.**

There are a few apex bodies at the central and the state levels, which perform different roles and functions for promoting and regulating higher education and research in India. They include Association Board of Education, Indian Council of Agricultural Research, All India Council for Technical Education, Medical Council of India, and various other bodies at the national and state levels.

Moreover, there may be a niche market for management education as well. India has one of the best management schools in the Asia- pacific region. Indian Institute of Management, Ahmedabad, recently started a two-year Global MBA programme. It also has a successful exchange Programme for students. More than 45 students go abroad for a term for which they do not have to pay fees. One must also remember that fees in western countries are much expensive than those in India. Promoting such exchange programme on reciprocal fee-waiver basis will certainly be useful to

India in terms of not losing foreign exchange, so, Indian institutes will move towards upgradation of their facilities and infrastructure in the near future. The institutes can also attract foreign students for their post-graduate programme in the long run.

Major challenges & Agenda for India

Some of the issues and their implications are highlighted here:-

Barriers to Trade by Commercial Presence

- Inability to obtain national licenses (e.g. to be recognised as a degree/certificate granting educational institution), and

- Measures limiting direct investment by foreign education providers (e.g. equity ceilings).

Barriers to Trade by Commercial Presence

- Existence of government monopolies and high subsidization of local institutions;

- Some countries do not legally recognise foreign education providers as universities and confine the power of granting of university degrees to domestic universities, and

- Students enrolled in these institutions might not qualify for benefits like passes and financial assistance.

Other related Issues

- Does the substantial role of the government in education as provider, financial supporter, regulator and promotor have implications for the treatment of the sector under GATS?

- In the light of gradual opening up of education markets through cross border supply and commercial presence, how can the problems of non-recognition of diplomas/degrees granted by foreign providers be prevented from frustrating the expected gains in market access?

- Do members see a need to encourage national education administrations to focus more closely on possible links between ongoing regulatory developments (like UGC/NAAC, AICTE, NOTE in India) and GATS obligations? Are the entities involved in regulating the sector sufficiently aware of GATS implications?

Regulations: What are the Domestic Regulations in Education at the State and Central levels, which are required to be met, if the market access is permitted to foreign suppliers? Whether these domestic regulations and requirements should also undergo a change to strengthen the domestic education sector to compete with foreign providers of the education services?

What are the regulations and the requirement of other countries, which are coming in the way of supply of Indian education abroad? Is there a need for developing a common frame of regulations to be followed by member countries. For instance, recognition of Indian medical degrees & professional degrees abroad.

Strength and Needs of India: What are those sectors in education services and modes of supply where India needs the access of foreign suppliers for its development?

MFN Exemption: What are those sectors and modes where India has the capacity to supply education services abroad? What are those countries for whom India would like to have MFN exception in order to strengthen regional ties and the programmes of mutual benefit?

Limitations to National Treatment: What are those areas where national treatment could not be accorded to the foreign suppliers in India, as that is likely to affect existing suppliers of education adversely or may have adverse affects on the society?

What are those areas where India should limit the entry of the foreign suppliers? Whether geographical access limitations also need to be considered before a foreign supplier of education is allowed market access.

Recognition of Degree: What are the conditions and negotiating points for recognition of Indian degrees by foreign countries in the areas of medical, engineering or any other field and similarly the recognition of degrees of foreign countries by Indian Universities? Should it be nationally or should it be as per acts ad statutes of various universities i.e. reciprocal basis?

Subsidies: The objective of the subsidy provided to education institutions in terms of grant, transfer of funds or provisions for tax and other concessions is to promote education at various levels, so as to develop capabilities of the people to serve the developmental needs of the country. Should this aspect form a part of negotiations in the education sector or not? If it is, whether a similar kind of concession be extended to the foreign suppliers, particularly to a non-profit making education provider?

Safeguards: Is there a need for negotiating emergency safeguards as in cheap supply of degrees

without following the standards and norms as prescribed? If yes, what are those safeguards, which need to be considered for negotiation at he time of discussion on the safeguards?

All these issues needs to be considered, keeping in view the local, regional as well as national level positions, so that at the time of negotiations situations prevailing in different areas/sectors and their impact can be taken into account very carefully. Views and opinion may be shared openly, so as to develop an informed response on this crucial sector for the sustenance and development of India.

Conclusion

The major challenge of all education is to develop an efficient and pro-active quality oriented education system, which fine-tunes itself regularly to meet the changing demand of WTO. This is something many business schools all over the world are struggling to achieve.

Reactions from educational establishments have come in the form of frequent review of syllabus, diversifying the structures and introduction of novel ways of delivering services. Part-time courses, evening classes, in-service courses, distance learning programmes, courses on the Internet, twining agreements and franchising arrangements are some of the new trends that have revolutionised the traditional forms and structure of the education.

Against this background, it is evident that the liberalisation and internationalisation of education is in a 'cruising speed' and WTO is acting as its "facilitators" by right. Where does India stand in facing this challenge of molding the future? When the policy makers in the education sector are openly vouching for self-sustainability of educational establishments and even urging them to realise "profits" from an activity which until recently was still considered a public good, it is clear that the days of "incubation" in the light of WTO agreements are over.

The country has comparative advantage in terms of lower costs of supply, providing instructions in English and supplier of information technology knowledge. However, India being a third-world country, lacking in infrastructure and other physical facilities. Students from developed countries are not likely to come to the country. Even the students from other third-world countries prefer to go to the developed countries. Even the response to IGNOU programmes, coming only from Middle East (UAE, Qatar, Kuwait and Muscat) and Indian Ocean is-

lands (Seychelles, Mauritius, Maldives) and other countries like Ethiopia and Vietnam is not very encouraging. The scope for promotion of Indian educational institution abroad is at best limited, going by the experience of campuses abroad, study centres and foreign affiliates. The scope has mainly been limited to India settlements abroad. Thus, despite low cost of Indian educational institutions within the country and abroad, the response of foreign students has not been encouraging, indicating that in education, not cost but quality; modern laboratories, techniques, equipment and infrastructure; and above all, the seal of the university of a developed country, carry more weightage. The mushroom growth of technical and medical institutions by private entrepreneurs (some of them with the background of contractors, sweet shops and politicians) with adequate infrastructure, qualified and regular staff and with the only objective of earning profits, has made things worse and credibility of the Indian education system is at stake. On the other hand, the experience of the limited number of foreign institutions working in India in collaboration, franchise or twining bases have shown better performance even with second rate (though rich) students.

> **The country has comparative advantage in providing instructions in English.**

It is sometime argued that allowing foreign institutions in India is better than Indian students going abroad. India is now the prime destination for the business of education. There is immense scope for foreign educational institutions to invest in the country and this could be done through educational fairs, which can later branch into specialised fair on business studies, information technology and by setting up full-fledged offices which serve as one-stop shops. These contact points can also facilitate the reverse flow of students into India. Though Management courses are the most popular at fairs, other courses such as media, advertising, environmental studies and biotechnology could also be developed jointly.

Delivery of courses can also be related to other backroom areas such as being provided by GE capital, educational related products such as prospectus, CDs, videocassettes be prepared in India for world-wide distribution. Foreign universities could have short-term courses for the corporate sector, a two to six weeks training to upgrade management skills.

There is also need of educational institutions to go in for strategic alliances and joint ventures which would not only help them cope with any financial constraints

but also provide the much-needed upgradation of skills.

While these areas require heavy infrastructure investment, which can only come from the government or the sector in question, all these require expertise in research, which can only be given by universities. Moreover, with such partnerships between major sectors of excellence and the industry, by developing synergies massive economies of scale can be achieved.

Thus collaborations, including strategic alliances and networks, are essential for universities operating in a global economy to access international opportunities to broaden research and commercialize intellectual property. Collaborations help in building competitive size, resources and capacity and to combine expertise, achieve economies of scale, develop synergies and provide regional benefits in human resource development. Delegates from foreign universities now generally visit India to market their education. Indian agencies and agents are also hired to recruit students.

First, the government must plan to set up new quality institutions or strengthen the existing institutions of excellence in different regions of the country by providing liberal funds for laboratories, equipment, other infrastructure and improve course curriculum so as to cater to emerging requirements.

Second, Indian universities and institutions must be exhorted to take measures to introduce cost effectiveness and improve work culture in the institutions.

Third, the country should identify its strengths for the commercial presence, mode of supply and potential demand in global markets, which may include philosophy, religion, language, culture, other basic sciences and humanities. Central and State Governments must give liberal grant to strengthen the institutions having such potential.

Fourth, because with the globalisation of the Indian economy, trade in education services cannot be indefinitely checked; the country must follow a gradual approach to allow partial commercial presence. In this context, only renowned foreign universities and institution (and not multinationals) should be allowed to set up centres in India on their own or in collaboration with renowned Indian institutions (and not with private entrepreneurs). Franchise programmes should be discouraged.

The programmes to be offered by the foreign institutions should be decided at the UGC/AICTE level and must be recognised/regulated by their bodies. Foreign institutions must be prevented from commercializing education, and the fee and fund structure is to be decided by UGC/AICTE. Their own countries and India must accredit the degrees offered on the basis of recommendations of the expert committees. The rules about payment transfers and 'code of product' for the foreigners be framed and provisions be made to terminate the contracts in the event of undesirable behavior without reference to WTO bodies and with legal jurisdiction in India only. The exemptions from MFN, NT and other provisions of WTO are to be laid down clearly keeping in view the interest of Indian institutions.

References

GATS (1995), "General Agreement on Trade in services, "WTO Document, Annex 1-B.

Joshi M.M. (1998), "Higher Education in India: Vision and Action", UNESCO World conference on Higher Education in the Twenty-First century, Country Paper, October 5-9: Paris.

Kolhatkar M.R. (1999), "Pre-requisites for Internationalisation of higher Education", Paper presented at the Policy Perspective Seminar on Internationalisation of Higher Education, National Institute of Educational Planning and Administration, New Delhi, November 26-27.

Khadria B. (1999), "Offshore Universities, and the Paradox of Factor-endowment and Factor-use in Trade in Services". Paper presented at Policy Perspective Seminar on Internationalisation of Higher Education, National Institute of Educational Planning and Administration, New Delhi. November 26-27.

NIEPA (2001), "Trade in Education Service under WTO Regime–An Indian Response". National Institute of Educational Planning and Administration, New Delhi.

UNESCO (1998), Statistical Yearbook, UNESCO Publishing & Bernan Press.

US (2000), Communication No. S/CSS/W/23, for the Doha Special Session of Council on Trade in Services, dated December 18.

□

Engineering Education in India

H. Ramachandran & Anil Kumar

Significant expansion in number of institutions as well as intake capacity for engineering education at both degree and diploma level has taken place during the last 50-55 years. Though there has been marginal decrease in the number of diploma level institutions during 2000-02, intake capacity was still on the increase. The earlier ratio of 1:1.5 of the intake capacity between degree and diploma has been reversed in recent years. Despite the fact that the number of unemployed engineers has been increasing, and a large proportion of capacity created remains unutilized, new institutions are being established. It may be partly due to the fact that the states with less number of institutions are trying to balance the imbalances between states, but the states with higher number of institutions are also still in the race for expansion.

H. Ramachandran is Director and Anil Kumar is Chief (NTMIS) at the Institute of Applied Manpower Research, Plot No. 25, Sector A-7, Institutional Area, Narela, Delhi – 110 040.

At the time of independence, the country hardly had an industrial base and trained manpower for the task of nation building. Soon after independence, many large projects were undertaken to meet the needs for irrigation, flood control, power, and to establish an infrastructure in steel, machine tools, fertilizer, transportation, drugs and pharmaceutical, petrochemical, power equipments, etc. The major bottleneck in implementing these projects was acute shortage of trained technical manpower. An ambitious programme of expansion of technical education was undertaken to meet the shortage of skilled workers, supervisory manpower and professionals who could perform functions such as planning, design, production, maintenance, management, etc. in various fields. To meet the requirement, technical education expanded at three levels:

- ITIs specializing in vocational programmes with emphasis on developing skills and providing reasonable theoretical knowledge to prepare skilled workers;

- Higher level vocational/technical institutes, such as polytechnics offering diploma programmes through advanced level vocational and technical instructions and training to prepare supervisory manpower and middle level executives in the industry; and

- Professional colleges, such as engineering colleges and technical departments of universities offering degree programmes to prepare professionals who performs functions such as planning, design, production, etc.

The contribution of technical manpower of all the three levels is crucial in providing an industrial base. However, the question of distribution of manpower across the three levels is an issue that is still open for debate. One would expect the distribution to be pyramidal in shape with larger proportion of workforce at the lower level tapering through the supervisory level to the managerial level. The shape of the pyramid, however, would vary to a certain extent with the engineering

disciplines. It follows from the above that if the functional demands of skilled manpower are need based and pyramidal, the supply of skilled manpower is also pyramidal and guided by need, and the mismatch between the two kept within a small range.

Degree Level Education in Engineering

The total number of institutions imparting education in engineering at the degree level was only 44 in the year 1947. By the year 1950 (prior to the First Five Year Plan), the number of engineering colleges increased to 53. During the subsequent 10 year period (1951 to 1960) development of facilities for undergraduate education in engineering was very impressive. During this period, for instance, 49 institutions were set up and the total number went up to 102. Growth of engineering educational facilities continued further during the subsequent period and the number of degree level institutions increased to 145 by the year 1970, then 158 by the year 1980, 302 by the year 1990 and 880 by the end of the year 2000 (Kumar & Kumar, 2002). If we look at the growth after the year 2000, we find that more than 300 institutions have been added between the years 2000 and 2002, and therefore, the total number of degree level institutions have gone up to 1195 (Fig. 1). Most of these institutions have come up through private initiative.

It can also be seen from Table 1 that, of the 1195 institutions existing in the country in the year 2002, about 60 percent (721) were located in the four southern states - Tamil Nadu (245), Andhra Pradesh (214), Maharashtra (151) and Karnataka (111).

Corresponding to the growth in the number of institutions, the intake capacity for under-graduate level programmes in engineering education also increased significantly. For instance, over the period 1990-2000, the total sanctioned capacity rose from 66,600 to 2,28,511. The 10 year period, 1990-2000, may be considered to be the most important period in the context of growth of undergraduate level engineering education in the country. During this period the number of institutions went up by 578 and stood at 880 by the year 2000, implying almost 200 per cent increase over the period. Of the 578 new institutions, as many as 119 were set up during the period 1990-95, and the remaining 459 during the period 1995-2000 (Kumar & Kumar, 2002). The sanctioned capacity has further increased sharply during 2000-02 and reached 3,48,400 in the year 2002 (Fig. 2) i.e. about 52 per cent increase in just two years with 300 new institutions having been established.

Table 1: Distribution of Number of Institutions and Sanctioned Intake by State*

State	Degree (Engg.)#		Diploma (Engg.)$	
	No. of Institutions	Intake	No. of Institutions	Intake
Andaman Nicobar	0	0	2	230
Arunachal Pradesh	1	210	1	180
Assam	3	720	10	1348
Bihar	6	1335	13	2250
Jharkhand	7	1690	28	1590
Meghalaya	1	135	2	280
Manipur	1	150	3	215
Mizoram	1	120	3	390
Nagaland	0	0	2	120
Orissa	39	9335	27	4739
Sikkim	1	420	2	240
Tripura	1	160	1	200
West Bengal	45	10284	43	6126
Eastern region	**106**	**24559**	**137**	**17908**
Chattisgarh	12	3205	11	1685
Daman	Diu	0	0	2
Goa	3	710	7	1100
Gujarat	24	9265	41	11571
Madhya Pradesh	44	12745	46	7854
Maharashtra	151	46486	156	38110
Western region	**234**	**72411**	**263**	**60590**
Andhra Pradesh	214	62730	93	17605
Karnataka	111	40385	201	33655
Kerala	67	16538	52	9320
Pondicherry	5	1690	5	742
Tamil Nadu	245	75107	213	51664
Southern region	**642**	**196450**	**564**	**112986**
Chandigarh	2	480	4	640
Delhi	14	3120	26	5237
Himachal Pradesh	3	650	7	815
Haryana	33	8800	31	5215
Jammu & Kashmir	5	1185	11	2950
Punjab	33	8530	41	12870
Rajasthan	30	7784	28	2943
Uttar Pradesh	83	21861	90	10893
Uttranchal	10	2570	19	1944
Northern region	**213**	**54980**	**257**	**43507**
All India	**1195**	**348400**	**1221**	**234991**

Source: AICTE; #: As on July, 2002; $ As on January, 2002.

*excluding the institutions imparting education only in architecture; dairy & agricultural engineering institutions not available in the AICTE approved list; and IITs.
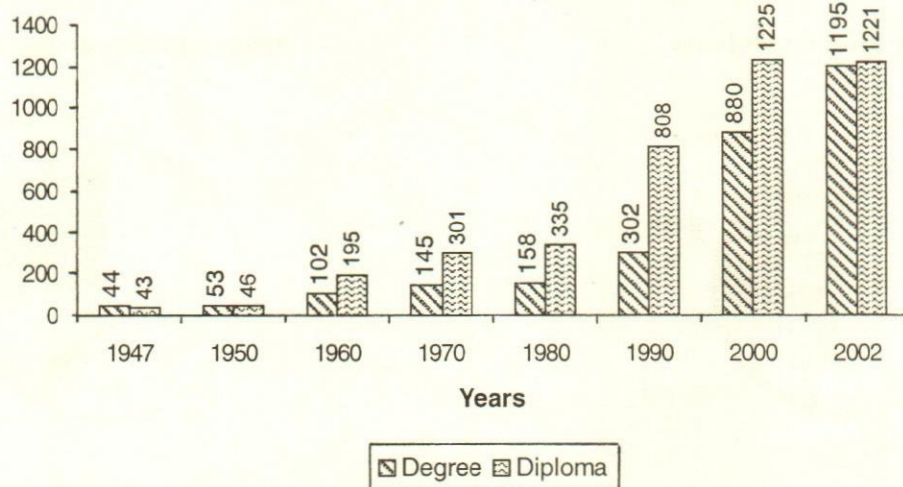
Fig. 1. Growth of Engineering Institutions
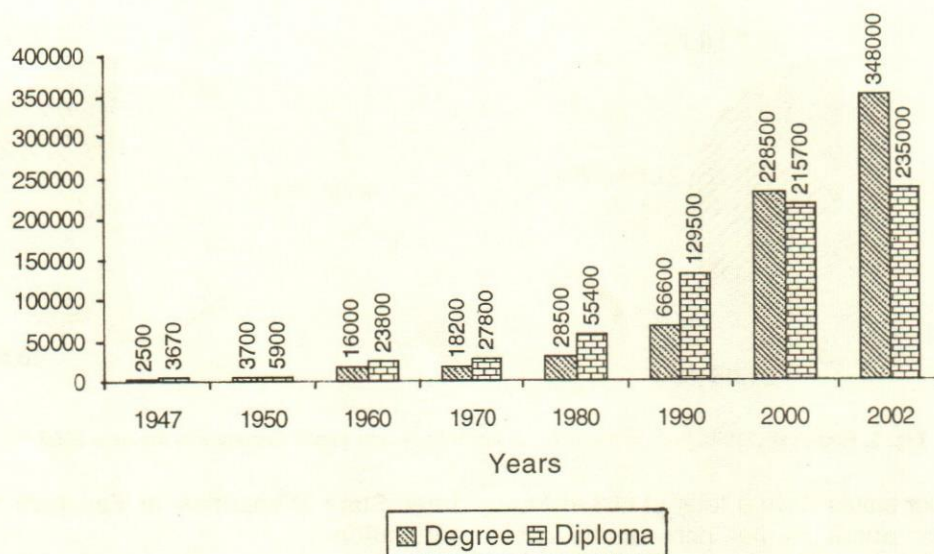
Fig. 2. Growth in Intake Capacity

Diploma Level Education in Engineering

There were only 43 institutions in the year 1947 providing engineering education at the diploma level which significantly increased to 86 by the end of the year 1950. This number rose to 195 in 1960. The increase was thus of the order of 127 per cent over the period 1950-60. The number further went up to 301 in 1970 implying an increase of 54 per cent over the decade. During this decade, as can be seen, the pace of growth in the number of polytechnics had slowed down. In the decade that followed viz., 1970-80, the number of polytechnics went up only marginally to 335 – an increase of 11 per cent in a 10-year period. The real boom in the growth of

polytechnics in the country was witnessed during the period 1980 to 1990 when the number of institutions increased from 335 in 1980 to 808 in 1990 - a decadal increase of the order of 141 per cent. The next ten years i.e. 1991 to 2000 witnessed yet another increase in the number of polytechnics to 1225, i.e. 52 per cent in ten years (Kumar & Kumar, 2002). However, the number of diploma level institutions has marginally decreased subsequently and in the year 2002 there were a total of 1221 (Fig. 1).

It can also be observed that (Table 1) of the 1221 institutions in the year 2002, as many as 213 institutions are located in the State of Tamil Nadu, followed by 201 in Karnataka, Maharashtra (156) and Andhra Pradesh

Degree level Institutions

8.87 (ER)

19.58 (WR)

53.73 (SR)

17.82 (NR)

Intake capacity at degree level

7.05 (ER)

20.78 (WR)

56.39 (SR)

15.78 (NR)

Diploma level institutions

11.22 (ER)

21.54 (WR)

46.19 (SR)

21.05 (NR)

Intake capacity at diploma level

7.62 (ER)

25.78 (WR)

48.08 (SR)

18.52 (NR
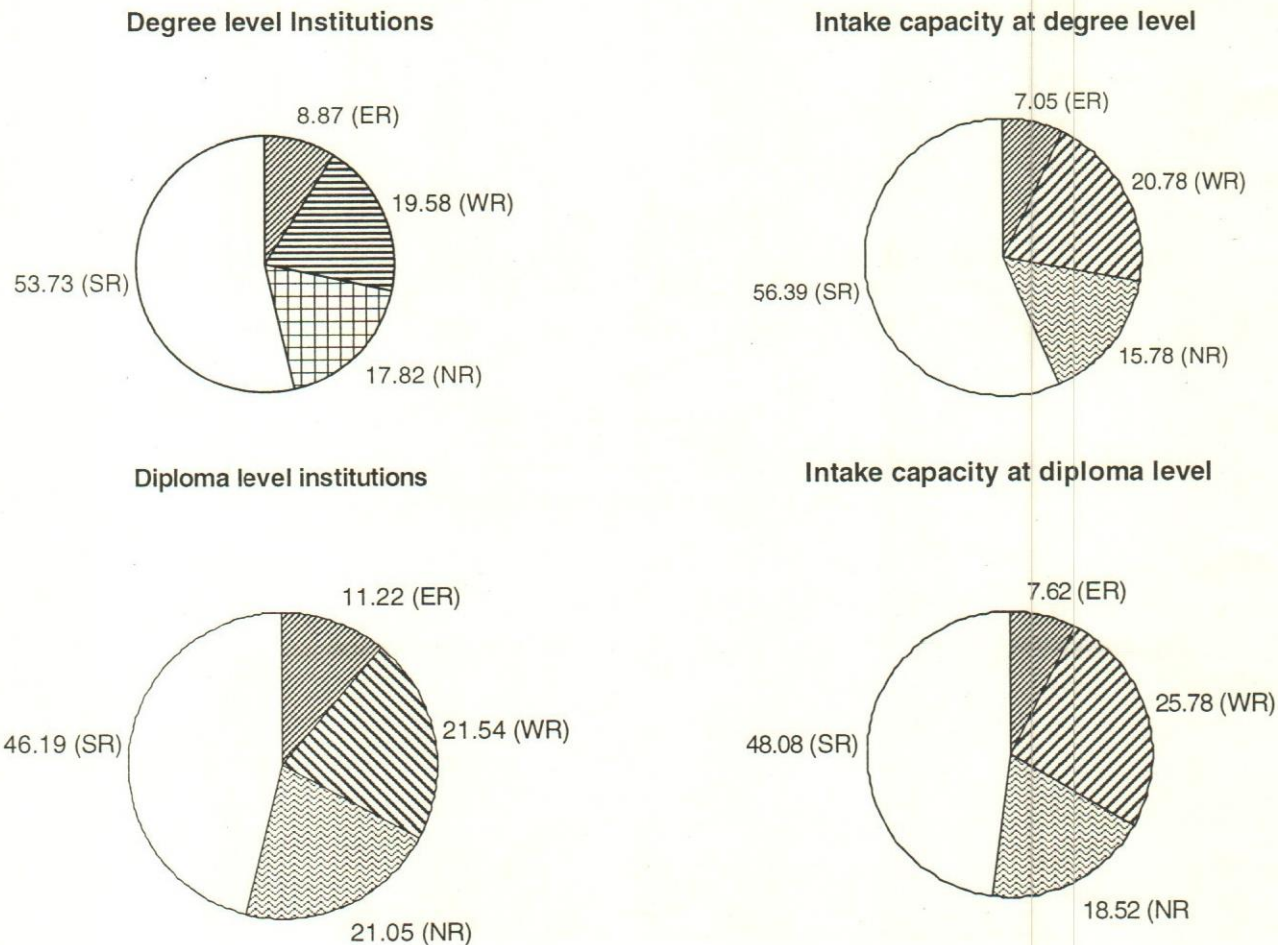
Fig. 3. Regional Distribution, in per cent, of Institutions and Intake Capacity in the year 2002

(93). Thus, these four states have a total of 663 institutions accounting for about 54 per cent of the total diploma level institutions in the country.

Along with the growth in the number of engineering institutions there has been a simultaneous increase in intake. In the year 1950, the intake into diploma courses was 5903 and the intake went up sharply to 23,736 implying almost a four-fold increase over the period 1950-60. The intake further went up only marginally in the ensuing decade ending 1970. In the subsequent decade of 1970-80 the intake doubled to 55,424. The growth rate was maintained in the next decade ending 1990 and the intake capacity rose to 1,20,860 and by the year 2002, the intake capacity was 2,34,991 (Fig. 2). It can also be observed that though the number of institutions has decreased marginally, there has been an increase of about 10 per cent in the intake capacity from the year 2000 to the year 2002.

Inter State Disparities in Facilities for Engineering Education

Among the various states of the country the major proportion of the educational institutions and sanctioned student intake is accounted for by the states of Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu. These four states together account for as much as 60 per cent of engineering degree institutions and 54 per cent of diploma institutions in the country. These states also account for 65 per cent of intake capacity at the degree level and 60 per cent at the diploma level.

Among the states within this region, as many as 38 per cent engineering colleges are located in Tamil Nadu followed by 33 per cent in Andhra Pradesh, Karnataka (17 per cent), Kerala (10 per cent) and Pondicherry (less than one per cent). At the diploma level, also, the state of Tamil Nadu accounts for a major share with about 38 per cent of the total institutions of this region.

Table 2: Estimates of Ratios of Degree Holders to Diploma Holders in Employment and Outturn by Select State

State/UT	Ratios in Employment (2001-02)		Ratios in Outturn		
	Stock	Fresh Absorption	1999	2000	2001
Eastern region					
Arunachal Pradesh	1:1.45	1:1.45	1:0.54	1:0.54	1:0.54
Assam	1:1.22	1:0.54	1:0.66	1:0.58	1:0.58
Bihar*	1:2.40	NA	NA	1:1.27	1:1.27
Orissa	1:1.29	1:0.69	1:1.90	1:1.31	1:0.59
West Bengal	1:2.93	1:1.06	1:1.51	1:1.50	1:1.50
Sub Total	1:2.16	1:0.87	1:1.46	1:1.28	1:0.86
Southern region					
Andhra Pradesh	1:1.10	1:0.79	1:0.78	1:1.38	1:1.38
Karnatka	1:1.11	1:0.67	1:0.82	1:0.83	1:0.83
Kerala	1:1.04	1:1.21	1:1.59	1:1.34	1:1.34
Tamil Nadu	1:1.52	1:1.52	1:1.46	1:1.25	1:1.25
Sub Total	1:1.25	1:1.07	1:1.10	1:1.16	1:1.16
Western region					
Madhya Pradesh	1:2.01	1:0.83	1:0.72	1:1.20	1:1.20
Maharashtra*	1:1.21	1:1.01	1:1.10	1:1.10	1:1.10
Gujrat	1:0.88	1:0.91	1:1.39	1:1.39	1:1.39
Sub Total	1:1.23	1:0.99	1:1.09	1:1.16	1:1.16
Northern region					
Chandigarh	1:1.50	1:0.38	1:0.79	1:0.66	1:0.67
Delhi	1:1.27	1:1.78	1:1.68	1:1.74	1:1.74
Haryana*	1:1.99	1:1.56	1:1.19	1:1.15	1:1.15
Punjab	1:1.33	1:0.57	1:1.19	1:0.99	1:1.38
Rajasthan	1:1.51	1:0.57	1:0.85	1:1.22	1:1.23
Himachal Pradesh	1:2.77	1:1.14	1:1.19	1:1.53	1:1.00
Jammu & Kashmir	1:1.02	1:3.52	1:3.13	1:0.81	1:0.81
Sub Total	1:1.46	1:1.36	1:1.22	1:1.22	1:1.30
Grand Total	**1:1.43**	**1:1.29**	**1:1.13**	**1:1.17**	**1:1.14**

Source: IAMR; NA = Not available   * Latest available data.

The western region comprising the States of Gujarat, Madhya Pradesh, Chattisgarh, Maharashtra and Goa together accounts for about 20 per cent of the engineering colleges and 21.5 per cent of the polytechnics. This region shares about 21 per cent of the student intake at the degree level and 26 per cent at the diploma level. Among the states of the western Region, the state of Maharashtra alone accounts for about 65 percent of the engineering colleges and 59 per cent of the polytechnics. This state also accounts for 64 per cent of the student intake at the degree level and 63 per cent at the diploma level.

The northern region comprising the states of Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttranchal, Delhi and the Union Territory of Chandigarh accounts for 18 per cent of the engineering colleges and 21 per cent of the polytechnics. Its share in the intake is 16 per cent at the degree level and about 19 per cent at the diploma level.

The eastern region, comprising of the states of Assam, Bihar, Jharkhand, Orissa, West Bengal, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura, has the lowest share in engineering educational
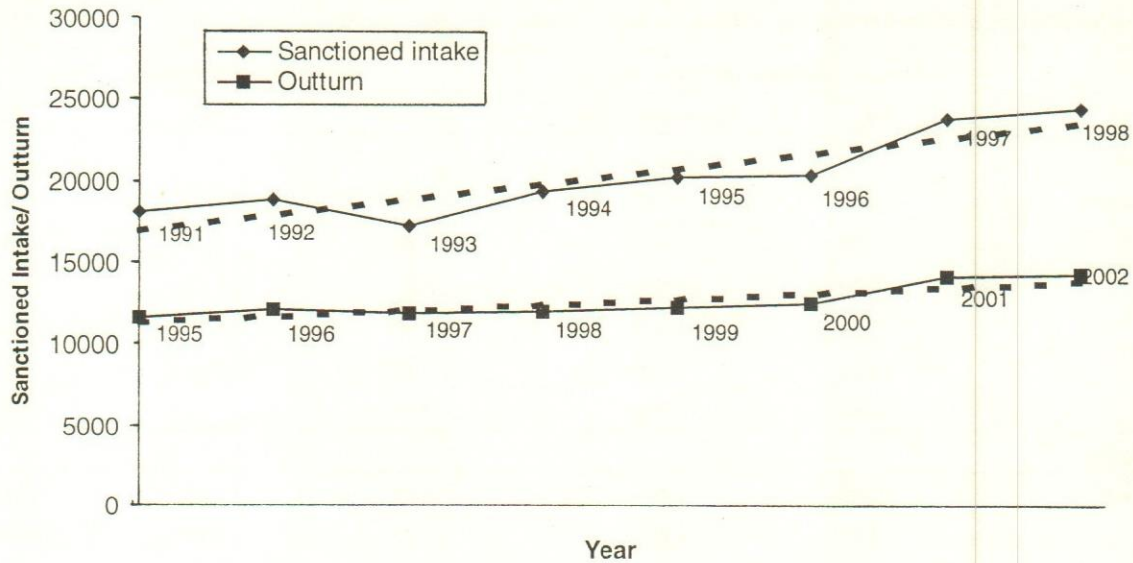
Fig. 4. Sanctioned Intake and Outturn at the Degree Level in Karnataka State
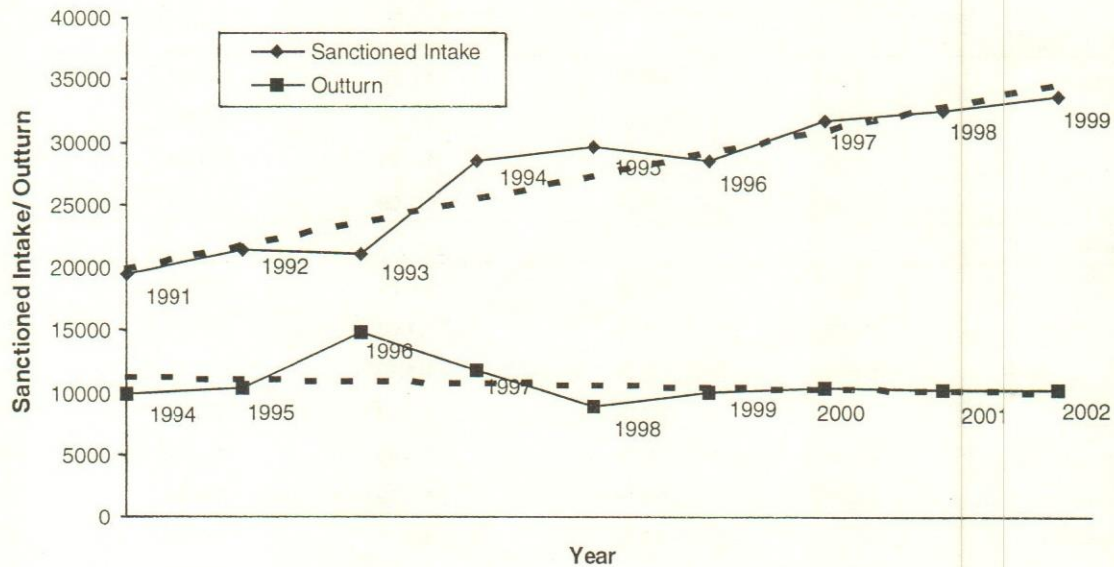
Fig. 5. Sanctioned Intake and Outturn at the Diploma Level in Karnataka State

facilities as compared with other regions. This region has only 9 per cent of total engineering colleges and 11 per cent of total polytechnics. Its share in the sanctioned intake is still lower i.e. 7 per cent at the degree level and 8 per cent at the diploma level.

Utilization/Wastage of Capacity Created for Engineering Education

As an illustration, comparison of sanctioned intake and outturn in Karnataka for degree and diploma level has been shown in Figures 4 and 5. Since the degree programme in engineering is of four-year duration and diploma level programme of three-year duration, the data provided in these Figures, for comparison, are the difference of four years and three years between sanctioned capacity and outturn for degree and diploma level, respectively. As a result, the sanctioned capacity has been considered starting from the year 1991 to 1998 and outturn from 1995 to 2002 at the degree level whereas at the diploma level the sanctioned capacity is from 1991 to 1999 and outturn from 1994 to 2002.

It can be seen from the trend shown in figures 4 & 5 that the unutilization of the capacity created is widening year after year. It is more pronounced at the diploma level. It may be noted that at the degree level the sanctioned capacity in the year 1991 was 18047 while the

corresponding outturn in the year 1995 was 11611 – the gap between intake capacity and the outturn was 36 percent. The sanctioned capacity in the year 1998 was 24384 while the corresponding outturn was only 14195 in the year 2002 i.e. the gap increased to 42 percent.

At the diploma level the sanctioned capacity in the year 1991 was 19453 while the outturn in the year 1994 was 9871 i.e. a gap of 50 percent. The sanctioned capacity in the year 1999 was 33608 while the outturn in the year 2002 was 10271, the gap having increased to 69 percent.

It can be also seen that, at the degree level, the outturn in 2002 was less than the intake capacity of 1991, which tends to indicate that additional capacities created between 1991 and 1998 were redundant. The capacity created in 1991 at the degree level was 18047 while the outturn in 2002 was only 14195.

At the diploma level, the capacity created in 1991 was 19453 while the outturn in 2002 was only 10271 i.e. only 52.8% of the capacity which was available in the year 1991. In other words, it can be said that we have never utilized the capacity created in the year 1991 at both the levels of engineering education.

Technical institutions need heavy investment for their establishment and maintenance. Private initiative has helped in increasing the number of institutions and intake capacity. The major source of revenue for such institutions are the fees charged from the students. Vacant seats result in lesser revenue affecting the quality of the infrastructure and the sustainability of institutions.

Degree versus Diploma Level Engineering Education

The ratio of intake capacity between degree and diploma level education was about 1.0:1.5 till 1992-93 but since then the scenario started changing and now the ratio between degree and diploma is 1.5:1.0, i.e. the ratio has been reversed. This has resulted in a situation where a significant proportion of the workforce with degree level education is engaged to perform functions that could be executed by those with diploma level

> A significant proportion of the workforce with degree level education is engaged to perform functions that could be executed by those with diploma level education.

education leading to a contraction of the labour market for workforce with diploma level education and depressing the income levels.

At the national level the labour market signals indicate that the ratio of degree and diploma holders is about 1:1.3 in the case of fresh absorption and 1:1.4 in the case of employed stock (Table 2). The ratio would be higher, but for the number of engineers with degree level education manning the positions that could be more appropriately manned by workforce with diploma level education. Corresponding ratio in the outturn was 1:1.14 (2001) and that of intake was 1:0.67 (2002). These ratios do vary from discipline to discipline, activity to activity, sector to sector and also state to state.

The absorption of degree holders within two years of completing the education is less than 70 per cent whereas for diploma holders it is below 50 per cent. This variation may be partly due to the fact that the degree holders are available for jobs meant for diploma holders. Since the labour market is not satisfactory for engineering manpower (both the degree and diploma levels), there is an immediate need either to reduce admissions at the degree level by 40 per cent and at diploma level by 15 per cent over the next 5 years and/or to diversify the admission capacity to emerging disciplines of current needs. States and regions that record less number of institutions and intake capacity are also the regions that have low levels of labour market absorption. Regional imbalance is not an important issue given the mobility of engineers with degree or higher level qualifications, but could be a consideration at the diploma level, since the workforce with diploma level education is found to be less mobile. Public initiatives are required at the diploma level since private initiatives in such states is not strong. It needs to be noted that a large proportion of intake capacity has remained unutilized in the last few years. A blue print for a reduction in intake and diversification that could be implemented over the next five years needs to be prepared rather than wait for market led solutions to the mismatch and distorted balance between different levels of engineering education. Since the primary objectives of technical education at different levels have remained the same over several decades and are likely to remain the same, the distortions in the intake capacity at degree and diploma level need to revert to the earlier level of 1:1.5.

Conclusion

The capacity created in recent years at the degree and diploma level of engineering education is also not being fully utilized. Most of the institutions have come up

through private initiative; their major source of funding is the fees charged from the students. Since vacant seats result in lesser revenue, unused capacities tend to affect institutional infrastructure.

Labour market varies from discipline to discipline and state to state. On the whole, at the national level, all the disciplines and states taken together, the labour market is not satisfactory for engineering manpower. Therefore, the expansion, in intake capacities as well as number of institutions, should be strictly guided by the labour market signals. At present, it seems that no relationship exists between labour market demands and supply so far as engineering manpower at different levels are concerned. It is also important to reflect on the reasons that many engineers are unable to find a job even after two years of qualifying. The answer could be one or more of the following:

a) The intake capacities (and therefore the outturn) of engineering institutions are higher than the labour market demands;

b) The skill level of the outturns is different from (also lower than) the labour market needs; and

c) The type of skill needed and type of skill supplied are different.

All these three appear to be responsible for the decreasing rates of labour market absorption of engineering manpower. Therefore, serious attention is required to reduce the mismatch between and within degree and diploma level engineering education at the national as well as state level.

References

All India Council for Technical Education (AICTE), various publications, 2003, New Delhi.

All India Council for Technical Education (AICTE), Technical Education in Independent India (1947-97), New Delhi.

Kumar, A. and P. Kumar (2002), "Facilities for Engineering Education and Employment Scenario of Engineers in India" presented in the National Conference on Emerging Trends in Engineering Education, Aurangabad, Maharashtra, October 25-26.

Institute of Applied Manpower Research (IAMR), Annual Technical Manpower Review, various issues of different states, New Delhi.

Institute of Applied Manpower Research (IAMR), NTMIS Bulletin, various issues, New Delhi.

> Half the time men think they are talking business, they are wasting time.
>
> — Edgar Watson Howe

Choosing Business School: An Application of Q-Methodology

Zillur Rahman & S.K. Bhattacharyya

The number of postgraduate programmes in India has dramatically increased in the past decade. With so many schools competing with one another, it is likely that a business school may want to differentiate itself from other schools. For an effective differentiation, it is however, necessary to identify the criteria used by candidates willing to join an MBA programme. The authors conducted a survey for this purpose, and this paper presents the results obtained by using the Q-Methodology.

Zillur Rahman is Assistant Professor, Department of Management Studies, Indian Institute of Technology, Roorkee. S.K. Bhattacharyya is Professor of Strategic Management, Institute of Social Welfare and Business Management, Kolkata.

During the 1980s, a Master of Business Administration degree was one of the key routes to career advancement. Universities around the world jumped on to the MBA bandwagon, a ticket to a good job with high pay, and the number of programmes on offer have been expanding ever since [Chiu, 1999].

The 1990s was a decade of turmoil, with an important development being the sustained efforts towards privatization of higher educations, through reduction in public expenditures, and the introduction of cost-recovery measures that were accompanied by policy measures towards the direct privatization of higher education [Tilak, 2002].

Underlying these reforms is the belief that by giving the people freedom of choice, standards throughout the education sector will rise, as educational institutions become more responsive to pupils' needs and requirements [Chaplin, 1987].

The Government of India, around the same time, also initiated the economic reforms process. Since then, the private sector has seen an unprecedented boom, and its requirement of professionally qualified managers has also increased substantially. The entry of transnational companies in the country in the post liberalization era has also made it possible for young management graduates to receive very high salaried jobs and get an opportunity to work in global companies.

As a result, there has been an increasing interest between educationists and marketers in the relationship between school and students, in particular in the processes and reasons behind students' last point of choice (choice of a business school). For schools, now, need to establish strategies to attract pupils and an understanding of consumer behavior are prequisites for a successful marketing strategy.

Prior studies have assessed the quality of MBA

programmes. The purpose behind this research has been to assist students (consumers) in making intelligent decisions regarding the selection of an MBA programme. For instance, *Business Week* conducts surveys every two years, wherein they ask graduates and recruiters to evaluate the quality and performance of business schools in the USA. The results are used to rank the top 20 US business schools. There are similar rankings or surveys in other countries also, such as those conduced by the University Funding Council in the UK, the Graduate Management Association in Australia, and business journals (*Canadian Business* and *US News & World Report*). These rankings, while helpful, do not help a potential student in terms of how to choose an MBA programme that is best suited for himself/herself.

Because of this, a number of studies has been carried out to generate a body of information that hopefully may provide specific guidelines or criteria for students in their attempt to select appropriate MBA programmes. For example, Powers (1988) conducted a survey to identify factors that influence a prospective student's choice of a business school; Parker *et al.* (1989) carried out a similar study in order to establish criteria used in choosing a business school; Luker *et al.* (1989) identified graduates' reasons for pursuing an MBA degree in the first place; Richardson and Stacey (1993) investigated the key attributes influencing students' applications to MBA programmes; and Webb and Allen (1994) studied the sources of information and criteria used in the selection of graduate business programmes.

> **Accreditation, teaching methods, fields of specialisation are important to evaluate an MBA Programme.**

Literature Review

Many researchers have investigated the factors influencing a student's choice of a college or university. However, only those studies relating to the selection criteria for MBA programmes or a business school will be reported here. Kurst (1984) asserted that placement office statistics is an effective way in which to evaluate an MBA programme. He claimed that graduates from better schools will find better jobs and that too sooner. He also found that accredition, supporting facilities, faculty make-up, and student/faculty ratio are important. Miller (1988) found that accredition, teaching methods, programme duration, fields of specialization, school ranking, and cost were the important considerations. Powers (1988) found that academic quality; quality and

reputation of the faculty, and placement opportunities were rated highly. Parker et al. (1989) surveyed 152 students, and their results indicated that educational attainments of faculty, image of the university, placement records, research of faculty, and tuition fees and average GMAT scores are important factors. In 1994, Webb and Allen examined the same issues and found academic reputation, accredition, and tuition ranked highly. Panitz (1995) surveyed 114 part-time MBA students at various stages in their MBA programmes, and found that these students expected to study under professors who had business experience, were knowledgeable in theory, and who provided high quality instruction. In addition, staff professionalism, supporting facilities, ethical standards, and the image of the school were considered important.

These studies suggest that students take the choice of a school offering MBA programme very seriously.

Current Study

The demand for management education in India has gone up so much that there are now about 760 approved institutions spread across the country and which impart post graduate education in management [Business India, 2001]

> **In India about 760 approved institutions impart post graduate education in management.**

Now, students are being regarded as customers [Zell, 2001] selecting a product. Management concepts suggest that for a sustainable competitive advantage, an enterprise must meet its buyers' need better than the competition. And it is not an aberration to apply this concept to an educational institution and is indeed a requirement that must be satisfied provided an institute wants to achieve its enrollment objectives without sacrificing the quality of the students [Fram, 1973, Gorman, 1974, Hausman and Wise, 1978].

This paper identifies the criteria used by the students in choosing a business school and the relative importance of these criteria to them.

Method

Studies of students' choice of a business school have adopted either quantitative or qualitative techni-

ques. Several of the studies cited above presented students with a fairly lengthy list of criteria that they were then asked to rank. Studies adopting a more qualitative approach, allowing students to explain how they arrive at their decision, tend to result in a great variety of responses.

The Q-sort, a rank ordering of a set of items by a participant under a specified condition of performance, allows the researcher to obtain a relatively precise ranking of large sets of items without completely overpowering participants [McKeown and Thomas, 1988].

Although the Q-sort technique and associated statistical method have been used primarily in psychology, it can be of value in many other areas also. Brown [1980] highlights decision-making as one of the areas that lends itself to being examined using the Q-methodology. Q methodology enables the researcher to study the decision-making exercise in itself where the participant can be presented with a wide variety of criteria similar to those she/he is actually facing in real life. The process of rank-ordering alternatives retains much of the complexity, that exists in the decision-making situation.

> **Q methodology enables the researcher to study the decision-making exercise.**

As research into a school selection suggests that different criteria emerge once a student has started at the chosen school (West and Varlaam. 1991; West, 1992) only those students who were still in the process of choosing a business school or would be choosing a business school in the near future were included in this study.

Research Design

As sufficient information regarding the criteria used by students in India for choosing a business school could not be obtained in the existing literature on the subject matter, brainstorming sessions were conducted to elicit the relevant criteria. The outputs of the sessions were then pruned to a manageable set for development of the questionnaire for the survey.

Brainstorming Sessions

Ten brainstorming sessions were conducted. Each session lasted for about 2 hours and consisted of a group of sixteen persons. The participants were selected from the third and fourth year students of the Bachelor of Technology programme of Indian Institute of Technology, Roorkee (IIT-Roorkee) to ensure that they would be users of the service of a business school in the near future (Bellenger, Berhardt and Goldstucker, 1976). In order to maintain homogeneity and ensure maximum participation, five groups consisted of only the male students and the other five groups only the female students. Each session produced a large number of statements, which were screened for consistency using the guidelines given in Appendix 1 (adopted from Edwards, 1969). The final list contained 73 statements in total (See Appendix 2).

Final List of Statements

The output of the brainstorming sessions was subjected to further pruning using the inter quartile range or Q value of a statement (Thurstone and Chave, 1929). A panel of judges was constituted, and it consisted of 50 fourth year students of Bachelor of Technology programmes of IIT, Roorkee. The panel members were selected randomly from the students' lists. Each of the judges was asked to place 73 statements collected at the end of the brainstorming sessions and printed on a card, in one of the 11 piles. The piles are assigned numbers from 1 to 11, and these numbers represent various degrees of a judge's agreement with the desirability of the attribute contained in the statement. The piles were so arranged that the leftmost pile, numbered as 1, contained those statements that represented the most undesirable attribute, while the right most pile, numbered as 11, contained the most desirable one. The middle pile, numbered as 7, contained statements that represented the neither desirable nor undesirable attribute needed to be recorded. The judges were asked to treat the numbered piles as an equal appearing interval scale, and only the degree categories for the two extreme piles and the middle pile were defined for them. For each of the statements, the frequencies with which it was placed in piles 1 to 11 were found out and the corresponding proportions calculated by dividing the number of judges into the frequencies. The cumulative proportion of a statement for a particular pile number was found by adding the proportion of judgements for that pile plus the sum of all the proportions below that pile. The 75th centile and 25th centile values of a statement were computed using the formula given below, and the difference between the two computed values represented its Q value.

$$C_{25} = I + \left(\frac{0.25 - \sum P_b}{P_w} \right) i$$

Where,

C_{25} = the 25th percentile

I = the lower limit of the interval in which the 25th percentile falls

P_w = the proportions within the interval in which the 25th percentile falls

i = the width of the interval which is equal to 1.

Similarly,

$$C_{75} = I + \left(\frac{0.75 - \sum P_b}{P_w} \right) i$$

Where,

C_{75} = the 75th percentile

I = the lower limit of the interval in which the 75th percentile falls

P_w = the proportions within the interval in which the 75th percentile falls

i = the width of the interval which is equal to 1.

Q values of the statements ranged from 10 to 1. Since higher the Q value of a statement, higher is the divergence of opinions among the judges about its desirability, statements with Q values above 2.5 were excluded for further consideration. The list of statements finally selected for development of the questionnaire is given in Appendix 3.

Sample Design and Data Collection

A list of business schools operating in and around Delhi and Dehradun city was prepared, and 10 schools were randomly selected for visiting. 450 students, spread across these schools, were interviewed using a survey questionnaire. The respondents were asked to record their responses against a statement on a five-point rating scale in which the number 1 stood for unimportant and number 5 the most important.

Data Analysis

Since certain criteria would be more important than the other criterias, it is necessary to ascertain their relative importance (Myers and Alpert, 1968). For this, correlation for each survey statement was computed between the statement scores across all survey statements of all respondents using the formula given below (Churchill, G A Jr., 1999).

$$p_i = \frac{\sum_j (x_{ij} - x_{bar})(y_j - y_{bar})}{s_x s_y} \quad \text{where,}$$

P_i = Correlation coefficient between rating of statement i and ratings of all statements

x_{ij} = Rating of statement i by judge j

x_{bar} = Mean rating of statement i

y_j = Total ratings given by judge j for all statements

y_{bar} = Mean of total ratings of all judges

S_x = Standard error of estimate of ratings obtained by statement i,

S_y = Standard error of estimate of total ratings of the judges

The correlation coefficients for all the survey statements are provided in Appendix 3. Myers and Alpert have suggested another way of finding out the correlation coefficient for survey statements. Essentially, this method, called item analysis, involves correlating the ratings obtained from each of the selected scales with a criterion score, which in this instance, would be computed from the sum of the ratings to the remaining scales combined. When carried to its conclusion, this analysis will indicate the variance accounted for each correlation coefficient as well as the average ratings that each of the brands received.

> **The reputation of an institution is highly related to employment prospects among MBA graduates.**

Interpretation of the Survey Results

We conducted a survey that investigated the criteria that students used in selecting an MBA programme. The results of this study confirm past studies.

Similar to other studies (e.g. Bowers and Pugh, 1973; Svier, 1987; Webb and Allen, 1994), the current study found institutional status (how famous it is and how good it is) to be the most important criterion used in selecting an MBA programme, followed by programme structure.

In terms of institutional status, the literature suggests that the reputation of an institution is highly related to employment prospects among MBA graduates. Glasser (1994) argued that international corporations recruit mainly MBA graduates from business schools with the best reputation, while Yaple (1994) found that programmes with the best academic reputation tend to be those that attract the highest financial return and better employment prospects.

The results also indicated that tuition fees, supporting facilities, accreditation are relatively important criteria for selecting MBA programmes. This finding is also supported by other studies (Parker et al., 1989; Schuster et al., 1988).

> **The results indicated that tuition fees, supporting facilities, accreditation are relatively important criteria for selecting MBA programmes.**

Respondents are very concerned about practical issues such as the chance of being accepted and the cost of the tuition and fees. To them, ideally, a suitable MBA programme should have a good reputation and reasonably low cost.

The survey findings highlight the criteria that students like to use for selecting a business school for admission. A business school, to ascertain its current image, can therefore, use these criteria. Another important application is to include these criteria to rate various business schools. Although business schools in Europe and US are regularly ranked, as mentioned earlier, the process was started in India only recently. Two such rankings are those conducted by Business India (Business India, 2001) and Competition Success Review (Competition Success Review, 2002). The methodology used in both of these surveys was to ask a predefined audience to rate various business schools on various criteria, which together ascertain the reputation of a business school. However, in selecting these criteria, students' views were not explicitly considered, and the manner in which the relative importance of these reputation criteria was computed was subjective in nature. We feel that if the students' expectations from a business school are included in such surveys, the findings would have more credibility than they have today.

Directions for Future Research

The respondents surveyed in this study had not yet made decisions regarding the pursuance of a postgraduate degree in management. Their responses may or may not reflect the criteria they would actually use in choosing a business school. The items listed in the survey were based on previous studies done in the West. Future studies could include factors that are relevant to the Indian situation, and focus groups could be used to collect information in exploring new factors that are culturally and socially applicable to India. Future research is also warranted to determine the relative

positions of various institutions in satisfying the attributes, which influence potential students in their selection of an MBA programme, relative to size and potential of this market.

Managerial Implications

The results of this survey should be useful to institutes in the production of their prospectuses and other direct mail materials. According to the findings of this study, institutes should examine the differences in attributes that are important to different student groups. This may lead to a multiple target market approach, whereby schools can effectively establish a different marketing mix for various target markets. Business schools should also give more thought as to how the MBA degree that they offer will be perceived as being more valuable to the employers of their prospective students. A fundamental means of marketing an MBA programme is to produce a high quality product. This long-term strategy entails keeping the admission standards high, providing comprehensive and rigorous delivery and on-going evaluations of the total programme.

> **A fundamental means of marketing an MBA programme is to produce a high quality product.**

References

Bellenger, Danny N., Kenneth L. Berhardt and Gold-stucker, Jac L. (1976), Qualitative Research in Marketing, Chicago: American Marketing.

Bowers T.A. and Pugh R.C (1973), "Factors underlying college choice by students and parents", Journal of College Student Personnel, Vol. 14, pp. 220-4.

Brown S.R. (1980), Political Subjectivity, New Haven, Conn: Yale University Press.

Business India (2001), November 12-25, p.97.

Byrne J.A. (1993), "Business Week's Guide to the Best Business Schools", New York, NY: McGraw-Hill.

Carpenter R (1997), "What's an MBA worth?", Canadian Business, Vol. 70 No. 14, October, pp. 40-42.

Chaplin J. (1987), "The Power and the Product", Times Educational Supplement, No 3724, Dec 4, p.4.

Chave E.J. (1929), The measurement of attitude. Chicago: University Chicago Press.

Chiu, Randy (1999), "Relationships between motivators and criteria in selecting a distance learning MBA programme in Hong Kong", Career Development International, Vol 4, Iss 1, Pp. 26-33.

Churchill G A Jr. (1999), Marketing Research: Methodological Foundations, 7th Ed., The Dryden Press.

Competition Success Review (2002), April, pp. 65-112.

Edwards Allen L. (1969, "Techniques for Attitude Scale Construction, Bombay: Vakils, Feffer and Simons (P) Ltd.

Fram E. (1973), "Marketing Higher Education in D.W. Vermilage, ed., The Future in the Making", Jossey-Bass Publishers.

Glasser J. (1994), "Nascent MBAs take their show on the road", Business Week, Vol. 37, September.

Gorman W. (1974), "Marketing Approaches for Promoting Student Enrollment in Higher Educational Institutions", College and University, Spring.

Hausman J. and D. Wise (1978), "A Conditional Probit Model for Qualitative Choice; Discrete Decisions Recognising Interdependence and Heterogeneous Preferences", Econometrica 46 (March), pp. 403-26.

Kurst C. (1984), "The Official Guide to MBA Programs, Admissions and Careers", Graduate Management Admission Council, NJ.

Linden D.W., Brennan J. and Lane R. (1992), "Another boom ends", Forbes, 20 January, pp. 76-80.

Luker A., Bowers M.R. and Powers T.L. (1989), "Factors influencing pursuit of the MBA degree: a student and employer perspective", Journal of Marketing for Higher Education, Vol. 2 No. 2, pp. 87-96.

McKeown B. and D.D. Thomas (1988), Q Methodology, Beverly Hills, CA: Sage.

Miller E. (1988), "Barron's Guide to Graduate Business Schools", Barron's Educational Series Inc., New York.

Myers, James H. and Alpert Mark I. (1968), "Determinant Buying Attitude: Meaning and Measurement", Journal of Marketing, October, pp. 13-40.

Panitz E. (1995), "Part-time MBA student's expectations of their academic experience", Journal of Marketing for Higher Education, vol. 6, No. 1, pp. 87-95.

Parker R.S., Pettijohn C. and Pettijohn L. (1989), "Choosing a business school: the relevant criteria", Journal of Marketing for Higher Education, Vol. 2, No. 2, pp. 97-106.

Powers T.L. (1988), "The consumer perspective on business school evaluation", Journal of Marketing for Higher Education, Vol.1, No. 1, pp. 109-31.

Richardson L.D. and Stacey E.C. 91993), "Key attributes affecting students' applications to MBA programs: public vs. private institutions", Journal of Marketing for Higher Education, Vol. 4, Nos. 1/2, pp. 235-49.

Schuster P.C., Constantino P. and Klein N.M. (1988), "The process of choosing institutions of higher learning", Journal of Marketing for Higher Education, Vol. 1, No. 2, pp. 37-54.

Sevier R.A. (1987), "How students choose a college", Currents, December, pp. 46-52.

Thurstone L.L. and Chave E.J. (1929), The measurement of attitude, Chicago: University Chicago Press.

Tilak J.B.G (2002), "Privatization of Higher Education in India", International Higher Education, Fall. (http://www.bc.edu/bc-org/sce/cihe/newsletter/news29/text007.htm)

Webb M.S. and Allen L.C. (1994), "Graduate business students: factors that differentiate diverse market's matriculating decisions", Journal of Marketing for Higher Education, Vol. 5, No. 1, pp. 87-107.

West A and A. Varlaam (1991), "Choosing a Secondary School: Parents of Junior School Children", Educational Management and Administration, Vol. 20, No. 4, pp. 212-22.

West A. (1992), "The MBA cost-benefit analysis", Economist, Vol. 332, No. 7875, 6 August, p. 58.

Zell Deone (2001), "The market driven business school: Has the pendulum swung too far?", Journal of Management Inquiry, Vol 10, Iss 4, Dec, pp. 324-338.

Appendix - I

Criteria for Short listing Relevant Attitude Statements

1. Avoid statements that refer to the past than to the present.
2. Avoid statements that are factual or capable of being interpreted as factual.
3. Avoid statements that can be interpreted in more than one way.
4. Avoid statements that are irrelevant to the attitude object.
5. Avoid statements that are likely to be endorsed by every one or by no one.
6. Select statements covering the entire range of feeling about the attitude object.
7. Keep the language of the statements simple, clear and direct.
8. Statements should be short, rarely exceeding 20 words.
9. Each statement should contain only one complete thought.
10. Statements containing universals such as 'all', 'always', 'none' and 'more' often introduce ambiguity and should be avoided.
11. Words such as 'only', 'just', 'merely' and others of a similar nature should be used with care and moderation in writing statements.
12. Whenever possible, statements should be in the form of simple statements rather than in the form of compound or complex sentences.
13. Avoid the use of worked that may not be understood by those who are to be given the completed scale.
14. Avoid the use of double negatives.

Final List of Statements

1. The course structure is accepted by the industry.
2. Average pay package offered is high.
3. Fees is payable in installments.
4. Management fairs are organised regularly.
5. Loan facility is available to the students.
6. Institute's reputation.
7. Facility for summer training in other countries is present.
8. B school offers a degree.
9. Latest changes are incorporated in the course structure.
10. The students do live projects.
11. Weightage is given to Written Test, Group Discussion, Interview and most importantly Extempore in the selection process.
12. Every student gets access to computers in the hostel.
13. The B school provides the study material.
14. All the latest business related software is installed in the lab.
15. Ranking of the institute.
16. 24 hours library facility is available.
17. Strict action is taken against any indisciplinary act.
18. Frequent industry visits are made.
19. The students are placed in blue-chip companies.
20. Library has a good collection of books on different subjects.
21. Visiting faculty from other B-school deliver lectures.
22. Fellowship programmes are offered.
23. Cultural programme in the B school are regular features.
24. Part time management courses are available.
25. The MBA program is recognised all over the world.
26. The B school offers dual specialisation.
27. The B school is located in a metropolitan city.
28. Weightage is given to work experience of candidate.
29. The B school is located in an industrial area.
30. Students are interviewed by a combination of faculty and people from industries.
31. The B school is locally accredited.
32. PSUs visit the campus for placement.
33. Round the clock internet facility is available.
34. The B school is affiliated to an 'A' class university.
35. Quality of food in the mess is good.
36. B school is very well known for a particular specialisation.
37. Application acceptance ratio.
38. Entrance is through CAT.
39. Graduation marks is a criterion for entering the B school.
40. Special advantage is given to reserved category students.
41. Number of students to job ratio is high.
42. The university with which the B school is affiliated is a technical university.
43. B school offers a diploma.
44. Engineers are preferred over other aspirants.
45. The entrance exam does not include general knowledge.
46. A formal dress code is followed.
47. Student faculty ratio.
48. Strict discipline in adhering to the dress code.
49. Late night permission for girls when on projects and during examinations.
50. Teaching methodology comprising mainly of projects and cases.
51. Strength in research.
52. Cordial student faculty interaction.
53. Organisation of departmental bonhomie and social functions.
54. Availability of national and international newspapers, journals and magazines in the library.
55. Lots of extracurricular and co-curricular activities in the department.
56. Affiliation with foreign universities.
57. Distance from hostel to the department should be less.
58. Own hospital facilities.
59. Own bus service of the institute for say, rafting, etc.
60. Flat administrative structure.
61. Student controlled activities.
62. The existence of the trimester system.
63. Not more than six subjects per trimester.
64. Relative grading scheme for marking.
65. Projects should be live and solicited from the industry.
66. Tuition fees.
67. Programme curriculum.
68. Supporting facilities.
69. Employment prospects.
70. Application acceptance ratio.
71. Strength in research.
72. Professors with doctoral degrees.
73. Specialised programme.

Relative Importance of Criteria

Criteria of Evaluation	Correlation Coefficient	Q values
Institution's Reputation	0.981	1.5
Programme Curriculum	0.963	1
Tuition Fees	0.944	1
Supporting Facilities	0.944	1.5
Accredition	0.944	1.5
Employment Prospects	0.940	2.5
Specialised Programme	0.931	2.5
Ranking of the Institution	0.929	2
Professors with Doctoral Degrees	0.907	2
Strength in Research	0.843	2
Student/faculty ratio	0.784	2
Application Acceptance ratio	0.710	2

Price is what you pay. Value is what you get.

— Warren Buffett

Design Characteristic Constructs of TQM in Education

Sangeeta Sahney

A comparative study of selected institutions imparting professional education was done to arrive at the design characteristics of TQM in education in India. Starting with a theoretical background, an empirical study is presented with analysis and results.

Sangeeta Sahney is with the Department of Management Studies, Indian Institute of Technology, Roorkee.

Higher education is a service organization composed of a set of interrelated processes from which society is demanding better results. Relentless global, social, cultural and economic change has been translated by agencies, both public and private into a continuous stream of complex reforms aimed at restructuring educational institutions. The growing popularity of quality, its impact on customer psychology and the resultant behaviour exhibited in consumption behaviour has led researchers and analysts to regard 'quality' as the single most important factor for long-term success and survival. In the wake of numerous environmental challenges faced by educational institutions all over the world, with changing customer demands on the one hand, and demands for greater responsiveness and accountability on the other, educational institutions are realizing the significance of customer-centred philosophies and are turning to total quality management (TQM) as a way of managing their businesses. TQM involves a whole array of techniques, management principles, technologies and methodologies which are put together to work for the benefit of the end customer. For complete success, an educational institution must embrace the principles of TQM and incorporate them into all of their activities.

Quality dimensions mean attributes that an educational institution must possess in order to satisfy the needs and wants of the stakeholder and customer groups. This paper presents the results of an empirical study conducted on select higher educational institutions to assess the importance/degree assigned to the various design characteristic constructs which would form the quality elements/components for an Educational System across the various internal and external customer groups. Starting with a theoretical background, an empirical study is presented with analysis and results.

Theoretical background

Owing to pressures from stakeholders, substantial

interest in TQM in education has begun to emerge, although this interest has been focussed primarily on higher educational institutions (Coate,1990; Cope and Sherr, 1991; Cornesky et al, 1991). Debate about quality is taking place world-wide (Craft,1992; de Rudder,1994; Neave, 1994). However, the concept of quality when applied to higher education has been inconclusive (Bauer, 1992; Staropoli, 1992; Cheng and Tam, 1997; Pounder, 1999).

The "Quality in Higher Education", project based in Birmingham speaks of the widely differing conceptualizations of Quality in Education (Harvey, 1994), which may be classified into five distinct, but interrelated ways of discussing quality (Harvey and Knight, 1996). Quality in Education can be viewed as being 'exceptional', as 'consistent', as in relation to the 'purpose of the product/service', as 'value for money through efficiency and effectiveness', and as 'transformative'. However, each of these approaches is not without limitations and has been subject to debate. Harvey and Knight conclude that transformation, here, is a meta-quality concept and that the other aspects of quality are possible operationalizations of the transformative process rather than ends in themselves.

Dahlgaard, Kristensen and Kanji (1995), define Total Quality Education as, "an educational culture characterized by increased customer satisfaction through continuous improvement in which all employees and students actively participate". While trying to amalgamate ideas from TQM with a systems approach, Cheng (1996) defines Education Quality as, "the characters of the set of elements in the input, process and output of the education system that provide services that completely satisfy both internal and external strategic constituencies by meeting their explicit and implicit expectations". This definition is all comprehensive and regards education quality as a multi-dimensional concept that cannot be assessed by only one indicator.

> **Total Quality Education is characterized by increased customer satisfaction through continuous improvement**

Mukhopadhyay (2001), remarks that depending upon the goals, the term "quality in education" has been defined as excellence in education (Peters and Waterman, 1995); value addition in education (Feigenbaum, 1951); fitness of educational outcome and experience for use (Juran and Gryna, 1988); conformance of education output to planned goals, specifications and requirements (Gilmore, 1974; Crosby, 1979); defect avoidance in education process (Crosby, 1979); and meeting or exceeding customer's expectations of education (Parasuraman et al., 1985).

Quality in Education has varying conceptualizations. Owlia and Aspinwall (1996), remark that while discussing quality in education, both the market orientation approach and the measurements approach, pose arguments (Tofte, 1993; Sayed, 1993). The terms 'customer' and 'market', have also met with resistance (Sallis, 1993). The customer-oriented definition of quality has also been debated upon (Madu and Kuei, 1993; Green, 1994). The dynamic and interactive nature of higher education, when viewed as a 'system', further complicates the matter, with the students being not only prime customers but also a part of the inputs to the system.

Nevertheless, the concept has been dealt and debated upon elaborately and variedly by Owlia and Aspinwall (1996), Barnett (1992), West-Burnham (1992), Green (1994), Harvey and Knight (1996), Dahlgaard, Kristensen and Kanji (1995) and Cheng (1996). While some studies concentrate on the institutional inputs and outputs (Cave et al., 1988; Johnes and Taylor, 1990), others examine the processes, even while assessing the feasibility or non-feasibility of adopting ideas from TQM to the industry (Barnett, 1992; Ellis, 1993; Green, 1994). The issue is made more complex by the presence of various customers who have diverse requirements and expectations that need to be prioritized and reconciled to meet the needs of all and provide a quality service.

Thus, Quality in Education is a multi faceted concept with varying conceptualizations that pose problems in formulating a single, comprehensive definition. It is an umbrella concept that includes within its ambit, the quality of inputs in the form of students, faculty, support staff and infrastructure; the quality of processes in the form of the learning and teaching activities; and the quality of outputs in the form of the enlightened students who move out of the system. In fact, it is all permeating covering the different aspects of academic life.

Quality is what the customer says it is; this is particularly true in the case of higher education, where there are a large number of complementary and contradictory customers, both internal and external. Hence, the desires of the various stakeholders need to be reconciled and design characteristics identified, which when adopted by an educational institution, can satisfy the various needs and desires of its customers and lead to quality in education.

Quality in education must be related to 'somebody', implying the customer or the stakeholder

group. Quality dimensions or design characteristics mean the attributes that an educational institution must possess in order to satisfy the needs and wants of the stakeholder and customer groups.

> **Design characteristics mean the attributes that an educational institution must possess in order to satisfy the needs and wants of the stakeholder and customer groups.**

Based on the literature review, and with particular emphasis on the various models and performance indicators in education, the variables and the items for the study were conceptualized. The design characteristics refer to the design elements that make up a system and act upon or are acted upon by the transformation system. These design characteristics for this study refer to the quality components/elements that an educational institution must possess in order to satisfy the needs and wants of the stakeholder and customer groups. If an educational institution adopts and implements these components/elements and designs its system with these as bases, the requirements of customer groups (faculty and students), could be met and satisfaction gained from the educational system.

The literature review helped identify the various design characteristics. These items were adapted/modified to suit the needs of the educational sector and its stakeholders. These items were pilot-tested to arrive at the final questionnaire.

The items were tested for reliability and validity, so as to arrive at statistically proven items that could be identified as design characteristics synonymous here to Total Quality Management elements. Qualitative validity was tested through the theoretical study as well as through expert comments. The test for quantitative validity was done through an Exploratory Factor analysis. The Principal Component method was used. With Eigen values above 1 and the maximum iterations for convergence as 100, the Varimax Rotation was applied and Rotated factor loadings examined. Factor loadings above values of .50 were considered. Internal consistency was examined through a reliability analysis. The Cronbach's model, inter-item correlation and covariances was used and alpha values over 0.50 were considered.

Certain items got deleted as they failed the test of

either validity or reliability. The tests for validity also helped classify and group such design characteristics under factors, which were identified as constructs. For this study, the design characteristics/quality components have been conceptualized from the works of the quality gurus. The terminology has been borrowed from Lewis and Smith (1994) and the items have been categorized under three constructs, viz., management system, technical system and social system. The various design characteristic constructs so identified for the various categories of customers are defined briefly as follows:

Management system: The practices, procedures and policies established /maintained in an organization.

Technical system: The tools and machinery; the practice of quality science.

Social system: Human side of the enterprise.

The various design characteristic constructs so identified ranged between 0.6607 to 0.8264 for the faculty; and, 0.5578 to 0.8290 for the students. (Cronbach, 1951; Nunnally, 1978).

The items included under the umbrella of design characteristics are the total quality components that are the foci of study. These quality elements are discussed briefly.

A well-accepted vision and mission statement

A well-accepted mission and vision statement gives a purpose and a sense of achievement to all. The "vision" of an organization refers to the future desired state, the situation that is being sought, to which the organization and its employees are committed. The "mission", on the other hand, refers to the statements of discrete objectives, allied to the vision, the attainment of all of which will ensure the attainment of the future desired state i.e., the vision itself. While the mission specifies use, requirements and expectations, a vision statement describes what the educational institution will be like when its mission and goals are achieved.

Clearly defined and specific goals

Clear and well-defined goals and objectives are necessary for the proper functioning of an organization. The formulation and specification of goals guide goal-directed activity and provide a linkage between the broad vision and mission on the one hand, and the operational activities of the organization, on the other.

Effective and efficient instructional/educational leadership

An effective and efficient leadership is a pre-requisite for the successful functioning of any organization and implies:

- Keeping a balance between a "strong leadership role" and maximum autonomy for teachers.

- Providing a structural institutional pattern in which teachers can perform effectively.

- Being a firm disciplinarian and providing a role-model for teachers and students alike.

- Performing all managerial functions, from planning to control.

- Setting a strong administrative set up; providing resources and facilities.

Clear and specific policies and procedures

Institutions define more widely their vision and translate it into guiding principles, policies and procedures. In the context of an educational institution, clear and specific policies and procedures are formulated by the top management and these direct the achievement of strategic and operational plans.

Strategic and operational planning

Strategic and operational plans refer to long and short range planning that relate the objectives with the goals. Strategic planning articulates the institutional vision, weighs external opportunities and threats, gauges internal strengths and weaknesses and determines appropriate action. It results in implementation decisions that relate the vision to day-to day operations. Operational plans are those that are required to channel institutional activities, within the boundaries of the vision. The strategic plan for an educational institution is institution-wide and the operational plans are departmental/unit-wise or even individual-wise.

Clear organizational structure and design

Organization structure and design refer to the formal design, the division of responsibilities and patterns of power and authority. It distinguishes the parts of an organization and delineates the relationship between them. In the context of an educational institution, organizational structure and design help direct the institution's activities by specifying who is to do what. It

defines the degree of centralization-decentralization, spheres of influence, as also the degree of autonomy available, not only to the administrative staff but also to teachers.

Delegation of authority/power distribution

This refers to the degree of autonomy that the leader/superior imparts to the followers/subordinates in discharging their responsibility in their day to day activities and functions. It is the amount of freedom that the people hold. For an educational institution, it is the positive leadership from the head of the institution and from the teachers that induce the sharing of responsibilities for decision making and implementation.

Machinery for evaluation and control

Machinery for evaluation and control refers to a mechanism for monitoring of progress and achievement. For an educational institution, this is a two-fold activity that involves the monitoring of progress of not only the employees (administrative and support staff and teachers), but also the students. This includes fair and objective outcome based assessment methods, feedback and record keeping.

Strict discipline

Strict discipline refers to an environment of better control that enhances rather than reduces effectiveness, wherein, clearly stated rules are consistently, fairly and firmly enforced. For an educational institution, it implies a supportive atmosphere of order, purposefulness and pleasure in learning. It is a pupil control system with rewards, praise, encouragement and appreciation, but in an environment of rules and regulations strictly enforced.

Budget priorities - proactive and objective driven

A budget is a plan expressed in numerical terms. It is an itemized summary of estimated or intended expenditures for a given period along with proposals for financing them. The total sum of money allocated for a particular purpose or period of time, may be prioritized on the basis of objectives or even in anticipation of events and needs. In the case of an educational institution, this may be in terms of the yearly resource allocation for infrastructure, salaries, etc. This is based on incremental adjustments up and down from previous years but may also be situational as in contingencies and emergencies.

Emphasis on continuous improvement

This refers to the identification of processes and

their continuous improvement. In terms of educational institutions, it means learning the appropriate processes, tools and skills and practising these newly developed skills on small achievable tasks and projects. It aims at improvements for greater customer satisfaction through improvements in technology and human resources. It involves all the units and requires the optimization of the entire system through interdependency among all the components.

Management-by-fact/information system/database

This refers to the use of meaningful and correct data for managing an organization. Management-by-fact aims at data gathering, compilation and dissemination to enable access of information to all. Its relevance in educational institutions lies in obtaining facts and maintaining the latest information system database, and to use them in the conduct of all administrative and academic functions and activities.

Cross functional collaboration

This refers to collaboration through co-operation, participation and breakdown of barriers across departments/units. For educational institutions, it implies the spirit of cooperation, the opportunity to work jointly with others and participation and empowerment, within and across departments, units and functional areas.

Process orientation

This implies a focus on and orientation towards management processes that have been identified through a systematic form of evaluation. For educational institutions, it refers to the identification of administrative, academic and non-academic processes, their breakdown into activities and tasks that are then managed and reviewed.

Administrative competence – expertise and adequacy

This refers to the competency of the administrative staff in terms of both quality and quantity. An institution has competent administrative staff when it has the right number of people with effective communication skills, interpersonal skills, leadership abilities, planning and innovative abilities and decision-making abilities, among other skills.

Administrative arrangement – adequate infrastructure and facilities

This refers to the adequate infrastructure, computer hardware and software, other equipment and materials for the administrative set-up.

Instructional competence – expertise and adequacy

This refers to the teaching competence of the faculty and the staff. There should be adequate number of people in an educational institution and they should have a proper academic/professional understanding of the subject matter. They should have communication skills, leadership qualities and high commitment towards classroom management.

Instructional arrangement – adequate infrastructure and facilities

This refers to adequate physical facilities and infrastructure, teaching and instructional materials and other equipment. It also includes access to computer hardware and software, library and laboratories.

Clearly defined teaching and learning strategies

This refers to the formulation of strategies that facilitate teaching and learning.

Teaching strategies include:

- Assured availability of materials/resources necessary for teaching/learning.
- Co-ordination of curriculum and instructional materials.
- Procedures for monitoring progress and achievement.

Learning strategies include:

- Proper understanding of aims and objectives of the programme by students.
- Active involvement of the students.
- Staff commitment to student achievement and learning.
- Focus on needs of individual students.
- Orderly, supportive and co-operative learning environment.

Well-defined curriculum design

A well-defined curriculum design refers to a coherent sequence and structure of the programme and course content. It is essential for the achievement of programme aims and objectives.

Suitability and relevance of curriculum content

The curriculum structure should be useful, relevant and up-to-date to meet job expectations. The important aspects are course content, academic standard and an appropriate programme for award of degree.

Curriculum planning, design, periodic review

This refers to a carefully planned curriculum and its coordination with the instructional expertise and arrangement. It also refers to the adaptation of the curriculum and its upgradation through periodic reviews to maintain its suitability and relevance in the wake of the changing nature of the job content and the job market.

Collaborative decision making

In collaborative decision making, decisions are shared and arrived at through participation and so there is full commitment to them. In the context of educational institutions, it refers to an atmosphere of openness and cooperation, collegial working and participation in decision making. Decisions are arrived through representatives of various groups and so commitment to them is ensured.

Adaptive resource allocation (as in contingencies)

Educational institutions, like any other institution, may be confronted with emergencies and unanticipated events. Adaptive resource allocation refers to providing of resources in such cases. A part of the budget is generally allocated for such purposes.

Adequate and competent administrative staff/ support staff

This refers to having the right number of administrative staff/support staff, well suited for different kinds of jobs.

Reward policy/incentive schemes

The reward policy/incentive schemes enable recognition of a person for good performance. Recognizing a person means informing him/her and others that their accomplishments are being appreciated. Such rewards may be for individual activity or for group activity, and lead to greater motivation and enthusiasm at work.

Clear and well-defined values and norms

Values and norms serve as a source of unity and cohesion between the members of the organization and also serve to ensure congruence between organizational actions and external customer demands and expectations. In the context of an educational institution, they refer to faculty/staff consensus on the values and aims of the institution.

Differentiation – adaptive service for its customers

Here, the term 'customer' includes both the internal and external customers. For the faculty and the administrative staff, differentiation means recognition of individual differences while implementing rules, regulations, policies, etc. For the students, it refers to the degree of student-centredness, that is, the extent to which the teaching and administrative staff is sympathetic and supportive to student needs. For the industry that is the final customer, differentiation implies looking into and giving attention to the individual company's needs.

Emphasis on training and development for all

This refers to the continuous upliftment of the academic, non-academic and administrative staff, in terms of their human, technical and conceptual skills and abilities. It should be in-service and an on-going process for the acquisition of knowledge and skills.

Customer focus/need based approach

This deals with the problem of identifying the different internal and external customers, their expectations and then trying to meet them. Every institution needs to know (a) what the customer wants, (b) how well the needs are being met, (c) how the different ways to meet the needs may be improved. The requirements, needs and expectations of customers must be met as far as possible.

Participation and involvement/meetings

Participation and involvement help create an environment where all become directly involved in shaping and monitoring the institution's mission, purposes and goals. Employee participation is the process of empowering the members of the organization to make decisions and to solve problems appropriate to their levels in the organization.

Trustworthiness amongst all

Trustworthiness leads to a healthy working environment. It promotes participation, cooperation and better coordination of activities amongst all. It leads to good interpersonal relations and this trust should be built within and across the faculty, administrative staff and students.

Well-defined channels of communication

Communication in any organization leads to transparency and a feeling of awareness and openness. Vertical, horizontal and lateral communication, within and across departments and units and also with the external environment is important. Clear channels of communication must be established for educational institutions and attention should be paid not only to the quantity of information received but also to the extent to which useful information is shared.

Teamwork

Teams are groups of people who work together towards common ends. Teamwork can be defined as the joint action by a group in which each individual subordinates his/her interest and opinion to the unity and interest of the group. It involves the breakdown of barriers between people to create synergy for a creative solution. Like any other organization, teamwork is essential for educational institutions because lasting and significant changes will not occur unless instructors and other staff are directly and actively involved in the planning and implementation of desired changes.

Respect for people

This leads to healthy interpersonal relations, necessary for all activities.

Methodology

The focus of the study was on highlighting the design characteristics for the educational system as identified by the numerous customers of the educational system. The study selected engineering and management institutions imparting graduate and post-graduate professional degrees/diplomas in and around Delhi. The sample included both the internal as well as external customers of the education system - faculty as internal customers and the students as the external customers. The study used probability as well as non-probability sampling for selecting the respondents. While selecting the institutions, non-probabilistic convenience and judgemental sampling techniques were used. However, within such institutions, the respondents were selected by stratified random sampling.

After a literature review, certain variables/constructs/dimensions were identified, that were adapted and incorporated in the questionnaires distributed to the respondents. Tests for validity and reliability during the pilot study helped identify the quality elements as per the various categories of customers. These items along with

the constructs have already been referred to in the previous section. Four different questionnaires were developed, one each for the four categories of respondents.

For the final study of the total questionnaires distributed, a total of 145 and 219 questionnaires from the faculty and the students were finally found to be complete and valid for analysis. These constructs so identified during the pilot test, formed the basis of the study. Univariate, bivariate and multivariate statistical techniques were conducted to arrive at the research findings.

The data has been analyzed for the entire sample (both engineering and management institutions, jointly), and for the engineering institutions and management institutions separately, with the two sets of customers studied separately. This has been done to enable a comparison between the samples from the engineering and management institutions, and for the testing of the hypotheses.

Keeping the objective and the sub objectives in mind, the research is aimed:

- To study the sample as a whole with two separate categories of customers.
- To compare the two sectors - engineering and management institutions.

Identification of the design characteristics reflecting the quality components for education and grouping them into constructs / dimensions:

For analytical purposes, descriptive statistics were used through measures of central tendency and dispersion. The means and standard deviation on the various constructs were calculated for the entire sample, and also for the engineering and management institutions separately. This helped to establish quantitatively the constructs so identified through literature review.

Faculty

The means and standard deviation for the various constructs was also calculated. For the entire sample, the mean scores for the various constructs ranged between 4.377 and 4.042, with 'technical system' scoring the highest and 'social system,' scoring the least. As far as engineering and management institutions are concerned, 'technical system' and 'social system' scored the highest and the lowest. The values are shown in Table 1.

Table 1: Descriptives for Design Characteristic Constructs

Constructs	Items	Faculty					
		Entire sample		Engg Inst		Mgmt Inst	
		Mean	SD	Mean	SD	Mean	SD
Management System	A well accepted vision and mission statement	4.153	.369	4.102	.346	4.205	.386
	Clearly defined and specific goals						
	Effective and efficient leadership						
	Clear and specific policies and *procedures*						
	Strategic and operational planning						
	Delegation of authority/power distribution						
	Strict discipline						
	Budget priorities						
	Emphasis on continuous improvement						
	Management-by-fact/ Information system						
Technical System	Instructional competence–expertise and adequacy						
	Instructional arrangement - class size	4.377	.461	4.278	.509	4.476	.386
Social System	Differentiation/adaptive service for its customers						
	Emphasis on training and development for all						
	Customer focus/need based						
	Trustworthiness amongst all						
	Well defined channels of communication						
	Teamwork						
	Respect for people	4.042	.454	3.945	.471	4.140	.417

Students

Here again, the means and standard deviation for the various constructs were also calculated. For the entire sample, the mean scores for the various constructs ranged between 4.132 and 3.905, with 'technical system', scoring the highest and 'management system', scoring the least. As far as engineering and management institutions were concerned, the constructs scoring the highest and lowest values were the same as for the entire sample. The values are shown in Table 2.

Determination of the level of importance (relative ranking) assigned to design characteristics:

The means and standard deviation of the various items and constructs for design characteristics were calculated for (i) the entire sample; (ii) for engineering institutions; and (iii) for management institutions. The items and constructs were ranked according to the mean scores and this helped to identify the most important items and constructs. This is discussed in the subsections below.

Faculty and Students

The constructs are illustrated in Table 3 for faculty and Table 4 for students. The ranks (order of importance) given under the three categories correspond to each other. They are the same for all the three categories.

Table 2: Descriptives for Design Characteristic Constructs

		Students					
		Entire sample		Engg Inst		Mgmt Inst	
Constructs	Items	Mean	SD	Mean	SD	Mean	SD
Management System	A well accepted vision and mission statement	3.905	.434	3.741	.440	4.070	.360
	Clearly defined and specific goals						
	Effective and efficient leadership						
	Clear and specific policies, procedures						
	Strategic and operational planning						
	Clear organization structure and design						
	Delegation of authority						
	Machinery for evaluation and control						
	Budget priorities						
Technical System	Well-defined curriculum design	4.132	.373	4.035	.415	4.230	.297
	Suitability and relevance of curriculum content						
	Curriculum planning, design, periodic review						
	Instructional competence						
	Instructional arrangement						
	Adaptive resource allocation						
	Adequate and competent administrative / support staff						
Social System	Trustworthiness amongst all	3.957	.567	3.781	.531	4.134	.550
	Well-defined channels of communication						
	Customer focus / need based						

Table 3: Relative ranking of the Design Characteristic Constructs

	Faculty		
Items	Entire Sample	Engineering Institutes	Management Institutes
	Rank	Rank	Rank
Technical System	I	I	I
Management System	II	II	II
Social System	III	III	III

Table 4: Relative ranking of the Design Characteristic Constructs

	Students		
Items	Entire Sample	Engineering Institutes	Management Institutes
	Rank	Rank	Rank
Technical system	I	I	I
Social system	II	II	II
Management system	III	III	III

Applicability of the dimensions as a measure for design characteristics; Are the dimensions valid constructs?

This section is aimed at studying the applicability of the various dimensions/constructs. As in the previous section, the analysis was based on a Factor Analysis. The data on design characteristics for the two categories of customers was subjected to Principal Component Analysis, and the values were then repre-
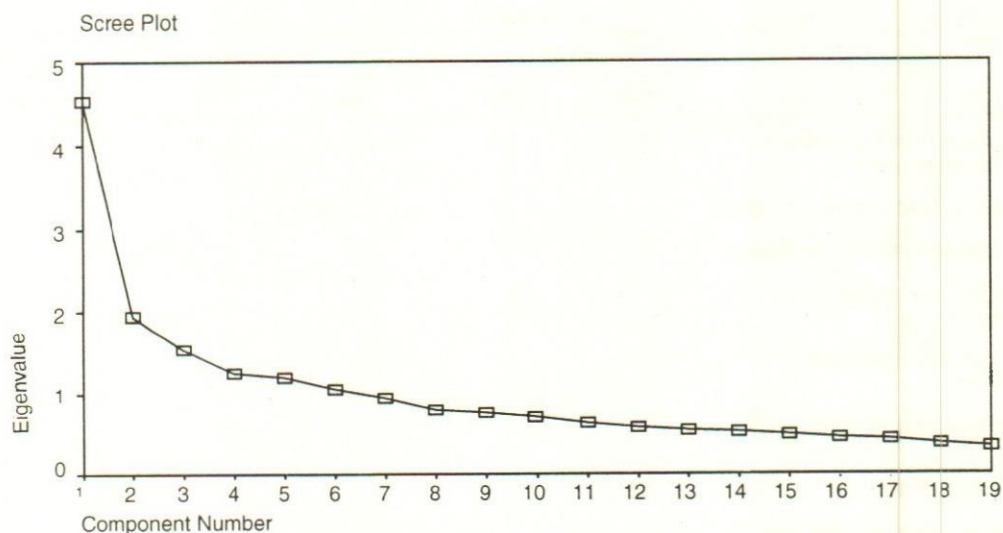
Scree Plot

Fig. 1. Scree Plot for Design Characteristics - Faculty
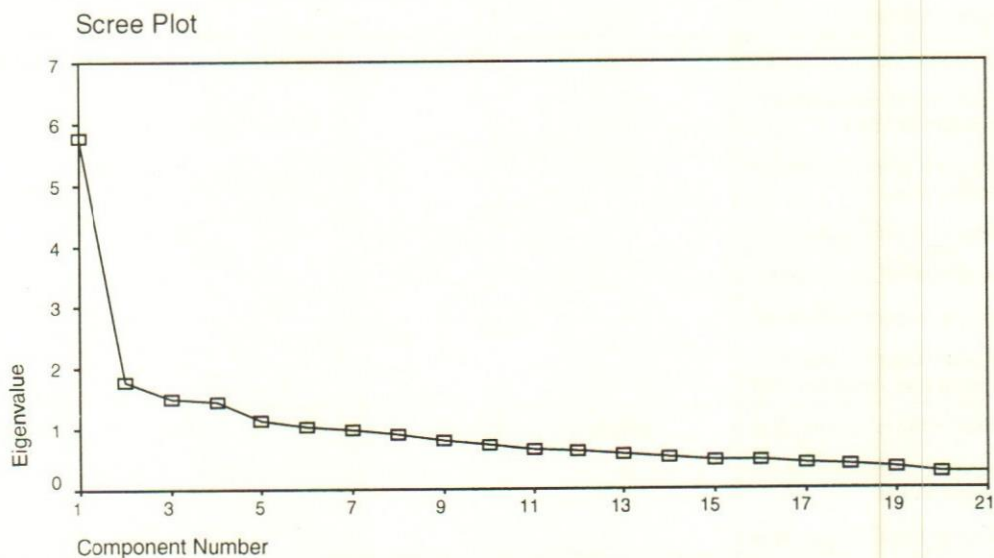
Scree Plot

Fig. 2. Scree Plot for Design Characteristics - Students

sented through Scree Plots. Descriptive statistics in the form of measures of mean and standard error were also used. These calculations were made for the whole data set and no distinctions were made for engineering and management institutions.

As may be observed in this section, the constructs proved to be statistically significant and the validity of the model/constructs could not be negated. These constructs have been, thus, used in the study for the testing of the hypotheses.

Entire Sample

The Principal Component analysis of the data on

levels of importance assigned to the various design characteristics items, suggests a six-factor model for each of the two groups viz., the faculty and the students. However, in all these cases, it was observed that there was a lack of coherent structure in the items within the factors so identified. Scree plots for the whole data set for the two groups indicated that a single factor model would be most appropriate (See Figs. 1-2). However, keeping in line with the constructs so identified during the pilot study, the mean and standard error values on the level of importance assigned to the various design characteristics were calculated. This was done for both the customer groups separately (See Tables 5-6). The values revealed that the validity of the model/construct could not be negated. It was statistically significant and the dimensions are valid constructs.

Table 5: Levels of Importance assigned to the Constructs of Design Characteristics - Faculty

Construct	Mean	Standard Error
Management system	4.153	0.03
Technical system	4.377	0.03
Social System	4.042	0.03

Table 6: Levels of Importance assigned to the Constructs of Design Characteristics - Students

Construct	Mean	Standard Error
Management system	3.905	0.02
Technical system	4.132	0.02
Social System	3.957	0.03

Hypotheses Testing

- Null hypothesis = The Variance/Means between the two groups do not differ significantly and are the same/equal

- Alternate hypothesis = The Variance/Means between the two groups differ significantly and are not the same/equal

Hypothesis 1 - There is no significant difference in the importance assigned to different Design Characteristic constructs.

Analysis for both Engineering and Management Institutions:

- The data was subjected to the Independent Samples t-test.

- The Levene's Test for Equality of Variances was applied.

- Further, the equality/inequality of variances determined the use of pooled/separate variance t-tests.

Hypothesis 1 A (i) There is no significant difference in the importance assigned to the various constructs viz., - management system, technical system and social system when compared between the faculty of the engineering institutions and that of the management institutions.

The Independent Samples t-test was applied. The Levene's Test for Equality of Variances indicated the F Statistic values for management system with corresponding significance (or p-value), which were more than .05. This meant that the null hypothesis failed to get rejected and that the variances of engineering and management institutions were equal. This supported the use of a pooled variance t test to test the equality of means. The associated p-value was more than .05, and thus, the null hypothesis failed to get rejected, i.e. the difference in means is not significant. As far as technical system was concerned, F Statistic values with corresponding significance (or p values), were less than .05. This meant that the null hypothesis got rejected and that the variances of engineering and management institutions were not equal. This supported the use of a separate variance t test to test the equality of means. The associated p-value was less than .05, and thus, the null hypothesis got rejected, i.e. the difference in means is significant. Finally, as far as the social system was concerned, the values for the F statistic with corresponding p values was more than .05. This implied that the null hypothesis failed to get rejected and that the variances of engineering and management institutions were equal. This indicated the use of a pooled variance t test. The associated p-value was less than .05, and thus, the null hypothesis got rejected and it was concluded that the difference in means is significant. (See Table 14).

Hypothesis 1A (ii) There is no significant difference in the importance assigned to the various constructs viz., - management system, technical system and social system when compared between the students of the engineering institutions and that of the management institutions.

The Independent Samples t-test was applied. The Levene's Test for Equality of Variances indicated the F Statistic values for management system and social system with corresponding significance (or p-values), which were more than .05. This meant that the null hypothesis failed to get rejected and that the variances of engineering and management institutions were equal. However, for the technical system, the p-value was less than .05, which indicated that the null hypothesis got rejected and that the variances of engineering and management institutions were equal. For the former, i.e. for the management system and the social system, the failure to reject the null hypothesis implied the application of the pooled variance t-test. As far as the means were concerned, the associated values of significance (p-values), for both, were less than .05, and thus, the null hypothesis got rejected, and the difference in the means is significant. For the technical system, the separate variance t test was applied wherein the p-value was less than .05, and thus, the null hypothesis got rejected, and the difference in means is significant. (See Table 15).

As far as these constructs are concerned, there is a significant difference in the importance assigned by the Students of Engineering and Management institutions.

Table 7: Hypothesis Testing – Hypothesis No. 1A (i)

Construct	Instt	Mean	SD	F	Sig. (p)	t value	Sig. (2-tailed)	95% Confidence Interval of the Difference	
								Lower	Upper
Management System	Engg	4.10	.34	.444	.506	-1.688	.094*	-.223	.017
	Mgmt	4.20	.38						
Technical System	Engg	4.27	.50	4.075	.045	-2.641	.009**	-.346	-.049
	Mgmt	4.47	.38						
Social System	Engg	3.94	.47	.421	.518	-2.642	.009**	-.342	-.049
	Mgmt	4.14	.41						

*- Difference in means not significant (p - value more than .05)   The null hypothesis failed to get rejected.
**- Difference in means significant (p-value less than .05)   The null hypothesis got rejected.

Table 8: Hypothesis Testing – Hypothesis No. 1A (ii)

Construct	Instt	Mean	SD	F	Sig. (p)	t value	Sig. (2-tailed)	95% Confidence Interval of the Difference	
								Lower	Upper
Management System	Engg	3.74	.44	3.320	.070	-6.042	.000**	-.436	-.221
	Mgmt	4.07	.36						
Technical System	Engg	4.03	.41	12.48	.001	-4.009	.000**	-.291	-.093
	Mgmt	4.23	.29						
Social System	Engg	3.78	.53	.112	.738	-4.826	.000**	-.496	-.208
	Mgmt	4.13	.55						

** - Difference in means significant (p-value less than .05)   The null hypothesis got rejected.

Inference

The results show that there is no significant difference in the importance assigned to different Design Characteristics constructs between the faculty and the students of engineering institutions and that of the management institutions. The same level of importance is assigned to the management system, technical system and social system by the faculty as well as by the students of engineering institutions as well as management institutions. This is because these constructs and items therein are universal to effective and efficient organizational functioning.

Conclusion

Quality issues, and more specifically the TQM approach, has no longer been confined to manufacturing businesses and a few service businesses, but have spread to the education sector. With the educational institutions finding themselves in a market-oriented environment, with demands from a variety of stakeholders, a 'customer focus' cannot be ignored. Not oblivious to the need for adaptation to serve the interests of its stakeholders, in terms of greater responsiveness, responsibility, accountability and increased expectations, the educational system has been pressurized to shift its focus from one on quantitative expansion, to one on emphasis on quality.

Keeping in view the relevance of total quality management in education, it is important to identify the various quality dimensions or design characteristics which if adopted by an educational institution can lead to quality in education. The literature review helped identify the various items for the study. These items were tested for reliability and validity, so as to arrive at statistically proven items that could be identified as the design characteristics according to the customers of the educational system. The test for validity through Rotated Component Matrix identified factors/constructs which were termed as management system, technical system and social system.

The importance/degree assigned to such requirements or their constructs may vary across customer groups and also amongst the institutions themselves. The paper presents the results of an empirical study

conducted on select higher educational institutions to assess the importance/degree assigned to the various design characteristic constructs across the various internal and external customer groups.

References

Barnett, R. (1992), Improving Higher Education-Total Quality Care, Published by SRHE and Open University Press, Buckingham.

Bauer, M. (1992), Evaluation Criteria and Evaluation Systems. Quoted in Craft, A., (Ed.), Quality Assurance in Higher Education: Proceedings of an International Conference, Hong Kong, 1991, Falmer, London.

Cave, M., Hanney, S., Kogan, M., and Trevett, G. (1988), The Use of Performance Indicators in Higher Education, A Critical Analysis of Developing Practice, Jessica Kingsley Publishers.

Cheng, Y.C. (1996), The Pursuit of School Effectiveness: Theory, Policy and Research, The Hong Kong Institute of Educational Research, The Chinese University of Hong Kong, Hong Kong.

Cheng, Y.C. and Tam, W.M. (1997), Multi-Models of Quality in Education, Quality Assurance in Education, Vol.5, No.1, 1997, pp 22-31.

Coate, L.E. (1990), TQM on Campus: Implementing Total Quality Management in a University Setting, Business Officer, Vol. 24, No. 5, pp 26-35.

Cope, R. and Sherr, L. (1991), Total Quality Management for Organizations: Concepts and Tools, A Handbook for Tertiary Education, Technical and Further Education, National Centre For Research And Development Ltd, Leabrook.

Cornesky, R., McCool, S., Byrnes, L. and Weber R. (1991), Implementing Total Quality Management in Higher Education, Magna Publications, Madison, WI.

Craft, A. (Ed.) (1992), Quality Assurance in Higher Education, The Falmer Press, London.

Cronbach, L.J. (1951), Coefficient Alpha and the Internal Structure of Test, Psychometrica, Vol.16, pp 297-300.

Crosby, P.B. (1979), Quality is Free, New York, McGraw Hill.

Dahlgaard, J.J., Kristensen, K., and Kanji, G.K. (1995), TQM and Education, Total Quality Management, Vol.6, No. 5 and 6, 1995, Carfax Publishing Ltd.

De Rudder (1994), Quoted in Goodlad, S., (1995), The Quest for Quality - Sixteen Forms of Heresy in Higher Education, SRHE and Open University Press.

Ellis, B. (1993), Total Quality Management in an Education and Training Context. Quoted in Shaw, M. and Roper, E., (Ed.) (1993), Aspects of Educational and Training Technology, Quality in Education and Training, 25, Kogan Page, London.

Feigenbaum, A.V. (1951), Quality Control: Principles, Practice and Administration, McGraw-Hill, New York.

Gilmore, H.L. (1974), Product Conformance, Quality Progress, Vol.7, No.5.

Green, D. (1994), What is Quality in Higher Education? Concepts, Policies and Practice. In Green, D., (Ed.) (1994), What is Quality in Higher Education, SRHE and Open University Press, Buckingham, 1994, pp 3-20.

Harvey, L. and Knight, P.T. (1996), Transforming Higher Education, SRHE and Open University Press, Buckingham.

Harvey, L. (1994), Continuous Quality Improvement: A System Wide View of Quality in Higher Education. Quoted in Knight P. T. (Ed.) (1994), System Wide Curriculum Change, SRHE and Open University Press.

Johnes, J. and Taylor, J. (1990), Performance Indicators in Higher Education, SRHE And Open University Press.

Juran, J.M. and Gryna, F.M. Jr. (Ed.)(1988), Juran's Quality Control Handbook, Mcgraw-Hill, New York, NY.

Lewis, R.G. and Smith, D.H. (1994), Total Quality in Higher Education, St. Lucie Press.

Madu, C.N. and Kuei, C.H. (1993), Dimensions of Quality Teaching in Higher Education, Total Quality Management, 4, pp 325-338, Carfax Publishing Ltd.

Mukhopadhyay, M. (2001), Total Quality Management in Education, National Institute of Planning and Administration.

Neave (1994), Quoted in Goodlad, S., (1995), The Quest for Quality - Sixteen Forms of Heresy in Higher Education, SRHE and Open University Press.

Nunnally, J.C. (1978), Psychometric Theory, Mcgraw Hill, New York.

Owlia, M.S. and Aspinwall, E.M. (1996), Quality in Higher Education - A Survey, Total Quality Management, Vol.7 No.2, Carfax Publishing Ltd.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985), A Conceptual Model of Service Quality and its Implications for Future Research, Journal of Marketing, Vol. 49, No.4, pp 41-50.

Peters, T.J. and Waterman, R.H. (1995), In Search of Excellence, Lessons From America's Best Run Companies, Collins, London.

Pounder, J. (1999), Institutional Performance in Higher Education: Is Quality a Relevant Concept, Quality Assurance in Education, Vol.7, No.3.

Sahney, S., Karunes, S. and Banwet, D.K. (2001), "Total Quality Management in Higher Education –The What and the Why?" Journal of Educational Planning and Administration, Volume XV, Number 1, pp 97-104.

Sahney, S., Karunes, S. and Banwet, D.K. (2002), Total Quality Management in Higher Education in India -A Diagnostic Study of select Engineering and Management institutions, IIT, 2002, Deptt. of Management Studies, Thesis submitted. (Unpublished).

Sallis, E., (1993), TQM in Education, London, Kogan Page.

Sayed, Y. (1993), A Perspective on Quality in Education, Quality Assurance in Education, 1, pp 35-39.

Staropoli, A. (1992), The French Comite National D'evaluation; Quoted in Craft, A., (Ed.) (1991), Quality Assurance in Higher Education: Proceedings of an International Conference, Hong Kong, 1991, Falmer, London.

Tofte, B. (1993), A Theoretical Model for Implementation of TQ Leadership in Education, EEC Seminar in Total Quality in Education, Denmark.

West-Burnham, J. (1992), Managing Quality in Schools-A TQM Approach, Longman Group UK Ltd.

□

Public-Private Partnerships in the Road Sector

Atmanand

Public-private partnerships (PPPs) represent a unique and flexible solution to road projects. PPPs can embrace a range of structures and concepts, which involve the sharing of risks and responsibilities between public and private sectors. Private sector involvement in the road sector in India has been under three routes, BOT route (build-operate-transfer), the annuity method and the SPV method (special purpose vehicle). In order to facilitate private sector participation in road projects in India, there should be a system of availability of long-term funds. Central road fund through cess on petrol and diesel is a new source of funds having significant importance. However, in case of successful PPP toll roads, it is imperative that the government should bear the responsibility of financing a part of total costs.

Atmanand is Professor, Management Development Institute, Gurgaon, India

Infrastructure Development through Public-Private Participation

With the massive increase in population in developing countries, particularly in the urban areas, the governments have not found it possible to mobilize adequate financial resources for development to cater to the basic needs of the people. As such, various ways and means are being explored to augment resources and enhance productivity of investments and greater coverage in providing benefits to the people in improving the quality of life (Economist, 2001).

Public- Private Partnerships (PPPs) represent a unique and flexible solution to implement infrastructure projects. PPPs can embrace a range of structures and concepts, which involve the sharing of risks and responsibilities between public and private sectors. PPPs are not only an alternative to government budgetary constraints; they are also the means to improve the quality and delivery of public services. The intervention by the private sector can reduce inefficiency and respond effectively to user demands. Governments can acquire extra resources by PPPs. PPPs can release states' resources which can be used for other purposes (Antonio, et al, 2002).

The United Nations has become increasingly prominent as an advocate of PPPs. The United Nations Economic Commission for Europe agreed to establish the Build, Operate, Transfer (BOT) Expert Group in January 1996, to provide information to its member states on new project finance techniques for countries in central and eastern Europe and the CIS. Given their lack of budgetary resources and the enormous needs in the transition economies, PPPs are a strategic necessity rather than policy option. PPPs can also achieve social and environmental objectives. Accordingly, the concept of PPPs has become increasingly attractive and is reflected in many UN global initiatives such as:

- The United Nations Global Compact (a partnership between the business community and the UN to address the challenges posed by globalisation);

- The United Nations Millennium Summit (where the world's countries call on partnerships with the business community to help in alleviating global poverty);

- Rio + 10 (a global movement to promote sustainable development where PPPs are recognised as necessary tools in the energy and transport sectors).

Despite the enormous international interest at national, regional and international levels, there has been disappointment at the lack of successful PPPs. One of the key barriers has been the lack of government skills in identifying and bringing forward projects into the market. PPP units have managed to overcome this problem. Within a short period of time, PPP units have been established and are identifying projects that are improving the quality of public services. A PPP unit or task force offers an important instrument to facilitate PPPs (World Bank, 1994).

Drivers:	Enablers:
• Financial need.	• Political framework: political will or commitment.
• Poor infrastructure.	
• Demands in public sector services.	• Legal framework: documentation not excessively complicated.
• Search for efficiency and creativity.	
• Desire to introduce competition.	• Public acceptance: acceptance of private sector involvement.
• Scarcity of domestic experience.	
• Desire to educate national contractors.	• Quality practitioners: experienced project sponsors.
• Bandwagon effect.	

Fig. 2. Key drivers and enablers for PPPs

PPPs can take different forms.

- Contracting out or management contracts — where the private sector is only partially involved, for example it provides a service or manages without taking any risks;
- Joint ventures — where the private and public sector jointly finance, own and operate a facility;
- Leasing — where part of the risk is transferred to the private sector;
- BOT — where the private sector takes primary responsibility for funding, designing, building and operating the project. Control and formal ownership of the project is then transferred back to the public secor. Possible variations on this theme can be BOOT (Build Own Operate Transfer); DFBO (Design Build Finance Operate); DCMF (Design Construct Manage and Finance); BLT (Build Lease Transfer), and many others;
- BOO (Build Own Operate) — where the control and the ownership of the projects remain in private hands.

Fig. 1. What is a public-private partnership?

Advantages of Public-Private Partnership

A reduction in the government's financial contribution

Partnership projects often call for fewer contractors to carry out the work and, above all, a reduction in supervision. The government's administrative and management costs are considerably reduced. Moreover, overall responsibility for the project, including future operation, fosters not only economies of scale but also encourages the use of materials and work methods that reduce to a minimum the project's overall

cost (design, construction and operation). The level of competition surrounding the call for tenders will also significantly affect costs. Experiences abroad suggests that road infrastructure projects carried out through partnerships can save as much as 10% of the cost of the project.

Advancement or acceleration of project execution

Private sector financing and the latitude and leeway granted to it in the execution of the work and the optimum use of its equipment and resources make possible the advancement and acceleration of projects.

Transfer to the private sector of a bigger share of risk

Partnership projects assume, in particular, more extensive involvement by the private sector, which in turn assume greater responsibility with regard to design, the execution of the work, and the operation or financing (or both) of infrastructure (interest rate, traffic and so on). A real transfer of risk to the private sector occurs and the public sector achieves savings.

Emergence of technically and financially innovative projects

The broader responsibility and leeway entrusted to the private sector foster the adoption of innovative work methods and techniques that allow for the more efficient execution of the work and the increased profitability of the project, which may lower costs.

Development of exportable expertise

The realization of partnership projects implies the development by the private sector of new expertise in

Government Department	Public Authority	Service Contract	Operations Cooperative and Maintenance (O&M) Contract	Lease-Build-Operate (LBO)	Build-Transfer Operate (BTO)	Build-(Own)-Operate-Transfer (BOT or BOOT)	Wrap around Addition	Buy – Build Operate (BBO)	Build – Own Operate (BOO)

Fully Public ←—————————————————————————————————————→ Fully Private
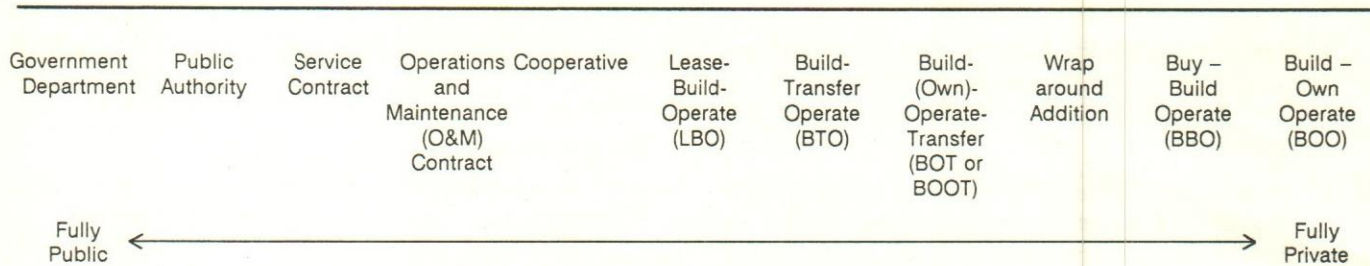
Fig. 3. The spectrum of public-private partnerships

the management of transport infrastructure projects from the standpoint of design, construction and long-term operation. Such expertise is now in demand in a number of countries. Each contract of this type that a firm obtains becomes a showcase that will help it obtain similar contracts abroad.

Public-private partnerships for infrastructure take many forms. Figure 3 shows the spectrum of principal models, ranging from fully public to fully private. The public-private forms are contracts, franchises, and divestments. The rankings of the models in the right half of the figure, that is, their relative degree of "privateness", should not be interpreted too rigidly, as the differences are subtle and depend on individual cases (Gary and Laurence, 1994).

Public–private partnership also involves sharing or transferring a measure of responsibility and control for operations. It may cause shifts in accountability arrangements, creating new accountability hierarchies and reporting requirements for public sector managers (Rodal and Mulder, 1997). While governments have been largely preoccupied with political accountability through the electoral process, public–private partnerships open new channels of accountability. In arrangements where the government still retains ultimate or partial accountability, government partners must ensure the respective accountability of their partners through the use of sound formal agreements. There are also new accountability demands on the private participants in a partnership, as they are required to disclose information about partnership – related activities, including expenditures, to their partners and the public. Problems that arise as a result of shifts in accountability arrangements can be avoided, if appropriate accountability arrangements are put in place a well defined regulatory framework (Pongsiri, 2002).

Public-Private Partnership in Road Projects

To meet the growing requirement of effective roads, the Indian government has unveiled a set of measures to attract private sector participation in road development as well as to find ways to mobilize funds required for expanding the networks. The government is keen to attract foreign investors in the development of road networks. A series of measures has been taken to make the investment attractive. These include providing a legal framework for private sector participation. The National Highways Act has also been amended.

Consequently, there is a rapidly growing niche for private sector participation in developing the road sector where the traffic densities are extremely high. Considering the long gestation period and the absence of proper tariff mechanism, the private sector investments are trickling in slowly. So far, the private sector has been awarded 20 projects at an estimated cost of more than Rs. 1000 crore.

The development and maintenance of roads is undertaken by the Central Government or the state governments, depending upon the location and status of the roads. India has an existing road network of more than 3 million kms, which is the second largest in the world (CRIS-INFAC, 2003). The road network in India (Figure 4) can be divided into the following broad categories:

- National Highways
- State Highways
- Major District Roads
- Project Roads
- Urban Roads
- Village Roads

The rate of growth in road infrastructure has not been at the same level as the growth in traffic and passenger movement. As a result, the national and state highways, which comprise around 6% of the total 3.3 million kms of road network, account for nearly 80% of the total traffic.

National highways (NH) provide connectivity between the union capital and the state capitals, major ports, foreign highways and strategic defence locations of the country. National highways carry medium and

Planning Commission
(Overall policy framework, overall integration, approval plans)

MORTH
(Policy, Resource allocation)

MORD
(Funding of rural roads under various schemes)

Road Department
(Planning & Policy, Funding National highways, approvals & ovrsight etc.)

Transport Department
(Motor-vehicle act, planning etc.)

NHAI
(NHDP implementation, Operations & Maintenance)

Central Level

(Planning, Policy and Budgeting)

Secretary (Panchayat Raj)

State PWDs for Roads-NH Wing
(Construction & Maintenance of NH)

State PWD for Roads
(Construction & Maintenance of State Roads & Rural Roads [for some states])

Panchayat Raj Engineering Deptt.
(Construction & Maintenance of Rural Roads in some states)

Road Development Corporation
(Construction, Maintenance, Operation of Roads)

State Level

Source: CRISINFC, India

Fig. 4. Road sector: Institutional arrangement at the Central and State level

long-range freight and passenger traffic. National highways, which constitute 2% of the total road network, carry approximately 40% of the total traffic volume.

The Ministry of Road Transport and Highways (MoRT&H) is the coordinating agency for planning, prescribing technical standards and budgeting for the national highways, on behalf of the Central Government. Generally, the work is planned and carried out by the state Public Works Departments (PWDs), after getting MoRT&H's technical approval. However, the maintenance of the portion of national highways lying within a municipal zone is the responsibility of the respective municipal corporations. The Central Government finances the national highways from the Central Budget.

State highways (SH) connect the state capital with the various district centres, other important cities and towns, within a state. State highways also provide con-

nectivity to the national highways and the highways of the neighbouring states. Along with the national highways, these form the basic road network in the country, and carry about 40% of the total traffic.

The respective state governments are responsible for the development and maintenance of all roads, except national highways. The state governments are empowered to enact legislations to facilitate the governance of roads. State roads are funded from the state government budget. The overall allocation of the central sector

> The state governments are empowered to enact legislations to facilitate the governance of roads.

and state sector plan funds for road development is done by the Planning Commission, through the five year and annual plans. The Central Government also provides funds to the state governments from the Central Roads Fund (Rakesh Mohan, 1995).

District roads facilitate local trade by connecting production centres with the markets, the highways and railway stations. They take the traffic to the *village* roads. District roads carry medium to heavy traffic. Project roads are the roads meant for providing access to organisations such as state irrigation departments, electricity boards, forest departments, and coal and steel mines. Urban roads and streets facilitate intra–city mobility. The urban road system, including the stretches of the national highways falling within the municipal limits, is developed and maintained by the city's municipal corporation. Village roads connect villages, district roads and highways, railway stations and river-sides.

Private sector involvement in the road sector, as mentioned earlier, started in the mid-1990s, and has been under three routes: BOT route, the annuity method, and the SPV method.

BOT Route

The BOT structure involves the grant of a concession by an empowered government authority (say NHAI) to a special purpose company (the concessionaire). Under the concession, the concessionaire is required to build, finance, control, operate and transfer the stretch of road after the concession period, which could range from 20 to 30 years (Dhameja and Sastry, 2002). During this period, the concessionaire has the right to recover his/her costs and make profits through the collection of tolls. After the expiry of the concession period, the rights and responsibility of maintaining the facility is transferred to the government, free of charge. The economics of a road project on BOT structure is determined by factors which include:

- Toll roads function – congestion reliever, inter city artery, development of road, or bridge/tunnel;

- Physical characteristics – new facilities or expansion, length and capacity of the road, geographic location, and toll collection mechanism;

- Market demand – actual and expected traffic levels, predictability of expected traffic and willingness of users to pay tolls.

Eight NHDP projects under BOT route (detailed in Table I) include five GQ projects. Main features of these projects are:

- NHAI – grant varied from 16% (Tumkur-Neelmangala) to 29% (Jaipur-Kishangarh) of the project cost. In the case of the Delhi-Gurgaon project, the concessionaire would pay NHAI a capital grant of Rs. 61 crore.

- Gearing of the projects is around 1.5-2.5 times.

- Concession period ranges between 19-20 years, except in the Nellore-Tada stretch which has a concession period of 30 years.

- Financial closure is yet to be achieved.

Projects having high-density stretches that assure good returns are normally awarded under BOT route.

The Annuity Method

Annuity method, a variant of the BOT scheme, assures the concessionaire a fixed annual payment to recover his/her costs and he/she is not entitled to all collections. There is no risk of lower traffic volume, and also the higher traffic revenue due to higher volume than anticipated belongs to the government. Annuity projects have found a fair amount of favour with private investors in India.

Eight projects under the annuity method are the GQ projects; these, detailed in Table 2, have the main features:

- Annuity amount as a percentage of the project cost varied in the range of 8-11%.

- Gearing is around 3-4 times, higher than that of toll-based BOT projects.

- Concession period is 17.5 years, including the construction period.

- Financial closure has been achieved or is close to being achieved.

Projects having higher traffic risks are awarded under the annuity route.

SPV Route

The SPV route involves setting up a joint venture company between two or more promoters to execute the project. The government is generally one of the promoters. Projects having relatively higher traffic risks

Table 1: Toll based BOT projects

Stretch	Concessionaire	Length (Km)	Start Date	Completion Date	Concession Period Years	Financial Closure Date	Estimated traffic in 1999 PCUs	Project Cost (Rs. Billion)	Grant (Rs. Million)	Debt: Equity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Golden Quadrilateral										
Vivekanand Bridge and Approach	AIDC Group/STRADC	6	Jun-02	Jun-05	n.a.	n.a.	20000	6	n.a.	n.a.
Satara - Kagal	MSRDC, India	133	Jan-02	Apr-04	n.a.	n.a.	24000	5.3	n.a.	n.a.
Tumkur-Neelmangala	Jayaswals Neco, India	32	May-01	Dec-03	19	Q3 FY03	20000	1.55	248.3	n.a.
Nellore-Tada	CIDB, Malaysia	111	May-01	Dec-03	30	Mar-02	16600-33300	7.555	1675	3:2
Jaipur-Kishangarh	GVK Industries, B. Seenaiah & Co., India	90.38	Oct-02	Apr-05	20	Q3 FY03	46000	7.29	2110	7:3
Other Projects										
Durg Bypass	Shakti Kumar Sacheti, India	18			n.a.	n.a.	n.a.	0.7	-	n.a.
Nadigama-Vijayawada Phase-II	CIDB, Malaysia	35	May-01	Dec-03	30	Mar-02	n.a.		-	3:2
Delhi-Gurgaon Section	Jaiprakash Industries Ltd./D.S.b Constt. Ltd., India-UK	27.7	Apr-02	Apr-05	20.5	Q3 FY03	189834	5.55	-610.6	2:1
Total		453.08						33.945	3422.7	

Source: CRIS-INFAC, India; PCU: Passenger Car Unit (a common unit to measure traffic)

are all normally suited for the SPV route. Fourteen projects awarded under the SPV route are detailed in Table 3.

In short, the Indian private sector has a significant role to play in the development of road projects. Of the total projects under execution by NHAI, 70% have been through cash contracts (where the contractor builds the road and hands over to NHAI). Indian companies (either of their own or in JV/Consortium) are implementing a major portion of these projects. Private sector involvement has also been through BOT projects (toll as well as annuity based), that account for around 22% of the total value of contracts. Most of these projects (except a few toll-based projects) have achieved financial closure within six months from the date of award of contract. Further, the returns on these BOT projects are commensurate with the associated risk. For example, the ROI for most of the toll-based projects is around 14-15% while the ROI in annuity projects is around 11-12%.

In other words, the NHDP project implemented by NHAI, indicates that a clear road-map and time-frame, a well-defined institutional structure, proper planning and implementation and strong government support are essential for infrastructure development. However, the following issues and concerns need to be considered for the timely completion, profitability of the projects:

- Continuous government support at various stages of a project is essential, and any loss of government focus will adversely affect the implementation of the process.

- Poor financial structure of the government authorities, coupled with the weak state of government finances, could impede the progress of projects, as this would affect actual disbursement of funds for maintenance as well as development of projects.

- Shortfall in the availability of funds vis-à-vis the funds requirements, lays emphasis on the need to identify sources of additional funds to bridge the gap. Private sector participation and development of bond market could be encouraged by streamlining the finances of state government authorities; securitisation of receivables and other assets, like that for SEBs in the power sector, would be another step in this direction.

Table 2: Annuity based BOT projects

Stretch	Concessionaire	Length (Km)	Start Date	Completion Date	Concession Period Years	Financial Closure Date	Estimated traffic in 1999 PCUs	Project Cost (Rs. Billion)	Grant (Rs. Million)	Debt: Equity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Golden Quadrilateral										
Panagarh -Palsit	Gamuda/WCT Engineering, Malaysia	65	Jun-02	Dec-04	17.5	Jul-02	14,617-21,054	5.25	555	4:1
Palsi t-Dankuni (Durgapur Expressway)	Gamuda/WCT Engineering, Malaysia	65	Oct-02	Feb-05	17.5	Sep-02	15,000	4.66	399.8	4:1
Maharashtra Border -Belgaum	Punj Lloyd/IL&FS-CTNL, India	77	Nov-01	Dec-03	17.5	Dec-01	n.a.	5.25	505	3:1
Ankapalli - Tuni	GMR/UEM, India-Malaysia	59	Aug-01	Dec-03	17.5	Jun-02	15,565-20,197	3.15	294.8	3:1
Tuni-Dharmavaram	Gammon India Ltd/Punj Lloyd, India	47	Nov-01	Sep-04	17.5	May-02	n.a.	2.56	279.1	4:1
Dharmavaram-Rajamundry	Gammon India Ltd/Punj Lloyd, India	53	Nov-01	Sep-04	17.5	May-02	n.a.	2.64	296.2	4:1
Nellore Bypass	Soma Enterprises/ Navyuga, India	17.2	Oct-02	Nov-04	17.5	Sep-02	n.a.	1.57	129.6	2.5:1
Other Projects										
Tambaram - Tindivanam	GMR/UEM, India-Malaysia	93	Aug-01	Dec-03	17.5	Jun-02	32,752	4.3	418.6	3:1
Total		476.2						29.38	2878.1	

Note: Annuity payments are to be made semi-annually
Source: CRIS INFAC, India

- There is a need to create sufficient awareness regarding the pricing of road services and the need for rational road pricing; as there is general resistance to toll payment. Besides, independent Road Regulatory Authority (RRA), on the same lines as that of TERI, CPRAI, IRAI should be created to regulate tolls and the availability of service.

- Approach to infrastructure reforms and its development should not be fragmented or lopsided. The need is for an integrated approach for development of transportation infrastructure covering road, road transport, rail network, warehouses and container depots.

Besides new roads, there should be a focus on regular maintenance of roads – highways and local. The private sector should be involved in this by the implementing authorities, i.e., NHAI and the state-level institutions in the road maintenance work. Experiences of Argentina and Madhya Pradesh (MP) in India with regard to road maintenance and private sector involvement through performance linked O&M concessions for 3-5 years need to be considered for adoption suiting our requirements. In Argentina, output-based contracts for road maintenance was introduced in August 1995, whereby contracts for a span of four years were assigned so as to maintain the roads as per agreed specifications. Otherwise, daily penalties were imposed and subtracted from the agreed monthly payments. For purposes of such output-based contracts, a nation-wide survey was carried out to estimate traffic, define minimum (rather than optimum) road standards, define the rehabilitation and maintenance required. The surveys were the bases for setting uniform national output indicators for the road contracts having traffic of a certain range say, 300-3000 per day on a road (India Infrastructure, Dec. 2001).

Project implementation through private sector involvement – both through BOT route or on annuity basis

Table 3: SPV projects

Stretch	Concessionaire	Length (Km)	Start Date	Completion Date	Project cost (Rs. Billion)
(1)	(2)	(3)	(4)	(5)	(6)
Golden Quadrilateral					
Jaipur Bypass Phase II	Punj Lloyd/Progressive Const. Ltd. India	34.7	Oct-01	Mar-04	1.55
Ahmedabad-Vadodara Expressway – Phase I	P.T. Sumber Mitra & Jaya Indonesia	43.4	Aug-00	Aug-02	1.34
Ahmedabad-Vadodara Expressway – Phase II	NCCC/LG Engg. & Construction India-Korea	50	Jun-01	Dec-03	2.95
Port Connectivity					
Mormugoa Port	BRO India	18	Nov-01	Jun-03	n.a.
Haldia Port – Phase I	CWHEC/HCIL China-India	55	Jan-02	Jul-04	2.20
Paradip Port – Phase II	-	74	To be awarded		n.a.
Jawahar Lal Nehru Port – Phase I	Thakur/Mhatre-Unity Construction India	26	Feb.-02	Aug-04	1.40
Jawahar Lal Nehru Port – Phase II	-	14	To be awarded		n.a.
Visakhapatnam Port – Phase I	Venkata Rao Engineering India	12	Apr-02	Oct-04	1.00
Cochin Port – Phase II	-	10	To be awarded		n.a.
New Mangalore – Phase II	-	60	To be awarded		n.a.
Tuticorin Port – Phase II	-	51	To be awarded		n.a.
Chennai & Ennore Port – Phase II	-	6	To be awarded		n.a.
Other Projects					
Morabadabad Bypass	U.P. State Bridge Corporation Ltd. India	18.4	Apr-99	Apr-02	0.78
Total		472.5			**11.21**

Source: CRIS INFAC, India

are skewed towards the extreme end of the risk. In the case of toll-based projects, the tariff risk is high and is borne by the concessionaire (with no risk to government), while in the case of annuity projects, minimal risk is borne by the concessionaire, with the government bearing the payment risk. As mentioned earlier, all annuity projects have achieved financial closure in a short span of time, some of the toll projects are yet to do so. In this respect, an approach where the risk is borne equally both by NHAI and the concessionaire would prove to be successful. Shadow toll concept where traffic risk is shared by concessionaire and government, though not found favour with the government at present, needs reconsideration.

Central Road Fund (CRF) through cess on petrol and diesel is a new source of funding. Such funds initially accrue to consolidate funds and then are passed on to respective agencies. This structure of CRF lacks ac-

countability, is prone to delay in disbursement, also lacks transparency and the funds are not completely utilized for the purpose intended. Independent bodies with professional management and user representation would take care of such structural issues. Further, to inculcate financial discipline, allocation of funds should be based on minimum requirement of performance and continuous maintenance.

> **Central Road Fund (CRF) through cess on petrol and diesel is a new source of funding.**

Development is a long-term activity. In order to facilitate private sector participation in road projects, there should be a system of availability of long term

funds. On the contrary, trends towards conversion of development banks/FI into universal banks, private investors are finding it difficult to raise funds having long term tenure. Further, some of the private sector participants are finding it difficult to contribute their share of the equity investment, given their relatively small balance sheet size. This emphasizes the need to develop a system for raising and channelising long term funds for infrastructure. Establishment of Infrastructure Equity Fund of Rs.1,000 crore by the government is a welcome step. This fund will be leveraged to raise more resources and provide funds for highway projects. In addition, there is a plan to have an institutional mechanism to coordinate debt financing by FIs and banks of infrastructure projects larger than Rs. 250 crore. Industrial Development Finance Corporation (IDFC) will act as the coordinating institution with primary responsibility for different sectors being shared with IDBI and ICICI. (Economic Survey, 2003).

Select Cases of Road Projects

NOIDA Toll Bridge

The NOIDA Toll Bridge (NTB) project comprises a main bridge (span of 552 metres), three minor bridges, and an 8-lane expressway (length of 7 km). The project was developed by NOIDA Toll Bridge Company Ltd. (NTBCL), an SPV promoted by NOIDA and the IL&FS. Strategic investors, AIG Indian Sectoral Equity fund and Asian Infrastructure Mezzanine Capital Fund, and the World Band also have a stake in the SPV. The NTB has ensured a reduction in the travel time from NOIDA (in Uttar Pradesh) to Lajpat Nagar (in South Delhi) to just 5-10 minutes. The project was commissioned in February 2001, four months ahead of the scheduled 29-month period.

The Marubeni-Mitsui consortium (assisted by Gammon India and Oriental Structural Engineers) was the EPC contractor for the project. The operation and maintenance contract has been given to Intertoll of South Africa, which would be paid an operator fee. Intertoll shares the traffic risk with NTBCL; the O&M fee for the first 10 years is linked to the revenue generation (11% of the annual toll collection) and subsequently, the O&M fee would comprise a variable fee (Rs. 0.725 per vehicle) and a fixed fee (Rs 31.9 million per annum); both the costs would be indexed to inflation.

The project concession is for a period of 30 years, with a provision for extension by two years on a recurrent basis, based on the sponsor's ability to achieve the estimated rate of return (of 20%). Periodic maintenance is envisaged every 12 years.

The overall project cost was around Rs 4.08 billion, and was funded based on a debt-equity ratio of 70:30. The Rs 2.86 billion debt component was funded by the sponsor, IL&FS (Rs 600 million), a consortium of banks and financial institutions, including IDBI, IFCI, SBI, Central Bank, PNB, Union bank and LIC (Rs 1.76 billion), and through deep discount bonds (DDBs of Rs 500 million) with a put/call option after 5 years and 9 years. IDFC was also involved in providing funds to the project through the take-out financing route, wherein the bands (which have investible funds, but are interested in short medium term lending) could participate in the lending in the initial period and IDFC would take-out their loans after a specified period. The equity contribution was made by IL&FS (29.4%), NOIDA administration (8.17%), INCI(4.08%), IFCI (4.8%) , Inter toll (5%), World Band (3.7%), a few strategic investors (32.68%) and the public (16.98%), through fully convertible debentures of Rs. 207.8 million.

The initial daily traffic levels, which were low at around 14,000 PCUs, increased gradually to around 23,000-24,000 PCUs by end 2001. Cars account for nearly 63% of the traffic; two wheelers, 33%, and trucks and buses, 4%.

Reportedly, the project needs a daily traffic of around 70,000 PCUs to breakeven. As per initial estimates, the daily traffic is expected at around 100,000 PCUs by 2010, and is expected to increase to around 250,000 PCUs by 2020.

The initial toll charges were Rs 7 for two wheelers, 15 for cars / three wheelers, Rs 30 for LCVs, Rs 35 for buses/trucks and Rs. 60 for multi-axle vehicles. Annual revisions in the toll charges have been linked to CPI (as against the initial plan of linking to WPI).

The 27-lane toll plaza has two lanes (termed as gold lanes) for payment through electronic toll collection (ETC); four silver lanes for payment through smart cards, and 21 cash and card or manual lanes. Due to the difference in the mode of toll payment, the rate of vehicle movement in each of these lanes differ; the manual lanes handle 200 - 250 vehicles an hour, the silver lanes handle 600 - 800 vehicles an hour, and the gold lanes handle 1,200 - 1,600 vehicles an hour.

The actual traffic in the initial year of operation (2001-02) had been much lower than the initial estimates, as a result of the congestion at the Ashram flyover due to the ongoing construction (which resulted in a loss in the time saved due to the NTB). With the completion of the Ashram flyover in October 2001, daily traffic on the NTB was expected to increase to around 30,000 - 35,000 PCUs.

Vadodara-Halol Highway

The 35 km Vadodara-Halol project in Gujarat state is the first state highway project to be developed under the BOT approach with private sector participation. The road, which connects Vadodara to the industrial city of Halol, is also the first tolled road in Gujarat, and is among the first projects to be commissioned as part of Vision-2010, a comprehensive plan drawn by the State to attract private sector participation in the infrastructure sector.

The project was developed by IL&FS and the Government of Gujarat (GoG) under an SPV, Vadodara-Halol Toll Roads Limited (VHTRL). IL&FS was involved in developing and implementing the project, while GoG played the role of an enabler and facilitator (obtaining necessary clearances and land acquisition).

The consortium of IRCON International Ltd. and Punj Lloyd Ltd. was appointed as the EPC and O&M contractor; both the contracts were designed as fixed price contracts with the inflation risk transferred to the contractor.

The construction of the road was completed within the scheduled time (within 18 months and commissioned in October 2000) and within the budgeted cost. The concession period is for 30 years.

The total project cost was around Rs. 1.75 billion, and was funded based on a debt-equity ratio of 3:1. The Rs. 1.20 billion debt component was funded by

- Loans from a consortium of banks and financial institutions, including IDBI, IL&FS, SBI, BoB, Gujarat Industrial Investment Corporation (GIIC) and Central Bank (Rs. 650 million).

- Deep discount bonds (DDBs of Rs. 300 million) with a guaranteed 'take-out' by IDFC and IL&FS

- Subordinate debt from IL&FS (Rs. 100 million), and

- An LoC by IL&FS agaisnt the cash debt service reserve (Rs. 150 million).

The interest cost on debt was around 16%. The equity contribution of Rs. 550 million was made by ILFS (Rs 150 million), GoG (Rs 150 million), the EPC and O&M contractors (a consortium of IRCON and Punj Lloyd) (Rs 150 million), and AIG (Rs 100 million).

Delhi-Gurgaon Expressway Project

The 27.7-km Delhi-Gurgaon project is an access controlled expressway (9.7 kms in Delhi and 18 kms in Haryana), and involves 6/8-laning of the existing 4-lane highway. Of the total stretch, 22 kms would be an 8-lane divided carriageway, and the remaining 6 kms will have six lanes with service roads on either side. The project is expected to result in a substantial reduction in the travel time between Delhi and Gurgaon/Jaipur (from 45 minutes to 20-25minutes), and also ease congestion (current traffic density is much higher than the capacity of 40,000 PCUs).

The project has been awarded to a consortium of Jaiprakash Industries and DS Constructions Ltd. of UK (JIDSC), which quoted the highest negative capital grant (the consortium would pay the grant to the government) of Rs 610.6 million. The consortium was selected from nine pre-qualified bidders of which five bidders submitted the financial bids, including Gamuda, IJM, RBM (all from Malaysia), L&T and JIDSC.

The concession period is for 20 years and 6 months, including the construction period. The EPC cost of the project is around Rs 4.827 billion, and the total project cost is estimated at Rs 5.55 billion. The project is expected to be funded based on a debt-equity ratio of 2:1. The financial closure of the project was expected in the last quarter of 2002.

The Delhi-Gurgaon section would have three toll plazas, a 16-lane main toll plaza at the Delhi–Haryana border, besides toll plazas at the Indira Gandhi International Airport road and the Gurgaon border.

The toll rates (one-way) fixed by NHAI are as follows:

- Access upto Indira Gandhi International Airport (IGIA): For traffic towards the international terminal, Rs 10 for cars, Rs 15 for LCVs and mini-buses, and Rs 30 for other vehicles. There will be no toll for traffic towards the domestic terminal.

- Access up to Gurgaon (Delhi-Haryana border: Rs 15 for cars, Rs 22 for LCVs and mini-buses, and Rs 45 for other vehicles)

- Access beyond Gurgaon (Delhi-Haryana border): An addtiional amount of Rs 19 for cars, Rs 28 for LCVs and mini-buses, and Rs 57 for other vehicles.

The toll rates would be indexed to WPI and would be revised annually.

Further revenue from the toll collection beyond traffic of 130,000 PCUs at each toll booth would be shared equally by the concessionaire and NHAI.

The traffic on this stretch was estimated at around 190,000 PCUs (as of 1999). Assuming an average toll rate of Re 1 per km per PCU and a collection rate of 70%, the annual toll revenue is expected to be around Rs 1.34 billion.

Conclusion

The experiences of various countries in road network development provide much learning for India. In many countries, roads carrying high volumes of traffic are increasingly being tolled to generate additional revenues. However, these roads in most countries rarely account for more than 2 per cent of the overall road network. Many countries like France and Japan have a clear strategic plan and policy framework, which enable them to optimize benefits and minimise costs. The private sector participates in these tolls road networks within the framework set by the government. Other countries like Mexico have an unclear policy resulting in a fragmented network. Similarly, in many countries, planning and management of roads is increasingly being separated from implementation of road works, either by contracting out design and civil works to the private sector or by moving them into two separate organisations. Every country has to adopt an approach that is best suited to its development needs e.g. by government agencies (US, Malaysia), public corporations (France, Japan), private sector concessionaires (Argentina, US, Mexico, Brazil) or through public private partnership (PPP, China). It is observed that the presence of strong public sector institutions ensures efficient planning and successful implementation. Irrespective of the institutional framework, well-drafted laws and regulations have proven to be necessary for successful toll road development (US, France, Japan). In countries with successful toll road development programmes, governments have provided an appropriate combination of support measures to public corporations or private toll road concessionaires. Even in the case of successful PPP toll roads (China), the governments have accepted that some costs will have to be borne by the government. Countries also need to identify the right mix of project financing options available, such as equity financing (Malaysia), subordinated loans, infrastructure funds, long-term loans from commercial banks (US and UK), and asset securitisation (China).

References

Antonio Estache, Vivien Foster, & Quenvin Wodon (2002), Accounting for Poverty in Infrastructure Reforms – Learning from Latin America Experience (The World Bank) Washington, D.C. February.

CRIS-INFAC, India (2003), Roads and Highways

Dhameja Nand and Sastry K.S. (2002), Public Sector Restructuring and Privatisation, Kanishka Publishers, New Delhi.

Economic Survey (2003), Ministry of Finance, Government of India, New Delhi.

Gary Bond & Laurence Carlee (1994), Finance for Private Infrastructure, Project Discussion Paper, 23 (Washington D.C.) (International Finance Cup)

India Infrastructure Report (2001), 3I Network, Oxford University Press, New Delhi.

Pongsiri, Nutavoot (2002), "Regulation and public-private partnerships," The International Journal of Public Sector Management, Vol. 15, No.6.

Rakesh Mohan Committee Report (1995), India Infrastructure Report Policy Imperatives for Growth & Welfare, Ministry of Finance, Government of India.

Rodal, A and Mulder, N. (1997), "Partnerships devolution and power sharing issues and implications for management", Optimum: The Journal of Public Sector Management, Vol.24.

The Economist (2001), A Survey of India's Economy, June.

World Bank (1994), World Development Report: Infrastructure for Development, Oxford University Press, New York. □

> *The hero is the one with ideas.*
>
> — **Jack Welch**

Metamorphosis of O.B. of Northern Railway Drivers through HRD

Anirudh Pandey & S.M. Khan

The aim of the article is to probe into the cognitive, conative and perceptual processes of drivers erring behaviour. An attempt was made to provide a microanalysis of the perceptual process through Role Efficacy Scale, cognitive process through Personal Values and co-native process through Locus of Control. Module of HRD intervention was developed to transform the erring behaviour into excellent behaviour and offer suggestions to the Indian railways and other organizations to replicate the model to augment their human resources.

Anirudh Pandey is retired Sr. Scientific Officer (Psychology), Northern Railways, New Delhi, and now running an HRD centre in Lucknow and S.M. Khan is working as Statistician & Behavioural Psychologist at RDSO (Ministry of Railways), Lucknow.

On being promoted to the post of driver on the railways, most employees find resources within themselves and within the organization commensurate with the demand of their new role. Consequently, they strive to attain excellence. There also exist a small segment of employees who find inadequacies both within themselves and within the organization. They, somehow, manage their train operation duties, but fail to adhere to certain safety rules, like whistling while passing through level crossing gates, exchanging signals with station staff, and calling out aspects of signals with their assistants. Such drivers are categorized in C rating by the railways. Bringing improvement or transformation or metamorphosis in the organizational behavior (O.B.) of these drivers, is a problem confronting Indian railways for quite some time.

Such drivers agree that compliance to the rules and commitment to the job is inescapable for survival and success on the job. However, they avoid obeying some rules and fully knowing their consequences. Whenever regular or special inspections are carried out by inspectors or by officers, their irregularities are reported without fail. In order to reinforce desired/appropriate O.B., safety counselors and monitors coach and monitor their performance. However, instead of improving, some of them become dependant on their monitors in such a way that they follow the rules only when their monitors accompany them. Such a mindset invites anxiety, tension, frustration, impersonation, depression and dissatisfaction.

Our assumptions are that the reason behind the problem is an inferiority complex, which might have developed in them due to low level of education, experience with the earlier jobs and organizational environment. In order to emancipate them from such a mindset, there was a need to arouse a sensibility in

them that they had immense resources within themselves and the organization. Professional counseling preceded by a probe into perceptual processes is reported (Pandey, 1995) to have prevented human failure of motormen and have brought about significant improvement in job behaviour of safety counselors and inspectors. (Pandey, 1997, Khan & Pandey, 2002). From the HRD angle, the problem relates either to cognition or to perception or to conation. Therefore, probing into cognitive, conative and perceptual processes was the rationale for bringing about a change in their O.B.

The Study

The present study on metamorphosis of O.B. through HRD interventions was undertaken to make a probe into the cognitive, conative and perceptual processes of their erring behaviour. The study attempted to make a microanalysis of the perceptual process through Role Efficacy Scale, cognitive process through Personal Values and co-native process through locus of control. The main objective of the study was to develop a module of HRD intervention to transform the erring behaviour into excellent behaviour and offer suggestions to the Indian railways and other organizations to replicate the model to augment their human resources. The purpose behind this exercise was metamorphosis of the C rated drivers to enhance their safety and efficiency performance for increasing the productivity of the organization.

Methodology

The HRD intervention was designed, planned and conducted by professional psychologists. Designs of the intervention were shown to eminent experts for their comments. Approval of the then chief safety officer of N Railway was sought before initiating the intervention. The intervention was carried out along with in-service psychological testing at the divisional headquarters. Not more than 15 persons were allowed in a session. The divisions were asked to send the list of C rated drivers (rated as such on the basis of their bad safety performance) along with their record of safety performance.

Sample

In all, 85 drivers were subjected to the intervention. Of them, 39 belonged to Lucknow, 10 to Ambala, 9 to Moradabad, 8 to Allahabad, 7 to Jodhpur, 4 to Delhi and 3 to Bikaner divisions. The drivers ranged in age between 38 to 58 years. They ranged in education from class viii to graduate level. In experience, they ranged between 1 to 38 years.

Description of the Intervention

The intervention was divided into three sessions. The first session dealt with Cognitive and Co-native processes. It consisted of Rapport formation, introduction and writing of answers to a set of questions by each participant. In the introduction exercise each subject was asked two questions 1) as to whom he liked most and 2) why? This facilitated in identifying their personal values and respondents came forward to express their feelings. These two questions were used to study their Cognitive Process, manifested through one of the six (sustantive, benevolent, malevolent, hedonistic, aesthetic, hierarchical and religious) personal values. Responses given by the subjects were categorized in one of the six values by two judges after verification with each of the participants through further questioning, if necessary. For making the probe into their co-native process, a brainstorming session was conducted thereafter. Each participant was asked to write one incident of his greatest achievement and another incident of his greatest failure. However, when this procedure did not yield any response, instructions were changed and subjects were allowed to write incidents both of achievement and failures, relating to their colleagues. For each incident they were asked to attribute reasons and allot score of 100 among the three factors — Self, Others and Luck. Feedback was taken to ensure that they had followed the scoring system.

The second session was devoted to administration of Role Efficacy Scale (RES) and its scoring by the participants and the third session was on Individual counseling, based on the data with regard to perceptual, cognitive and co-native processes.

HRD Tools Used

HRD tools of Personal Values and Locus of Control, (designed and used earlier, Pandey, 2002) were used to probe into cognitive and co-native processes. In addition, Role Efficacy Scale (RES), developed by Professor Pareek was used to make a micro-analysis of the perceptual process. The scale has 10 dimensions, namely: Centrality, Integration, Pro activity, Creativity, Inter role linkage, Helping Relations, Super ordination, Influence, Growth and Confrontation. The scale is reported to possess sufficient psychometric property.

Results

Study of Cognitive Process

As stated earlier, this was studied through Personal

Values. Participants were forced to show only one out of six values. As expected, participants showed differences with regard to their preferred values. Approximately, 30 per cent of the drivers showed sustantive value as their most preferred value. For them, job was the greatest source of livelihood. The highest value for them was to rear their family and themselves. Our results are quite similar to the results offered by Khan in his comprehensive study on organizational commitment. Approximately 20 per cent of them showed Hierarchical value as their most preferred value. For them, obeying the supervisors, the officers and abiding by the rules and regulations, was the greatest force to sustain them on the job. These results are quite similar to the results arrived at earlier with drivers. Approximately, 30 per cent showed 'Religious' value as their most preferred value. They had a strong belief that it is due to obeying their religion and their faith in God that they had got such a good job. Approximately 8 per cent of drivers had highest preference for benevolent value. They believed that by doing good for others, their life would be free from danger. One of the drivers of Jodhpur division reported that in the past they used to feed 3/4 of their food to dogs in hot weather and that on account of this benevolent act on their part, no accident took place, when steam engines were in operation. Approximately 7 per cent were found preferring malevolent value. For them, everybody was against them. Remaining 5 per cent were having a preference for aesthetic value. They loved nature and natural surroundings, music, dance and other such activities.

Probe Into Co-native Process Through Locus of Control

Brainstorming session brought to light some critical incidents pertaining to others. Most of them did not mention incidents relating to themselves, perhaps for fear of punishment. Content analysis of these incidents brought to light the following facts.

Most of the drivers could not remember achievements of their own which they could mention. However, when they were asked to mention incidents pertaining to their colleagues, they mentioned only a few incidents.

Approximately 70 per cent of the drivers attributed the achievements to their mentors who acquainted them with crucial and important clues of driving which could enable them to avail of such achievements.

Approximately 20 per cent of them attributed such achievements to luck or godly powers and only 10 per cent of them attributed the achievement to themselves.

Approximately 73 per cent drivers attributed the

failures to others. Interferences by supervisors and by their counterparts, failures of signals, engines or track were the main causes of the failures.

Approximately, 12 per cent of the drivers attributed the failures to luck. Remaining, 15 per cent of the drivers attributed the failures to the incumbents themselves. The reasons put forth by them were lack of knowledge, lack of proper rest, bad family conditions and in a very few cases, use of alcohol on duty.

Micro Analysis of Perceptual Process

Finer aspects of the process are presented in Table 1. The table gives details of the percentages of subjects scoring 4 out of 4 as positive perception; 3 out of 4 under 25 per cent distortion, 2 out of 4 under 50 per cent distortion; I out of 4 under 75 per cent distortion and those scoring less than 1 out of 4 under 100 per cent distortion with respect to each dimension.

Table 1: Micro Analysis of Role Perception Of Drivers

Dimensions	Positive Perception Score: 4	25% Distortion Score: 3	50% Distortion Score: 2	75% Distortion Score: 1	100% Distortion Score 0 & below
Centrality	28.54	34.92	28.54	8.00	00
Integration	69.42	14.28	6.34	9.52	00
Pro activity	6.34	20.63	34.92	9.52	28.57
Creativity	4.76	31.14	46.03	0.00	17.46
Inter-role linkage	43.13	30.15	9.52	9.52	7.93
Super ordination	31.74	28.54	7.93	26.48	4.46
Helping relationship	53.96	19.04	11.00	9.52	6.52
Influence	12.64	30.15	22.22	15.87	19.04
Growth	34.92	39.68	15.87	7.93	0.00
Confrontation	63.00	12.64	3.17	15.87	4.76

Centrality: This dimension measures the perception of the importance of the role given by the incumbent holding the role. It can be noticed from the table that on this dimension, only 28.54 per cent of the participants had positive perception and rest about 71.46 per cent had distortion in their perception ranging from 25 to 100 per cent percent level.

Integration: This dimension measures the perception of integration between the incumbent and his role. On

this dimension, 69.42 per cent had positive perception and the rest, about 30.58 per cent, had distortion from 25 per cent to 100 per cent.

Proactivity: This dimension measures the perception of taking initiative in performing the role by preparing in advance. On this dimension, only 6.34 per cent of the participants had positive perception about thinking in advance i.e. pro activity and 93.66 per cent had distortion from the levels of 25 per cent to 100 per cent. Another point of specific attention is that 28.57 per cent were found to have developed negative perception to the extent of 100 per cent. This is an alarming situation and needs to be further probed.

Creativity: This dimension measures the perception that something new or innovative can be done or can be learnt by the individual. On this dimension, 4.76 per cent of the participants had positive perception and 95.24 per cent had distortion ranging from 25 per cent to 100 per cent.

> **Creativity measures the perception that something new or innovative can be done or can be learnt by the individual.**

Inter-role Linkage: This dimension measures the perception of the inter-dependence with other roles. It was found that 43.13 per cent of the participants had positive perception about inter-role linkage and 30.15 per cent had marginal distortion to the level of 25 per cent. The percent of subjects having distortion from 50 to 100 per cent level was 26.

Helping Relationship: This dimension measures the feelings of participants with regard to helping others and taking help from others. Approximately 54 per cent of the participants were found to have positive perception on this dimension and 19.04 per cent were found to have marginal distortion to the level of 25 per cent. However, 27 per cent of the participants had distortion from 50 to 100 per cent.

Superordination: This dimension measures the perception that something beyond the regular call of duty is being contributed to the larger society and to the nation. 31.74 per cent of the participants had positive perception about this dimension and 28.54 per cent had distortion up to the level of 25 per cent. Rest of them had distortion ranging from 50 to 100 per cent levels.

Influence: This dimension measures the percep-

tion of the individual towards one's own capacity to make an impact on others. On this dimension, only 12.64 per cent of the subjects were found to have positive perception and 87.36 had distortion up to the level of 25 per cent to 100 per cent.

Growth: This dimension measures the perception about opportunity to learn new things for personal growth. 34.92 per cent of the participants were found to have positive perception and 65.08 per cent had distortion to the levels of 25 per cent to 100 per cent.

Confrontation: This dimension measures the perception about the capacity of the individual to solve problems and putting his point of view boldly. On this dimension, 63.00 per cent of the subjects had positive perception and 37 per cent had distortion from the level of 25 per cent to 100 per cent.

Counseling for Commitment: Taking a note of the strengths and weaknesses in respect of each of the three processes, as elicited through HRD tools, individual counseling sessions were organized. The drivers became highly impressed when the counselor told them their strengths. On being told that they had to bring to light their strengths and had to overcome their weaknesses through them, they gained confidence. They were given to develop an understanding that they can perform the job in a better way, if they keep their eyes open to learning through experience, take responsibility for their actions and develop a commitment for the job and for the organization. Those having malevolent value were given to realize that overall help was being rendered to them by the system of working and they had to bring about a change in their thinking in order to prosper on the job. Those having hedonistic and aesthetic values were also convinced to bring about a change. At the end of the individual counseling sessions at each venue, each of the drivers was asked to give a commitment on his own before the group and the counselor not to repeat errors which he considered his enemies in future.

Their performance record was checked after a gap of three years. While improvement was noticed in all the cases, approximately, 60 per cent of them improved their performance records in such a way that they were rated A. 20 per cent of them came in the rating B and did not show any noticeable improvement.

Discussion

The primary purpose behind undertaking this HRD intervention was to bring metamorphosis in the organizational behavior of a select group of drivers who

were rated C due to their lack of adherence to safety rules. The fact that improvement is seen approximately in 80 per cent of the cases, gives a firm support to the assumptions of metamorphosis in organizational behaviour through HRD interventions. As most of the drivers were semiliterate, had been promoted to the post of drivers from a lower cadre, their counterparts selected through RRBs had higher qualifications, diplomas or higher degrees, development of inferiority was obvious. However, on being told that they had learnt on the job, their complex started declining in the counseling sessions itself. They had high regard and obedience to their mentors, because of their highest preference for hierarchical value. Their high preference for Sustantive value is also similar to the values of normal population. As regards their locus of control, the situation was most alarming, as approximately 70 to 75 per cent of the drivers attributed their success or failure to externality i.e. either to others or to chance/ luck. Intensive counseling was rendered to bring about a change in this process. The structure of their values and their locus of control give a clue that possibly they can be corrected in attribution of responsibility through their mentors. This has been reported elsewhere in various case studies wherein the drivers did not give any statement until their mentors assured them of there being nothing wrong.

With regard to their perceptual process, the fact that, on the one hand, approximately 69.42 per cent of the drivers have developed perfect and coherent sets of perception with respect to the dimension of Integration, 63 per cent with respect to Confrontation, 54 per cent with respect to Helping Relations and 43 per cent with respect to Inter Role Linkage indicates that they are strong on these dimensions and that counseling may be initiated through utilization of these strengths.

On the other hand, the fact that approximately 96 per cent of the drivers have developed incoherent sets of perception with regard to Creativity, 94 per cent with regard to Proactivity, 87 per cent with regard to Influence, 71 per cent with regard to Centrality and 69 per cent with regard to Super ordination, shows that they are weak in these areas. If these clues are taken care of in counseling, metamorphosis of organizational behavior can be easily attempted.

Conclusions and Suggestions

The analysis throws up some pertinent issues for consideration of management, in general, and railway management, in particular. The study deals with larger issue of metamorphosis of organizational behaviour or bringing betterment in the performance of C rated drivers. The assumption that cognition and perception have linkages with co-nations/ performance has proved its validity against performance records. Hence, incorporating cognitive, co-native and perceptual processes under the purview of HRD interventions will lead to better performance.

It is believed that incorporation of personal values, locus of control and role perception in the existing system of counseling will strengthen and reinforce positive behaviour and weaken negative behaviours of the employees. It is also believed that if the programme is conducted on all the staff, it will trigger a sense of belongingness, commitment and sense of responsibility that will in turn utilize their potential in bringing betterment in their performance.

References

Khan, SM & Pandey, Anirudh (2002), "Tool to study sensitivity of rail engine drivers about work environment", Rail Transport Journal, 11 No. 1.

Pandey, Anirudh (1995), "Prevention of accidents through Role efficacy", Rail Transport Journal, 4 (1), Jan.-March.

Pandey, Anirudh (1997), "Role efficacy and Role Stress Relation ship", Pestonjee & Pareek (eds), Rawat Publications, Jaipur.

Pandey, Anirudh (1998), "Enhancing motivation of railway drivers;", An OD Intervention Rail Transport Journal, 8 (4), No. 4.

Pandey, Anirudh (1998), "HRD in Accident Prevention", Paper presented in Northern Railway, Golden Jubilee Safety Seminar, held at New Delhi on August 12 & 13. □

Productivity of Public Sector Banks

Jaynal Uddin Ahmed

An empirical analysis of productivity of public sector banks is undertaken in this article. It is inferred that the productivity of PSBs is low compared to the national level but is still showing some progress. An analysis of various indicators of productivity is undertaken and the factors responsible for lower productivity and profitability discussed.

Jaynal Uddin Ahmed is with the Department of Business Administration, Assam (Central) University, Silchar.

Banks as business concerns cannot overlook the profitability aspects since profit signifies efficiency. Public sector banks have, of late, demonstrated a remarkable ability to adjust to the new operating environment and acquired a high level of business strength. Productivity is one of the factors affecting the profitability, among others, like the expansion of a bank's operations in areas where the avenues of profitable deployment of funds are less, increased over draft, higher over head expenses, increase in sickness in industrial units faced by the banks, non performing assets etc. Higher the productivity, proportionately lower will be the establishment cost. It also indicates the kind of business a particular bank may be doing. A high productivity indicates that, alongwith smaller transactions, a bank does a high volume of transactions too. Lower productivity increases relative operational costs and often becomes the cause of losses as intermediary returns are directly related to the quantum of productivity. An attempt has been made to analyse the productivity performance of public sector banks (PSBs) in a backward region viz., south Assam.

Definition

Productivity as an universal and simple concept refers to an organisation's effectiveness in using all its resources viz, labour, financial resources, fixed assets, premises. It indicates the relationship between output and input expended in any work situation (Monga; 1992). In this respect Peter Drucker (1980) says "without productivity objectives, a business does not have direction. Without productivity measurement, it does not have control." Productivity is an efficiency index which measures the rate of output per unit of input like man, material, machine, money and space. It explains the efficiency in the use of factors of production employed by an organisation. Productivity is the cornerstone of banking growth and economic deployment. It means efficiency and effectiveness of services. In fact, productivity is an essential part of our urge for self improvement and achievement of excellence. Optimum productivity is reached when there is a balance

Table 1: Productivity Ratios of Public Sector Banks vis-a-vis Other Banks (1985-2001)

Year	Deposit per employee			Advances for employee			Total Business Per employee			Deposit per bank branch			Advances per bank branch			Business per branch		
	PSBs	Pvt.	FB	PSBs	Pvt:	FB	PSBs	Pvt.	FB	PSBs	Pvt.	FB	PSBs	Pvt.	FB	PSBs	Pvt.	FB
1985-86	10.2	12.7	32.8	9.3	7.5	233.6	17.1	17.6	36.3	269.8	78.1	2739.3	126.3	91.2	1971.19	344.7	291.2	4710.4
1986-87	14.1	15.2	37.1	10.6	12.1	24.3	20.3	16.2	61.3	298.6	91.3	3155.4	19.6	106.5	2072.7	351 2	341.6	5228.1
1987-88	16.2	16.5	40.5	11.3	8.3	31.6	27.3	25.1	71.2	392.0	172.6	3681.7	181.2	120.9	2720.1	361.2	356.2	6839.2
1990-91	24.0	16.0	50.0	12.6	9.3	35.6	36.1	25.2	87.6	455.2	219.3	4675.6	257.8	128.5	3195.7	356.1	3478	7871.3
1995-96	38.5	71.6	237.8	20.9	37.7	174.8	62.0	88.9	412.6	782.9	696.7	17694.7	326.7	358.6	13003.4	961.2	1039.2	30698.1
1996-97	47.9	83.7	281.1	24.7	46.8	192.2	76.1	86.3	481.4	952.6	1143.8	21246.5	429.1	639.6	15203.9	1444.7	1783.4	34308.1
1998-99	68.7	131.4	313.1	29.6	66.3	130.0	9.3	196.5	513.0	1324.3	1590.9	27020.9	569.7	860.9	11220.9	1891.2	2736.6	41306.2
2000-01	104.1	197.6	416.7	47.8	98.3	302.6	151.8	295.8	719.4	1792.6	2607.9	31152.6	823.1	1297.3	22629.5	1874.9	3905.1	53782.1
Grand mean	40.5	68.1	176.1	20.7	35.7	114.3	61.1	93.9	300.3	783.5	825.1	13920.8	356.7	450.4	8957.2	948.2	1350.1	23092.8

PSBs denotes public sector banks, Pvt. = Private sector banks and FBs = Foreign banks

Source: Self calculated on the basis of

      (i) RBI, Statistical tables relating to banks in India, Vol. 1987, 1991, 1997-98, 2000-2001.

      (ii) RBI, Basic Statistical Return, Vol. 1987, 1991 and 1997.

between all factors of production that yield maximum output for the least effort (Choudhary; 1998). But there are difficulties in measuring productivity in service industries where quality of services assumes greater importance. A bank is described as a financial institution generating a stream of financial services in order to sustain a stock of assets and liabilities. The financial services are produced, delivered and consumed instantaneously. In the process, the consumer is exposed to an experiential quality which is part of the service. In case of banks, the distinctions between input and output is not clear (Athma and Srinivas; 1997). One aspect of productivity is the measurement of business (deposit + advances) per branch and per employee and the other aspect is cost responsiveness and return on the working fund (Angadi; 1984).

The productivity ratio of banks may be worked out by relating the total deposits, total advances and the total business (deposit plus advances) of the banks to the total number of branches and also total number of employees. Cost responsiveness (CR) measures degree of cost effectiveness which reflects the bank's, profitability to a greater extent. "In the context of regulated interest rate structure, the profits of a bank have a greater bearing on profitability then the spread management" (Angadi; 1984). In case of banks, a service industry, earnings are in the nature of output and costs in the nature of input. Therefore, the profits of a bank can be evaluated by CR, which is defined as:

$$CR = \frac{\% \text{ variation in cost}}{\% \text{ variation in earning}}$$

The return on the working fund enables the overall profitability of the working fund. It shows the productivity of capital employed in a bank and is defined as—

ROWF = Profit 100/working fund.

The Productivity Analysis of PSBs

The bank groupwise productivity ratios relating to labour productivity and productivity per branch are presented in Table 1. The table shows that the average labour productivity measured either by deposit or by advances or total business per employee is lower in PSBs than in foreign and private banks. The deposit per employee of PSBs increased from Rs. 10.2 lakhs in 1985-86 to Rs. 104.1 lakhs in 200-01 which is lower than in foreign and private banks. The same for foreign banks increased steadily from Rs. 32.8 lakhs in 1985-86 to Rs. 416.7 lakhs in 200-01. The advances and the total business per employee of PSBs also registered a lower growth than in foreign and private banks. This lower labour productivity may be attributed to the national level trade union that opposes modernisation, automation and computerisation and advocates regular pay hikes without any corresponding increase in productivity (Pedgaonkar; 2002). The average productivity of branches of PSBs in terms of deposits, advances and total business was better than private banks but much lower than the foreign banks in the pre reform years. In 2000-01 the total business per branch for PSBs was Rs. 1874.9 lakhs, for pvt. banks Rs. 3905.1 lakhs and for foreign banks Rs. 53782.1 lakhs, respectively. Moreover, the average of the deposit per branch was around Rs. 783.5 lakhs for PSBs and Rs. 825.1 lakhs for pvt. banks from 1985 to 2001. The other aspect of productivity of banks viz, cost responsiveness (CR) and return on

working fund (ROWF) are presented in Table 2.

Table 2: Productivity Ratio relating to CR & ROWF

Year	Cost responsiveness			Return on working fund		
	PSBs	Pvt. Banks	Foreign Banks	PSBs	Pvt. Banks	Foreign Banks
1982	NA	NA	NA	0.12	0.13	0.81
1983	1.01	0.99	0.96	0.11	0.11	0.79
1984	1.01	0.98	1.01	0.09	0.11	0.90
1985	0.98	1.03	0.97	0.11	0.15	1.94
1986	0.97	0.93	0.85	0.15	0.15	1.34
1987	0.98	1.05	1.56	0.17	0.19	1.14
1988-89	1.00	0.98	0.79	0.19	0.25	1.34
1989-90	1.31	1.03	0.84	0.13	0.25	1.54
1990-91	0.99	0.98	0.99	0.18	0.35	1.50
1991-92	0.97	0.90	1.05	0.27	0.57	1.57
1992-93	3.62	1.12	7.34	−1.00	0.34	−2.88
1993-94	1.60	0.89	6.83	−1.15	0.57	1.51
1994-95	0.13	0.77	0.89	0.25	1.16	1.60
1995-96	0.14	0.71	1.86	0.36	1.20	1.31
1996-97	0.53	0.69	1.91	0.38	1.31	1.70
1997-98	0.71	0.92	1.03	–	–	–
1998-99	1.15	1.06	1.09	–	–	–
1999-00	0.84	0.79	1.31	–	–	–
2000-01	1.06	0.79	1.53	–	–	–

Source: Indian Banks Association Bulletin, various issues
RBI, Statistical Tables relating to banks in India, various issues

A high CR results in lower productivity and vice versa. The average cost per unit of output (earnings) increases, if the percentage increase in cost (input) is higher than in earnings (output) over a period of time and vice versa. There is a sudden spurt in CR for all the bank groups in 1992-93 owing to the banking sector reforms. This is followed by a decline in 1994-95 and 1995-96 which is *inter se* much steeper in the case of private and foreign banks. Indeed, a clear symptom of cost effectiveness/productivity is noticeable for 1994-96, resulting in profits. However, in the subsequent year of reform viz., 1998-2001, cost effectiveness was hampered and stood at 1.06 cost responsiveness for PSBs.

The return on working funds enables us to know overall profitability of the working funds. It shows the productivity of capital employed. By and large, an increasing trend is noticeable in the percentage of profits on the working fund over the period under consideration in case of private banks. It was, however, a negative percentage for foreign banks in 1992-93, which recovered the next year whereas PSBs recovered in

1994-95. It may be observed that all the three bank groups made efforts to improve their productivity in the reform years and succeeded in earning profits by recovering operating costs but productivity is still low compared to international standards. It is learnt that lack of prudence, absence of concern for national wealth, selfish attitude on the part of the bank employees are at the root of many disasters. Flawed management is the root cause of many a malady. However, the foreign banks have out performed the PSBs and pvt. banks for the entire period.

Juxtapose against this the kind of constraints PSBs work under. Besides high priority sector advances, the PSBs in addition to issuing Kishan Credit Cards, are required to provide personal insurance packages to all card holders to cover them against accidental death or permanent disability. They are required to earmark 5 per cent of their net bank credit to women and that should be achieved by March 2004. Moreover, they cannot close any rural branch on the plea of non-availability of staff and volume of business. Despite these, PSBs have turned in a stellar performance.

The Empirical Analysis In South Assam

The foregoing analysis clearly reveals that efforts are being made to improve the productivity of PSBs in the reform era but it is still low compared to international standards. In the following paragraph an attempt has been made to analyse the productivity performance of PSBs in Barak Valley which consists of three districts of south Assam. Table 3 shows the banking profile of the area under consideration.

Table 3: Banking infrastructure in Barak Valley as on 31-12-2000

Types of banks	Barak Valley			
	Cachar	Karim-ganj	Haila-kandi	Total
Public Sector Banks (PSBs)	50	30	15	92
(a) State Bank group (SBs)				
State Bank of India (SBI)	10	6	6	22
(b) National Banks (NBs)	40	24	9	70
Regional Rural Bank (RRBs)				
Cachar Gramin Bank (CGBs)	19	17	8	44
Private Sector Banks				
Federal Bank	1	Nil	Nil	1
Co-operative Banks	1	5	23	8
Total	72	52	23	143

Source: Lead Bank Office, United Bank of India, Cachar, Karimganj and Hailakandi district.

The table exhibits that of the total branches of DCBs the district Cachar has 50 branches (10 from SBI and 40 from nationalised groups), the district Karimganj has 30 branches (6 from SBI and 24 from nationalised group) and Hailakandi district has 15 branches (6 from SBI and 9 from nationalised groups). It also revealed that PSBs comprise 64.3 per cent of total branches in the study area which is much lower than the national level.

To analyse the productivity of PSBs in the districts under consideration we have considered both labour productivity and branch productivity for the period 1985-2000. The same ratios measuring productivity are used as employed at the national level. The productivity ratio of PSBs in the districts under study are presented in Table 4.

Table 4: Productivity ratios of PSBs in Barak Valley in the post reform period (1985-2000)

(Amount in Rs. in lakhs)

Year	Labour productivity			Branch productivity		
	Deposit per employee	Advance per employee	Business per employee	Deposit per branch	Advances per branch	Business per branch
1985	NA	NA	NA	135.7	46.2	181.9
1988	NA	NA	NA	179.8	82.6	273.6
1991	24.99	9.75	34.74	279.0	106.1	378.1
1995	36.45	11.05	47.50	443.74	136.0	584.7
1997	47.10	10.80	57.84	606.4	139.8	742.6
1999	60.40	11,45	71.89	876.6	166.1	1042.8
2000	68.84	13.06	81.90	1010.8	191.7	1202.6
Grand mean	47.56	11.2	61.7	504.6	124.0	629.5

NA = Not available

Business indicate deposits + advances.

Source: Self calculated on the basis of deposits, advances, employees and no. of branches of 8 PSBs in the districts.

The average labour productivity and average productivity of branches have increased. The deposit per employee in the district increased from Rs. 24.99 lakhs in 1991 to 68.84 lakhs in 2000. The advances per employee and total business per employee have increased from Rs. 9.75 lakhs and Rs. 34.74 lakhs to Rs. 13.06 lakhs and Rs. 81.90 lakhs, respectively, throughout the period. The labour productivity average in the district is higher than the national level but the rate of increase of such productivity is lower than at the national level.

The average productivity per branch in terms of

deposits, advances and total business have increased. The deposit per branch increased from Rs. 135.7 lakhs in 1985 to Rs. 1010.8 lakhs in 2000. The advance per branch also increased from Rs. 46.2 lakhs in 1985 to Rs. 191.7 lakhs in 2000. Similarly, although business per branch increased from Rs. 181.9 lakhs to Rs. 1202.6 lakhs throughout the period, the productivity per branch averaged around 629.5 lakhs which is much lower than the national level of Rs. 948.2 lakhs.

The per employee and per capita income and expenditure of banks are depicted in Table 5. The per capita income of bank employees increased from Rs. 1.57 lakhs in March 1993 to Rs. 6.36 lakhs in March 2000 and income per bank branch also increased from Rs. 19.1 lakhs to Rs. 95.4 lakhs during the same period. Following the same trend, the per capita expenditure of employee and per branch expenditure have increased 3.25 and 4.38 fold during 1993- 2000.

Table 5: Per employee, per branch income, expenditure

(Amount Rs. in lakhs)

Year	Per capita employee income	Income per bank branch	Per capita employee expenditure	Expenditure per bank branch	Per employee business	Business per bank branch
31-3-1993	1.57	19.1	1.56	17.9	34.74	361.3
31-3-1994	1.81	20.9	1.70	21.6	42.18	509.0
31-3-1995	2.54	33.0	2.03	27.9	47.50	584.7
31-3-1996	3.12	40.5	3.01	32.2	60.44	734.5
31-3-1997	4.95	71.1	4.18	43.6	57.94	742.6
31-3-1998	4.55	69.8	4.53	67.7	68.67	953.5
31-3-1999	5.07	76.1	4.12	63.5	71.89	1042.8
31-3-2000	6.36	95.4	5.08	78.57	81.90	1202.6

Source: Self calculation on the basis of earlier tables.

In order to analyse the relationship between per capita employee income and per employee volume of business of PSBs during the post reform era (1993-2000), Pearson's correlation coefficient (r) has been calculated. In this respect we have framed the hypothesis "the level of per employee volume of business has direct impact on per capita employee income". The result of 'r' was obtained as below—

r = 0.939

t (cal) = 6.688

t (tab) at 6 df

5 pc = 2.447

1 pc = 3.707

The highly positive 'r' value (0.939) is statistically significant at both 5 per cent and 1 per cent level of significance. This indicates a high degree correlation between per capita employee income and business per employee of banks in the study area. Hence, the hypothesis is found to be true. This suggests that the low level of volume of business in the study area is a reflection of the low per capita employee income rather than low productivity of the staff.

To examine the relationship between the branch productivity and income per branch, correlation coefficient (r) between business per branch and income per branch have been calculated. The result is found as —

r = 0.926

t (cal) = 6.008

t (tab) at 6 df

5 pc = 2.447

1 pc = 3.707

The highly positive correlation coefficient (0.926) is statistically significant. This indicates that the low volume of business per bank branch resulted in low per bank branch income in the study area.

Further, an attempt has been made to assess the relationship between the per capita employee expenditure and per employee business of banks in the post reform years (1993-2000). For this purpose the analysis of correlation coefficient has been used. The result is obtained as below:

r = 0.872

t (cal) = 4.368

t (tab) at 6 df

5 pc = 2.447

The positive 'r' value is statistically significant at 5 per cent level of significance. This reveals a high degree of correlation between the per capita employee expenditure and per employee volume of business. It indicates that with the increase in volume of business the expenditure or costs is increasing in the post reform era. This may be due to the mismatch of various components of expenditure/costs viz., interest cost, manpower cost etc. Since it would not be possible to reduce various costs viz., man power and establishment cost through technological substitution, the bank's attention should be focussed on the optimum use of other types of inputs and reallocation of existing man power to increase overall effectiveness. In general, there is a mismatch between manpower needed and man power allocated or available. This mismatch may be corrected through reallocation.

It can be inferred from the above analysis that PSBs are showing progress in productivity in spite of initial shocks. But it is still low compared to the national level. The analysis of various indicators of productivity reveals that there is vast disparity in profitability of PSBs in the districts. The nature of clientele in the districts resulted in lower productivity and profitability. The factors like lower contribution to priority sector lending, lesser involvement in private sector lending and profitable activities are mainly responsible for this state of affairs.

Reference

Angadi, V.B. (1984), "Some Issues relating to Productivity of Indian Scheduled Commercials Banks" The Journal of the Indian Institute of Bankers, Vol. 58, No. 4.

Athma, P. and Srinivas P. (1997), "Productivity in Commercial Banks", Productivity, Vol. 38, No. 33, Oct. Nov. 1997.

Choudhary, A.K. (1998), "Bank management", Rajat Publication, New Delhi.

Drucker, P.F. (1980), "Managing in Turbulent Times", New York, Harper - Row.

Monga, R.C. (1992), "Dynamics of Productivity Management', Productivity 33 (1).

Pedgaonkar, S.L. (2002), "Competition: The Rationale of Financial Sector Reform", in Banking and Financial Sector Reform in India.

□

Market Imperfections, CAS & Cable TV Industry

Veena K. Pailwar

An assessment of the impact of CAS on social welfare is attempted in this paper via economic reasoning and analysis of the market structure of the cable TV industry in India. The analysis of the market structure of the Cable TV Network (Regulation) Act, 1995 is likely to improve social equity, increase competitiveness and quality of the programmes by inducing competition in the cable TV industry.

Veena K. Palwar is an assistant professor at XLRI, Jamshedpur.

As per the recommendations of the Task Force, the Parliament cleared the amendment in the existing Cable Television Network (Regulation) Act of 1995 (hereafter in this paper referred as to CAS Amendment) last year. However, the implementation of this act is also surrounded by controversies and will take place in phases.

In this article an assessment of the impact of CAS Amendment on the social welfare is attempted via economic reasoning and analysis of the market structure of the cable TV industry in India.

Cable TV Industry in India

Till the beginning of 1995, the cable TV industry in India was in its infancy. Number of TV channels and small cable operators emerged during this period in a haphazard manner all over the country and thrived in a non-regulatory environment. In 1995 the Cable Television Network (Regulation) Act was brought to check the screening of undesirable programmes and advertisements and to regulate the cable television networks in the country. In this regulatory environment, large companies, in the form of Multi System Operators (MSOs) entered the Indian cable TV industry by investing crores of rupees in creating a massive cable infrastructure. MSOs consolidated the small cable operators. Inspite of the consolidation of the small operators there are around 40,000 cable operators in India. MSOs are under constant pressure to upgrade the technology in order to improve the reception quality for the viewers.

Along with the cable operators, a large number of TV channels (Indian as well as foreign) have also emerged in India over the last decade. These entered in the market in a "free to air" mode. However, over the last 5-6 years, many of these have become "pay" channels. Many of the TV channels were earlier available in a stand-alone form. But very recently banners, like Star

Network, have stopped offering TV channels under stand-alone forms on a La Carte basis. From the modest level of a subscription rate of Rs. 2.85, the pay channel Star package is now available for Rs 41.50, Zee - Turner package for Rs 40.50, ESPN Star Package for Rs 24, Sony Package for Rs 40 and so on (Box 3B). In fact, there has been further revision in these rates since this paper has been written. The overall increase in the rates over a period of time is approximately 500%.

The Indian subscribers view this hike as unjustified. However, the facets of the new technology and cable TV are so irresistible that they would not like to forgo the cable services.

The TV channels have their own justification for the hikes. They have invested crores of rupees in setting up TV channels and networks. To remain in the competition they have to constantly update the technology and the quality of the programmes, which increases the operational cost. On the other hand, growth in the revenue and profit is not as per their expectations and hence the revenue targets are met through hiking the subscription rates. The hike is also justified on the grounds of substantial underreporting of the subscriber figures from the cable operators. The lower figures cited by the cable operators, results in a lower growth of revenue and profits for the TV channels. Hence they try to meet their growth targets by hiking the subscription fees.

> **The hike is justified on the grounds of substantial underreporting of the subscriber figures.**

The cable operators justify the under reporting of the figures on the ground that the Indian subscribers with low purchasing power do not want to pay the high subscription rates and hence they have to give a large subsidy to them. The threat that rival cable operators may take over their subscribers makes the cable operators reluctant to cut the connections to the non co-operating subscribers. Thus, the cable operators keep subsidising the low-income groups and areas by charging low subscription rates. The different rates charged in different areas of Mumbai (Box 3C) (the similar price differences are noticed all over the country) substantiate this argument.

Market Structure of the Cable TV Industry in India

Major participants in the cable TV industry in India are content providers (or producers), broadcasters,

cable TV operators and finally the subscribers (or consumers) (Box 1). These various constituents of the cable TV industry in India participate in an imperfect market.

Box 1: Major Participants in the Cable TV Industry in India

Broadcasters

Content Provider (Producers)

Cable Operators

Viewers or Subscribers
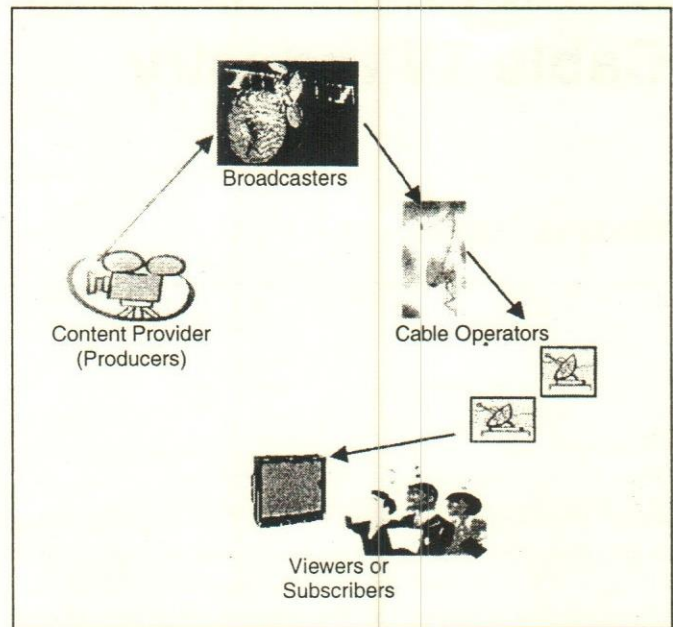
Box 2: Market Imperfections & Product Differentiation

TV Channel	Distinguishing Feature
Zee Cinema	Hindi Movies
SET Max	Hindi Movies
Star Plus	Serials & game Shows
Sab TV	Serials/Sitcoms
Discovery Channel	Documentary
Animal Planet	Documentary
AAJ Tak	News
CNN	News
MTV	Music
Cartoon Network	Cartoons
Disney Channel	Cartoons
ESPN	Sports
Star Sports	Sports

Source: Compiled from www.indiatelevision.com

Oligopoly or Monopolistic Competition?

It may seem, on a cursory look, that the cable TV industry faces monopolistic competition in India where there are many sellers of a differentiated products and entry into or exit from the industry is rather easy in the long run. At present, there are more than 100 TV channels. The subscribers recognize each of these by their

Box 3: Market Imperfections Monopoly Power: Price Setting & Price Discrimination

A: Monopoly power & price setting	
Channel	Rs p.m.
Zee Network	
Zee TV	16.00
Zee Cinema	8.00
Zee MGM	8.00
Zee English	5.00
Alpha Bangla	5.00
Alpha Gujrati	5.00
Etc.	
Star Network	
Star Gold	10.00
Star Movies	12.00
Star News	6.00
Star Plus	15.00
Star World	10.00
NGC	10.00
Channel V	2.50
ESPN Star Sports	
ESPN	9.90
Star Sports	8.25

Source: Compiled from www.scatmag.com: "Pay Channel Rates"

- Recently some of the networks have stopped offering the TV channels at a la carte rate or in stand-alone form, therefore the stand-alone rates mentioned here are for 2001.

B: Second Degree Price Discrimination	
Pay Channel Packages	Rs p.m. in 2002
Zee Turner Package (18 channels)	42.50
Star Package (7 channels)	40.50
ESPN + Star Sports Package (2 channels)	24.00
Sony Package (6 channels)	22.90

Source: Compiled from www.scatmag.com: "Pay Channel Rates set to Explode!" & www.hinduonnet.com: Hike in cable TV subscription rates stirs a hornet's nest

C: Third Degree Price Discrimination	
Area	Rate: Rs p.m.
Malabar Hills Mumbai	350
Slums-mumbai	50

Source: Compiled from www.agencyfaqs.com: "Pay Television: Has the time come? Part I"

specific features; such as Discovery Channel for documentaries, Aaj Tak for news, Star Plus for serials and game shows, MTV for music, etc. (Box 2). However, a closer look reveals that most of the TV channels are under a few large banners such as Zee network, Sony network, Star network, etc. (Box 3A). Since these banners provide very close substitutes, each of the banners have to be aware of the rivals' reactions to its managerial and pricing decisions. Similarly, though there are a large number of cable operators in the country, subscribers can consider only a few nearby operators and hence these operators can be identified by the geographical locations. To set up a TV network crores of rupees are invested. Therefore, the cable TV industry in India is closer to a differentiated oligopolistic market structure.

Product Differentiation, Monopoly Power and Price Discrimination

Various TV channels, because of their differentiating features, have been able to create a niche for their programmes in a imperfectly competitive market and set a price like a monopoly (Box 3A).

A monopoly, on fulfillment of certain conditions, can charge different prices for different household groups as per their demand elasticity or (put in a common par-

lance) at the level at which they are willing to pay for the product. In this pricing strategy, the consumer surplus, which is available to some of the household groups when a uniform pricing policy is followed, is transferred to the producer. The diagram in Box 4 depicts this phenomena.

The figure in Box 4 depicts the demand curve for two household groups, with differing elasticity of demand for the product produced by a monopoly. Household group A, belonging to middle income strata, is assumed here to have a more elastic demand curve for the product. Household group B, on the other hand, belongs to a higher income group and has more inelastic demand for the product. For simplicity, assume that the monopolist has linear average and marginal cost curves in both the markets. Let us further assume that the monopoly is not aware of the differing elasticity curves for the two household groups and hence charges the uniform price, Po, in both the markets. At this price, assume that the household group B enjoys a large consumer surplus (equivalent to the triangular area XP_0Z). Over a period of time, however, with the help of a consultant, the monopoly conducts a thorough market research and is able to estimate the differing elasticity. Realising that by charging a higher price to the group with inelastic demand he can increase his total revenue, the monopoly sets the price at P_1 for the Household
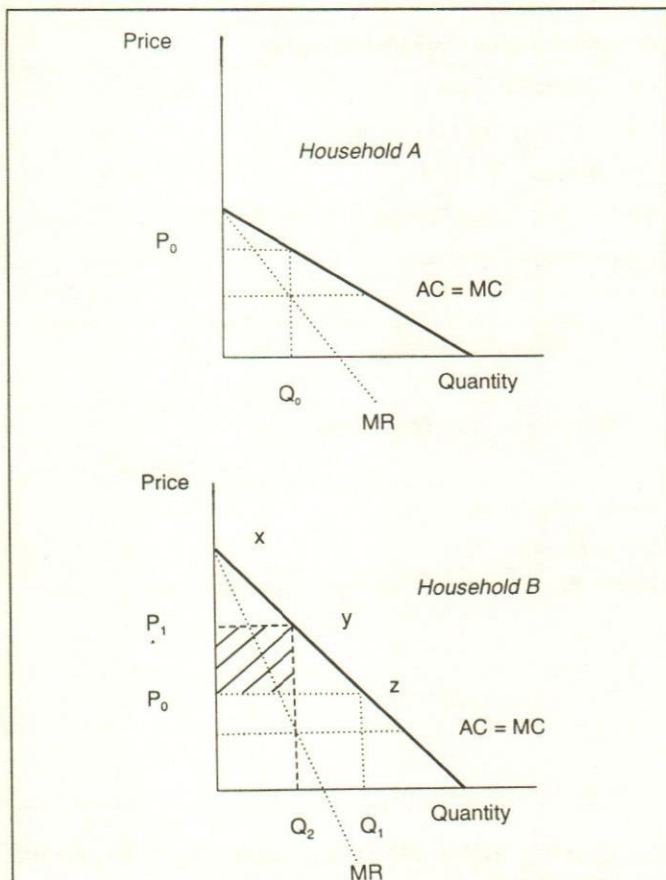
Demand Curve for Different Types of Households

Household Group: A: Elastic Demand

Household Group: B: Inelastic Demand

Uniform price P_0 set by the Monopoly

Large Consumer Surplus for Household B = Area $\times$ $P_0 z$

Price Discrimination by the Monopoly

Price for Household A = P_0

Price for Household B = P_1

Revenue Maximisation by the Monopoly: By setting the price in the two markets at the level where MC = MR

Transfer of part consumer surplus from household B to the monopoly

group B. Thus, the monopolist maximises his revenue in the market for the product where the household category B transacts. The revenue for the monopoly, from the two markets is,thus, maximised by price discrimination in the two markets.

TV channels, empowered with some monopoly power, can also pursue price discrimination if they can estimate the demand elasticity (or the level at which the

> **The revenue for the monopoly, from the two markets is, maximised by price discrimination in the two markets.**

TV channels are rated) for their programmes accurately for different household groups. So far it has not been possible to a large extent, and hence they are charging flat rates of subscription. However, some element of second-degree price differentiation has been observed as some of the TV channels are charging lower rates for their entire package than the sum total of a La Carte rates in the package (Box 3B). Zee package scheme, for example, costs just Rs. 42.50/- p.m., though the sum total of subscription rates for the stand-alone channels under its banner is much higher. Similarly, the cable operators have also been observed to be pursuing third degree price discrimination by charging different rates in different areas (Box 3C). However, the pay channels and the cable operators are not able to pursue first-degree price discrimination, i.e. charging the different subscription rates to different households, because of their inability to estimate accurately the level of utility attached to each TV channel by the different households or to estimate the extent of viewership from different households.

Impact of Uniform Flat Subscription Rates

As each of the TV channels has some element of monopoly for its package it has been able to hike the subscription rate and increase its profitability. However, more than the rate hikes, the problem lies in the uniform flat subscription rate structure. The subscribers, at present, have only two options: either pay at the uniform flat rate and purchase whatever is offered in the package deal or forgo the entire deal (Box 5).

Subscribers in India are heterogeneous. Broadly it can be classified in to three categories viz-lower income group, middle-income group and high-income group. Low-income group value TV channels only if the subscription rates are nil or minimal. Middle-income group has slightly less elastic demand and would be willing to pay for the pay channels that it rate or value highly. On the other extreme, there is the upper income strata,

> **Low-income group value TV channels only if the subscription rates are nil or minimal.**

which has inelastic demand and would be willing to pay a very high subscription rate for viewing different TV channels.

The figure in Box 5 depicts the demand curve for the three household groups mentioned above. The CC' curve, the most elastic in shape, depicts the preference of the low income household group. On the other hand, the high-income households are represented by AA' curve. The preferences of the middle-income group is somewhere between the upper income and low-income groups and hence has been depicted by the BB' curve which is less elastic in shape.

At an uniform flat subscription rate, say S_1, the amount of viewership from the high, middle and low income households in OX, OY and OZ respectively. With the increase in the uniform flat subscription rate, say to S_2, the low-income group is completely deprived of the cable TV services. The viewership from the middle and high income group also declines to OX' and OY' respectively. With a substantial increase in the rate, say to S_3,

Box 5: Impact of the uniform Flat Subscription Rates on Different Income Household Groups

Demand Curve for Different Types of Households

High Income Group: AA': Inelastic Demand

Middle Income Group: BB': Less Elastic Demand

Low Income Group: CC': Highly Elastic Demand

Total No. of Subscribers at the subscription rate of S1 = OX+OY +OZ

Total No. of Subscribers at the subscription rate of S2 = OX'+OY'

Total No. of Subscribers at the subscription rate of S3 = OX"
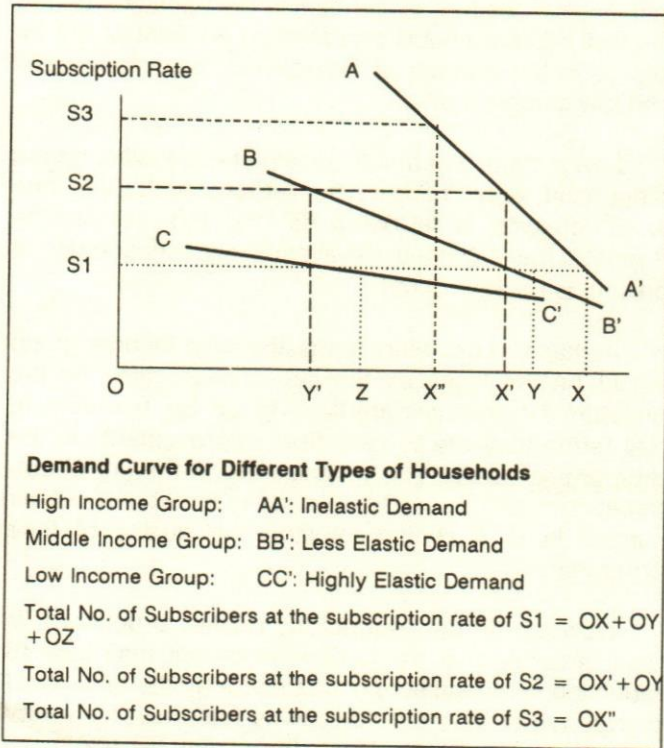
the middle income group is also eliminated from the market for cable services and the viewership from the upper income group declines to OX".

Thus, with the substantial and continuous increase in the uniform flat subscription rates even the middle-in-

come households fear deprivation of cable services. Agitation is also from the subscribers who continue subscribing to the cable services. The cable operators provide package of TV channels rather than stand alone channels. The increases in the uniform flat subscription rates make the lower and middle-income group pay even for those TV channels which it does not rate highly. In case they refuse to pay forego even those TV channels which are placed high in their utility graph. In either case there is a consumer loss.

CAS Amendment and Social Welfare

Will the CAS amendment resolve the problem? The answer lies in the answer to the following question:

How would the pricing policy be affected by the legislative changes introduced in the form of CAS Amendment?

The CAS Amendment would widely change the scenario in favour of the TV channels or content providers. However, there are gains even for the subscribers.

Box 6: Major Recommendations of the Task force on Condition Access System

- The Set Top Box (SET) shall be required only for "Pay" Channels and the "Free to Air" channels shall be receivables by the subscribers in the current mode, without Set Top Box. The encrypted channel should be defined as "Subscription based Channel"

- The Set Top Box should be mandated only for "Premium Tier", "Free-to-Air" channels being taken in a "Basic Tier", receivable by all viewers at a standard subscription rate.

- The Cable Operator/Equipment Provider should declare, in a transparent manner, the capability of the Set Top Box and its inter-operability with other networks.

- The unauthorised viewing/redistribution of the signal should be made a cognizable offence.

- The packaging of services, including Value Added Services, should be left to the Operators who should be free to choose the middleware/software/hardware provided that it conformed to basic minimum performance standards.

- The subscriber management system should provide transparent information to all the players.

- The consumer should not be burdened with the cost of changing his television sets on purchasing a Set Top Box.

- The pricing of various channel bouquets, by the broadcasters, MSO, should be done in a transparent manner.

- The government should fix the price of the "Basic Tier".

Source: Compiled from www.indiatelevision.com: "Report of the Task Force on Introduction of Conditional Access System"

The CAS amendment suggests that the "pay" channels should be made available by the cable operators

through the Set Top Box (STB) installed at the subscriber's end. The "free to air" channels, on the other hand, are to be provided at a flat rate to those subscribers who do not opt for the STB (Box 6).

The STB can record the amount of viewership for different TV channels. Hence the introduction of new technology, in the form of STB, and the changes in the legislative frame work, in the form of the CAS amendment, would make it possible for the various TV channels to assess the demand for their programmes accurately and set the subscription rates and the advertisement rates as per the amount of viewership. Cable operators will also be able to charge the subscribers as per the viewership. This is a case of price differentiation rather than price discrimination as the cable service provided to the different household will consist of different packages of TV channels. The low-income household will get only "free to air" channels. On the other hand, high-income group will get all the TV channels ("pay" as well as "free to air"). However, to the extent that the price setting may not have much relation to the cost of production of different TV channels and is affected by the demand elasticity this can be treated a case of price discrimination.

The figure in Box 7 again depicts the elasticity curve of different household groups mentioned in Box 5. Let us assume that the middle and high income group install the STB. On the other hand, the low income group restrict the cable TV viewing to the "free to air" channels only and do not go for STB. Flat rate charged to the lower income household is S_0, which is assumed here to be lower than was prevalent in the pre CAS amendment scenario (say S_2). Knowing the different elasticity curves with the help of STB the cable operators will able to set differential rates for the middle and higher income households (say S_2 and S_3 respectively) so as to maximize their revenue. With the introduction of STB, each household could be charged a different subscription rate as for telephone services.

It emerges that the total viewership or the number of subscribers is higher when STB is installed and price discrimination is pursued. It can be seen that in the pre CAS Amendment scenario (Box 5), at the uniform flat rate of subscription, S_2, the viewership is higher. The total viewership, in the event of price discrimination at the level of S_0, S_2, and S_3, is equal to $OX'' + OY' +$

> **The number of subscribers is higher when STB is installed and price discrimination is pursued.**

OZ_0 which is higher than $OX' + OY'$.

It may be argued that since a much higher subscription rate would be charged to the upper income strata the number of subscribers from the upper income group would decline and hence the total viewership may also decline. However, this is unlikely because the upper income strata face highly inelastic demand and hence the decline in the viewership from this group, as a result of increase in subscription rates, would be minimal (in Box 7 it is just $X'X''$). On the other hand, there would be substantial increase in viewership from the low-income group with small decline in the subscription rates. Thus, the decline in the number of subscribers from the upper income group is likely to be much less than the increase in the number of subscribers from the low-income group in the post CAS Amendment scenario ($X'X''$ is much smaller than OZ_0). Hence, the total subscriber base for the cable operators is expected to increase.

The pay TV channels would gain, as the large amount of consumer surplus, which at present has been enjoyed by the large income households, would be transferred to them. Profitability of the producers would increase on account of increase in the rates charged to the well off households and also on account of the increase in the number of subscribers from the middle and low income strata.

Low income and middle income households, on the other hand, would benefit if the flat rate, set for the "free to air" channel, is set below Rs 120/- p.m. (as per the Report of the task Force the average subscription rate at present is Rs 120/- p.m.).

Perhaps, in monetary terms, the large income group would be the loser, as the subscription rates by the premium TV channels are likely to go up. However, in real terms they are to gain from improvements in the programme quality. The TV channels, in the era of cutthroat competition, would be made to invest part of their surplus in R & D and improve the quality of their programmes.

However, in the oligopolistic market structure, it is quite possible that the CAS Amendment may lead to reduction in the subscription rates for all the household groups rather than an increase as has been feared by many. Unlike pure monopoly, the oligopolist has to be aware of the reactions of the competitors. Overall the demand for the cable TV services (or all the TV channels combined) may not be very elastic but for each TV channel the demand curve is expected to be rather elastic because of the availability of close substitutes. For example, Star Plus quite closely competes with Sony and Zee TV. Similarly, Aaj Tak and CNN are close com-

Box 7: Impact of the CAS Amendment on the Viewership or the Demand for the Cable Services

Demand Curve for Different Types of Households and installation of STB

High Income Group:	AA': Inelastic Demand	With STB
Middle Income Group:	BB': Less Elastic Demand	With STB
Low Income Group:	CC': Highly Elastic Demand	Without STB

Households without STB (Flat Rate of S_0)

Total No. of Subscribers = OZ_0

Households with STB (Variable Rates of S_2 & S_3)

Total No. of Subscribers = $OX'' + OY'$

Total No. of Subscribers with CAS Amendment = $OZ_0 + OX_0 + OY_0$

→ Total No. of Subscribers without CAS Amendment at Subscription rate S_2 = $OX' + OY'$

Since $X'X'' < OZ_0$ $(X'X'' = OX' - OX'')$

→ Total No. of Subscribers without CAS Amendment < Total No. of Subscribers with CAS Amendment

petitors each other. In the light of a rather elastic demand curve for these TV channels, the increase in the subscription rate by one of the TV channels may not be followed by the other close competitors, but the reduction in the subscription rate by one of them would definitely result in price reduction war among the TV channels. Even a small decline in the rate by one of the TV channels would lead to substantial increase in the viewership of that TV channel and reduce the number of subscribers for the close competitors. In order to maintain their market shares the close competitors will also

reduce their subscription rates. Therefore, unless these TV channels go for a cartel arrangement, the reduction in subscription rates is also a likely scenario. In such an eventuality the subscription rates may in fact decline for the Indian viewers in the post CAS Amendment scenario.

Conclusion

The differential subscription rates, as is expected in the post CAS Amendment scenario, would definitely lead to social equity as the subscribers would be paying as per their capacity to pay and at the same time would not be completely deprived of the cable TV services.

> **CAS Amendment may lead to reduction in the subscription rates for all the household groups.**

The amendment is also expected to enhance the competition in the cable TV industry. The uniform flat subscription rate, as existing in the present scenario in India, is a form of a cartel and protects the inefficient TV channels. Implementation of the new technology in the form of SET and the changes in the legal framework in the form of CAS Amendment will introduce the much-needed competition in the cable TV industry in India.

Acknowledgement

References

The websites referred in the paper are as follows

www. agencyfaqs.com: Pay Television: Has the time come? Part I

www.hinduonnet.com: Hike in cable TV subscription rates stirs a hornet's nest

www.indiantelevision.com: Report of the Task Force on Introduction of Conditional Access System

www.scatmag.com: Pay Channel Rates

www.scatmag.com: Pay Channel Rates Set to Explode!

Outsourcing of Information Systems Services

Umesh Gulla & M.P. Gupta

This paper provides a broad overview for outsourcing the Information Systems (IS) services. Today, the outsourcing IS functions and services is preferred by large corporations but remains a critical decision since it involves stakes of high value. The Information System strategy calls for identifying various reasons for which a company would go for outsourcing its IS services. Further, it dwells upon the drivers that drive the IS manager to opt for the outsourcing route and the likely risks associated with the outsourcing of Information System services.

Umesh Gulla is with the School of Management Studies, G.G.S. Indraprastha University, Kashmere Gate, Delhi. M.P. Gupta is with the Department of Management Studies, Indian Institute of Technology, Delhi, Hauz Khas, New Delhi.

Information Systems outsourcing is one of the critical issues facing Information System management recently. The outsourcing market potential estimated to be US$ 120 billion in 2002 (Lacity and Willcocks 2000) has ensured that it attains extensive, on-going, worldwide business attention. While some proponents have talked of benefits of outsourcing in the form of lower costs, focus on core business, keeping up with IS upgradation, there has been an equally large number of unresolved issues for outsourcing in the form of higher risks, lack/loss of innovation, poor understanding about business practices, security of data, etc. While there have been success stories like Xerox, there have been equally few cases of failures in outsourcing IS decisions. Keeping in line with global trends, in India also the outsourcing of IS services has started catching up.

It is important first to understand the meaning of IS outsourcing and related terms. Information Technology (IT) is the enabling mechanism that facilitates the processing and flow of this information, as well as the technologies used in the physical processing to produce a product or provide a service. Information System (IS) refers to the flow of information in an organization and between organizations, encompassing the information the business caters to, uses and stores. Information System is the combination of Information Technology (hardware, software) and its applications, which incorporate the human aspects also.

Outsourcing Information Systems has been defined by a number of researchers. One definition is "the significant contribution by external vendors in the physical and / or human resources associated with the entire or specific components of the IT infrastructure in the user organization" (Loh & Venkatraman, 1992). It refers to the transfer of assets, computers, networks and people – from a user to a vendor, the vendor taking over the responsibility for the outsourced activity. This is an act of subcontracting a part, or all of an organization's IS

work to external vendor(s), to manage on its behalf. Willcocks et.al. (1995) defined it as "handing over to third-party management, for required result, some or all of an organization's IT information system (IS) and related service". It is the practice of turning over part or all of an organization's IS function to external service provider(s). There exists no major differences among these definitions, which encompass three components: first, the external provider takes over part or all of an organization's IS functions; second, the external provider should take the responsibility; and third, customers transfer IS functions to an external provider as well as employee and part of computer facilities.

The first information system outsourcing practice began in 1954 when General Electric Corp. contracted with Arthur Andersen and Univaac (Klepper & Jones, 1998). Early times saw a greater range and depth of services being outsourced, service providers accepting management responsibility and risk, and the nature of the relationship with the service provider changing. These were the different aspects of outsourcing in the 1990s from those of the 1970s and 1980s (Schultze & Boland 2000). The value of these deals were also very high, for example, Xerox awarded EDS a 10 year $3.2 billion outsourcing contract in June 1994, one of the largest ever seen so far. International Data Corporation (IDC) predicted that the worldwide outsourcing market would grow from $100 billion in 1998 to $151 billion in the year 2003 with a 12.2% CAGR (Murphy, Ker & Ross, 1999). The US market is expected to expand from $51.5 billion in 1998 to $81 billion in 2003 (Murphy et al., 1999). In Asia, for example in Taiwan, the outsourcing market is just emerging. In India too, more and more companies are going for Information Systems outsourcing. ICICI has gone for IS outsourcing and has outsourced to EDS. Telco has placed its Information Systems in the hands of IBM and similarly other companies are increasing the share of IS outsourcing component.

Strategic Reasons for Information System Outsourcing

Business complexity and increasing competition demand the core competence approach to business operations. Information Technology is deployed as the means to improve productivity and quality. However, the complexities of Information Technologies put these organizations under pressure to keep up with the pace of technology solutions. It is becoming difficult to maintain the focus on the core business activity for the business organizations. Hence, outsourcing is found to be a sensible option to this problem. The strategic reasons for outsourcing Information Systems services can be attributed to three reasons:

- Improving the existing Information Systems' performance,

- Enhancing Core Competence in operations,

- Utilizing investments in information systems optimally.

> **Information Technology is deployed as the means to improve productivity and quality.**

Improving IS performance

As the deployment of Information Technology solutions such as Enterprise Resource Planning (ERP), Supply-Chain-Management (SCM) and Customer Relationship Management (CRM) is increasing in business organizations, a breakdown of any of these proves very costly for the organizations. This may lead to significant direct losses in terms of affected operations as well as loss of goodwill and trust of the associated customers and business partners. Hence, there is pressure on the Information System departments to increase their performance capabilities. Companies that want better performance from their core IS resources – the hardware, software, networks, people, and processes involved in managing and operating the technology and supporting users – have the strategic intent of IS improvement (Fig. 1). Their objectives typically include cost reduction, service quality improvement, and acquisition of new technical skills and management competencies.

It is reasonable to believe that outside specialists who are better able to keep pace with new technologies and skills, and who use superior processes and management methods, should manage some, if not all, of their IT services.

Enhancing Core Competence

Today, IS organizations are struggling to develop the right mix of technical and business skills to make full utilization of technology. The IT outsourcing market hold promise, on the premise that outsourcing vendors' state-of-the-art skills, capabilities, and proficiency at recruiting and managing technologies make them better than internal IS organizations at using IT to improve business results. This can be referred to as business impact. Its primary goal is deploying IT to significantly improve critical aspects of business performance in terms of market leadership and market innovation. Realizing this goal requires an understanding of the business needs and the

Transform IT
resources and skills

Introduce new IT
resources and skills

Upgrade existing IT
resources and skills

Improve Productivity
of existing Itresources

Ambition

IS Department
Human Resources
Intellectual
Property
Technology
Processes

Benefits/Risks
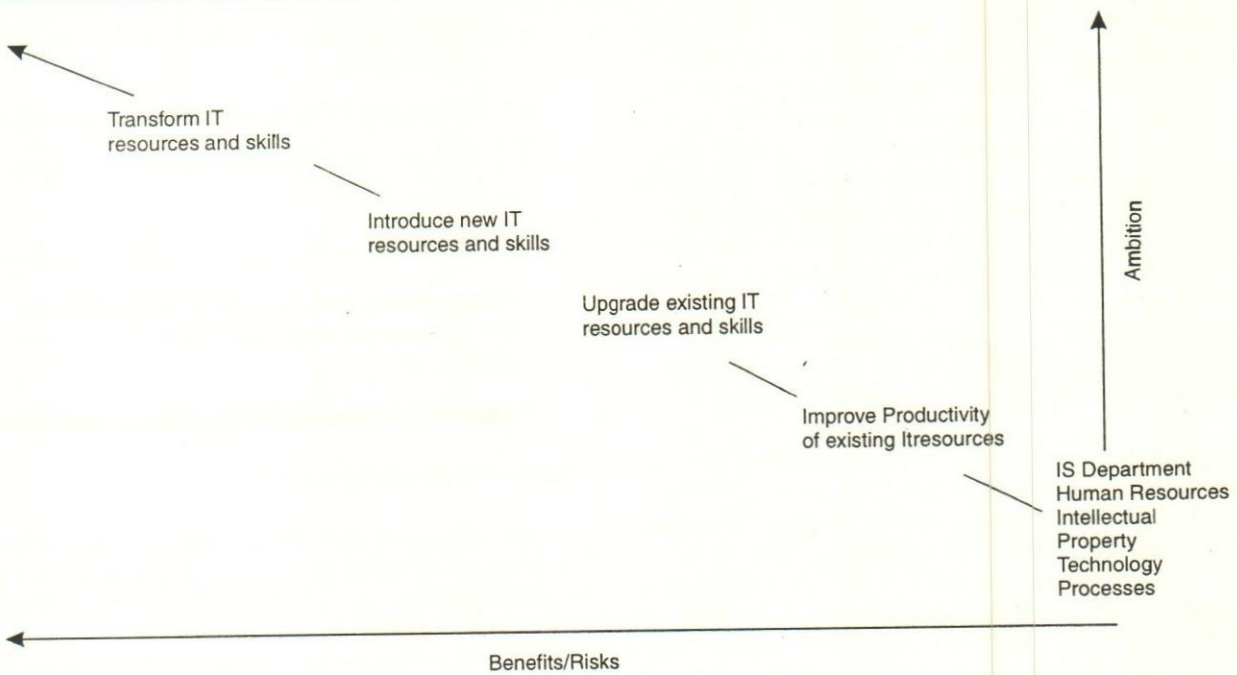
Source : DiRomuldo & Gurbaxani, 1998

Fig. 1. IS improvement cycle

synergy between IT and business processes, and the ability to implement new systems and business change simultaneously (Fig. 2).

Optimizing Financial Returns

The strategic intent of outsourcing information technology aims at improving the return on IT investments. Today, a business organization may have to put in a high amount of capital investment to come up with a IT infrastructure that may enable it to take advantage of the IT enabled business intelligence tools. Further, the technology life cycle in IT has shrunk significantly due to high obsolescence rate on the one hand in the Information Technology domain and the rapid changes in business processes required due to fluid market scenario and changing customer expectations on the other. For certain industries like those in the service sector, mission critical systems have to be supported by an extensive IT infrastructure. Under such circumstances, companies may find the migration costs towards IT enabled processing to be burdensome and may not be able to finance it through capital expenditure. IT system

> The strategic intent of outsourcing information technology aims at improving the return on IT investments.

set-up involves high expenditures in acquiring, developing and maintaining the human and technical know-how necessary to maintain the existing system and modifying it as the needs change.

Under such circumstances, the company may have to explore innovative ways to utilize IT investments. Thus, the companies have to look for an IT structure that exploits the investments for current uses of its own as well as provide additional uses for the optimal utilization of IT investments. There are few organizations that have the capabilities to exploit fully the IT infrastructure inhouse as well as to use and commercialize the IT based products and services for multiple purposes. One way of achieving the financial optimization of IT investments is to forge a relationship with IT outsourcing vendors.

There are few IT outsourcing vendors who have the capabilities required to exploit IT in the marketplace: the know-how to commercialize and sell IT products and services originally developed for use by a single company, the ability to establish new distribution channels for IT-based products and services, the skill to port systems to various technology platforms, and the wherewithal to support and enhance products and services after they are sold. One way to gain these capabilities is through relationships with outsourcing vendors.

Degree of Outsourcing

Reasons for outsourcing IS ranges from high

IS Department

Human Resources
Intellectual Property
InformationTechnology
Business Processes

⬇

Respond To Business Needs

⬇

IT enabled Business Processes

↙ ↘

**Routine Operations
performed by IT enabled
Outsourced setup**

⬅ ➡
⬇

FOCUS ON CORE COMPETENCE

⬇

┌─────────────────────────┐
│ **Business Impact** │
│ • Market Leadership │
│ • Market Innovation │
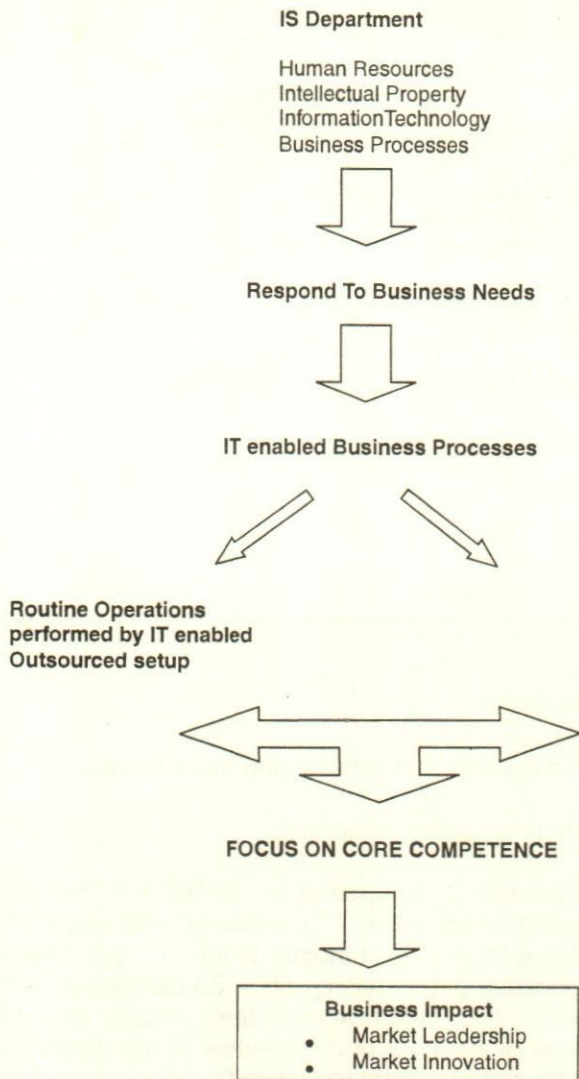└─────────────────────────┘

Fig. 2. Business Impact

profile, continuous technological changes, competition, complexities of Information Systems, core focus of business organizations on its main business functions and economic recession. However, it is not an easy decision domain. It requires careful evaluation of all the pros and cons of IS outsourcing. The negative side of IS outsourcing can be excessive dependence on an IS outsourcer, difficulty of the IS outsourcer in understanding the business functions, rigidity of the company to innovate and modify the IS structure and security aspects of the information and many more. Hence, the IS manager needs to evaluate both sides of IS outsourcing. Lacity et. al (1996) have categorized IS outsourcing into four categories depending upon the extent to which a company relies on the outsourcer for its IS activities.

Total outsourcing transfers IT assets, leases, staff and management responsibility for delivery of IT ser-

vices from internal IT functions to third-party vendors, which represents at least 80 percent of the IT budget.

Total insourcing retains the management and provision of at least 80 percent of the IT budget internally after evaluating the IT services market. Included in the definition of insourcing is the buying-in of vendor resources to meet a temporary need, such as programmers in the latter stages of a new development project or management consultants to facilitate a strategic planning process. In these cases, the customer retains responsibility for the delivery of IT services; vendor resources are brought in to supplement internally managed teams.

Selective sourcing locates selected IT functions with external providers while still providing between 20 percent and 80 percent (typically 24 percent) of the IT budget. The vendor becomes responsible for delivering the result of the selectively outsourced IT activities, while the customer remains responsible for delivering the result of the insourced IT activities.

De facto insourcing uses internal IT departments to provide products and services that arise from historical precedent, rather than from a reasoned evaluation of the IT services market.

The practice of outsourcing select IT applications to vendors while retaining other IT applications in-house, referred to as "selective sourcing", "smart sourcing", or "right sourcing" eschews the all-or–nothing approach in favour of more flexible, modular outsourcing (Lacity 1996).

Companies that have successful experiences with IT outsourcing used a reasoned, incremental, and selective approach to outsourcing, which is increasingly reflected in the market structure. In Indian markets too, a similar selective IS outsourcing trend has been observed. In a panel discussion conducted by Dataquest (2001) on 'Obsolescence & Standardization', with seven CIOs for leading Indian companies and MNCs , one of the major outcome that emerged was that "total outsourcing" or "total insourcing" is not viable. It is the "selective or smart outsourcing" that is the best option before the IS managers.

Drivers of Information System Outsourcing

There are several factors that drive an organization to IS outsourcing, however, they may vary from organization to organization. These may include the shortage of skilled manpower in maintaining core focus on strategic and core business functions, cost advantage, rigid and ineffective internal IS department, high pressure/market-

Benefits
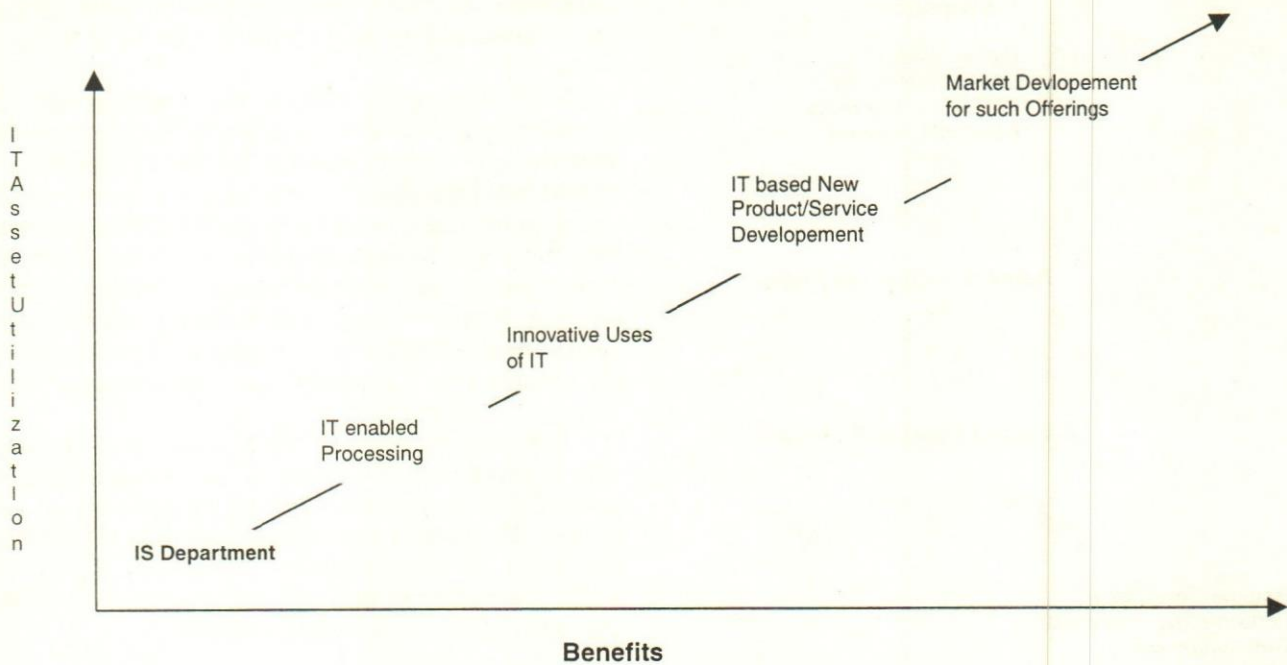
Fig. 3. Commercial Exploitation Objectives

ing effort by IS outsourcer. The success of the Kodak IS outsourcing contract led to a strong trend towards IS outsourcing. The following are some of the factors that drive a company towards IS outsourcing:

Outsourcing IT has low set-up time

In a scenario where agility of a company in operationalising its IS infrastructure and in keeping it updated with changing requirements determine its competitiveness, outsourcing provides the IS managers an attractive option. Because of the expertise of IT vendors, they can start an IT enabled system for their clients in a much shorter period.

Outsourcing IT has low set-up cost

Today, companies are forced to acquire IT solutions that involve a significant amount of investments. IS managers have the choice of acquiring IS services for a fee according to usage. Hence companies are saved from capital expenditure, and for some companies outsourcing IT for a specified fee is suitable for their capital structure.

Outsourcing IT leads to lower cost of Acquiring, Maintaining & Training employees

In the case of IT vendors, all the training and development costs spent on its IT employees/ experts are spread over various clients. However, such costs to be spent on IT employees in case of inhouse IT systems are a costly proposition. Hence, cost-sensitive companies are exploring the options of IT outsourcing more closely.

Shortage of skilled manpower

These days, companies are finding it difficult to attract and retain skilled IT manpower, and when an IT employee leaves the company, there is usually a serious performance gap in related area. So companies find in outsourcing an option wherein the company can utilize the specialized pool of IT expertise of the outsourcing vendors and their ability to retain the required pool of IT experts.

Expertise of IT outsourcing vendor

IT outsourcing vendors are in the business of offering IT related services which is their core business. For the companies where role of IT is to facilitate its operations, IT remains a troublesome exercise. Hence, companies can bank upon the expertise of IT vendors in conceptualizing a system design for installing and maintaining the IT systems.

Organization needs to focus on Core Function

In the current competitive scenario, companies are trying to identify their core functions and develop their business strategy around its core competencies. Under this business approach, managing IT function does not list in its priority tasks, and companies are increasingly realizing that IS is only an enabling function in their operations. Hence companies are looking towards out-

> **Companies are looking towards outsourcing their IT functions to focus their resources on improving their competence skills in their core functions.**

sourcing their IT functions to focus their resources on improving their competence skills in their core functions. For example, for a manufacturing company, IT activities are only supporting functions to its core functions of product design, development, manufacturing and maintaining a close customer interaction. Hence this company would prefer to focus on these core functions rather than spending precious management focus and financial resources on the complexities of its IT systems.

Low Downtime

As the dependence of companies on IT managed processes is increasing, there are higher pressures on the IS managers to increase the uptime of its IS systems. Hence IS managers are achieving lower down time of their Information Systems by entering into service level agreements with IT outsourcing vendors. These outsourcing vendors, because of their competence in such IT activities supported by appropriate systems, are able to provide lower down time to their clients.

Better Service to Users

The companies which have outsourced part or full IS services have been reporting improved services to their users. This has happened firstly because of the customer orientation of the IS vendors, besides the availability of skilled IT professionals with the outsourcing vendors who can understand the user requirements, design, develop and implement the systems with much faster responsiveness.

Improved Output/Performance of Information System

The prudent use of IT infrastructure by outsourcing vendors by utilizing the pool of human skill and other resources over multiple clients leads to higher utilization of the IT infrastructure. Further, in the event of outsourcing, the client expects the vendors to provide them state of the art functionalities from its IT systems which force vendors to keep up with the technology race leading to improved performance of the Information Systems.

Risks of Outsourcing is Services

Outsourcing of Information Systems is accompanied by structural changes in any organization, especially in the context of its IT division. Outsourcing is associated with a radical approach of the management to have a mutually advantageous alliance with the outsourcing vendor, usually over long periods especially in cases where significant portion of IT activities are outsourced. In such an alliance, both the client and the outsourcing vendor need to understand each other's requirements and concerns. In this context, the client's dependance upon the IT vendor increases depending upon the extent of outsourcing undertaken. This relationship hence tends to raise some of the concerns which expose the clients to some of the below mentioned risks :

- **Overdependence on Outsourcing Vendor**

Outsourcing of IT by any business organization results in sharing some of the functional responsibilities, especially related to Information Systems, with the Outsourcing vendor by way of delegating tasks related to IT. Hence, this results in the dependence of the organization on the external IT outsourcing vendor. If there arise any issues which may lead to differences between the company and the vendor, there may be a deadlock which can severely affect the operations of the company. There have also been experiences with some IS managers wherein IS managers feel IT vendors use it as a weapon to dictate their terms over them. Hence IS managers fear the powershift towards the IT vendor with IT outsourcing.

- **Inability of Outsourcer to understand business needs**

While the employees of the outsourcing vendor may have a good command over the technical domain of Information Systems, especially Information Technology, they may lack similar knowledge over the business domain. This may lead to the non-understanding of the client's requirements accurately by the IT outsourcing vendor. The problem becomes more serious when there is a communication gap between the users at the client side and the outsourcing vendor. This may lead to misunderstanding of client requirements and hence faulty system design and unsatisfactory implementation and other maintenance support. At Maruti Udyog Limited, a leading Indian automobile company, IS managers had faced difficulties in making the IT vendors understand their operations and requirement and hence have preferred to develop and maintain much of the IT tools inhouse.

- **Resistance from Organization's employees**

Outsourcing of IT functions is followed by the sharing of some responsibilities and authority with the IT outsourcing vendor. This may affect the interests of some of the managers of the client organization. This has been widely experienced in the Indian government

organizations and Public Sector Undertakings. When an external IT vendor enters the organization's domain through the route of outsourcing, there are employees of two distinct organizations which have different organization cultures, management structures, remuneration scales, especially when the client is a government or public sector organization, leading to lack of coordination between the two sides. Further, because of loss of jobs or relocation resulting from IT outsourcing, employees usually show resistance to IT outsourcing.

- **Security Issues**

When an organization outsources its IT functions to an external IT vendor, it provides access of most of its information stored in the Information Systems to the vendor's employees. This poses risks related to disclosure of business plans, sensitive operational data, information about business strategies, privacy about customer data and other sensitive information.

- **Difficulty in changing/modifying Information Systems**

As outsourcing IT functions to the external IT vendor increases, the organization may start losing expertise in the IT domain. The IT vendor begins to have a strong role in deciding the structure and details of Information System. This leads to the IT vendor forcing outdated technologies on the organization. Further, because of costs involved in modifying the Information System infrastructure, the vendor may show resistance in updating the Information System according to the changing requirements of the organization or market forces. Hence, it is advisable for IS managers to maintain a reasonable level of IT expertise inhouse that would ward off such risks.

- **Higher Running Costs**

Most of the IT outsourcing vendors in their sales pitch talk about Total Cost of Ownership which considers, apart from the direct costs of IT equipment acquisition, the indirect costs on account of management focus, service level, overheads related to employees and other costs. However, many IS managers are not convinced with this argument because of a significant part of fixed costs (e.g., costs related to employees in IT department) is already borne by the organization because of the HR policies that usually would discourage layoffs and relocation. In this light, the fee that the IT vendor charges turns out to be a high running cost for many IS managers.

- **IS considered as a competitive tool in the organization**

In an era where operations are driven by IT tools, IT has become an integral and critical component of the business architecture. In this situation, the line of division between IT and operations becomes very thin. This is true of service sector organizations, where IT has driven newer competitive skills. Hence it may not be advisable to outsource the entire IT functions to external vendors.

Conclusion

Information System services outsourcing has started generating a lot of interest globally among the corporate sector. As the complexities in Information Systems increase, companies realize the importance of strategic and core functions of their businesses and at the same time as the significance of Information Systems in achieving the strategic competitiveness in the market place increases, there is a growing interest in exploring the IS outsourcing options. The paper provides the understanding on which to decide the reasons for outsourcing Information system services and the extent of IS outsourcing that may be the best fit for the individual companies after considering the various risks associated with the IS outsourcing and the drivers of IS outsourcing.

References

DiRomuldo A. and Gurbaxani V. (1998), Strategic Intent for IT Outsourcing, Sloan Mangement Review, Summer, pp67-80.

Hammer M. and Champy J.A. (1993), Re-engineering the Corporation, Harper Business.

Kern, T. and Willcocks, L. (2000), Cooperative relationship strategy in global IT outsourcing: the case of Xerox corporation. In: Faulkner, D. and De Rond, M. (Ed.), 2000. Perspectives on Cooperation, Oxford University Press, Oxford

Kern, T. and Willcocks, L. (2000), The Relationship Advantage, Oxford University Press, Oxford.

Klepper, R., & Jones, W. O. (1998), Outsourcing information technology, systems and services. Englewood cli!s, NJ: Prentice-Hall.

Lacity M.C., Willocks L.P. and Feeny D.F. (1996), The Value of Selective IT Outsourcing, Sloan Management Review, Spring, pp13-25.

Lacity, M. C. and Willcocks, L. (2000), Global IT Outsourcing: Search for Business Advantage, Wiley, Chichester, UK.

Loh L. and Venkatraman N. (1992), Determinants of Information Technology Outsourcing: A Cross-Sectional Analysis, Journal of Management Information Systems, pp 7-24.

Murphy, C., Ker, S., & Ross, L. M. (1999), U.S. and worldwide outsourcing market and trends, 1998-2003. IDCdW19322.

Schultze U. and Boland R.J. (2000), Place, Space and Knowledge work: Outsourced Computer Systems Administrators, Accounting Management and Information Technologies, pp 187-219.

Willcocks L, Lacity M.C. and Fitzgerald G. (1995), Information Technology Outsourcing in Europe and the USA: Assessment Issues, International Journal of Information Management, Vol 15, No. 5, pp 333-351.

☐

Feature

Organisational Commitment & Motivation among Managerial Staff

Radha R. Sharma & Baldev R. Sharma

Organisational Commitment (OC) is an intense positive orientation towards an organisation, one's identification with it, viewing the organisation's goal as one's own and overstretching oneself to achieve the same. Motivation, a driving force for goal directed activity and OC, exerts considerable influence on various aspects of work performance and withdrawal behaviour. The present study is an attempt to explore determinants of organisational commitment and motivation from among 11 organisational variables. Based on a sample of 254 middle level managers from a high performing organisation, the study reveals that job content and scope for advancement are critical determinants of organisational commitment and work motivation.

Radha R. Sharma is Professor, Management Development Institute, Gurgaon. Baldev R. Sharma is former Executive Director, Shri Ram Centre for Industrial Relations.

Organisational Commitment

Organisational commitment has been receiving considerable attention from HR professionals in recent years due to its role in organisational performance, absenteeism and turnover. It involves both attitudinal and behavioural commitments, and provides a basis for understanding the emergence of linkages between employees and organisations. It has been observed that the level of commitment is higher in organisations where self-esteem is considered a core value.

The concept of organisational commitment has its roots in some organisational and sociological theories developed on the basis of the research work of Kelman (1958), Kanter (1968) and Etzioni (1975). Employee attitudes involving job satisfaction and job involvement are indicative of an employee's involvement and identification with the organisation (Mowday, Steers, and Porter, 1979). Importance of these attitudes in organisational behaviour was highlighted by Baron and Greenburg (1990); Meyer and Allen (1997). These attitudes are found to involve affective aspects, as a highly committed employee exhibits a strong and positive orientation towards the organisation, treating the organisation's goals as his/her own. Highly committed employees attach considerable value to their membership with the organisation and leave no stone unturned for the achievement of organisational goals.

Managerial Motivation: A Review

A number of researches have been undertaken and reported on motivation (probing the question of what motivates a manager or a worker in Indian organisations) using a variety of methods. Among managers, promotion has been found to be the most important incentive and dissatisfier and recognition as the most important job factor in satisfaction and dissatisfaction (Roy and Raja 1977). In a study of Indian executives

Kalyansundram and Arason (1992) found executives to be extensively dominated by dependency and control motives. Sharma and Kaur (2000) in their study of 163 executives from a public sector organisation reported 44.9% variation in job satisfaction due to job related factors.

Most of the studies on organisational commitment have been done in relation to absenteeism and turnover in a western setting. The importance of organisational commitment and motivation in organisational performance and knowledge gap have provided the impetus to undertake this study in a high performing organisation in India.

Objectives of the Study

The study envisages ascertaining the motivation and commitment of employees in relation to various organisational variables among the managerial staff of a high performing public sector company. The specific objectives of the study are:

(a) To assess the level of organisational commitment and motivation of the managerial staff of the company, and

(b) To identify the determinants of organisational commitment and employee motivation.

Profile of the Company

The company was founded in 1965, and it became a wholly owned Government Company in 1967. Since then it has grown into various fields relating to Engineering and Technology. In 1969, it diversified into petrochemicals, and in 1970, it established two more wings, one for creation of Heat and Mass Transfer, and the other a Computer Services Department. In 1971, an Ocean Engineering Department was set up. Thereafter, it undertook projects and assignments in the field of engineering and technology, not only in India, but overseas as well. It has successfully handled 4000 assignments, 35 petroleum refinery projects, 6 petrochemical complexes, 200 offshore platforms, 32 oil and gas processing projects, 11 ports and terminals, 25 mining and metallurgical projects, 8 fertilizer projects, 32 pipeline projects and a number of specialised assignments. It has achieved a number of milestones in India and overseas, and in 1994, it received ISO 9000 certification.

In view of its contributions, it has been receiving awards from various professional organisations in India and abroad. It received the Award of Excellence for Development of Indigenous Technology by the Department of Petrochemicals, Government of India (1989), Company Standardisation Award by The Institute of Standards Engineers (1991), Economic Times/Harvard Business School Association of India Corporate Performance Award (1993), National Export Award, (1993), Golden Peacock Quality Award (1995), NPMP Creativity & Innovation Award (1999), to name a few.

Performance Over the Years

In the past 10 years, the company performance (turnover) has grown by about six times from Rs. 66.6 crores to Rs. 391.7 crores. Its reserves and surplus have grown from Rs. 79.3 crores in 1989-90 to Rs. 529.2 crores in 1998-1999. All these developments have been possible because the company has been pursuing certain core values of benchmarking with superior role models, strengthening customer relationships, fostering innovation with emphasis on value addition, integrity and trust, organisational commitment, knowledge updation, passion for excellence, quality as a way of life, collaboration and synergy through cross-functional team work and promoting a sense of ownership, and above all, functioning as a learning organisation.

Methodology

Sample

A sample of 254 managerial supervisory staff was drawn by random sampling. Table 1 below presents the sample of 254 respondents from various levels in the organisation, comprising 234 respondents based in two city offices, and of 20 respondents from various project sites located in different parts of India from job level 1-6.

Table 1: Details of the Sample

Designation	Sample Size as Strength	% of the Sample
First Management Level	1	00.39
Supervisor	2	00.79
Officer/Engineer	60	23.62
Senior Engineer/ Senior Officer	48	18.90
Deputy Manager	54	21.26
Manager	64	25.20
Senior Manager	25	09.84
Total	254	100.00

Research Tool

A structured questionnaire developed by the researcher, consisting of 01 items having four pre-determined response categories ranging from 0 (zero) to 3 (three) was used, and the respondents were requested to tick their response in the appropriate column. The questionnaire collected data on various parameters of managerial motivation, job satisfaction, organisational commitment and social satisfaction and organisational characteristics viz., scope for advancement, grievance handling, monetary benefits, participative management, objectivity and rationality, and security, training and development, welfare facilities, job content and delegation of authority. Although it was a standardised questionnaire, the research team worked out its reliability on the sample as well to see its appropriateness for the sample from the company. The reliability co-efficient obtained through Cronbach Alpha for each of these parameters is given in Table 2.

Table 2: Cronbach Alpha for various Parameters of the Questionnaire

Variable Name	No. of Items	N
Scope for Advancement	3	250
Grievance Handling	3	249
Monetary Benefit	3	250
Participatory Management	3	248
Objectivity & Rationality	3	247
Recognition & Appreciation	3	249
Safety & Security	3	249
Training & Development	3	247
Welfare Facilities	3	249
Job Content	4	249
Delegation of Authority	7	247
Trust	3	249
Interpersonal Satisfaction	4	250
Job Satisfaction	8	235
Organisation Commitment	5	249
Manager Management Relation	3	250

Procedure for Data Collection

The data collection was done in a group setting where the managerial staff were put in batches of 15 to 20 each, and were explained the purpose of this study before responding to the structured questionnaire.

Age Profile of the Sample

The average age of the sample was 41.67 years.

58% of the sample was above 40 years of age, 24.8% in the age group 30 to 39 and 17.32% in the age group 20 to 29. The youngest employee in the sample was 23 years, whereas the oldest employees was 60 years old.

Table 3: Age Profile of the Sample

Age	Frequency	Percentage (%)
20-29	44	17.32
30-39	63	24.80
40-49	70	27.55
50-59	75	29.52
60-69	02	00.78
Total	254	100.00

Work Experience

The respondents' earlier experience ranges from 0 to 23 years. The average experience at the time of joining the company has been 3.22 years. Table 4 presents details of earlier experience.

Table 4: Details of Earlier Experience

Experience (in years)	Frequency	Percentage (%)
0	104	40.09
5-8	35	13.80
9-12	24	09.45
13-16	09	03.54
17-20	01	00.39
21-24	01	00.39
Total	254	100.00

Table 5: Details of Present Experience

Present Experience (in years)	Frequency	Percentage (%)
1-5	44	17.30
6-10	50	19.70
11-15	13	05.10
16-20	63	24.80
21-25	36	14.20
26-30	40	15.80
31-35	08	03.10
Total	254	100.00

The table indicates that 40% of the sample has had no previous experience, and that 31% had experience ranging between 1 to 4 years. The present experience of respondents ranges from 2 to 34 years, with an average

Of all the three determinants identified by this study, Job Content has emerged as the most critical determinant of managerial motivation and organisation commitment. The net contribution of this variable is the highest. The next highest predictors of variance in motivation and organisation commitment are scope for advancement and objectivity and rationality, respectively. Other significant determinants of organisational commitment are safety and security and monetary benefits, and for job satisfaction it is monetary benefits.

With a view to assessing the exact contribution of each of the determinants, further analysis was carried out. The data obtained has been presented in Table 11.

Table 11: Individual Contribution of each Predictor of Managerial Motivation and Organisational Commitment

Predictors of Each Dimension of Motivation	Zero order co-relation	Standardized Beta co-efficient B	Individual Contribution (AXB)
Job Satisfaction			
Job Content	.790	.616	.486664
Scope for Advancement	.497	.179	.088963
Objectivity & Rationality	.549	.150	.08235
Monetary Benefits	433	.101	.043733
		R^2	.70171
Organisational Commitment			
Job Content	.622	.351	.218322
Scope for Advancement	.502	.224	.112448
Objectivity & Rationality	.542	.165	.08943
Safety & Security	.503	.154	.077462
Monetary Benefits	.455	.124	.05642
		R^2	.536329

A perusal of Table 11 reveals that job content is the most important predictor of organisational commitment and job satisfaction. The second most important predictor of organisation commitment is scope for advancement.

Policy Implications

The study has clearly brought out that job content is the most significant determinant of organisational commitment and motivation. Organisations striving for performance improvement and productivity enhancement need to focus on not only enriching the job but also finding the right person for the right job. it is often observed that employees are assigned jobs that do not match their ability and background. Consequently, neither are they able to contribute nor are they able to guide their subordinates, causing low motivation and commitment among them as well. Competency mapping and matching of person-position profiles can take care of this problem, and should go hand in hand with job enrichment.

Another implication of the findings is that for developing organisational commitment among managerial staff, organisations need to create more opportunities for their vertical movement and scope for professional development and career enhancement.

References

Baron R.A. and Greenburg J. (1990), "Behaviour in organisations: Understanding and managing the human side of work", (3rd ed.). Boston: Allyn & Bacon.

Etzioni A. (1975), "A Comparative analysis of complex organisations", (Rev. ed.). New York: Free Press.

Kalyansundram P. and Arason M.T. (1992), "A study of the motivational climate in an industry", Management and Labour Studies 17 (2), 19-28.

Kanter R.M. (1968), "Commitment and social organisation: A study of commitment mechanisms in Utopian communities", American Sociological Review, 33, 499-517.

Kelman H.C. (1958), "Compliance, identification, and internationalisation: Three processes of attitude change", Journal of Conflict Resolution, 2, 51-60.

Meyer J.P. and Allen N.J. (1997), "Commitment in the workplace: Theory, research and applications", Thousand Oaks, CA: Sage.

Mowday R.T., Steers R.M. and Porter L.W. (1979), "The measurement of organisational commitment", Journal of Vocational Behaviour, 14, 223-247.

Roy S.K. and Raja G.A. (1977), In Roy, S.K. and Menon, A.S. (Eds.) "Motivational and Organisational Effectiveness", New Delhi: Sri Ram Centre of Industrial Relations, 104-35.

Sharma B.R. and Kaur K. (2000), "Determinants of managerial motivation in public sector manufacturing organisations", Indian Journal of Industrial Relations, 36 (2) 140-158.

Table I: Distribution of Respondents on Present Job Level

Present Job Level	Frequency	Percentage (%)
Level 6-9	1	00.39
10-11	2	00.78
12-13	60	23.62
13-14	48	18.89
14-15	54	21.25
15-16	64	25.19
16-17	25	09.84
Total	254	100.00

Table II: Distribution of Sample on Managerial Experience

Managerial Experience (in years)	Frequency	Percentage (%)
0	64	25.2
1-10	115	45.26
11-20	49	19.29
21-30	19	07.48
31-40	07	02.76
Total	254	100.00

> *No matter how motivated an employee is, his or her performance is going to suffer if there isn't a supportive work environment.*
>
> **— Stephen Robbins**

Competing Definitions of Quality

B. Mahadevappa & G. Kotreshwar

This paper presents the competing definitions of quality. The definitions range from 'excellence', 'fitness for use', 'conformance to specifications', 'customer satisfaction', to 'minimising the loss imparted to society'. The strengths and weaknesses of each defini- tion of quality are discussed in relation to concep- tualization and operationalisation, managerial useful- ness, and consumer relevance. The paper concludes that no one definition of quality is best in every situation. Managers and researchers must examine the strengths and weaknesses of each before adopting a definition to guide their work.

B. Mahadevappa is Lecturer and G. Kotreshwar is Professor in the- Department of Studies in Commerce, Post Graduate Centre, Hemagangotri, University of Mysore, Hassan, Karnataka, India.

The word "Quality" has multiple definitions. On the conceptual and operational front, a number of questions are apparent. They include: What is quality? What would someone mean by the quality of a colour television set? What would one mean by the quality of banking or transportation service? Who would judge the quality of a product or service? Is he a consumer or a producer? Is quality objective or subjective? Is it relative or absolute? Is it timed or timeless? Is it static or dynamic? Is it measurable or unmeasurable? Can it be divided into narrower and more meaningful dimensions? In this ar- ticle, we attempt to answer these conceptual and opera- tional questions by investigating the competing definitions of quality.

Conceptual and Operational analysis

Quality is customer-driven. It is customer determina- tion, not a producer's determination. Quality is charac- terized by changing conditions. It is a dynamic concept, which changes from consumer to consumer, from product to product and with time (Anand, 1997). Quality is always referred to a product or service. Thus, quality is a relational attribute. It is not viewed independently. For example, consumers judge the quality of a Hero- Honda motorcycle in relation to Kawasaki-Bajaj, Yamaha or TVS.

Quality is either subjective or objective. Subjective quality belongs to personal or individual thinking. Objec- tive quality belongs to the things external to the mind rather than thoughts or feelings. Subjective quality refers to the qualitative dimensions, while objective quality refers to the quantitative dimensions. Subjective quality is important to differentiate products from competing ones and also to target different market segments, but standards can be established and performance can be measured only for objective quality. Quality is a form of overall evaluation of a product, similar in many ways to attitude. It is a relatively global value judgement or mental position of a person towards a product or service. Quality is a multi-faceted body, and, in some ways, is like the story of the blind men and the elephant (Srinivásan, 1998).

Competing Definitions of Quality

There are different definitions on what constitutes a quality product or a quality service. Its definitions range from 'excellence' to 'minimizing loss imparted to society'. Different definitions of quality proposed by different experts at various times in response to the evolving and constantly changing demands of business are:

- Quality is Excellence
- Quality is Value
- Quality is Conformance to Specifications
- Quality is Conformance to Requirements
- Quality is Fitness for use
- Quality is Customer Satisfaction
- Quality is Meeting and Exceeding Customers' Expectation
- Quality is minimizing the loss imparted to society

Quality Is Excellence

The New Webster's Dictionary (1988) defines quality as "the level of excellence of something".

Smith (1993) defines quality as "The goodness or excellence of some thing. It is assessed against accepted standards of merit for such things and against the interests/need of users and other stakeholders".

Pirsig (1974) defines quality as "innate excellence – the good, the highest form, the highest idea of all." His view implies that high quality is timeless and enduring, an essence that rises above individual tastes or styles.

The origins of this definition come from the Greek word "arête", which means ideal or excellent. Quality is the goodness or excellence of some thing. Anything excellent or meritorious is quality. Anything superior or ideal or perfect is considered as quality. Anything that is 'the best' is quality. A standard of something in its highest perfection is quality. A thing regarded as conforming to such a standard and taken as a model for imitation is quality. The highest degree of proficiency or most perfect degree of goodness is quality. For example, the majority of people around the world travel to India to see the Taj Mahal, a proof of excellence. It is regarded as conforming to an excellent standard and taken as a model for imitation.

> The highest degree of proficiency or the most perfect degree of goodness is quality.

Historically, Greek philosophers such as Socrates, Plato, Aristotle, and others initiated significant discussions on quality. The ideal to them was 'excellence'. The definition of excellence varied by its context: for a racehorse, it was speed, for a cart, strength. For a man, it connotes excellence in the ways a man can be excellent – mentally, intellectually, physically, practically (Kitto, 1957). Tuchman (1980) emphasises that 'Quality means investment of the best skill and effort possible to produce the finest and most admirable results possible .... You do it well or you do it half-well ... Quality is achieving or reaching for the highest standard as against being satisfied with the sloppy or fraudulent . . .It does not allow compromise with the second-rate'.

Strengths and Weaknesses: Defining quality as excellence remains maddeningly elusive (Garvin, 1988), and highly subjective. Its vagueness may give rise to such comments, as "I know it when I see it" (Juran, 1992). Philip B.Crosby (1980), one of the proponents of the quality as excellence definition argues, "the word "quality" is used to signify the relative worth of things in such phrases as "good quality" and "bad quality". He has proposed that managers hold several erroneous assumptions about quality, the first being that quality means goodness, or luxury, or shininess, or weight ...It is a situation in which individuals talk dreamily about something without ever bothering to define it .... They are thinking of quality as goodness and spend their time having emotional discussions which make it impossible for management to take specific, logical actions to attain quality". Crosby stressed that goodness is unmeasurable, and that quality, defined as "conformance to requirements", can be precisely measured.

Smith (1993) argued that what a concept means is one thing; how to measure it is another. Defining quality as excellence or goodness – what Garvin (1988) called the 'transcendent approach' – may not facilitate measurement efforts, but it does reflect the concept's meaning. Although articulating precisely what excellence is operationally for commercial purpose may be difficult, but more operational definitions like 'conformance to requirements' are conceptually weak.

The practicality of defining quality as excellence in matters of commerce was called into question in the mid-1700s when western businessmen began to target a wider market for their commercial goods (Reeves and

Bednar, 1994). For operational reasons, alternative definitions of quality emerged gradually after the industrial revolution.

Quality is Value

Value-based definitions actually define quality in terms of costs and prices (Garvin, 1988). It is the worth of a thing as measured by the amount of other things for which it can be exchanged. No matter how high the quality, if the product is overpriced, it cannot gain customer satisfaction (Ishikawa, 1985). This is important in planning and designing quality. There can be no quality that ignores price for the customer and cost and profit for the producer. Thus, a quality product is one that provides performance or conformance at an acceptable price or cost.

The consumer is not interested in knowing which materials or processes have been used, what is the actual cost of manufacture, how much profit margin has been added, etc. His only concern is in fulfilling his minimum functional needs at the desired place and time, at the lowest cost.

A recent survey of India's most trusted brands 2002 (The Economic Times, August 2002) to assess the consumer perceptions of quality in one hundred and twenty product categories suggests that the value-based view is becoming more relevant. Respondents were asked to define brand trust on seven attributes. One of the seven attributes was "Is the product worth the price it commands". In this survey, Dettol, a sixty-year-old antiseptic brand was ranked first.

Strengths and Weaknesses: Defining quality as value allows one to compare widely different objects and experiences, such as dinner at a five-star hotel versus a meal received at an ordinary hotel; a train journey by a Shatabdi express versus a train journey by an ordinary express. The value definition of quality facilitates cross-industry analyses about consumers' decisions among multiple substitutes. In its survey, (The Economic Times, December 2002) found that "consumers clearly recognize differences in value, as demonstrated by the fact that firms offering high quality at consistently low prices were market share

> **The value definition of quality facilitates cross-industry analyses about consumers' decisions among multiple substitutes.**

leaders. Interestingly, the value for money segment with brands such as Nirma, Wheel and Lifebuoy has done exceedingly well in terms of sales. Nirma ranked seventh by sales (Rs.1,182 crore) while Wheel ranked tenth (Rs.814.6 crore) by sales in the Top 100 FMCG brands in India".

Defining quality as value may give a more accurate indication of how products or services are perceived in the marketplace and how purchase decisions are made (Reeves & Bednar, 1994). Despite its obvious importance, defining "Quality as Value" is difficult to apply in practice. It blends two related but distinct concepts: excellence and worth. The result is hybrid - "affordable excellence" - that lacks well-defined limits and is often highly subjective (Garvin, 1988).

Quality is Conformance to Specifications

The manufacturing-based definition of quality, which is widely prevalent even today, is "Conformance to Specifications or Conformance to Standards".

During the first and second world wars, there were great demands for mass-produced, reliable armaments, and the main determinants of quality by the armed forces was to asses whether the armaments conformed to their specifications (Yong & Wilkinson, 2002). The industry during that period was very particular about receiving parts that conformed to specifications because failing to meet 'specifications' meant that parts would not be interchangeable, and the whole production process would fail.

'Conformance' means agreement; it means that the substantiate, observable, and measurable attributes of two or more entities are identical. Conformance is a state, or binary variable; it exists or it does not. A 'specification', on the other hand, is something specified or mentioned in a detailed description of dimensions. In most cases, specifications represent the producer's view of the product or the provider's view of the service. 'Conformance to specifications' means quality is present; nonconformance to specifications means quality is absent. Once a design or a specification has been established, any deviation implies a reduction in quality (Garvin, 1988). In this definition, quality has been equated with meeting specifications. In these terms, a well-made Maruthi car is a high-quality automobile, as is a well-made Indica car.

Strengths and Weaknesses: This is a manageable definition of quality. It facilitates measurement efforts and provides consistent results. Based on this definition, quality can be measured again and again by com-

Competing Definitions of Quality

paring a product to its stated specifications. As a result, a company can monitor progress in achieving its quality goals by measuring how well it is conforming to established specifications.

> **A company can monitor progress in achieving its quality goals by measuring how well it is conforming to established specifications.**

Apparently, the "Conformance to specifications" definition does have a place in the lower levels of the company. In those levels, the personnel-workers and supervisors are often unaware of what customer needs are. Nevertheless, these same people require clear definitions of their responsibility with respect to quality. One way of defining those responsibilities is to provide them with specifications and procedures. The responsibilities then become to follow the procedures and to meet the specifications (Juran, 1992). As is evident, defining quality as "conformance to specifications" is easy to implement in practice, especially at the manufacturing stage.

Yet, in spite of those operational strengths, this definition has some serious conceptual weaknesses. Many proponents identified several weaknesses with this definition. Juran (1992) contends "The conformance to specifications, or conformance to standards are dangerous definitions when applied at managerial levels. At those levels what is essential is that the products respond to consumer needs. Conformance to standards is only one of many means to that end". Moreover, he adds, "conformance by its nature relates to static standards and specifications, whereas quality is a moving target".

Dr. Deming calls attention to the absurdity of "meeting specifications". He adds, "This practice implies that anything inside the specifications may be all right, while something just outside is all wrong. Meeting specification does not result in constant improvement of quality. It ensures the statuesque" (Walton, 1986). Ishikawa (1985) also argues "The mere fact of meeting national standards or specifications is not the answer. It is simply insufficient... They contain many shortcomings. Consumers may not be satisfied with a product which does meet JIS (Japanese Industrial Standards)".

Quality is Conformance to Requirements

Defining quality as "conformance to requirements" means manufacturers study the opinions and requirements of consumers, and take them into account when they design, produce, and sell their products. When developing a new product, a manufacturer must anticipate the consumers' requirements. For that reason, requirements are different from specifications. 'Requirements' are the consumer's view of the product, while 'specifications' are the producer's view of the product. A good "requirement" must have three important attributes. First, it must be *complete;* that is, include all the needs and the manner in which they are to be met. Second, it must be *clear;* that is, easily understandable and unambiguous to those who will have to respond to it. Third, it must be *timely;* that is, represent needs as they currently exist; if time is critical to meeting the stated needs, the requirements should be stated in terms that allow adequate time for a satisfactory response and implementation.

Strengths and Weaknesses: "Conformance to requirements" is a precise and consistent definition. Based on this, quality can be verified again and again by comparing a product to its stated requirements; either they are met or not. This definition is adaptable to change, as it does not depend on technology, resources, standards, or procedures. Furthermore, "Conformance to requirements" is clearly understandable and easy to implement - as long as good requirements are available and the process of producing the product and measuring conformance are defined.

It is the job of the producer, by using marketing research-directly or indirectly-to anticipates the requirements of the consumers. In turn, the producer converts these requirements into a set of specifications, which will determine the product and the process that produces it. However, a critical factor in total quality management is how accurately the producer translates requirements into specifications. Thus, it is more challenging to establish specific requirements for each class of products and services, but also for processes.

> **A critical factor in total quality management is how accurately the producer translates requirements into specifications.**

Quality is Fitness For Use

Juran (1988) defined quality as "Fitness for use". Fitness for use is the extent to which the product successfully serves the purposes of the user during its useful life. Fitness for use, Juran adds, is achieved through

two components: product features and freedom from deficiencies. In the eyes of customers, the better the product features, the higher the quality. In the same spirit, the fewer the deficiencies the better the quality (Juran, 1992). Product features refer to the quality of design. Freedom from deficiencies refers to quality of conformance. Higher product features and lower deficiencies means increased customer satisfaction (Juran & Gryna, 1995).

Strengths and Weaknesses: The definition "fitness for use" has gained some followers, but of date there has been no consensus on adoption of such a phrase. The major problem with this definition is that of operationalisation. It is often difficult to determine user needs for a product, in part because the needs may not exist until after the product is introduced. It is also difficult to translate user needs into specific product attributes. Different individuals have different needs of a product, making it impossible for a single product design to be best for all potential customers (Garvin, 1988).

Quality is Customer Satisfaction

A short definition that has achieved acceptance is: "Quality is customer satisfaction" (Juran & Gryna, 1995). Customer satisfaction is a result achieved when product features respond to customer needs. Product deficiencies are in all cases sources of customer dissatisfaction (Juran, 1992).

Mohandas Karamchand Gandhi emphasized the importance of customer satisfaction in his famous exhortation: "The customer is the most important visitor to our establishment. He is not dependent on us. We depend on him. He does not disrupt us in our work. He is the purpose of it. He is not an alien in our business. He is part of it. We do not do him a favour when we serve him. He does us a favour by making it possible for us".

> **The customer is the most important visitor to our establishment.**

Strengths and Weaknesses: This definition is especially noticeable in a buyer's market and in an open market that does permit 'trade liberalization. In such markets, producers make and sell products that they consider will satisfy customers. This means to listen to their opinions and to act in a way that will take their views into account. "Quality means customer satisfaction" does have place at the managerial levels. At those

levels what is essential is that the products respond to customer needs.

However, individual consumers are assumed to have different wants or needs, and the goods that best satisfy their preferences are the ones they regard as having the highest quality. "Quality as customer satisfaction" faces two problems. The first is practical: how to aggregate widely varying individual preferences so that they lead to meaningful definitions of quality at the market level? The second is more fundamental: how to distinguish those product attitudes that connote quality from those that simply maximize consumer satisfaction? (Garvin, 1988).

Quality is Meeting and/or Exceeding Customer's Expectations

The extent to which a product or service is meeting and/or exceeding the expectations of customers is currently the most widely used definition of quality, especially to define service quality. This definition grew out of the services marketing literature (Parasuraman et al, 1985), wherein researchers argued that a conformance-to-specifications definition of quality failed to address the unique characteristics of services.

Lewis and Booms (1983) define quality as follows: "Service quality is a measure of how well the service level delivered matches customer expectations. Delivering quality service means conforming to customer expectations on a consistent basis".

The writings of Pasauraman et al. (1985), unambiguously support the notion that service quality, as perceived by consumers, stems from a comparison of what they feel service firms should offer (i.e., from their expectations) with their perceptions of the performance of firms providing the services. Perceived service quality is viewed by them (Parasuraman, et al. 1988) as "the degree and direction of discrepancy between consumers' perceptions and expectations".

Strengths and Weaknesses: Quality must ultimately be evaluated from the customer's perspective in the market place. Customers can articulate how well a product and/or service meets their expectations. It is a perceptual judgement. Meeting and/or exceeding expectations is an externally focused definition of quality. If a firm can consistently discover or drive customers' expectations, and meet them, its competitive advantage will be difficult to overcome. Defining quality as the extent to which a product and/or service meets and/or exceeds expectations allows managers and researchers to include subjective factors (i.e., courtesy, helpfulness,

Competing Definitions of Quality

confidence, appearance) that are critical to customers' judgements but difficult to quantify into assessments of quality (Reeves and Bednar, 1994). Meeting and/or exceeding customers' expectations is the most complex definition of quality, and, thus, is the most difficult to measure. It is also highly subjective.

> **Meeting and/or exceeding customers' expectations is the most complex definition of quality.**

Quality Is Minimising the Loss Imparted to the Society

Dr. Genichi Taguchi (1986), an international expert on technology upgrading and the development of robust product and process design, discussed a totally new dimension to quality economically. According to him, 'The quality of a product is the (minimum) loss imparted to the society from the time the product is shipped'.

Fundamental to Taguchi's definition of quality is the concept of "loss". Taguchi uses his mathematical function – Quality Loss Function (QFD) - to calculate the quality loss. He takes it as a function of loss for the producer as well as for the customer. If the producer saves cost by making an inferior quality product, the customer is the loser; what is saved by the producer may not be zero. This phenomenon is different from what happens when a robber steals Rs. 10. When the robber gets Rs. 10, it is exactly the same as what his victim loses.

The total value of quality loss function of this phenomenon, if we can quantify, will be an astronomical figure and it involves a loss for the producer as well as the society. For example, if a carburetor emits smoke due to poor quality of the product, the producer may be saving some money for not making the product up to the required quality standard. But as far as the environment is concerned, it will affect public health. The enforcement of Euro-II emission norms to control vehicular pollution in the National Capital Region (New Delhi) from 1st April 2000 by the Supreme Court of India, in its judgement dated 29th April 1999 (The Economic Times, 30 April, 1999, p.1) aims at minimisng loss imparted to the society from the time the product is shipped. The passenger cars, of course, were meeting the needs of the customers, but they failed to meet the needs of the society. However, compliance with Euro-I and Euro-II emission norms minimizes the loss (in the form of air pollution) imparted to the society from the time the car is on the road. Pollution

is the loss imparted to a third person. The third person did not buy the product and did not enjoy the function; he/she only suffered the loss. The Bhopal gas tragedy is yet another example that can be understood in this connection. By neglecting the safety standards, Union Carbide Ltd. saved some money, but the huge loss of human lives counteract what the company saved by omitting the safety standards.

Taguchi's vision went beyond meeting and/or exceeding customer needs and expectations. Quality should meet societal needs, and customer needs are part of that. The better the quality, the more favorable is the product to society. If products and services are created with this concept in mind, the life of every citizen will be more comfortable and enjoyable (Anand, 1997).

> **The better the quality, the more favorable is the product to society.**

Strengths and Weaknesses: Defining quality in terms of "loss after shipment" as a whole has fostered considerable gains in quality for manufacturing industries in Japan and abroad (Schvaneveldt & Enkawa, 1992). However, the idea of minimizing loss to the society is rather abstract and thus difficult to deal with as a company objective (Byrne, 1998). This definition may have more meaning, when a company considers loss to society to be a long-term loss to it. Furthermore, defining quality in terms of "loss after shipment" is not readily interpretable for most services. Unlike products, which can be produced at a factory and shipped intact to the customer at a later date, services are generally produced and consumed simultaneously.

Conclusion

No one definition of quality is the "best" in every situation because each definition has both strengths and weaknesses in relation to conceptualization and operationalisation, managerial usefulness, and consumer relevance. Quality is measured most precisely when defined as conformance to specifications; it is most difficult to measure when defined as excellence. Definitions of quality also vary in their usefulness to managers. Quality defined as excellence can provide powerful motivation to a workforce. It drives their pride of workmanship. Quality defined as value or conformance to specifications can lead an organization to focus on efficiency. Quality defined as fitness for use, customer satisfaction and meeting and/or exceeding ex-

pectations compel the management to keep abreast of changes in consumer demands. Quality defined as minimisng loss imparted to society emphasizes management to be socially responsible. However, each definition has drawbacks for managerial usefulness. Excellence provides limited practical guidance. Value and quality typically represent different concepts. Conformance to specifications may cause managers to focus on internal efficiency while neglecting external effectiveness. Fitness for use, customer satisfaction, and meeting and/or exceeding customers' expectations are difficult to measure and thus problematic. For consumers, meeting and/or exceeding expectations are the most relevant definition of quality. When notions of excellence, value, or conformance to specifications dominate consumers' expectations, any of these quality definitions may apply.

References

Anand, K.N. (1997), Quality: An evolving concept, Total Quality Management, Vol.8. No.4, pp.195-240.

Byrne, Diane M. (1998) Taguchi Methods in Taguchi Methods and QFD, edited by Nancy E. Ryan, ASI press, Dearborn, Michigan, pp.11-23.

Crosby, Philip B. (1980), Quality Is Free, Penguin Books USA Inc., New York.

Garvin, David (1988), Managing Quality, The Free Press, New York.

Ishikawa, Kaoru, trans. David J. Lu (1985) what is Total Quality Control? –The Japanese Way, Prentice-Hall Inc., New York.

Juran, J.M. (1988), Juarn's Quality Control Handbook, Fourth Edition, McGraw Hill Book Company, New York.

Juran, J.M. (1992) Juran on Quality by Design, The Free Press, New York.

Juran, J.M. and Gryna, Frank M. (1995), Quality Planning and Analysis, Third Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Kitto, H.D.F. (1957) The Greeks, Chaucer Press, Middlesex, England.

Lewis, Robert C. and Bernard H. Booms (1983), The Marketing Aspects of Service Quality, in Emerging Perspectives on Service Marketing, L.Berry, G., Shostack, and G.Upah, eds., American Marketing, Chicago, pp.99-107.

New Webster's Dictionary of the English Language (1988), College edition, Fourth Reprint, Surjeet Publications, Delhi.

Parasuraman, A, Valarie Zeithaml, and Leonard Bery (1985), "A Conceptual Model of Service Quality and Its Implications for Future Research," Journal of Marketing (Fall), pp.41-50.

Parasuraman, A, Valarie Zeithaml, and Leonard Bery (1988), SERVAQUAL: A Multiple – Item Scale of Measuring Consumer Perceptions of Service Quality, Journal of Retailing, Vol.64, pp.12-23.

Pirsing, Robert M. (1974), Zen and the Art of Motorcycle Maintenance, Bantam Books, New York.

Reeves, C.A. & Bednar, D.A., (1994), Defining Quality: Alternatives and Implications, Academy of Management Review, Vol.19, No.1, pp.419-445.

Schvaneveldt, Shane J & Enkawa, Takas (1992), Variability and quality loss in services: Concepts and countermeasures, Total Quality Management, Vol.3, No.3, 1992, pp.233-241.

Smith, Gerald F. (1993), The Meaning of Quality, Total Quality Management, vol.4, No.3, 1993, pp.235-244.

Srinivasan, Venu (1998), Excellence Is A Moving Target, Business Today, November 22, 1998, pp.82-87.

Taguchi, Genichi (1986), Introduction to Quality Engineering, Asian Productivity Organisation, Tokyo.

The Economic Times (1999), The Enforcement of Euro II Emission Norms, 29th April, p.1.

The Economic Times (2002), Survey of India's Most Trusted Brands 2002, published in the Brand Equity issue, 14 August, pp.1-8.

The Economic Times (2002), India's Hundred Largest Brands by sales in the Brand Equity issue, 18 December, pp.1-4.

Tuchman, Barbara W. (1980), The Decline of Quality, New York Times Magazine, 2 November, pp.38-41, 104.

Walton, Mary (1986) The Deming Management Method, The Putnam Publishing Group, New York.

Yong, J & Wilkinson, A (2002), The Long and Winding Road: The Evolution of Quality Management, Total Quality Management, Vol.13, No.1, pp.101-121.

Nurture great thoughts, for you will never go higher than your thoughts.

– Benjamin Disraeli

Energy Waste in an Engineering Industry

T.P. Singh & Anish Kumar

This paper presents a case study aimed at identifying and reducing energy waste, in an auto parts manufacturing unit. Firstly, the system and its boundaries are defined and the inputs to and outputs from the system of energy and materials for the study period are recorded. From the number of operations carried out and the energy consumption per operation, the actual energy consumption on productive operations has been calculated. The difference between the actual energy consumption in a sub-system and the calculated energy consumption reflects the waste in the sub-system. Further, the areas, reasons and causes contributing to waste have been found out. A work sampling study has been carried out to ascertain waste in the machine shop on account of idle running of machines, breakdowns and other reasons. The Lighting system has also been analysed. Suggestions have been made for the reduction of energy waste.

T.P. Singh is Professor, Mechanical Engineering Department. Thapar Institute of Engineering & Technology (Deemed University), Patiala, and Anish Kumar is Lecturer, Mechanical Engineering Department, M.M. Engg. College, Mullana, Ambala.

The finite reserves of fuel oils and other fossil fuels restrict the energy generated through these resources. While it is essential that new sources of supply be developed, an efficient and economic use of available resources assumes great importance. For effective energy management, it is essential to know the present use patterns of energy in the process of transformation of raw material to finished goods at various stages. This is accomplished by the application of techniques of energy audit. Once the use patterns are known, a detailed analysis is required to draw inferences from these patterns and find out areas where improvements can be made along with the reasons and root causes of inefficient use. After having identified the energy consumption patterns and the resultant waste, the reasons and root causes of occurrence of waste can be worked out through a cause and effect analysis. Remedial measures can then be applied to minimize the energy losses. This paper focuses on energy audit and energy analysis to identify waste in various areas along with the reasons and root causes of waste.

Case Study

The study has been conducted in a leading manufacturing unit of bi-metallic engine bearings in the country. A large variety of products are being made in this company in order to meet the demands of a wide variety of engine and automobile manufacturers. The products manufactured in the company are: straight bearings, flanged bearings, bushes and washers. They vary from one another with respect to their shape and size; again, within each category, there is a large variation of sizes of products. A bi-metallic strip is used for the manufacture of all these products.

Firstly, powder is made from its constituents by powder metallurgy. This powder is sintered on the sanded steel strips in order to make bi-metallic strips. Slitting is done to cut the strip in required sizes. Subsequently, various pressing and machining operation such as blanking, forming and coining, facing, chamfering, lipping, grooving, hole punching, counter sunking,

height broach and plating, are carried out to make the finished products. The operations used are energy intensive. The products and operations involved are quite complex, needing sound planning and control. A mistake at any stage can cause waste.

Methodology Used

The following methodology was employed for conducting the case study:

- Defining the system and sub-systems.

- Recording the inputs and outputs of materials and finished goods.

- Recording the consumptions of electricity for the whole plant as well as for individual sub systems from the energy meters installed for various sub-systems.

- Recording the consumption of fuel oils from the records of receipts and issue.

- Finding out the energy consumption per operation for each type of product from the standard time, wattage of machine, etc.

- Finding out total energy consumption on productive operations from the figures of production and energy consumption per product.

- Working out the waste as the difference between the actual energy consumption and calculated consumption.

- Finding out the reasons and root causes of each type of wastage. For this, a work sampling study is conducted to ascertain the waste due to idle running of the machines.

- Recommending solutions for energy management.

Description of the Product and Process

The Products

The products of the company are classified in to four categories:

- Straight bearings
- Flanged bearings
- Bushes
- Washers

The material used for the manufacture of all these categories of products is a bi-metallic strip. One side of this strip is of steel, which has the requisite strength and other mechanical properties commensurate with the fitment and location requirements of the bearings. The other side of the strip is made of a special alloy, which has the bearing properties as required, so as to cause least damage to the matching components and at the same time work with minimum friction.

The Process

Powder metallurgy is used to produce bi-metallic strips. Firstly, powder is made from its constituent elements in a Powder Plant. This powder is then sintered on one side of the steel strip. The bi-metallic strip thus made is cut into the required sizes. Subsequently, various pressing and machining operations are carried out to make the final product. Figure 1 shows the flow of material through various sections of the plant.
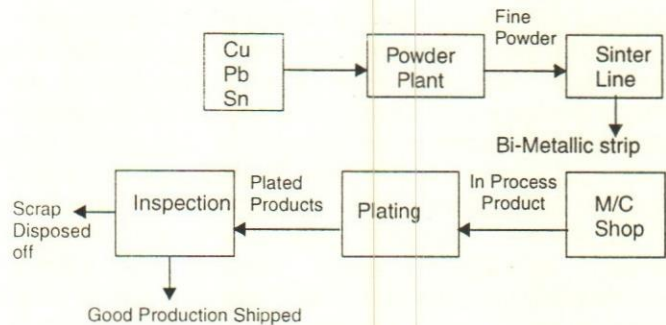
Fig . 1. Material Flow

Energy Audit and Analysis

The System Defined

(a) The System includes:

  (i) All energy inputs during the study period including those of fuels and electricity.

  (ii) All direct material inputs to the system during the study period.

  (iii) All material outputs.

(b) The System excludes:

  (i) Indirect material inputs.

  (ii) Energy consumed on the production and delivery of raw material outside the factory boundaries.

  (iii) Energy consumed on transportation of raw materials outside the factory premises.

The main function performed in the system is to convert the raw material to engine bearings, flanges, bushes and washers by processing at various stages. These stages consume a lot of energy. The objective of the study is to find out areas of energy wastage, identify the reasons and root causes and then develop ways to reduce the waste. Figure 2 shows the system with its inputs and outputs.

Material
Input

Copper
Lead
Tin

[Conversion or Transformation]

Output

Bearings
Flanges
Bushes
Washers

Electricity
N_2H_2
L.D.O
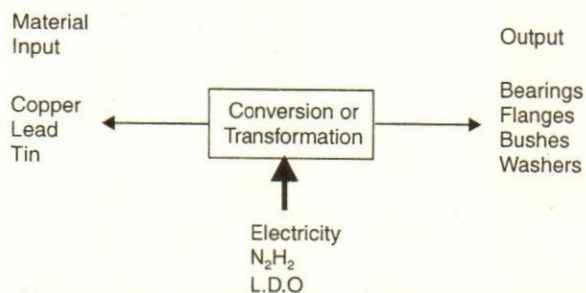
Fig. 2. Input Output Diagram

Sub-Systems

The system is divided into various sub-systems for the purpose of analysis. These are given below:

(i) Powder Plant

(ii) Sinter Line

(iii) Plating

(iv) Machine Shop

(v) Lighting

Data of inputs and output has been compiled from the records and actual observations for the period from 1st June to 30th June 2002. The inputs are in the form of electricity, L.D.O, and N_2H_2. Table 1 lists energy and fuel inputs to various areas of the system during the period of study.

Table 1: Various Energy and Fuel Inputs to the System

Area	Elect (KwH)	N_2H_2 (Kg)	L.D.O
Total	754042	7856	5654 Lt
Machine Shop	98873		
Flange Line	117533		
Auto Line	42592		
Sinter Line-I	19806		
Sinter Line-II	60391		
Large Size Bearing	207471		
Plating	104825		
Powder Plant	102749		

The energy consumption for each sub-system is calculated from energy meters and from the records showing the actual amount of electricity, fuel oil, etc. in each sub-system during the study period.

Energy Consumption and Running Time for various Equipment

For each piece of equipment in each sub-system, the cycle time details were taken from the records maintained by the company. These timings were verified by actual observations and are used in the analysis carried out in subsequent sections. Table 4 shows the details

Table 2: Material Input to the System and Sub-system

Area	Steel (m)	Copper (Kg.)	Pb (Kg.)	Tin (Kg.)	Cu (Kg.)	Coarse Powder (Kg.)	I.D. (Shavings) (Kg.)	Blanks
Total	43294	20305	4728.5	1294.6	49.7	7581	2290	7441792
Powder Plant	–	20305	4728.5	1294.6	49.7	7581	2290	–
Sinter Line	43294	–	–	–	–	–	–	–
Machine Shop	42694 (Strip)							

Table 3: Material Output from the System and Sub-system

Area	Powder (Kg.)	Strip (m) Blanks	Products	
Total	29201	42694	–	1047496
Powder	29201	–	–	–
Sinter Line	–	42694	–	–
Machine Shop	–	–	–	839836 (Good) + 207660 (Reject) = 147496
Plating	–	–	–	839836

regarding time spent by energy consuming devices in each sub-system.

Table 4: Time Spent by Energy Consumption Devices on Operations

S.No	Area	Equipment	Running Time	Output
1.	Powder Plant	Induction Furnace	2.0 Hrs. for first heat and 1.5 Hrs for subsequent heat	500 Kg.
		(i) Reciprocating Pump	12 min	500 Kg
		(ii) Slurry Pump	7 hr	500 times 3 Kg
		(iii) Cooling Pump	10 hr	1500 Kg
		(iv) Drier	5 hr	1500 Kg
		(v) Vacuum Pump	2 hr	1500 Kg
		(vi) Classifier	3 hr	1500 Kg
		(vii) Blender	2 hr	1500 Kg
		(viii) Boiler	7 hr	1500 Kg
		(ix) Feed water pump	7 hr	1500 Kg
2.	Sinter Line	(i) Sinter Line-I	1 min	32 to 33 inch/min
		(ii) Sinter Line-II	1 min	34 to 35 inch/min
		(iii) Sanding & Degreasing	1 min	40 Ft.
3.	Press and Machine Shop	All Machines	Standard time of products available separately and used in actual calculations only.	
4.	Plating	LTC Plating (Bushes, Bearings, Washers)	1.05 mm 41 min 1 min	42 PCS 1st SET 35 PCS

Connected Load

The data regarding the wattage of the energy consuming part of each piece of equipment and the total connected load for the equipment have been compiled and made use of in the analysis presented under each sub-system.

Details of Analysis

To find out the wastage of energy at various places, first of all, the actual input of energy is found out. This consumption is then compared with the desirable or minimum possible consumption. The difference is the waste. Energy consumed by each of the sub-systems is recorded from the energy meters or from the records of receipt and dispatches. Table 5 shows the energy consumption by each sub-system as recorded from the energy meter readings or from the other records.

Table 5: Energy Consumption by each Sub-System

Sub System	Electricity (Kwh)	Fuel Oil/gas
Powder Plant	102749	5654 LT L.D.O
Sinter Line	80197	7856 N_2H_2 Kg
Plating	104825	–
Machine Shop	98873	–
Lighting Road	57984	–
Total	422076	

Calculation of Energy Consumption and Energy Wastages in Various Sub-Systems

After having recorded the actual energy consumption figure for all the sub-systems, the next step is to find out the amount of energy, that should have been spent. This has been done in the following sections for individual sub-systems.

Powder Plant

Energy consumed on productive operations in the powder plant has been calculated by using the equation (i)

$$EC_T = EC_{UT} \times RT_R \qquad ...(i)$$

Where

EC_T is total energy consumption on productive operations

EC_{UT} is Energy consumption per unit time in hours.

RT_R is running time of energy consuming devices in hours

Calculations using this equation are in column H and I of Table 6

EC_{UT} has been taken from the wattage of the energy consuming part of the equipment.

Taking wattage of the equipment as EC_{UT} gives slightly approximate results but this will assume the equipment to be running on full load and hence would give the energy consumption values to be slightly on the higher side and waste on the lower side. A more precise

Table 6: Energy Consumption in Powder Plant

Equipment	No. of first heats	No. of subsq. heats	Qty. of powder made	Qty/Hrs.	No. of hrs. for running	Energy consumption (k.w)	Total energy (Kwh)
Induction Furnace	19	39	–	–	58	550	31900
Rec. Pump	–	–	29201	2500	11.68	37.5	438
Slurry Pump	–	–	29201	214.28	136.27	37.5	5110.12
Furnace cooling pump	–	–	29201	150	194.67	5.62	1094.0
Feed water pump	–	–	29201	214.28	136.27	5.62	766
Drier	–	–	29201	300	97.33	13.45	1309.0
Vacuum Pump	–	–	29201	750	38.93	5.5	214.11
Blender	–	–	29201	750	38.93	5.62	218.78
Classifier	–	–	29201	500	58.40	3.75	219.0
Boiler	–	–	29201	214.28	136.27	1.3	177.15
Blower motor	19	40	29201	–	58	3.75	217.5
Total							41663.6 KWH

L.D.O. CONSUM. 2720 Lts

method would have been to use VI cos phi rather than wattage but it would have been more complicated considering the size, complexity and arrangement of equipment. Running time RT_R has been calculated by the amount of material processed through each piece of equipment and the rate at which the material is processed as per the following equation:

$$RT_R = Q_P/Q_{PT} \qquad \text{...(ii)}$$

Where

Q_P is quantity of powder processed through a piece of equipment in kg

Q_{PT} is quantity of powder processed per unit time in kg/hour

Calculations using the above equation are shown in columns E, F and G of Table 6. Column C and D show the number of heats (charges) of 500 kg processed on the induction furnace for powder making. First, heat takes more time because the furnace has to be started from cold. Everyday in the morning there is one first heat. Subsequently, if there is a breakdown of long duration it also results in extra first heats. Running times of the equipment have been standardised by taking actual observations.

In addition to energy consumption on main equipment, as shown in Table 6, some more energy is consumed on smaller equipment like power hacksaws, pumps, exhaust fan, etc. This is assumed to be 10% of

the EC_T. Thus, gross energy consumption:

$$EC_G = 1.10 \times EC_T = 1.10 \times 41663.66 = 45830 \text{ kwh.}$$

Energy Wastage in Powder Plant

The difference between gross energy consumed on productive operation EC_G and the actual energy consumed in the powder plant as per energy meters readings is

Waste = 102749 – 45830 = 56919 kwh of electricity (55.4%)

Similarly, waste of L.D.O = 5654 – 2720 = 2934 litres (47.6%)

Areas of Energy Wastage in Powder Plant

Time spent on heats taken out in a day

Sometimes the prepared alloy is kept in the induction furnace for a longer time than actually required, causing energy wastage. This loss has been calculated by using the following equation:

$$W_{ET} = EC_G (1 - T_S/T_A) \qquad \text{...(iii)}$$

Where W_{ET} is waste due to running of equipment for extra time

EC_G is the gross energy consumption

Table 7: Energy wastage due to break down during the study period

Equipment	Total Break Down during study period	Resultant idle running of other equipment	Total wattage of the equipment stopped (K.W)	Energy wastage (KWH)
Induction furnace	10 hr	Drier, classifier boiler, blender	574.12	5741.2
Drier	4 hr	Induction furnace, boiler	564.75	2259
Boiler	4 hr	Drier	14.75	59
Slurry pump	2 hr	Drier, boiler	20.25	40.5
High pressure pump	5.20 hr	Ind. furnace, drier, boiler	564.75	2963.7
Total				11036.4 KWH

T_S is the standard time taken for a heat of alloy

T_A is the actual time taken

T_S has been observed to be 3 hrs for the first charge and 1.5 hours for the subsequent charges and T_A has been observed to be nearly 10 hours for 3 heats. Using the above equation the loss has been calculated as 18332 kwh of electricity and 1088 Lts of L.D.O.

More number of starts from the cold furnace

It was observed that a time of two hours were spent during the study period on starting and heating the furnace from cold resulting in wastage of 1000 kwh of electricity and 48 litres of L.D.O.

Production of coarse powder

The number of heats required to be taken for the quantity of powder produced in the study period were 59. But as per the record, the actual number of heats taken are 61. This is due to production of a coarse powder, which has to be recycled. The waste on account of this reason is 932 kwh of electricity and 92 litres of L.D.O.

Energy wastage due to breakdowns

It is seen that the capacity of the drier, classifier and blender is less than the capacity of the furnaces, thus, even a small breakdown on drier, classifier and blender will result in the stoppage of the whole plant, thereby, causing energy loss as the metal has to be kept in the furnaces and cannot be taken to further operations. However, when there is breakdown in the furnace or any of the pumps or other equipment associated with melting, atomising and pumping of slurry, the energy loss will be restricted to only that equipment which is directly used for these operations. Based on this logic, the energy loss has been calculated and shown in Table 7.

Thus total wastage of energy and fuel oils are:-

(a) Due to holding of prepared alloy

Electricity = 18332 KWH

L.D.O = 1088 Lts

(b) More number of starts from cold furnace

Electricity = 1000 KWH

L.D.O = 48 Lts

(c) Production of coarse powder

Electricity = 932 KWH

L.D.O = 92 Lts

(d) Energy wastage due to breakdowns

Electricity = 11036.4 KWH

Total wastage due to above factors = 31300.4 kwh of electricity and 1228 litres of L.D.O.
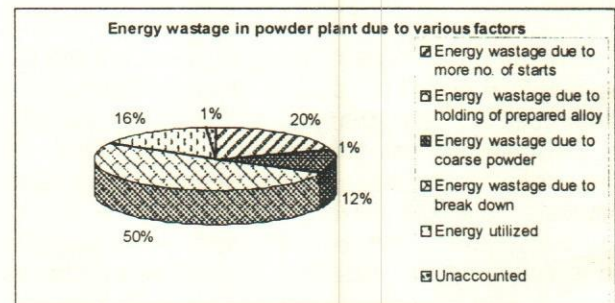
Fig. 3

Thus, total unaccounted wastage is

Electricity = 14530 kwh

L.D.O = 1772 Litres

Table 8: Energy Consumption in Sinter Line

S. No. (A)	Main Area (B)	Equipment (C)	K.W. (D)	Running Time Per Min. (E)	Running Time (F)	Total Consumption (D × F)
1.	Degreasing and Sanding	Degreasing Equipment	50.87	0.082 Mt.	41 Hrs.	2086
2.	Sinter Line	Sinter Line	180.0	33 Inch./Min.	248 Hrs.	44640
3.		Equipment Runs Intermittently				
		(a) Loop Hoist	10.5	–	40 hrs.	420
		(b) Cooling Tower	22.5	–	200 hrs.	4500
		(c) Slitting Machine	22.5	–	200 hrs.	4500
	Total					56146 KWH

This unaccounted wastage may be because of transmission losses, weighing losses, spillage and other smaller reasons. The pie diagram pictorially depicts the percentage wastage of electricity due to various reasons, on the powder plant.

Sinter Line

Total Energy consumption on sinter line (as per Table 5) is:

Electricity = 80197 kwh

N_2H_2 = 7856 Kg

Strip made on Sinter Line = 42694 (m) (From Table 2)

Strip rejected during subsequent operation = 600 metres

Energy consumption on productive operations has been calculated using the (iv) equation

$$EC_{SL} = Wt_i \times T_i \qquad \text{...(iv)}$$

Where EC_{SL} is energy consumption on productive operations on the sinter line

Wt_i is the wattage of the ith equipment in use on the sinter line

T_i is the time for which ith equipment was used on productive operations for the study period. Wattage of the equipment has been found from the catalogues of the equipment and running time equipment. The calculations are shown in Table 8.

Wastage of Energy on Sinter Line

Actual consumption	= 80197 KWH	(From Table 5)

Calculated consumption	= 56146 KWH	(From Table 8)
Difference (Waste)	= 24051 KWH, 30%	
Similarly, calculated consumption of N_2H_2	= 18.8 Kg per hour × 223 Hrs	= 4192 Kg
Actual Consumption during the study period as per records	= 7856 Kg.	
Wastage	= 3664 Kg (46%)	

Reasons and Areas of Wastage

Energy wastage in sinter line has been due to poor/unacceptable quality of bonding achieved. This is happening due to moisture in the air, which affects the bonding properties of the strip. It was observed that for nearly 20% of the running time the sinter line equipment was in use but production was halted because of quality problems.

Machine Shop

Energy input = 98873 KWH (From Table 5)

Output of finished products = 839836 (From Table 3)

Rejected Blanks = 207660 (From Table 3)

Total Input = 7441792 (From Table 2)

Energy consumption on productive operations in the machine shop is calculated using equation (v):

$$EC_{MS} = Wt_i \times N_i \times TS_i \qquad \text{... (v)}$$

Table 9: Energy Consumption in Machine Shop

Operation	Number of Operations	Time of 1 Operation. (min.)	Total Time	K.W. of Machine	Total Energy
Blanking					
a) 200T	417033	0.029	201	24	4824
b) L2PO1 (25T)	289198	0.087	419	17.25	7233
c) L3P10	289162	0.030	144	17.25	2484
Drilling	895393	0.065	970	0.75	727
Forming					
a) 40T	61808	0.043	45	2.25	99
b) L2PO4	232225	0.031	120	17.25	2070
Facing & Chamfering					
a) FO3	100430	0.072	120	6.75	810
Coining					
a) PO4	257893	0.075	322	15.75	5077
Lip Punching					
a) L2PO1	244880	0.044	179	3.75	671
Lip Milling					
a) MO3	73087	0.092	112	3.75	420
Grooving					
a) FN3	81163	0.092	124	9.75	1213
Hole Punching	71859	0.065	78	3.75	293
a) L1 PO1 (25T)					
Counter Sunking (DOl)	41554	0.065	45	3.75	169
Grinding (CL01)	242826	0.056	226	7.02	1587
HT Broach (H01)	214092	0.065	232	5.71	1325
ID Broach (IO1)	242282	0.065	262	3.84	1006
Notching (M01)	72130	0.099	152	3.75	570
Shear Broach (S01)	5945	0.065	6.44	7.50	48
Total					30626

Where ECMS is the energy consumption on productive operations in the machine shop.

Wti is the wattage of the ith machine

Ni is the number of operations carried out on the ith machine

TSi is the standard time of ith machine.

The calculation of energy consumption in the machine shop using the above equation has been shown in Table 9. As depicted in the table, the gross energy consumption on productive operations by major equipment is 30626 kwh. If we also include consumption by some smaller equipment like inspection instruments, deburring grinders etc. as about 10% of the above consumption, the gross consumption will come out to be 33687 kwh.

Thus energy wastage is 98873 – 33687 = 65186 kwh of electricity (66%)

Areas of Wastage in Machine Shop

These were mainly two areas identified for excessive energy wastage in machine shops - high scrap percentage or rejected goods and running of machines when production is not being made.

(i) High scrap percentage or rejected goods

Scrap items produced during the
study period   = 207660

Table 10: Running time for various products

S.No	Product	Quantity	Qty/Lot	Time spent on one normal lot	Extra time spent on first lot	Total time spent on normal lots	No. of first lot	Total time spent on first lot	Gross time spent
	A	B	C	D	E	F	G (F/8)	H (G*E)/60	I (F + H)
1.	Straight Bearings	517864	35	1.00 min	41 min	246 hr.	31	21 hr.	267 hr.
2.	Bushes	264099							
3.	Washers	54507							
4.	Flanges	3368							
	Added up bushes, washers, flanges	321972	44	1.05 min	41 min	128 hr.	16	11 hr.	139 hr.
	Total	839836							406 hr.

Total products produced = 1047496

Scrap% = 207660/1047496 = 20%

Energy waste on production of

scrap products $= \left(\dfrac{207660}{1047496}\right) \times 33687$

$= 6678$ kwh

ii) Running of machines when the production was not being made

To find out this waste, a work sampling study was

Details of Idle Time

Code	Percentage
Working	55%
Machine remain Idle (switched off)	12%
Setting of machines	6%
Waiting for material	9%
Talking to co-worker	7%
Break downs	5%
Worker absent from machine	6%
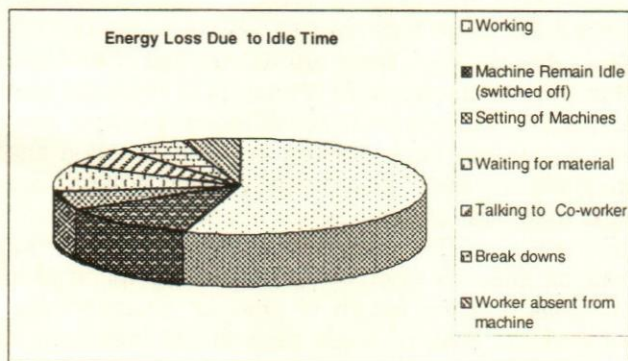
Fig. 4

conducted. The aim was to find out the time for which the machines were on but because of same reason production was not made.

Work Sampling Study in Machine Shop

For conducting a detailed work sampling study, initially a pilot study was conducted. Using the results of the pilot study, a number of observations required in the main work sampling study were calculated for a confidence level of 95%. The observations were then made and recorded on specially designed work sampling sheets. Figure 4 presents the results pictorially.

Plating Section

Energy wastage in plating has been calculated as the difference between actual energy input as per the energy meters and the calculated energy input. The calculated values have been found using equation (vi).

$$EC_{PT} = N_i \times T_i / n_i \times W_T$$

Where EC_{PT} is the energy consumption in plating

N_i is the number of products of each type (bushes, bearings, flanged bearings and washers plated)

T_i is the cycle time

n_i is the number of products plated in one cycle

W_T is the wattage of the equipment used in plating.

The calculation of running time of each piece of equipment is tabulated in Table 10.

Table 11: Energy Consumption by plating operation

S.No.	Equipment	Running Time as Fraction of Total Time	Total Running Time	K.W.	Total Kwh
(A)	(B)	(C)	(D) (406 × C)	(E)	(D X E)
1.	Water Pump Motor	2/8	101.75	5.50	559.62
2.	Hydraulic Motor	8/8	407.00	9.37	3813.6
3.	Ltc Filter	2/8	101.75	1.68	171.0
4.	Agitator Motor	4/8	203.50	1.50	305.25
5.	Cathode Rectifier-1	8/8	407.00	3.00	1221
6.	Cathode Rectifier-II	8/8	407.00	3.00	1221
7.	Hcl Rectifier	8/8	407.00	3.00	1221
8.	Nickel Rectifier	8/8	407.00	6.0	2442
9.	Ktc Rectifier	8/8	407.00	27.0	1099
10.	Tin Rectifier-I	8/8	407.00	2.00	814
11.	Tin Rectifier-II	8/8	407.00	0.75	305.8
12.	Cathode Heater	5/8	254.37	18.0	4578.66
13.	Anodic Rectifier	5/8	254.37	18.0	4578.66
14.	Nickel Heater	1.5/8	76.31	30.0	2289.37
15.	Alketine Heater	1.5/8	76.31	6.0	457.86
16.	Tin Plating Heater	1.5/8	76.31	36.0	2747.16
17.	Hot Air Blower	2/8	101.75	18.0	1831.5
18.	Hot Water Heater	2/8-	101.75	9.0	915.75
19.	Agitator Heater	2/8	101.75	9.0	915.75
	Total				41377 KWH

Further, the energy consumption in plating has been calculated using this gross plating time and the fraction for which each piece of equipment in plating was operational. The calculations are shown in Table 11.

The wattage of equipment used in calculations has been taken from the specifications and records of the equipment. Total energy consumption on plating operations as per Table 11 = 41377 kwh.

Actual energy consumption as per energy meter reading = 1,04825 kwh (From Table 5)

Wastage = 104825 – 41377
= 63448 kwh
(60.52%)

Areas of Energy Wastage in Plating Section

i) Less production per unit time.
The process of plating is continuous. There are a number of stages a 'lot' of bearings has to pass through. The design of the process is that there are as many racks available as the number of stages. At all the times the worker is removing the plated bearings and replacing them with the rack in which the bearings to be plated are put. This rack goes to the first stage and the rack, which was earlier at the last stage, would come to the worker for replacement. This way the process goes on. If sometimes the rack is not replaced then the whole process will keep running but the rack will be empty, causing waste.

ii) Plating Bath concentration is not correct it causes excessive time, poor quality or excessive scrap.

iii) Current variation during plating process causes poor quality or scrap.

iv) Defective racks which do not house the required number of products or which cause products to fall result in scraping of products and stoppage of process.

v) Deburring, degreasing and washing of bearings not done properly before plating result in poor quality or rework.

Lighting System

Lighting constitutes one of the major loads in the plant. The plant has incandescent lamps, fluorescent tube lights, mercury vapour lamps and flood lights. The unit has a total of 76.8 KW of lighting load, out of which mercury light load is 52.40 KW, the incandescent lamp load 4.2 KW, flood light load 10.0 KW and the rest 10.2 KW is tube light load. There are 100 number of 40 W tube lights and 100 number of 20 W tube lights inside the plant. Most of HPMV lamps are of 400 W. Mercury vapour lamps used to provide basic lighting in the production shed during the day and night are mostly of 400 W. It has been found that most of these lamps are switched on during working hours. The energy consumed by a lighting installation depends upon the power consumption of the luminaries and the length of time for which they are switched on. Both of these aspects are important, as changes in either will affect the energy efficiency of the installation. It is important to know the energy consump-

Table 12: Energy Consumption by Appliances

S. No.	Appliance	Location	Qty (A)	Working time (B)	K.W. (C)	Total K.W. (D) = A*C	Energy Consumption D*B*250
1.	HPMV Lamp	Shop Floor	116	15 hrs	0.40	46.4	17400
2.	HPMV Lamp	Shop Floor	24	15 hrs	0.25	6.00	2250
3.	Tube Light	Shop Floor	100	16 hrs	0.04	4.00	1600
4.	Lamp	Shop Floor	42	16 hrs	0.1	4.2	1680
5.	Exhaust Fan	Shop Floor	15	16 hrs	0.75	11.25	4500
6.	Ceiling Fan	Whole Plant	100	16 hrs	0.083	8.3	3320
7.	Power Plug	Whole Plant	7	3 hrs	2.0	14.0	1050
8.	Light Plug	Whole Plant	24	8 hrs	0.08	1.92	384
9.	Flood Light	Out door	8	16 hrs	0.5	4.0	1600
10.	Flood Light	Parking	6	16 hrs	1.0	6.00	2400
11.	Air Conditioner	Admn Block	8	12 hrs	6.25	50.0	15000
12.	UPS supply	Admn. Block	10	24 hrs	1.0	10.0	6000
13.	Tube Light	Shop Floor (80) & admn block (20)	100	16 hrs	0.02	2.00	800
	Total						57984 Kwh

tion of an existing or proposed lighting installation when considering the cost-effectiveness of measures to improve its energy efficiency. The installed lighting load should be estimated by counting the number of each type of luminaries and then multiplying by the power of the luminaries. The energy consumption has been derived from the total lighting load and the hours of use of the installation. The basic requirement of any lighting installation in a commercial building is to provide right light at the right place.

From the energy audit it was found that 20-30% of the mercury vapour lamps were on even when there was no need for supplementary lights as daylight was more than sufficient. Most of the operators were feeling uncomfortable with the lights on. Further, no identification has been provided on the switches of fans and lights. When the operator wants to switch on a particular appliance, due to lack of identification he presses a number of switches, including the one he wants to switch on. This also causes a lot of wastage. The characteristics of all existing light sources are shown in Table 13. The comparison of existing and proposed light sources is carried out in Table 14.

Potential Energy Saving Actions

A system of proposed lighting sources shown in Table 14 and compared with the existing system consumes less energy while at the same time fulfilling the illumination requirements for various areas and tasks. Table 15 shows the calculations of expected savings from the system per annum (25 working days a month for 12 months). The proposed system involves the following.

Replacement of inefficient (100 w) incandescent lamp with (40 w) compact fluorescent lamps on the shop floor

For saving energy in lighting, the existing 100w incandescent lamp can be replaced with a CFL 40w lamp. The lumen efficacy of incandescent lamp is very low as shown in Table 13. The proposed lamps will save about 80% of electricity in the concerned areas. The calculations of energy saving are shown in Table 15.

Replacement of 40W fluorescent lamps (with ordinary choke) with 36w fluorescent lamp (with electronic choke)

The lumen output of a 40W fluorescent lamp is around 2450. The 36W slim tube also has the same lumen output but it saves 4W per lamp. The 36W trulite with tri-phosphorous coating has 3250 lumen output, which would give 30% extra light. Now 28W extra slim T-5 tube lights are available in the market with a light output of 2900 lumen and longer lamp life. Replacement of 40 W fluorescent lamp with a T-5 fluorescent lamp saves around 25 W per lamp. The cost of a T-5 fluorescent lamp is very high as compared to 36W FTL. The energy saving with the proposed lighting has been calculated, as shown in Table 15.

Table 13: Characteristics of Existing Light Sources

Appliance	Location	Qty	Working Time (Hrs.)	Wattage (W)	Luminous Efficacy (lm/w)	Lamp Life (Hrs)	Temp (k)	Colour Rendition index
Incandescent Lamp	Shop Floor	42	16 hrs	100	19	1000	2700	100
Fluorescent Tube light (FTL) T-12	Shop Floor	75	16 hrs	40	70	8000	6500	85
FTL-T-12	Admn. Block	25	16 hrs	40	70	8000	6500	85
Fluorescent Tube Light	Shop Floor	80	16 hrs	20	45	8000	4100	85
FTL	Admn. Block	20	16 hrs	20	45	8000	4100	85
Flood Light	Out door	8	16 hrs	500	12	2000	3000	100
Flood Light	Parking	6	16 hrs	1000	18	2000	3000	100
HPMV Lamp	Shop Floor	116	15 hrs	400	60	15000	4100	42
HPMV Lamp	Shop Floor	24	15 hrs	250	32	10000	3900	33

Table 14: Comparison Between Existing and Proposed Light Sources

Existing Light Sources						Proposed Light Sources					
Appliance	Luminous Efficacy	Lamp Life (hrs)	Colour Temp (K)	Wattage (w)	Colour Rendition Index	Appliance	Luminous Efficacy	Lamp Life (hrs)	Colour Temp (K)	Wattage (w)	Colour Rendition Index
Incandescent Lamp	19	1000	2700	100	100	CFL (Integral Ballast)	65	10,000	2790	40	85
FTL T-12	70	8000	6500	40	85	FTL T-8	100	8000	6500	36	98
HPMV Lamp	60	15000	4100	400	42	HPMH	70	20000	6000	300	93
Flood Lights	12	2000	3000	1000	100	HPSV Lamp	110	24000	2200	500	80
FTL T-12	70	8000	6500	40	85	FTL T-5	100	8000	6000	40	85

Replacement of 400W HPMV with 300 W HPMH lamp on the shop floor

These are similar in construction to mercury lamps. The difference is in the arc tube, which contains various metal halide in addition to mercury. They are available in either clear or phosphor-coated bulbs. The addition of metal halide gases to mercury gases within the lamp results in higher light output, more lumens per watt and better colour rendition than from mercury gas alone. The proposed energy savings are shown in Table 15.

Replacement of flood lights with high pressure sodium vapour lamp

The floodlights are the incandescent lamps, which consume more energy as compared to the high pressure sodium vapour lamp. The HPSV lamp is fast becoming the most common type of outdoor lighting. It provides 90 to 150 lumens per watt and these lamps are reliable and have a long life. Their colour is a warm white and their colour rendition ranges from poor to fairly good, depending on design and intended use. Potential energy savings are shown in Table 15.

Replacement of ordinary choke with electronic choke

The power loss in copper wound chokes in a fluorescent lamp is 15w per ballast, and in a electronic choke it reduces to 1-3W. Replacement of the copper choke in a fluorescent lamp fixture can save upto 25% of the energy being consumed in the fixture.

Total expected energy savings from the above measures	= 95616 KWH
Expected monetary savings @ Rs. 3.5 per KWH	= Rs. 3,34.656

The expenditure on the proposed system is expected to be less than the savings which are expected to accrue in one year. Thus, the proposed system investment will

Table 15: Energy Consumption between Existing and Proposed Appliances

S.No.	Existing Appliances	Qty	Wattage (W)	Time of Use (Hours)	Proposed Appliance	Wattage (W)	Time of use (Hours)	Energy saving (kwh)
1.	Incandescent Lamp	42	100	4800	CFL	40	4800	12096
2.	Fluorescent tubes (T-12) FTL	100	55	4800	FTL (T-8) slim Tube	38	4800	8160
3.	Ordinary Choke	100	15	4800	Electronic choke	1-.3	4800	5760
4.	HPMV	116	400	4500	HPMH	300	4500	52200
5.	Flood Lights	6	1000	4800	High Pressure sodium vapour lamp	500w	4800	14400
	Total							95616

be paid back in less than a year and the company will save on energy expenditure for all times to come.

Recommendations for Energy Waste Reduction

There is large energy wastage in all the sub-systems of the organisation. Most of the causes of wastage pertain to lack of planning and control and human error. A better management of energy resources is expected to reduce energy losses a great deal. This will not require much of an investment in new machinery and equipment. Some specific recommendations are as under:

i. In case of a powder plant a better material planning and decision to store the finished powder in an inventory will reduce the stoppages and restarting of the equipment again and again. This is expected to save a lot of energy.

ii. General lack of awareness and concern about the usage and wastage of energy resources has been found to be one of the major reasons. Education and awareness programmes need to be conducted to promote awareness.

iii. Maintenance of process parameters has caused wastage in various sub-systems, particularly in the sinter line. Better controls must be installed and work instructions must be established and adhered to for reducing wastage.

iv. Idle running of machines must be avoided by reducing breakdowns, better material planning and a clear and efficient information system.

v. All personnel, managers, supervisors, workers and suppliers of materials etc. should be made aware and should be emotionally involved to work for reducing energy wastage.

vi. Breakdown of machinery and equipment should be avoided.

vii. There should be special incentive schemes for energy savings and these should be separate for each department.

viii. Identification facility on each switchboard should be provided so that a worker/operator switches on a particular light required by him.

To reduce scrap the following actions should be taken:-

(a) Workers should be trained and educated.

(b) All inputs of materials, tools and indirect materials should be properly checked and controlled.

(c) All system parameters should be properly maintained.

(d) Incentives should be given depending upon the scrap rate. This will help in reducing scrap in all the sections and save energy.

ix. Lights and other appliances not needed should be switched off. When daylight is enough, particularly near windows, the lights should be switched off. All appliances should be switched off when an area is not occupied. Some automatic arrangement should be made for the purpose.

x. If the lamps are removed but their ballast is not disconnected the fixture will continue to use some electricity when it is switched on. For maximum energy saving in a fixture, after delamping the ballast should also be disconnected.

xi. If lights can be controlled separately, turn off those nearest the windows whenever there is enough natural light.

xii. Lights should be turned off whenever an area is left unoccupied for any length of time. Consider using level or sign next to the light switch to

remind people to turn it off. Although the life of a lamp is shortened if it is turned on an d off frequently, it is to be remembered that the cost of the lamp is insignificant when compared to the cost of energy the lamp will consume during its life time.

xiii. Dust, grease and other dirt accumulation can absorb as much as 30% of the light from lamps and reflecting surfaces. Clean them on a regular basis.

xiv. Installation of time clocks in external lighting will switch the light on and off automatically at desired timings. Timers that are activated by photocells will automatically adjust for seasonal variations in daylight. Timers that are set by hand to operate at fixed predetermined times must be readjusted seasonally.

xv. Install dimmer switches as a different amount of light may be needed at a different time or in the whole of the plant. Dimmers help lighting level control.

Conclusions

In this study, energy audit and analysis of an auto parts manufacturing unit has been carried out. A large amount of energy wastages have been found in each sub-system, including the lighting system. The reasons and root causes of the wastages point towards lack of care and attention given to this important resource. Efficiency of equipment, particularly, in the lighting system, of course, is among the major reasons of waste but flaws in planning and control in almost all sub-systems have emerged to be significant areas of waste. The management should take action to reduce idle running, breakdowns and also improve material planning to reduce energy waste. In each area the measures to reduce waste involve doing a cause and effect analysis and then developing alternatives to remove the cause. Depending upon the prevailing conditions, constraints and limitations, the best alternative can be selected. This can be achieved by developing work instructions; displaying them and then making people adhere to them.

References

Bellarine, Arokiasway S. (1995), "Energy Management Techniques to meet power shortage problems in India", Energy conservation management, vol. 37, April.

Prasad, Reddy (1995), "Energy management and conservation strategy", Energy conservation management, vol. 37 April.

Ananthapadmanabhan (1994), "How to conduct an energy audit", Energy and fuel users, May.

Bowonder, Prasad (1996), "Energy audit in manufacturing industries", Energy conservation and management, June.

Joshi, N.M. (1996), "Energy audit and conservation in manufacturing industry and in foundries", (AICTE) counting education program.

Chakarvati, K.K. (1997), "Energy audit of arc furnace in steel foundry industry", Energy management, Oct.

Selvaraju, Alagumoort (1997), "Energy conservation and audit", Energy management, July-Sept.

Malik, T.P.S., Bali P.L. (1991), "Energy analysis of non-ferrous piston foundry", Energy management, April-June.

Chowdhury, Bhaktavatsala (1995), "Energy inefficiency of Indian steel industry", Energy conservation and management, vol. 38, March.

> *Learning to write is earning to think. You don't know anything clearly unless you can state it in writing.*
>
> — S.I. Hayakawa

New Trends in Employment Relations

R. Satya Raju, N.L. Narasimha Rao & Y.V.V.S.S.V.S. Prasad

The new economic policy announced by the Government in 1991 had far reaching implications for labour and trade unions in the country. It consolidated and reinforced the process of industrial restructuring which began in the 1980s. This primarily meant a shift in the management strategies. This article covers the issues relating to employment relations in South Asia, India and Visakhapatnam. Based on the data available from various sources, there is a change in the employment relations during the pre and post liberalised era.

R. Satya Raju is Professor, Dept. of Commerce & Management Studies, N.L. Narasimha Rao is Professor at S.D.E., and Y.V.V.S.S.V.S. Prasad is Research Scholar, Andhra University, Visakhapatnam.

The policies of the state and employment relations play a crucial role in establishing and maintaining industrial harmony. A number of factors, social, economic and political, influence employment relations. There are important tendencies in recent globalisation which affect employment. The overall rate of growth of job creation has fallen well below the rate of growth of output; unemployment in Europe and disguised or unrecorded unemployment in the US and Japan, high unemployment rates in some Asian countries, and absolute falls in aggregate employment in parts of Latin America and Africa are some other features. Technology has created different types of labour requirements. There is one set of workers involved in highly skilled professional activities in high value-added processes, whose remuneration is accordingly high and who are typically privileged to receive more permanent or secure contracts. On the other hand, there is a larger group of semiskilled or relatively unskilled workers in lower value-added activities or processes, with minimal on-the-job learning, little prospects of upward mobility, for whom job security is increasingly rare.

In India, in the pre-independence days, workers were 'hired and fired', as the principle of demand and supply governed relations. When these conditions continued despite the efforts of leaders, it paved the way for revolutionary movements. Till the end of the First World War, the trade union movement had not emerged. There were hardly any laws to protect the interests of workers except the Employers and Workmen (Disputes) Act, 1860, which was used to settle wage disputes. After the First World War, the employment relations concept assumed a new dimension. Gradually, during the last five and a half decades, in India, several changes have been introduced to maintain industrial harmony.

All over the world, industrial disputes can be observed in some form or other. The policy of the Government or attitude of the employees and employers causes conflict. An industrial dispute means cessation of work in a unit due to breakdown of understanding between workers and the employers on some issue.

The 'strikes' and 'lockouts' are two manifestations of the industrial disputes. Whereas employees of an establishment to express a grievance or to enforce a demand strike work, the lockout' represents temporary withholding of work from all or a group of employees connected with matters relating to employment or non-employment or the terms and conditions of employment. The issues relating to employment relations in South Asia, the new economic policy, employment relations in India and Visakhapatnam, are briefly presented in this write-up.

The Objective and Methodology

Research studies reveal that employment relations are highly essential for organisational success. Global organisations have been very competitive and some measures are taken by the appropriate governments to meet competition. Reduction of employment and elimination of wasteful practices and reducing costs are the strategies of several managements.

As studies on employment relations in the post liberalised environment are scant in India, this study has been undertaken with the objective of examining employment relations.

This study is mainly based on secondary sources of data. Some interviews were also conducted with the officials, employees and executives to understand the changing trends. Related literature containing reports, records, books, journals and other publications were consulted.

Employment Relations in South Asia: In Bangladesh, Pakistan, India, Srilanka, Nepal, Bhutan and Maldives (South Asian countries) similar conditions of employment relations are found. The employment relations scenario of South Asia over the past decade is quite interesting. Based on the research, the following are important observations:

- Industrialisation strategies have changed, not industrial relations policies/strategies.

- Majority of the labour force is outside the purview of a formal industrial relations system.

- Unemployment and poverty are growing. The concerns of women and child labour, environment and related matters are a source of concern that requires special attention.

- Industrial strife has not abated. In some countries such as India and Nepal, even though the incidence of man-days lost due to strikes is decreasing, the incidence of man days lost due to lock-outs is on the rise.

- Occupational safety and health issues require special attention, particularly in view of the dangers posed by new technologies, new materials and consequences of increased exploitation of natural resources without due concern for balance between nature and economic development.

- Work organisation and workplace governance, skills development and compensation practices are undergoing changes though the patterns observed in industrialised countries have not become trends except in terms of increased casualisation of labour in atypical and non-standard employment contexts.

- Decentralisation affects the actors in the industrial relations system at the national level and increases the sphere of influence at the enterprise level. The impact of new human resource policies on industrial relations deserves close scrutiny.

- The reduction of the state's role in production and distribution will have tremendous consequences for unionism, but not so much for collective bargaining. Unions are strong in the public sector, but real collective bargaining is not. Incentives to attract foreign investors have, in several cases, abridged the right to unionise and the right to strike.

- Political consensus on globalisation is still lacking, and the response of the social actors to the changes is diverse and ambiguous. The state is unable to generate political consensus among social partners.

The state is generally unable to meet the burden of transitional social costs which is slowing the pace of globalisation. If this is slowing down the pace of economic growth, too, the transitional effects could be much more devastating.

There is a changing trend in South Asian employment relations during the last three decades. During 1970-1995, the number of strikes went down drastically in India, Bangladesh, Pakistan and Nepal. Research studies reveal during the 21st century also, the number of strikes has gone down drastically in these nations. The economic reforms and new employment policies, declining strength of unions, are main reasons for the change.

Impact of New Economic Policy

The new economic policy announced by the

Government in 1991 had far reaching implications for labour and trade unions in the country. It consolidated and reinforced the process of industrial restructuring which began in the 1980s. This primarily meant a shift in the management strategies in three areas:

- To reduce permanent workforce and organise bulk of their production through ancillary units or by employing casual, contract or other forms of unprotected labour.

- To shift production facilities to backward areas where labour is both cheap and not unionised and

- To bypass unions and sign agreements with individual workers.

These new management strategies created an atmosphere of job insecurity among workers and severely curtailed their trade union activities, besides, militant unionism has discouraged firms from entering into labour intensive industries. This is evident from the fact that despite an annual growth in output of 5 percent, private sector employment remained stagnant. Following the removal of investment and import licensing which forced some discipline on unions, the number of workers grew to 10 million in 1995-96 but it remained substantially below its true potential.

In such an atmosphere strikes ceased to be a weapon in the hands of unions because employers who were keen on closing down their operations would quickly respond with a lockout. Since firms are not permitted to close down their operations even when faced with mounting losses they found this backdoor exit. This is accomplished by missing payments on the monthly electricity bills which leads to loss of electric connection and renders the firms technically inoperable.

The owner then locks the factory and the government declares them sick and refers them to BIFR. It is therefore not surprising to find a rise of lockouts from 1986. Several factors have combined to put unions on the defensive.

When the strikes were at their prime as a weapon of labour, Ross and Hartman surprised everyone by declaring that strikes may be going out of style or withering away. Basing their data on various aspects of strikes in fifteen countries including India, Ross, and Hartman came to the conclusion that there was a decreasing trend in various aspects of strikes. Though these observations appeared to be premature at that time they are proving to be prophetic in the case of India now. Strike statistics during the last one and a half decades clearly indicate that strikes may be going out of style.

Employment Relations in India

In India, overall employment growth has decelerated substantially during the last decade. As per the estimates, annual employment has grown about 1.01 per cent in the 1990s compared to the earlier 1.55 per cent. The total employment in the organised sector accounted for 279.50 lakhs in 2000 as against 263.53 lakhs in 1990. There is a significant growth in informal sector activities.

In India, there has been an improvement in the industrial relations scenario in the nineties, as compared to the eighties. The number of strikes registered declined to 665 during 1998 as against 793 during 1997. The number of lockouts also went down to 432 in 1998 from 512 in 1997. There have been a few instances of protests by workers in response to restructuring measures in the infrastructure sectors like power and ports and docks. The reduction in strikes and lockouts was more prominent in the public sector and the central sphere compared to the private sector and the state sphere. The Government's proactive role, seeking solutions through involvement of social partners in various tripartite forums for arriving at policies importing on labour interests, was responsible for bringing down the outbreak of strikes and lockouts. The mandays lost on account of strikes and lockouts has, however, increased from 17 million in 1997 to 22.1 million in 1998. Mandays lost due to strikes increased by 3.1 million whereas mandays lost due to lockouts increased by 2 million between 1997-98. In the central sphere there was a significant increase in mandays lost, by 5.48 million, over this period. In the contract, the state sphere recorded a decline of 0.75 million mandays only. The public sector revealed a trend similar to that witnessed in the central sphere, reporting to an increase in mandays lost by 5.40 million during 1998 in sharp contrast to a decline of 0.30 million reported by the private sector during the same period.

> **The reduction in strikes and lockouts was more prominent in the public sector and the central sphere**

The Second National Labour Commission Report examined the issue of changes in industrial relations in some detail. Some of its conclusions are so significant that they are worth quoting. "A review of industrial relations in the pre-reform decade (1981-90) reveals that as against 402.1 million mandays lost during the decade (1981-90), that is, in the pre-reform period, the number of mandays lost declined to 210 million during 1991 to

2000, that is, during the post-reform period. But more mandays have been lost in lockouts than in strikes…A large number of workers have lost their jobs as a result of VRS, retrenchment and closures both in the organised and the unorganised sector".

Andhra Pradesh, Tamil Nadu and Gujarat experienced maximum instances of strikes and lockouts in 1998. The industries facing the highest incidence of strikes and lockouts were coalmining, engineering and cotton textiles. Wage and wage related issues were the important reasons behind the strikes along with incidents of protests against privatisation and multinationals.

Employment Relations in Visakhapatnam

Visakhapatnam is one of the fastest growing cities in the Asian Continent. The geographical location and climatic conditions are quite interesting. It is situated in the Eastern Ghats in between latitude 17.42° N and longitude 83.2° E and located between Calcutta and Madras. It has the Bay of Bengal, Simhachalam hill range, Rushikonda, Dolphin's Nose Hills on different sides.

Streams such as Meghadrigedda, Hanumanthavaka gedda and Utagadda, which signify the beauty of the landscape of the geographical area of Visakhapatnam. It is quite interesting to observe near the harbour, three temples of the Hindus, Christians and Muslims constructed for communal peace and harmony. Visakhapatnam has different climatic conditions. The temperature goes down with the onset of the South West Monsoon and tumbles down to a mean minimum of 17.5 °C by January after which there is a severe trend till the temperature reaches a mean maximum of 40 °C by the end of May. There is an increase in population in Visakhapatnam due to industrial development. The population is expected to be about 15 lakhs by 2002.

Visakhapatnam has a large number of commercial banks, cooperative banks and some non-banking financial institutions. For instance, the city has 127 scheduled commercial banks, 12 cooperative banks, six foreign exchange branches and a few industrial financial institutions. Private financial organisations also provide financial assistance, besides the organised sector. In India, Visakhapatnam is one of the industrially developing cities having all types of infrastructure facilities, both for importing raw materials as well as exporting finished goods. So many large-scale industries like Visakhapatnam Steel Plant, Hindustan Petroleum Corporation, Coromandel Fertilizers, Bharat Heavy Plates and Vessels, L.G. Polymers, Hindustan Zinc and several other enterprises, are located here. Sixty five large and medium enterprises employed 49,107 employees and 24,786 small scale industries provided employment to 2,43,007 persons in 2002.

The number of unions registered in Visakhapatnam decreased from 62 in 1995 to 42 in 2000. During 1996, the highest number of unions got registered and gradually the number decreased. The number of registered trade unions in Visakhapatnam was 62 in 1995 and 96 in 1996. Later, it declined to 82 in 1997, 78 in 1998, 60 in 1999 and 42 in 2000. The reasons might be due to the impact of management strategies and reduced strength of the employees in the liberalised era.

> The number of unions registered in Visakhapatnam had decreased from 62 in 1995 to 42 in 2000.

The number of workers involved in strikes showed that it was the highest in 1996 and gradually reduced by 2002. In Hind Containers, the number of workers involved was 41 in 1995. During 1996, there was an industrial strike in Anakapalli Cooperative Sugars Ltd. where about 850 workers were involved in strikes while about 218 workers participated in a strike at Deccan Chronicle. About 100 workers participated in a strike at Chitivalasa Jute Mills during 1997. Over 820 workers were involved in a strike at Anakapalli Cooperative Sugara Ltd. During 1998 and 1999 strikes were recorded in L G Polymers, Gum Raghavendra Engineering Works, Alu Floride Tech and Magnare Electricals Private Ltd., Vicco Pharma and Neelankanta Cements (P) Ltd.

Most of these strikes were launched as a result of non-cooperation of the managements at the bargaining table. The duration of strikes varied from two days to 55 days in large organisations. Outside leadership played a major role in organisation of strikes. The main causes for strikes during the last three decades have been analysed. The major reasons before 1991 were protest against unilateral revision of canteen rates, intra-union rivalry, in response to national unions, non-implementation of wages and welfare facilities, etc. After 1991, the main reasons were Government policy and privatisation of public enterprises, delay in long term settlement, introducing strict norms and changing role of unions to protect the interests of union leaders.

The trends at the regional level broadly reflect the national level trends. In earlier days classic long drawn battles (strikes) were the order of the day. The 60s, 70s and early 80s witnessed such an era. In Hindustan

Shipyard which was the battleground for many such long drawn battles, strikes are conspicious by their absence. Once a veteran trade union leader, when questioned by researchers about decline in conflict, aptly summarised the situation and commented. "Well we strike work when there was plenty of work to do, now there is no work hence no scope for striking work also". In recent years the bargaining strength of the unions has been reduced as a result of several national and international management strategies adopted by various managements at different levels. Several public sector organisations are also preparing for structural changes. Hindustan Zinc Ltd., a public enterprise in Visakhapatnam has been disinvested recently. In other organisations VRS has already been implemented.

> **The bargaining strength of the unions has been reduced as a result of several national and international management strategies**

Conclusion

In view of the changes in the global economy during the last decade, some structural changes in employment and employment relations have been occurring. Reduction of permanent employment, shifting production facilities to developing areas and new recruitment practices created conflict among the employers, government and employees at various places. The role of the unions or their strength is significantly reduced during the post liberalisation period. At this crucial stage, the actors in employment relations have to play a major role for industrial harmony.

The managements of the organisations have to consider the employment changes with human face. The job is to be treated permanent and employment protection guaranteed. The policies of the appropriate governments are also to protect the employment and employment contracts. The employees and unions have to understand the changes and challenges of employment and employment conditions. They have to cooperate with the managements to introduce the necessary changes to meet the global competition and for survival.

Indian trade unions, in order to discharge their new role, must first discard their ideological baggage and unite in this hour of crisis. Over the years the labour movement is changing from craft unionism to industrial unionism to enterprise unionism. The spread of individual enterprise unionism is dangerous from the point of view of trade union unity. It becomes incumbent for national level federations to bring these unit level unions under their umbrella. The Central federations also have little chance of survival unless they start organising the unorganised sector also.

The weakening of unions seem to cause a shift from collective bargaining to individual bargaining. The unions are forced to accept a variety of trade offs between wages and job cuts in order to save companies from liquidation and preserve threatened jobs. With weakening collective bargaining, unions are left no option other than taking participation in management seriously. In the present condition, employees and managers need proper understanding and trust. Negotiation skills are highly required for both managers and workers. The HR managers have to conduct as many programmes as possible for the unions, workers and managers on the issues relating to communication skills, behavioural dimensions and negotation skills, Proactivism, collaborative and contributing attitudes are to be encouraged among the people in the organisations.

References

A Sivananthiran and C S Venkata Ratnam (1999), Globalisation & Labour Management Relations in South Asia (Edn.), ILO, SAAT & IIRA, New Delhi.

Ashok Mitra as quoted in Economic Times, 23rd July, (2000), Mumbai.

C.P. Chandrasekhar and Jayati Ghosh (2002), Regulating Labour Markets For More Employment, Business Line, 12 November.

General Manager, District Industries Centre (2002), Industrial Profile of Visakhapatnam District, Visakhapatnam.

Government of India, Ministry of Labour, (1998), "Pocket Book of Labour Statistics".

John Hoerr (1992), What should Unions do now? Reprinted by permission from Harvard Business Review in SPAN, February.

N.L. Narasimha Rao (1985), A Study on Strikes in Large Organisations, Ph.D., Dissertation, Andhra University.

R. Satya Raju (2002), "The New Role of HRM Towards Corporate Excellence", Kerala Personnel, Annual Issue.

Records of the Joint Regional Commissioner of Labour, Visakhapatnam.

Ross A. M. and Hartman P.M. (1970), "Changing patterns of Industrial Conflict", Wiley, New York.

Sarath Davala (1997), "New Economic Policy and Trade Union in Response". Labour and Unions in a period of Transition, Ed. By C.S. Venkata Ratnam et. al. Friedrich Ebert Stiftung, New Delhi.

Venkata Ratnam C.S. (1997), "Labour Management Relations in Era of Globalisation", Management & Change, Volume No.1, April.   □

Impact of Ethical Leadership on Subordinates' Work Behaviour?

Rooplekha Khuntia & Damodar Suar

The study examines whether ethical leadership at the top influences the middle-level managers' unethical practices and work behaviour. The sample comprised 340 middle-level managers from two private and two public sector manufacturing organizations who assessed their superior on ethical leadership. Irrespective of the nature of the firm and the age of the managers, the presence of an ethical leader at the top inhibited the middle-level managers' unethical practices such as manipulation and cheating. Also, an ethical superior enhanced subordinates' job performance, job involvement, affective commitment, intrinsic job satisfaction, extrinsic job satisfaction and ability to take the initiative. By and large, ethical leaders at the top inhibited unethical practices and facilitated the work behaviour of subordinates.

Rooplekha Khuntia is a Research Scholar and Damodar Suar is Associate Professor in the Department of Humanities and Social Sciences, Indian Institute of Technology, Kharagpur.

The study of leadership as a group and organizational phenomenon has been the focus of scholars from different disciplines. Though it has been extensively researched, it is less understood. Past researches have contributed to the development of various theories on leadership. 'Crises in leadership research' have been observed because researchers have not been able to link leadership to organizational and group performance (Kanungo and Conger, 2003). The newly emerged 'ethical leadership (EL)' is left inadequate by lack of empirical evidence on how it influences organizational and group performance. It is already underscored that the organization's and its leaders' unfair decisions and actions defame the company, cost hard cash, reduce share price, dampen business prospects, encourage lawsuits and ruin the business in the long-run (Becker and Fritzche, 1987). So also current business performance and organizational effectiveness depend on subordinates' work behaviour. This study, therefore, examines whether EL at the top influences the unethical practices and work behaviour of middle-level managers.

Kanungo and Mendonca (1996, 1998) have conceptualised three dimensions of EL - (a) leader's motive, (b) leader's influence strategies, and (c) leader's character. (a) On need for affiliation, ethical leaders' affiliative interest manifests itself in task-oriented interventions, providing information on efficacy, and recognizing subordinates' ability to solve problems. On need for power, ethical leaders governed by institutional power display self-discipline, emotional maturity, and arrange tasks so that followers accomplish organizational objectives. They reward followers impartially and are open to criticism and disagreement. Where need for achievement is concerned, ethical leaders, motivated by 'social achievement' rather than 'personal achievement', engage in collective activities that benefit the organization and its members. (b) Ethical leaders influence the followers through transformational mode. Leaders change the beliefs, values and behaviour of their followers so that they are consistent with the vision of the

organization. The leader articulates the vision and goals of the organization and steers the employees to accomplish these goals. The leader influences the followers through empowerment rather than control strategies. In such strategies, the leader inculcates self-efficacy beliefs by seeking followers' participation in goal-setting, problem solving and decision making, providing helpful feedback on task performance, and taking steps to remove deficiencies through coaching, counselling, training, guiding and monitoring the assigned tasks. The subordinates identify with and internalise the goal of the organization and work towards it. Gradually, subordinates develop and function as autonomous persons. (c) Ethical leaders transform themselves habitually, incorporating moral values in their character that become worthy of emulation by their followers. Their characters exhibit commitment to a higher purpose, prudence, pride, patience, persistence and perspective. Blanchard and Peale (1988) suggest these as the six principles of ethical power. Researchers mention other virtues of ethical leaders such as integrity, determination, fairness, honesty, humility, tolerance, enthusiasm, courage and responsibility (Guillen and Gonzalez, 2001; Solomon, 1999).

An unethical executive can have as much corroding influence on the firm as much as the positive influence that an ethical chief has on the entire firm. The superior provides the criteria within which business decisions are made and activities are considered. The perceived behaviour of superiors is found to be an important factor influencing unethical decisions of MIS professionals (Vitell and Davis, 1990) and ad agency managers (Chonko, Hunt and Howell, 1987) because subordinates look upon their supervisors as social models of acceptable behaviour (Falkerberg and Herremans, 1995; Nielsen, 1989). Hongkong and US managers have ranked the behaviour of superiors as the most influential determinant of ethical behaviour (Dolecheck and Dolecheck, 1987). Posner and Schmidt's survey (1982) reported that while 80% of their respondents believed that their organizations were guided by highly ethical principles, the conduct of leaders was the important factor in reducing the unethical behaviour of the led. In making decisions, an ethical leader assesses the situation, the problem, and the consequences of her/his decision on others in the light of moral standards. S/he adheres to fair and just means in the pursuit of the goal even at great personal risk and sacrifice. Considering 30 years of replicated findings, it is reasoned that employees depend upon supervisors to be the exemplar of appropriate daily organizational conduct. Even in the presence of formal ethics, policies and procedures, subordinates do what they see their supervisors do rather than adhere to companies' policies and procedures (Andrews, 1989).

Based on these findings, it is conclusive that an ethical leader at the top can significantly reduce unethical practices of immediate subordinates. Moreover, the virtues and motives cultivated by ethical leaders at the top will induce similar ethical behaviour among the immediate subordinates.

> **Employees depend upon supervisors to be the exemplar of appropriate daily organizational conduct.**

Work performance is found to be associated with the leader who seeks subordinates' participation (Jenkins and Lawler, 1981; Singh, 1982), who is employee-oriented or democratic (Habibullah, 1980; Hoque, 1998; Sharma, 1989; Welch and LeVan, 1981) and with whom subordinates feel satisfied. Because the ethical leader empowers the subordinates through coaching, training, counselling and seeking their participation in goal-setting, problem solving and decision making, and because s/he looks to the welfare of the subordinates, such a leader is likely to enhance subordinates' work behaviour.

Previous studies on leadership have been conducted on different levels of managerial hierarchy (Sinha, 1995). This study focuses on middle-level managers. Top-management goals, policies and strategies are concretised for action at the middle-level, and corresponding actions are realised through bottom-line managers and workmen. Middle-level managers deal with breakdown in normal flow of work and ensure the smooth functioning of the organization. Their behaviour is crucial for the effective functioning of the organization.

The nature of the organization (private vs. public) and the age of the employees are likely to influence unethical practices and work behaviour. Public sector organizations derive power from state or political bodies and meet the long-range interests and needs of the public. They operate in an environment of red-tapism and bureaucratic nepotism (Petrick and Quinn, 1997). Contrarily, private sector companies have a constant drive to meet the demands of the consumers. They operate in an intense competitive environment and try to beat their competitors. Their survival depends on retention of market share along with profit maximization. They are sensitive and respond quickly to the changing business environment (Petrick and Quinn, 1997). Sinha (1990, pp.199-200) studying the work culture in private (including a fertilizer cooperative) and public sector companies in India found two distinct cultures. In a soft

work culture, with pliant management of public sector, employees engaged in non-work activities, social-personal interests, did not work hard, did not have a positive effect for work, and maximized personal gains. The managerial policies, practices, and philosophy were more liberal. The opposite existed in the private sector, the synergetic work culture with assertive and people-oriented management. Given these findings, the unethical practices of employees are likely to be less and work attitudes are likely to be more favourable in private than in public sector companies.

As age increases, employees become more ethical (Mudrack, 1989; Deshpande, 1997). Younger employees tend to have a more liberal view and older employees a more adamant view on unethical practices (Brenner, 1988). Older employees, by virtue of their longer tenure, are more exposed to the norms in the organization and are aware of the adverse consequences of unethical practices (Lerner, 1980) that reinforce them to be ethical. Because they have financial security and are settled in their jobs, they are less likely to engage in unethical practices that could jeopardize their security (Serwinek, 1992). Older employees were found to be better performers (Waldman and Avolio, 1986), more committed (Meglino, Ravlin and Adkins, 1989; Sayeed, 2001) and more satisfied with their jobs (White and Spector, 1987) than younger employees. Based on this discussion, we intend to control the confounding effects of type of organization and age on unethical practices and work behaviour, and propose the following hypothesis:

H1: An ethical leader at the top would decrease unethical practices and enhance the work behaviour of the immediate subordinates.

> Younger employees tend to have a more liberal view and older employees a more adamant view on unethical practices.

Method

Sample

Permission to collect data was sought from the authorities of two public sector and two private sector manufacturing industries located in eastern India. Four hundred middle-level managers from the rank of assistant/senior managers were selected randomly for the study. They were approached individually and briefed about the purpose of the study. They were given the questionnaires, assured complete anonymity of their responses, and requested to return the filled-in questionnaires within a fortnight. The questionnaires were collected personally. It resulted in the return of 340 (85%) completed questionnaires. There were a few female executives in such organizations and they were excluded from the sample to avoid contamination of results by sex differences.

The sample comprised 152 middle-level managers from two private sector and 188 middle-level managers from two public sector companies (Table 1). Almost all had nuclear families. Barring three widowers and two unmarried persons in private sectors and 15 unmarried persons in public sectors, the rest were married. The managers in private sector were a little older than their counterparts in the public sector companies; they had a higher basic salary, but had less years of formal education than the managers in public sector companies. However, managers from both the sectors did not differ in the length of their service in their present organizations.

Measures: The questionnaire included measures of ethical leadership, unethical practices, performance, involvement, commitment, job satisfaction and taking initiative along with the socio-demographic variables on age, education, length of service, salary, number of promotions, and family members.

Ethical Leadership: EL was assessed on 22 items. It included four items from the multifactor leadership questionnaire (Bass and Avolio, 1996), five items from the leader's style scale (Sinha, 1987) and the rest were developed. All items were positively keyed. Response descriptions against items were given on a five-point Likert-type scale - 'never' (1), 'rarely' (2), 'sometimes' (3), 'usually' (4), and 'always' (5). Middle-level executives were asked to indicate to what extent each statement was true regarding their immediate superior. Scores on the items were analysed using exploratory factor analyses and rotated through varimax procedure. It ascertained the existence of two factors that explained 58.68% of total variance. The first factor, containing 12 items, incorporated the influence strategy of EL and was renamed as 'empowerment' with an alpha reliability of .95. The second factor, having 10 items, was 'motive and character' and its alpha reliability was .90. High scores indicated more empowerment and high motive and character (see Appendix 1).

Unethical Practices: Fourteen items were taken from Newstorm and Ruch (1975), and Jones (1990) scales and three items were developed to assess unfair and wrong practices. Response categories against each item were on a six-point Likert-type scale ranging from 'not at all acceptable' (1) to 'all the time acceptable' (6). The scores on the items were factor analysed using the

Table 1: Sample Characteristics

Characteristics	Sector						
	Private		Public		Total		
	M	SD	M	SD	M	SD	t
Age	39.65	7.60	37.75	6.65	38.60	7.14	2.42*
Length of Service	13.63	7.82	13.05	6.67	13.31	7.20	0.72
Basic Pay (in Rs.)	12,175.07	2281.92	9,193.22	2223.45	10,526.28	2692.75	12.12***
Years Studied	16.61	1.34	17.90	1.41	16.87	1.40	-3.25***
Number of Promotions	1.91	2.04	3.12	1.52	2.61	1.88	-6.35***
Number of Family Members	4.44	1.49	3.96	1.39	4.17	1.46	3.06**

* p .05. ** p .01. *** p .001.

principal component method and rotated through varimax procedure. Three factors were extracted that explained 56.85% of total variance. The first factor loaded significantly on nine items and was 'manipulative and expedient behaviour'. Sample items include, "Giving/accepting gifts in exchange for preferential treatment" and "Falsifying time/quality reports". The second factor, containing five items, was 'cheating in performance and misuse of finance'. Sample items include, "Taking longer time than necessary to do a job" and "Padding an expense account". The third factor, containing three negatively keyed items, was 'violation of organizational norms'. Sample items include, "Being very secretive about organization's sensitive information" and "Sticking to organization's rules and policies". The alpha reliability for manipulative and expedient behaviour was .89, for cheating in performance and misuse of financial resource it was .82, and for violation of organizational norms it was .51. High scores indicated high value for each variable.

Job Performance. Job performance was measured through seven items - taking decisions, meeting deadlines, producing satisfactory quality of work, producing satisfactory quantity of work, planning and organizing work, facing conflict situations, feeling confident enough to handle the job - of Abrainis's (1985) job performance scale. The response categories against each item were given on a five-point Likert-type scale - very poor (1), poor (2), neither poor nor well (3), well (4), very well (5). When scores on the scale were factor analysed using the principal component method, one factor emerged that explained 49.77% of total variance. The alpha reliability of the scale was .82. High scores indicated high performance.

Job Involvement. Six items were taken from Lodhal and Kejner's (1965) job involvement scale. Response descriptions against each item were given on a four-point Likert-type scale ranging from 'strongly disagree'

(1) to 'strongly agree' (4). All the items were positively keyed. Sample items include, "Most of my interests are centred around my job", and "I like to be absorbed in my job most of the time". When scores on the items were factor analysed using the principal component method, one factor emerged that explained 46.16% of total variance. The alpha reliability of the scale was .76. High scores indicated more involvement.

Organizational Commitment. Eight items were taken from Mowday, Steers and Porter's (1979) scale to measure organizational commitment. Response categories against each item were on a five-point Likert-type scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). When scores on the items were factor analysed using the principal component method and rotated through varimax procedure, two extracted factors explained 48.60% of total variance. The first factor, named 'affective commitment' contained five items and its alpha reliability was .66. Sample items include, "I am proud to tell that I am a part of this organization" and "I really care about the fate of this organization". The second factor, containing three negatively keyed items, was 'continuance commitment' with an alpha reliability of .53. Sample items include, "There is not too much to be gained by sticking with this organization indefinitely" and "Deciding to work for this organization was a definite mistake on my part". High scores indicated more affective and continuance commitment.

Job Satisfaction. Job satisfaction was measured using a fourteen-item questionnaire of Kanungo, Misra and Dayal (1975). The responses against each item were given on a five-point scale ranging from highly dissatisfied (1) to highly satisfied (5). When the scores on these items were factor analysed using the principal component method and rotated through varimax procedure, two factors were extracted that explained 49.87% of total variance. The first factor that loaded significantly on eight items was 'predominant intrinsic satisfaction'.

Table 2: Unethical Practices and Work Behaviour Against Sector and Age

Variables		Sector			Age groups in years			
		Private	Public	t	24-35	36-45	46-60	F
Manipulation	M	14.87	15.72	-1.00	16.43	14.36	16.50	3.06*
	SD	7.90	7.80		7.84	6.97	10.18	
Cheating	M	9.59	9.27	.61	9.14	9.12	11.08	3.68*
	SD	4.96	4.57		4.42	4.32	6.40	
Violation of Norms	M	6.69	7.71	-3.20***	7.28	7.30	7.04	.16
	SD	2.76	3.05		3.25	2.92	2.48	
Performance	M	29.13	27.51	4.10***	27.27	28.73	28.56	5.68**
	SD	3.09	4.01		4.22	3.77	3.31	
Job Involvement	M	18.32	17.12	3.72**	16.45	18.17	18.46	14.22***
	SD	2.99	2.93		3.22	2.74	2.73	
Affective Commitment	M	21.38	19.95	4.45***	19.56	20.99	21.38	10.27***
	SD	2.86	2.99		3.53	2.59	2.63	
Continuance Commitment	M	10.38	10.16	.69	9.51	10.71	10.28	6.11**
	SD	3.12	2.66		2.88	2.66	3.26	
Intrinsic Satisfaction	M	30.32	25.99	7.77***	26.05	28.28	30.80	14.53***
	SD	5.27	4.97	.	6.37	4.88	4.24	
Extrinsic Satisfaction	M	21.64	21.52	.29	20.63	21.62	23.48	9.85***
	SD	4.25	3.55		4.28	3.71	2.66	
Taking Initiative	M	44.25	41.21	4.21***	40.95	43.17	43.96	4.97**
	SD	6.78	6.49		8.28	5.56	6.65	

* p .05. ** p .01. *** p .001.

Sample items include, "To what extent are you satisfied or dissatisfied with... responsibility", and "... advancement". The second factor, loaded significantly on six items, was 'extrinsic satisfaction'. Sample items include, "to what extent are you satisfied or dissatisfied with...basic salary", and "... working hours". The alpha reliability of predominant intrinsic satisfaction was .86 and that of extrinsic satisfaction was .74. High scores indicated more intrinsic and extrinsic job satisfaction.

Taking Initiative. Initiative taking was measured by drawing eleven items from the checklist provided by Kelly and Caplan (1991). The response descriptions against each item were given on a five-point Likert-type scale ranging from never (1) to almost always (5). When the scores of the items on the current sample were factor analysed using the principal component method, one factor was extracted that explained 43.86% of total variance. Sample items include, "I do more than I am asked to do" and "I look for other interesting projects to work on when my present work gets closer to the finish line". The alpha reliability was .87. Higher scores indicated taking more initiative.

Results

Control Variable

Middle-level managers in the public sector violated the organizational norms more than the managers in the private sector. Managers in both the sectors endorsed manipulation, and cheating in performance and misuse of finance to the same extent. Managers in the private sector had higher performance, job involvement, affective commitment, predominant intrinsic job satisfaction and initiative than the managers in the public sector. By and large, middle-level managers in the private sector were less unethical and had more favourable work behaviour than the managers in the public sector (Table 2).

Middle-level managers belonging to different age groups differed on manipulative behaviour, cheating, performance, job involvement, affective commitment, continuance commitment, predominant intrinsic satisfaction, extrinsic satisfaction and taking initiative but not on violation of organizational norms. Post-hoc analysis using Tukey's test further confirmed that cheating in per-

formance and misuse of finance were more acceptable to the middle-level managers in the age group of 46-60 years than the same cadre managers in the age group of 36-45 years. Also, middle-level managers in the age group of 46-60 years had significantly higher involvement, affective commitment, predominant intrinsic satisfaction, extrinsic satisfaction and initiative than the same cadre managers in the age group of 24-35 years. In all the variables of work behaviour, except extrinsic satisfaction, managers in the age group of 36-45 years had significantly more positive affects for work than the managers in the age group of 24-35 years (Table 2). In the Indian employment scenario, with permanent jobs and corruption (www.transparency.org), older managers were more unethical towards the flag-end of their career to amass wealth, false reputation and happiness but had more positive work behaviour than the younger managers. These findings confirmed our assertion that the nature of the organization and the age of the managers influenced unethical practices and work behaviour.

Ethical Leadership, Unethical Practices and Work Behaviour

Top-level managers were perceived by their subordinates to be more ethical in the private sector (M = 83.18, SD = 14.17) than in the public sector (M = 74.23, SD = 17.99; t (338) = 5.04, p .001). Superiors in the private sector empowered their subordinates more (M = 46.06, SD = 8.64) and possessed more altruistic motives and moral virtues (M = 37.13, SD = 6.97) than their counterparts in the public sector (M = 41.87, SD = 10.51; t (338) = 4.03, p .001; M = 32.36, SD = 8.10; t (338) = 5.83, p .001).

To control the confounding effects of sector and age on unethical practices and work behaviour, sector as a *dummy* variable (private = 1, public = 0) and age of the managers were entered in the first step of regression analysis. The correlation between the total scores on two dimensions of EL was highly significant, r = .83, p .001; suggesting multicollinearity (Lewis-Beck, 1993; p.52). To avoid multicollinearity, in the second step, one dimension of EL was entered at a time.

Controlling the confounding effects of sector and age, when the middle-level managers perceived their immediate superior to be ethical, their unethical practices reduced considerably. The subordinates' 'manipulative and expedient behaviour', and 'cheating in performance and misuse of finance' declined in the presence of ethical superiors. Comparison of beta weights confirmed that both the dimensions of EL more or less equally decreased the two dimensions of unethical practices. However, ethical superiors could not sig-

nificantly reduce the subordinates' 'violation of organizational norms', albeit the trend was there.

> **The subordinates' 'manipulative and expedient behaviour', and 'cheating in performance and misuse of finance' declined in the presence of ethical superiors.**

Irrespective of the organization and the age of the managers, as the middle-level managers perceived their leader as ethical, their work behaviour increased accordingly. The presence of the ethical superior at the top enhanced the immediate subordinates' job performance, job involvement, affective commitment, predominant intrinsic job satisfaction, extrinsic job satisfaction and initiative but not the continuance commitment to the organization. The comparison of beta weights further ascertained that both the dimensions of EL were more or less equally responsive to facilitate work behaviour (Table 3).

Discussion

The study was conducted on middle-level managers from private and public sector manufacturing organizations. Leaders were perceived to be more ethical in the private sector organizations than in the public sector organizations. Irrespective of the nature of the firm and the age of the managers, the presence of an ethical leader at the top decreased the subordinates' unethical practices of manipulation and cheating but not the violation of norms. Also, an ethical superior enhanced immediate subordinates' job performance, job involvement, affective commitment, predominant intrinsic job satisfaction, extrinsic job satisfaction and initiative but not the continuance commitment to the organization. By and large, ethical leaders at the top inhibited unethical practices and facilitated work behaviour.

The immediate juniors or middle-level managers assessed their superiors or top-level managers on different dimensions of leadership. First, empirical evidence suggests that the individual has a tendency to over evaluate herself/himself compared to her/his peers on positive attributes and undervalue herself/himself on negative attributes (Brenner and Molander, 1977; Perloff and Fetzer, 1986). If the leaders rated themselves, they would have overestimated themselves on positive attributes. By using the rating given by the followers, this was minimised. Second, Johari Window has uncovered that in the interpersonal context, some of the attitudes, motives

Table 3: Ethical Leadership Predicting Unethical Practices and Work Behaviour

Criterion		Predictors	B,SE	B	β	R²	F
Manipulation	Step 1	Sector	-.83	.86	-.05	.003	.53
		Age	-.01	.06	-.01		
	Step 2	Empowerment	-.23	.04	-.29***	.08	9.84***
		Motive and Character	-.25	.06	-.25***	.06	7.08***
Cheating	Step 1	Sector	.20	.52	.02	.01	1.48
		Age	.06	.04	.09		
	Step 2	Empowerment	-.12	.03	-.25***	.07	8.14***
		Motive and Character	-.13	.03	-.23***	.06	6.45***
Violation of Norms	Step 1	Sector	-1.01	.32	-.17**	.03	5.13**
		Age	-.01	.02	-.01		
	Step 2	Empowerment	-.01	.02	-.06	.03	3.75*
		Motive and Character	-.03	.02	-.07	.03	3.95*
Performance	Step 1	Sector	1.49	.40	.20	.07	11.72
		Age	.07	.03	.13*		
	Step 2	Empowerment	.11	.02	.29***	.14	18.89***
		Motive and Character	.10	.03	.21***	.10	12.95***
Involvement	Step 1	Sector	1.00	.32	.17**	.10	18.82***
		Age	.11	.02	.25***		
	Step 2	Empowerment	.08	.02	.21***	.17	23.31***
		Motive and Character	.10	.02	.28***	.17	22.78***
Affective Commitment	Step 1	Sector	1.28	.32	.21***	.09	15.86***
		Age	.07	.02	.18***		
	Step 2	Empowerment	.10	.02	.32***	.18	24.96***
		Motive and Character	.12	.02	.31***	.17	23.46***
Continuance Commitment	Step 1	Sector	.15	.32	.03	.01	1.44
		Age	.03	.02	.09		
	Step 2	Empowerment	-.02	.02	-.05	.01	1.26
		Motive and Character	-.02	.02	-.05	.01	1.19
Predominant Intrinsic Satisfaction	Step 1	Sector	4.03	.55	.36***	.19	40.17***
		Age	.16	.04	.20***		
	Step 2	Empowerment	.26	.03	.46***	.39	72.26***
		Motive and Character	.30	.03	.43***	.36	62.58***
Extrinsic Satisfaction	Step 1	Sector	-.15	.41	-.02	.07	12.04***
		Age	.14	.03	.26***		
	Step 2	Empowerment	.10	.02	.25***	.13	16.14***
		Motive and Character	.14	.03	.29***	.14	18.61***
Taking Initiative	Step 1	Sector	2.77	.72	.20***	.07	13.06***
		Age	.14	.05	.15**		
	Step 2	Empowerment	.16	.04	.24***	.13	16.11***
		Motive and Character	.20	.05	.23***	.12	15.27***

* p .05. ** p .01. *** p .001.

and behaviour of the person are unknown to herself/himself but known to others with whom the individual interacts (Luft, 1961). Such unknown attitudes, motives and behaviour of the leader were tapped by taking the subordinates' assessment of their leader. Therefore, the rating of the subordinates of their leader was more authentic than the rating given by the leaders themselves for assessing EL dimensions.

> **The individual has a tendency to over evaluate herself/himself compared to her/his peers on positive attributes and undervalue herself/himself on negative attributes.**

Through empowerment strategies, the superior granted power and freedom to subordinates and enhanced their feelings of competency or self-efficacy. An ethical leader not only gave the subordinates the opportunity to grow, but also structured their roles and impelled them to work hard towards the realization of organizational goals. When the leader reposed faith in the subordinates and treated them as an integral part of the organization, it boosted their morale and zeal to work. The character and altruistic affiliation, power and achievement motives/intentions of the ethical leader were reflective of her/his concern for the organization and subordinates. That is why, the two dimensions of EL were more or less equally responsible in decreasing immediate subordinates' unethical practices and work behaviour.

Qualitative research provides the evidence that private sector companies in India have operated in a fairly competitive environment, emphasised high-task, close relationships, participation, and care for employees, whereas public sector companies have operated in a protected environment, away from market pressures, emphasised low-task, impersonal work environment, and bureaucratic set-up with too many rules and regulations for employees without actual practice (Sharma and Bhal, 2001). Such contextual factors influenced the ethical orientations, and the top-level leaders in the private sector were perceived to be more ethical than their counterparts in the public sector.

The ethical superior's concern for subordinates, altruistic motives and cultivation of moral virtues percolated down the line and reduced the manipulative and expedient behaviour of subordinates as well as cheating in performance and misuse of finance. The ethical superior significantly increased immediate subordinates' job performance, job involvement, affective commitment, predominant intrinsic job satisfaction, extrinsic job satisfaction and taking initiative but not the continuance commitment to the organization. These results have three implications. First, the ethical superior can change and mobilise the mind of subordinates to foster positive work attitudes and enhance performance. Second, the ethical superior can counter poor performance, alienation, and non-commitment that may occur because of the prevailing cultural values and group pressures, and finally align the subordinates with the organization. Third, the positive work behaviour of subordinates are preludes to the adoption of professional management practices such as quality circles, total quality management (TQM), and employee participation in management. The ethical superior can facilitate such adoption. Evidence supports the fact that ethical leaders with technical competency facilitate the implementation of TQM (Guillen and Gonzalez, 2001).

> **The positive work behaviour of subordinates are preludes to the adoption of professional management practices such as quality circles, total quality management (TQM), and employee participation.**

The presence of the ethical superior neither reduced the middle-level managers' violations of organization's norms nor enhanced their long-term continuance in the organization. Discussion with the managers during data collection revealed that the studied companies were restructuring their organizations. The middle-level managers were apprehensive of job loss in a populous country with high rate of unemployment and low opportunity for reemployment. They were under mental pressure. Moreover, the main interest of middle-level managers is professional development. They may perform their jobs well with high involvement and affective commitment, yet continuance commitment and conformation to organization's norms may not be there. Their developmental interest, long-range planning and scope for challenge may drive them to switch over to new and presumably better organizations.

The study has certain limitations that must be acknowledged. First, perceptual data have been procured through self-reported inventories that are likely to be tainted with social desirability effect. Qualitative research can be further carried out to ascertain the external validity of results. Second, the findings are obtained after studying only four manufacturing units. Caution must be exercised in generalising the findings to other organizations, particularly the service sector. Not-

withstanding the limitations, the EL at the top inhibited unethical practices and facilitated work behaviour of immediate subordinates.

References

Abrainis, D. J. (1985), "Job Stressors, Strain, Job Performance, Social Support and Social Conflict: Causal Relationship in a Four-wave Longitudinal Panel Study", Unpublished Doctoral Dissertation, University of Michigan.

Andrews, K. R. (1989), "Ethics in Practice", Harvard Business Review, 67 (5).

Bass, B. and Avolio, B. (1996), "Multifactor Leadership Questionnaire for Research", Mind Garden, Palo Alto, CA.

Becker, H. and Fritzsche D. J. (1987a), "Business Ethics: A Cross-cultural Comparison of Managers' Attitudes", Journal of Business Ethics, 6 (4).

Blanchard, K. and Peale N.V. (1988), " The Power of Ethical Management", Morrow Publishing, New York.

Brenner, O.C. (1988), "Relations of Age and Education to Managers' Work Values", Psychological Reports, 63 (2).

Brenner, S. N. and Molander, E. A. (1977) "Is the Ethics of Business Changing?", Harvard Business Review, 55 (1).

Chonko, L. B., Hunt, S. D. and Howell, R. D. (1987), "Ethics and the American Advertising Federation Principles", International Journal of Advertising, 6 (3).

Deshpande, S. P. (1997), "Managers' Perception of Proper Ethical Conduct: The Effects of Sex, Age, and Level of Education", Journal of Business Ethics, 16 (1).

Dolecheck, M M. and Dolecheck, C.C. (1987), "Business Ethics: A Comparison of Attitudes of Managers in Hong Kong and the United States", The Hong Kong Manager, (April-May).

Falkerberg, L. and Herremans, I. (1995), "Ethical Behaviour in Organisations: Directed by Formal or Informal Systems?", Journal of Business Ethics, 14 (2).

Guillen, M. and Gonzalez, T. F. (2001), "The Ethical Dimension of Managerial Leadership: Two Illustrative Case Studies in TQM", Journal of Business Ethics, 34 (3-4).

Habibullah, M. (1980), "Employee-centre Supervision and Productivity in the Jute Industry" Bureau of Business Research, University of Dhaka, Dhaka.

Hoque, M. E. (1998), "Some Correlates of Work Performance as Perceived by Industrial Workers of Bangladesh", Indian Journal of Industrial Relations, 34 (2).

Jenkins, G. D., and Lawler, E. E. (1981), "Impact of Employee Participation in Play Plan Development", Organizational Behavior and Human Performance, 28 (1).

Jones, W. A., Jr. (1990), "Student Views of "Ethical" Issues: A Situational Analysis", Journal of Business Ethics, 9 (3).

Kanungo, R. N. and Conger, J. A. (2003), "Leadership Research: Basic Assumptions, Modal Orientations and Future Directions", in J.W. Berry, R.C. Mishra and R. C. Tripathi (Eds.), Psychology in Human and Social Development (pp. 170-188), Sage, New Delhi.

Kanungo, R. N. and Mendonca, M. (1996) "Ethical Dimensions of Leadership", Sage, Thousand Oaks.

Kanungo, R. N. and Mendonca, M. (1998), "Ethical Leadership in Three Dimensions", Journal of Human Values, 4 (2).

Kanungo, R. N., Misra, S. and Dayal, I. (1975), "Relationship of Job Involvement to Perceived Importance of Satisfaction of Employee Needs", International Review of Applied Psychology, 24 (1).

Kelly, R. and Caplan, J. (1991), "How Bell Labs Creates Star Performers", Harvard Business Review, 69 (4).

Lerner, M. (1980), "The Belief in a Just World", Plenum, New York.

Lewis-Beck, M. S. (1993), "Applied Regression: An Introduction", in M.S. Lewis-Beck (Ed.) Regression Analysis (vol. 2), (pp. 1-68), Toppan Co. and Sage, Singapore.

Lodhal, T. M. and Kejner, M. (1965), "The Definition and Measurement of Job Involvement", Journal of Applied Psychology, 49 (1).

Luft, J. (1961), "The Johari Window", Human Relations Training News, 5 (1).

Meglino, B. M., Ravlin, E. C. and Adkins, C. (1989), "A Work Value Approach to Corporate Culture: A Field Test of the Value Congruence Process and Its Relationship to Individual Outcomes", Journal of Applied Psychology, 74 (3).

Mowday, R. T., Steers, R. M. and Porter, L. W. (1979), "The Measure of Organizational Commitment", Journal of Vocational Behavior, 14 (2).

Mudrack, P.E. (1989), "Age-related Differences in Machiavellianism in Adult Sample", Psychological Report, 64 (3).

Newstorm, J. W. and Ruch, W. A. (1975), "The Ethics of Management and the Management of Ethics", MSU Business Topics, 23 (2).

Nielsen, R.P. (1989), "Changing Unethical Organizational Behavior", Academy of Management Executive, 3 (2).

Perloff, L. S. and Fetzer, B. K. (1986), "Self-other Judgments and Perceived Vulnerability to Victimization", Journal of Personality and Social Psychology, 50 (3).

Petrick, J. A. and Quinn, J. F. (1997), "Management Ethics: Integrity at Work", Sage, New Delhi.

Posner, B. Z. and Schmidt, W.H. (1982), "What Kind of People Enter the Public and Private Sectors? An Updated Comparison of Perceptions", Human Resource Management, 21 (2).

Sayeed, O. B. (2001), "Organisational Commitment and Conflict: Studies in Healthy Organizational Processes", Sage, New Delhi.

Serwinek, P. J. (1992), "Demographic and Related Differences in Ethical Views Among Small Businesses", Journal of Business Ethics, 11 (7).

Sharma, D.C. (1989), "A Study of the Relationship of Organizational Climate with Organizational Commitment and Psychological Well-being", Unpublished Doctoral Dissertion, Himachal Pradesh University, Shimla.

Sharma, P. and Bhal, K. (2001), "Ethical Decision Making by Managers in Public and Private Sector Organizations", Psychological Studies, 46 (3).

Sinha, J. B. P: (1987), "Leader's Style Scale", Assert Publications, Patna.

Sinha, J. B. P. (1990), "Work Culture in the Indian Context", Sage, New Delhi.

Sinha, J.B.P. (1995), "The Cultural Context of Leadership and Power", Sage, New Delhi.

Singh, S. B. P. (1982), "A Study of Leadership Styles and Their Effectiveness", Unpublished Doctoral Dissertion, Bihar University, Muzaffarpur.

Solomon, R. (1999), "A Better Way to Think About Business: How Personal Integrity Leads to Corporate Success", Oxford University Press, Oxford.

Vitell, S. J. and Davis, D.L. (1990), "Ethical Beliefs of MIS Professionals: The Frequency and Opportunity for Unethical Behaviour", Journal of Business Ethics, 9 (1).

Waldman, D. A. and Avolio, B. J. (1986), "A Meta-analysis of Age Difference in Job Performance", Journal of Applied Psychology, 71 (1).

Welch, H. P. and LeVan, H. (1981), "Inter-relationships Between Organizational Commitment and Job Characteristics, Job Satisfaction, Professional Behaviour and Organizational Climate", Human Relations, 34 (12).

White, A. T. and Spector, P. E. (1987), "An Investigation of Age-related Factors in the Age/Job Satisfaction Relationship", Psychology and Aging, 2 (3).

Appendix 1

Item Contents and Factor Structure of EL

Items[a]	Rotated factor loadings	
	I	II
My Superior...		
(8) Protects subordinates from external criticisms.	0.64	0.38
(9) Involves subordinates in goal setting and decision making.	0.72	0.34
(10) Gladly guides and directs those subordinates who work hard.	0.73	0.38
(11) Coaches and counsels the subordinate whenever required.	0.76	0.30
(12) Works with subordinates in a satisfactory way.	0.71	0.42
(13) Appreciates those subordinates who want to perform better.	0.61	0.50
(16) Is affectionate to hard working subordinates.	0.57	0.52
(17) Encourages subordinates to take greater responsibility.	0.77	0.31
(18) Identifies the deficiency of each subordinate and provides opportunity to remove the deficiency.	0.75	0.30
(19) Gives subordinates the opportunity to try out innovative methods.	0.78	0.29
(20) Communicates and specifies in simple ways what the organization aims to achieve in future.	0.69	0.26
(21) Suggests new ways of looking at how we do our jobs.	0.57	0.55
(1) Goes out of his way to help subordinates.	0.30	0.64
(2) Moves ahead with determination amidst difficulties.	0.45	0.64
(3) Coordinates the activities of different departments to achieve organizational goals.	0.49	0.54
(4) Provides rewards and sanctions for worthwhile contribution of subordinates.	0.55	0.60
(5) Goes beyond self interest for the good of the organization.	0.39	0.60
(6) Encourages to take risk to achieve goals.	0.28	0.60
(7) Does what he/she says.	0.10	0.67
(14) Is open to criticisms and disagreements.	0.34	0.57
(15) Heightens subordinates desire to succeed.	0.54	0.57
(22) Pursues the organizational goals with single-minded devotion.	0.32	0.68
Eigenvalues	7.36	5.55
Percentage of variance	33.45	25.23

[a] The serial number of the items in the questionnaire is put in parenthesis. The first 12 items measure 'empowerment' and the last 10 items 'motive and character'.

Feature

How Green are Indian Firms?

Samir K. Srivastava & Rajiv K. Srivastava

This paper presents a snapshot view of seven firms in North India in the context of Green Supply Chain Management (GrSCM) practices. The field study focused on assessing the degree of awareness about GrSCM, firms' strategic intent and initiatives, internal environmental management systems, tools and techniques used, collaborative GrSCM efforts undertaken and finally their impacts and results. Based on the findings/ inferences and criteria suggested in literature, these firms were categorized. The emerging trends in GrSCM were analysed and their policy, managerial and research implications are presented. Finally a strategy for the Indian firms in the present scenario is suggested.

Samir K. Srivastava and Rajiv K. Srivastava are with Indian Institute of Management, Lucknow.

Objective and Methodology

The environment is no longer a not-in-my-back yard problem. Society, governments and industry are increasingly confronted with the results of our throw-away society. Deepening environmental concerns and perceptions of increased risk to health and safety of community residents from industrial activities have led to a significant increase in interest in research at the interface of environmental management and operations (Corbett et al., 2001).

In many countries, environmental protection laws, regulations and tax implications are already in place (Gungor and Gupta, 1999). In fact, environmental regulations and public pressures, coupled with economic and technological factors, have influenced industry worldwide to become more environmentally conscious and green. Manufacturers and consumers are forced to pay more attention to these issues.

However, most consumers are not prepared to pay a premium for a "green" product (Thierry et al., 1995). Similarly, the regulatory forces, too, are weak in most countries. Nevertheless, the perspective is gradually changing from greening as a burden to greening as a potential source of competitive advantage (van Hoek 1999). The role of supply chain management and its relationship to environmental programmes in organisations is in its infancy from both a research and practice perspective. Technologies, processes and methodologies to reap economic benefits of GrSCM need to be developed further.

This was the motivation to initiate a field study to find out how green are the Indian firms at this point of time and how ready are they for GrSCM. Explanatory and case-based methodology was chosen, as most of the published applications in the area of GrSCM are from Europe and the US. Though Indian context articles have been appearing in the popular press, especially regarding ISO 14001 accreditions, research-based papers and case studies are uncommon in Indian academic literature.

GrSCM Practices: Literature Survey

The meaning of "greening" is ambiguous and may imply different things to professionals in various fields (Gupta, 1996). Greening of the supply chain means simply passing on good environmental management system practices to suppliers by the end producer or primary buyer. GrSCM involves a host of issues that deal with "cradle-to-grave" management of resources and goods. Fundamentals of greening as a competitive initiative are explained in detail by Porter and Van der Linde (1995a, 1995b). Their basic reasoning is that investments in greening can be resource saving, waste elimination and productivity improvement. As a result, green initiatives can lower not only the environmental impact of a business but also raise efficiency, possibly creating major competitive advantages in innovation and operations for a firm.

Literature mentions three approaches in GrSCM: the reactive, proactive and value-seeking (Kopicki et al., 1993). The most far-reaching approach is the value-seeking approach. In this, as a strategic initiative, companies integrate environmental activities into a business strategy and operate the firm to reduce its impact on the environment. The perspective then changes from greening as a burden to greening as a potential source of competitiveness (van Hoek, 1999). Such competitiveness may be based on:

- Cost-savings realised through resource-savings;

- Leveraging innovations; or

- Creating a marketing edge by using greening as a unique selling point.

An enhanced corporate image through better GrSCM performance can be an enabler of significant synergies with plant-level productivity efforts (Chinander, 2001; King and Lenox, 2001; Klassen, 2001), as well as with increased revenues and market share (Delmas, 2001). Another aspect of GrSCM activity is product stewardship (Samir, 2001), whereby companies assist their customers in the proper use and disposal of their products.

Firms can address environmental impact right at the source and throughout the process, and migrate from low-end solutions to solutions far higher in the greening hierarchy, with a far more significant impact on greening as shown in Fig. 1. Friedman (1992), Gupta (1996) and Guide and Wassenhove (2002) discuss the changing role of the environmental manager. A company may go for various GrSCM initiatives as shown in Fig. 2. The options are only indicative and not exhaustive.
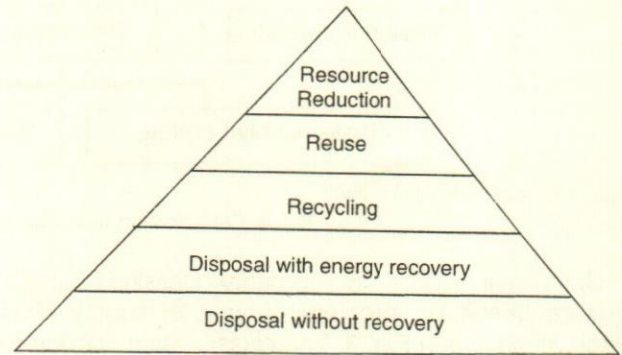
Source: Carter and Ellram, 1998

Fig. 1. Greening hierarchy

Source : Wu and Dunn, 1995

Fig. 2. GrSCM initiative options available to a company

Green Supply Chain Management

- Importance of GrSCM
- Green Operations
- Green Design

Waste Management
- Disposal
- Pollution Prevention
- Source Reduction

Green Manufacturing & remanufacturing
- Reducing
- Recycling
- Inventory Management
- Remanufacturing

Reverse Logistics & Network Design
- Production Planning & Scheduling
- Collecting
- Inspection/ Sorting
- Reuse

Green Design
- LCA
- ECD
- Pre-processing
- Location & Distribution (Network Design)

Remanufacturing
- Product and Material Recovery
  - Repair/ Refurbish
  - Disassembly
    - Disassembly Leveling
    - Disassembly Process Planning

Source : Srivastava, 2002

Fig. 3. Classification based on problem context in Supply Chain Design

Srivastava (2002) has broadly classified GrSCM literature based on problem context in supply chain design as shown in Fig. 3. The classification is done for the purpose of easier understanding of different problem contexts of GrSCM, their interactions and relationships.

Even in the global context, not many case studies about GrSCM practices have been published in academic journals, although articles appear regularly in business magazines and newspapers. Most of the case studies deal with green design (product and logistics) and green operations (remanufacturing, recycling, etc.).

Plant-level environmental management orientation and the influence of management views and plant characteristics were studied by Klassen (2001). The relationship between lean manufacturing practices and environmental performance, as measured in terms of air emissions and resource use, were examined by Rothenberg et al. (2001). They conducted two unique surveys of 31 automobile assembly plants in North America and Japan, which contain information on manufacturing practice and environmental performance, as well as in-depth interviews with plant level employees at 17 assembly plants.

In the Indian context, international clients are pressuring Indian companies into implementing environmental standards and taking a few GrSCM initiatives. Economic and technological factors too are having impact. Arvind Mills Ltd. invested in pollution control devices, and, accredited with ISO 14001 certification, satisfies their customer Marks and Spencer. In the pharmaceutical industry, Ranbaxy Laboratories reportedly decided to upgrade all its manufacturing sites to make them 'zero discharge' states after being queried by Hoechst, their buyer, on their environmental standards.

This greening of the supply chain has ramifications throughout the industry. Das (2002) highlights the importance of the role of government and business in this context. Initiatives by other companies such as Kirloskar, Maruti Udyog Ltd., Reva Electric Car Company, GAIL, ACC, etc. have been reported.

GrSCM Practices

The study presents a snapshot view of seven firms in North India in terms of GrSCM practices. The choice of the firms was mainly driven by their location and the wide spectrum they covered in terms of factors listed in

Table 1: Wide spectrum coverage of the sample firms

Firm	Size (As per industry)	Stage in Life Cycle	Type of Management Control	Level of Technology	Manpower Quality	Type of Products	Type of Processes	Customer Segments & Markets
A	Medium	Decline	Family-run	Old	Semi-skilled	Potable Spirits	Continuous	India & abroad
B	Medium	Maturity	Participative Pub. Sector	Mixed	Semi- skilled + Technical	Three Wheelers	Assembly	India & abroad
C	Small	Decline	Bureaucratic State Gov.	Obsolete	Semi-skilled + Technical	Power	Continuous	Northern Grid
D	Medium	Growth	Family-Run	Modern	Semi-skilled + Highly Specialized	Medical Super speciality	Ad Hoc (All types)	Parts of Northern India
E	Large	Growth	Professional	Modern	Semi-skilled + Technical	Automobiles	Assembly	India & abroad
F	Large	Saturation	Participative	State-of-the-art	Semi-skilled + Technical	Fertilizers	Continuous	North India
G	Small	Maturity	Missionary	Mixed	Semi-skilled + Specialised	Medical	Ad Hoc	Local City

Table 1. This method of convenience sampling adopted may not totally represent the true picture, but for the purpose of the preliminary study, serves well as a good indicator of the state of greening and the various initiatives taken by the Indian firms for getting greener. The information was obtained mainly through unstructured interviews and discussions with various management cadres and supplemented by secondary sources.

The visits mainly focused on the assessment/evaluation of greening aspects and their assessment/evaluation parameters as given in Table 2. The aim was to gauge the ground realities in India and to find out potential areas for further study and research. The field visits show that GrSCM practices are at the infancy stage in India, and except for economic forces that may lead to better profits and competitive advantage (as in reverse logistics and remanufacturing), there still are no regulatory or consumer pressures to give them a big push. Infrastructural bottlenecks further hamper these initiatives (Refer Table 3).

Categorisation of Firms Based on Literature

The visited firms were categorized by combining the developmental stages of environmental management programs suggested by Hunt and Auster (1990) and the possible strategies to integrate environmental issues with the manufacturing strategy of a company suggested by van Wassenhove and Corbett (1991). The same is shown in Table 4. It was found that firms fall under the first three stages, and that none of them qualifies for the higher fourth (pragmatist) and fifth (pro-activist) stages – the predominant stages in which most of the Western firms fall. In terms of the strategy too, follower strategy seems to be the more common one in the sample firms.

Table 2: Focus of Field Visits

GrSCM Aspect	Assessment/Evaluation Parameters
Awareness, Strategic Intent and Initiatives	Sources known/exploited for access to environmental information; Total Quality & Environment Management (TQEM) principles and their application; ISO 14000 Standard/Environment Policy Statement and its implementation; Initiatives; Changing Management; Culture and Philosophy.
Internal Environmental Management Systems	Degree of Design for Environment (DfE); Green Operations: Energy Efficiency, Pollution Prevention and Waste Minimization throughout the supply chain; Attention to environmental issues, in addition to the conventional criteria, such as time, cost and customer demand requirement in decisions related to product and process selection, layout and location, material selection, vendor selection, inventory management; Focus on Reverse Logistics.
Tools, Techniques, etc.	Various analytical tools and techniques and their frequency of usage; SWOT (Strength/Weakness/Opportunity/Threat) Analysis; Environment audit; Life Cycle Costing (LCC). Any Model(s)/Software(s) used for these?
Collaborative Efforts	Partnering with suppliers and contractors; Environmental standards/criteria or management systems for suppliers; Quantification of benefits by minimization of environmental impact of production network through cooperation and information sharing; Supplier outreach and assistance; To what extent do suppliers manage supply streams, inventories and operations?
Impacts and Results	Cost Implications: Energy Costs, Cost of Waste, Environmental Compliance Costs; Environmentally Conscious Consumer Demands; Impact on Quality, Delivery and Price.

Table 3: Findings and inferences from field visits

GrSCM Aspect	Findings/Inferences
Awareness, Strategic Intent and Initiatives	GrSCM still in infancy. Significant awareness of concept and implications through Government regulatory agencies, news items and seminars. No focused and concerted efforts for greater awareness amongst various stakeholders; Environment conscious consumer demands practically in questionnaires and surveys only. Not much strategic intent visible for getting greener. Of late, a renewed focus on greening for competitive advantages; however, focus is on specific areas of concern/perceived opportunity only.
Internal Environmental Management Systems	Firms going for ISO 14001 certification. Very genuine R&D for greening. Some breakthroughs in material substitution. Waste segregation efforts limited only to cost savings and regulatory compliance. Reverse consumption negligible. Energy costs calculated but limited focus on reducing consumption. Environment SWOT analysis generally done but Environment Impact Assessment (EIA) in most cases not done or not linked to decision-making. Policies/strategies defined or getting defined. Just-in-Time (JIT), TQEM and Total Employee Involvement (TEI) being tried successfully to a limited extent by certain firms. Remanufacturing (repair, rework, refurbish) and Reverse Logistics not explored or given adequate focus. Recycling and Reuse getting attention for economic considerations.
Tools, Technique and Models used	Simple tools and techniques, proprietary software of legacy systems for design and development. Spreadsheets and Intranet getting introduced. Unavailability of customised and cost-effective software for estimating savings. Lack of infrastructure, technology and database for LCC, EIA, Social Cost-Benefit Analysis (SCBA), etc. No Green Supply Chain Modelling.
Collaborative Efforts	To a limited extent with suppliers in product/service development. Rare instances of Supplier Managed Inventories (select categories of items) and practically no supplier managed operations (Except BOT: Build-Operate-Transfer) arrange-ments. Lack of systems, infrastructure, technology and database for collaboration, outreach and assistance with suppliers and more so with customers/consumers. Greening finds no weightage in vendor ratings.
Impacts and Results	Cost savings achieved by product or process improvements/innovations, forward and backward integration, better work practices, reduced consumption, material substitution and indigenisation. No holistic and integrated views about GrSCM. Remanufacturing and reverse logistics almost unexplored. The contributing reasons may be lax regulatory laws, the regulation- circumventing attitude of managements, inadequate environment consciousness among consumers, poor infrastructure and lack of any financial incentive.

Emerging Trends and their Implications

GrSCM involves a paradigm shift, going from end-of-pipe control to meet environmental regulations to the situation of not only minimizing ecological damage, but also increasing overall economic profit. Firms will place increasing emphasis on environmentalism and greening in the evaluation of effectiveness of business processes as this will provide them sustainable competitive advantage. Many changes in concepts, technologies and players can be expected in the years ahead. Some of the emerging trends will have important policy, managerial and research implications.

Table 4: Categorisation of Firms Visited

Firm	Categorisation
Firm A	The Beginner Stage with Follower Strategy
Firm B	The Concerned Citizen Stage with Environment-Oriented Strategy
Firm C	The Fire-Fighter Stage with Follower Strategy
Firm D	The Concerned Citizen Stage with Follower Strategy
Firm E	The Fire-Fighter Stage with Market-Oriented Strategy
Firm F	The Concerned Citizen Stage with Market-Oriented Strategy
Firm G	The Beginner Stage with Environment-Oriented Strategy

Emerging Trends

Four major inter-organisational forces will drive green supply chain management activities. These forces are governments, suppliers, customers and competitors. Globalisation, WTO requirements and depleting natural resources are likely to lead to much stricter regulations and guidelines by the regulatory authorities. The level of consumer awareness of environmental issues is increasing rapidly. This will lead to consumers' preference for green products as well as products and services from suppliers with green supply chain management processes. More sustainable products by technological innovations are likely to emerge. This, in turn, will force the supply chains to get green quickly.

The rules that govern the attractiveness of recovery/reuse of products, materials and components are undergoing changes at the local, state, national and global levels. In addition to traditional brokers, many firms are now selling this material through on-line and traditional auctions. Companies are quickly learning that reverse logistics and remanufacturing play an important role in their competitive strategy.

Major producers of virgin items, many of whom have not been particularly active in various R's (Reduce, Reuse, Rework, Repair, Refurbish, Remanufacture, Recycle) will have to increase their activities in response to public, regulatory and market forces. In many cases,

they will probably want to work in partnership or even joint ventures with entrepreneurial firms.

The policy implications relate to what the government and regulatory authorities need to do, the managerial implications relate to what the practicing managers at the industry and firm level need to do, and research implications relate to what the thinking professionals (academicians and researchers) need to do.

Implications on Government and Regulatory Authorities

The level of public perception of risk, technology and the environment needs to be increased. Various fora may be utilised for it. The government also needs to set up and spruce certain regulations to protect the environment (such as for process and product emissions). Organisations like Centre for Science and Environment (CSE), Confederation of Indian Industry (CII) and Federation of Indian Chambers of Commerce and Industry (FICCI) may be involved in terms of policy proposal formulation and feedback but it also needs the immediate attention of policy makers. Moreover, national environmental laws and regulations must be globalised (they should be in synchronisation with laws elsewhere) because our environment is a global issue rather than an individual nation's problem.

Process mapping may be done to facilitate environment audit by firms. This will help in elimination of unnecessary processes/sub-processes on one hand and improvements in environmental criteria on the other. It will also open an avenue for *Process Benchmarking*. Similarly, specific energy consumption mapping of various sectors may be done.

> **Process mapping may be done to facilitate environment audit by firms.**

Various incentives should be extended to industry consortia and firms for developing/promoting environment conscious products and processes. The resulting technological innovations will have long-term impacts on GrSCM. Industry specific and national level models may be developed for supplier managed inventories and operations and for waste segregation and recycling. These will result in enhanced co-operation and collaboration and higher efficiencies.

Implications on Industry

The industrial structure for manufacturing and re-manufacturing activities in a large country like India will have to be recognised in order to be closer to the assets in the market; this means smaller (re-) manufacturing volumes using appropriate technologies and methods such as advanced remanufacturing technologies employing higher skilled labour, the cost of which will largely be financed through the strongly reduced purchases of materials and a virtual elimination of disposal costs.

Disassembly is an important component of remanufacturing which is currently labour-intensive and expensive. There is a need to develop automated disassembly systems which may eliminate the drawbacks of manual disassembly, i.e. lengthy disassembly completion time, human exposure to possible hazards, expensive labour use, etc. The industry and academia should collaborate to come up with technological innovations to address this issue.

Effective approaches for data sharing within and across the industries need to be developed. Industry consortia may go for intra-nets. Existing networks like CII, FICCI, etc. may be utilised and the Internet may be leveraged to achieve more cooperation and collaboration.

Implications on Individual Firms

Environmental considerations can influence management decisions related to the size, location, design, or specialisation of operations of firms. The location of facilities relative to process inputs, customer markets or waste disposal locations needs to be considered both analytically and empirically. All environmental consequences of a product or a process from initial design to development phases need to be understood and analysed. Operation and maintenance systems must be improved to increase the efficiency of the materials used. Equipment design must address waste and emission management as well as disposition. Organisation culture too needs a paradigm shift and should focus on eliminating waste and look for reuse/recycling, reverse consumption and using waste as a by-product.

A management process for minimizing ecological impacts of economic production while enhancing competitiveness of firms needs to be promoted. Firms can

> **Minimizing ecological impacts of economic production while enhancing competitiveness of firms needs to be promoted.**

gain competitive advantage by managing ecological variables. The underlying imperatives driving this should be eco-efficiency and asset recovery. At a more general level, customer concerns about social responsibility must be integrated with other dimensions of value when managing suppliers and contractors.

Individual firms should develop systems for effective collaboration with suppliers and customers/consumers. They should develop integrated GrSCM models incorporating the impacts of greening on quality, delivery and price in the decision-making process.

Implications on Research

One of the biggest challenges facing the field of GrSSM is extending the historical 'common wisdom' about managing operations. Much research, management education, and practical application have focused on buffering the operation's function from external influences, including the natural environment, in order to improve efficiencies, reduce cost and increase quality. When the natural environment was considered, it was typically recognised or modelled as an external constraint, requiring operations to work within prescribed limits. Once this basic assumption is relaxed, research on green issues can be integrated into existing operations, management research frameworks and areas.

Literature on integrated business strategy (comprising product and process design, manufacturing, marketing, reverse logistics and regulatory compliance) in the context of GrSCM is at the level of thought papers and perspectives only. More integrative contributions are needed for intra and inter-firm diffusion of best practices, green technology transfer and for developing environmental performance measurement indices.

Reverse logistics costs account for a large share of the total costs. Reverse channels' membership and capabilities have a significant impact on the efficiency of recycling and remanufacturing activities. Differing product characteristics, extensive handling, and low density shipments pose considerable obstacles to establishing an efficient reverse channel for these activities. This needs to be addressed.

Although the product life cycle has been studied at great length, more research is needed to understand reverse logistics and its connection to the product life cycle. An important area for investigation would be to see how, in practice, reverse logistics activities change over the life of a particular product. Additionally, more information is needed about return levels in general: at a basic level, there is little published information on product return levels by product type. More study of the

impact of marketing on returns is needed. Theory and models need to be developed to establish the relationship between new product sales and return rates. Research is also needed to determine how companies should process, store and dispose of returned goods. Similarly, research is needed for understanding secondary markets, and how companies should best sell treated take-back products.

For successful implementation of GrSCM, it becomes imperative to develop quantitative decision tools and models. The applicability of traditional tools and models is limited because the objectives, constraints and other characteristics of the traditional systems are different from those for the GrSCM systems. Artificial intelligence techniques, including knowledge-based systems, fuzzy systems, and neural networks, are expected to play a significant role in research and development.

> **For successful implementation of GrSCM, it becomes imperative to develop quantitative decision tools and models.**

Advanced models, heuristics, tools and techniques may be developed for impact analysis, improvement analysis, substitution possibilities, material purification, customer satisfaction, product liability, consumer product safety, occupational safety and hygiene. Mathematical models for reverse logistics network design, including location and distribution of collection, inspection and sorting, pre-processing and remanufacturing centres based on forecasts of returns and changes in sales over the product's life cycle need to be developed. Easy to use, customised and cost-effective heuristics, simulation programme may be developed to calculate cost savings due to various initiatives/decisions for use at the firm level.

Although the current development in GrSCM research is encouraging, it is being conducted in clusters (mainly Europe and North America). Other geographical areas and economies, too, need to be covered. Effort must be made to make GrSCM systems profitable so that the incentive for development and planning of these systems continues.

Strategy for Indian Firms in the Present Scenario

On the basis of available literature and present trends, a three-force model have been developed for GrSCM as shown in Fig. 4. The study identified three

major forces likely to act as the key drivers for GrSCM in the coming future. These three major forces are the economic, the regulatory and the consumers. In the Indian context, the first one is rather weak and unexplored, and the rest are virtually non-existent.

A force field analysis was then carried out in the Indian context, and the same is depicted in Fig. 5. Only a firm's own innovation and improved practices act as positive forces right now. Even the stakeholders' support is neutral. The negative forces far outweigh the positive forces at present. All this needs to be taken into consideration by the Indian firms in devising their business strategies.
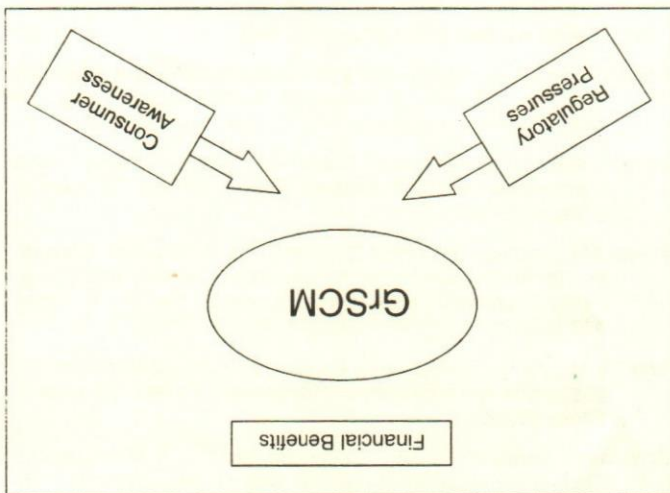
The analysis of the sample firms in terms of various GrSCM aspects shows that firms with higher level of initiatives (both GrSCM and non-GrSCM related), in general, showed better results in terms of brand equity, growing market share, resource savings and employee morale. They have better prospects of long-term sustainability and profitability. However, short-term impacts of some greening initiatives have been negative on firms' profits. Thus, in the present context, greening initiatives have to be firm-specific. All the firms do not need to get green to the same extent. The pace of greening too has to differ. A host of factors of the business environment such as the type and nature of business, the government policies and various market conditions as well as the factors listed in Table 1 would together determine the extent to which firms need to get green and also the pace at which they need to do so. They can go for various GrSCM initiative options shown in Fig. 3 as and when they find them rewarding. The "proactive" approach is likely to benefit them, but at the same time they have to ensure that they are not too ahead of their times.

Fig. 4. Three Forces Model for GrSCM

Firms with higher level of initiatives (both GrSCM and non-GrSCM related), showed better results in terms of brand equity, growing market share, resource savings and employee morale.
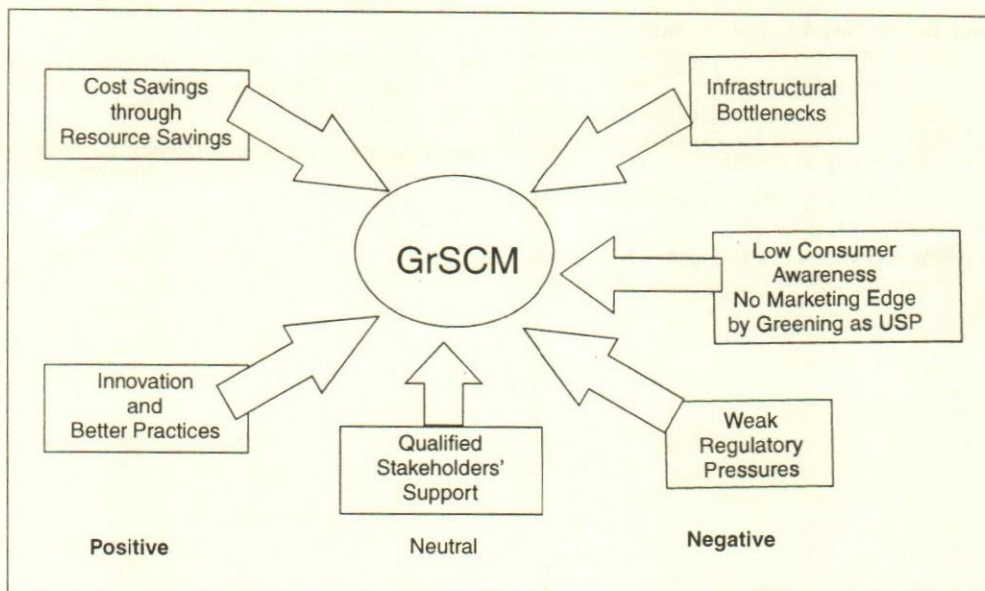

Fig. 5. Force Field Analysis of GrSCM in the Indian context

Environmental impact assessment, life cycle costing taking "cradle to grave" system into consideration and waste segregation and recycling may be incorporated in the existing decision-making models of the firms in order to become greener and sustainable for the future. Again, the weightage to these considerations in the decision models will have to be firm and industry specific.

Conclusion

GrSCM issues are gaining justifiable popularity among society governments and industry. They are mainly regulatory-driven in Europe; economy-driven in North America and at an incipient stage in other parts of the world, including India, where both consumer awareness and globalisation are likely to lead to greater economic, consumer and regulatory pressures in the future. Organisation cultures need to be changed to eliminate waste and look for reuse/recycling, reverse consumption and using waste as a by-product. Society in general, and particularly in the Indian context, is still price sensitive and to a little extent quality sensitive (quality for a given price) but not environment sensitive in its buying and promotion behaviour. Lack of incentives/disincentives from regulatory authorities and lack of pressure from prospective customers and consumers on the manufacturers/service providers are inhibiting GrSCM initiatives in India.

References

Chinander, Karen R. (2001), "Aligning accountability and awareness for environmental performance in operations", Production and Operations Management, Volume 10, Number 3, Pages 276-291.

Corbett, Charles J. and Kirsch, David A. (2001), "International Diffusion of ISO 14000 Certification", Production and Operations Management", Volume 10, Issue 3, Pages 327-342.

Delmas Magali (2001), "Stakeholders and Competitive Advantage: The Case of ISO 14001", Production and Operations Management, Volume 10, Issue 3, Pages 343-358.

Friedman F.B. (1992), "The Changing Role of the Environmental Manager", Business Horizons, Page 28.

Guide Jr. V.D.R. and van Wassenhove Luk N. (2002), "The reverse supply chain", Harvard Business Review, Volume 18, Number 2, Pages 25-26.

Gungor Askiner and Gupta Surendra M. (1999), "Issues in environmentally conscious manufacturing and product recovery: a survey", Computers & Industrial Engineering, Volume 36, Issue 4, Pages 811-853.

Gupta Mahesh (1996), "Environmental Operations Management: an opportunity for improvement", Production and Inventory Management Journal, Vol. 37, Issue 3, Pages 40-46.

Hunt C.B. and Auster E.R. (1990), "Proactive Environmental Management: Avoiding the Toxic Trap", Sloan Management Review, Volume 31, Number 2, Pages 7-18.

King A.A. and Lenox Michael J. (2001), "Lean and Green? An Empirical Examination of the Relationship between Lean Production and Environmental Performance", Production and Operations Management, Volume 10, Issue 3, Pages 244-256.

Klassen Robert D. (2001), "Plant level environmental management orientation: The influence of management view and plant characteristics", Production and Operations Management, Volume 10, Number 3, Pages 257-275.

Kopicki Ronald J., Legg L., Berg M.J., Dasappa V. and Maggioni C. (1993), "Reuse and recycling: Reverse logistics opportunities", Council of Logistics Mgmt., Oak Brook IL, USA.

Porter M.E. and van der Linde C. (1995a), "Green and Competitive", Harvard Business Review, Volume 73, Number 5, Pages 120-34.

Porter M.E. and van der Linde C. (1995b), "Toward a New Conception of the Environment-Competitiveness Relationship", Journal of Economic Perspectives, Volume 9, Number 4, Pages 97-118.

Snir Eli M. (2001), "Liability as a Catalyst for Product Stewardship", Production and Operations Management, Volume 10, Issue 2, Pages 190-206.

Srivastava Samir K. (2002), "Green Supply Chain Management: State-of-the-art study of literature and industry practices", Unpublished Dissertation, Indian Institute of Management, Lucknow, India.

Thierry M., van Wassenhove, Luk N., van Nunen, Jo A.E.E. and Salmon Marc (1995), "Strategic Issues in Product Recovery Management", California Management Review, Volume 37, Issue 2, Pages 114-135.

van Hoek, Remko I. (1999), "From reverse logistics to green supply chains", Supply chain Management, Volume 4, Number 3, Pages 129-135.

van Wassenhove L.N. and Corbett C. (1991), "How green is your manufacturing strategy?", INSEAD R&D, Working Paper No. 91/50/TM/SM.

□

Japanese Manufacturing Strategies for Indian Industries

Rambabu Kodali

Japanese manufacturing strategies have attracted the attention of industries all over the world. The perceptible impact of Japanese manufacturing strategies lies in attaining far-reaching productivity and quality standards. Attempts have been made to examine Japanese manufacturing strategies for feasibility in Indian industries. The present work describes a comparative rating model for the justification of Japanese manufacturing strategies for Indian industries.

Rambabu Kodali is Professor and Group Leader, Mechanical Engineering Group, BITS, Pilani.

The perceptible impact of Japanese manufacturing strategies lies largely in attaining far-reaching productivity and quality standards, providing business houses tremendous growth potential to meet the challenges of ever increasing market demands. After the successful emergence of Japanese manufacturers as formidable competitors in the global market, prospective Indian managers have scrutinized the factors beneath the success of Japanese manufacturers. To Japanese managers every stage of the manufacturing process - from product design to distribution - is equally important. They constantly work to improve equipment design, inventory control systems, and worker skills through cooperation at all levels. The ultimate goal is perfect products and error-free operations. The Japanese have achieved their current level of manufacturing excellence mostly by doing simple things but doing them very well and slowly improving all the time (Hays, 1981). "The nail that sticks up is hammered down", says the Japanese proverb. The effect of Japanese culture or social norms on management behaviour, the distinctive aspects of Japanese management systems, or the virtues of Japanese industrial policy have been the subject of innumerable books and articles (Peter, 1971; Peter, 1980; Peter, 1978; Byron, 1977; Richard, 1978; Howard, 1970; Erza, 1978; Erza, 1979). Here, the focus is simply on how the Japanese manage their manufacturing functions.

The most distinctive feature of Japan is the lack of natural resources, which makes it necessary to import vast amounts of materials including food. Japan is placed in a disadvantageous condition in terms of the cost of raw materials when compared to European and American countries. To overcome this handicap, it is essential for Japanese industries to put forth their best efforts in order to produce better quality goods having higher added value and at an even lower production cost than those of other countries. This was the first thing that Toyota recognised (Sugimori, 1977; Monden, 1981; Monden, 1994). The second distinctive feature is

the Japanese concept of work, such as consciousness and attitude, different from that held by the European and American workers. The Japanese traits include:

- Group consciousness, sense of equality, desire to improve, and diligence born from a long history of a homogeneous race.

- High degree of ability resulting from higher education brought by a desire to improve.

- Centering their daily living around work.

Such Japanese traits have also been reflected in the enterprises, (Sugimori, 1977; John, 1990; Peter, 1971) customs such as:

- Lifetime employment system.

- Emphasis on flow of information and initiative from the bottom up.

- Making top management the facilitator of decision making rather than the issues of edicts.

- Use of middle management as the impetus for, and shaper of, solutions to problems.

- Labour unions by companies.

- Paying close attention to the personal well-being (paternalism) of employees.

- Little discrimination between shop workers and white-collar staff. Chances available to workers for promotion to managerial positions, have been of great service in promoting the feeling of unity between the company and workers. Also, unlike European countries, Japan does not have problems of foreign workers.

Therefore, from the standpoint of labour environment, Japan is much better off than the European and American countries. In order to make full use of the Japanese advantages, it is important that the industries have their workers display their capabilities to the utmost. Most of the Japanese companies have an open-door policy, any employee has access to any manager, regardless of the chain of command. Such access is facilitated by the fact that very few CEOs of large Japanese companies have any time available for managing their companies. All their time is spent on relations, even the time spent on internal company business. They keep control of things by giving careful attention to personnel decisions in the upper ranks and by requiring meticulous financial and planning reports. But they do not "manage"- that is left to lower levels. Since these manufacturing strategies have emanated from Japan, it is believed that this system of manufacturing

excellence has deep cultural and national roots. To make Japanese methods work in Indian industries, for instance, is not only a matter of applying these techniques: much careful thought must be given to the timing and scope of what is done, and how the new methods can advance progress towards the vision of excellence. A comparative study of Japanese manufacturing strategies will help in examining the applicability of Japanese manufacturing strategies in Indian industries.

Japanese and Indian Manufacturing Strategies

It is paramount to compare Japanese manufacturing with its Indian counterpart for the better understanding of the distinction existing between them. There have been studies which have attempted to identify differences in socio-economic, quality, people, purchasing, production system and management practices of Japanese vis-a-vis traditional manufacturing practices (Prem Vrat, 1993; Leavy, 1994; Bounds, 1994; Harrison, 1992; Peratec, 1994; Korgaonkar, 1992; Ansari, 1986; Hays, 1981; Peter, 1971; Peter, 1980; Richard, 1978; Howard, 1970; Steven, 1981; Skinner, 1974; Cheng, 1993). Depending upon the circumstances, type and operations of the organisations a methodology should be developed to adopt these strategies to reap maximum benefits accrued in the novel concept of Japanese manufacturing . Priorities among feasible elements can be established to achieve the organisational goal objectively and effectively. Comparative study of Japanese and Indian manufacturing strategies is presented in Table 1.

Comparative Rating Model

Comparative rating model is a practical approach in solving relatively complex problems. Comparative rating model enables the decision maker to represent the simultaneous interaction of many factors in a complex and unstructured situation.

The steps to follow in using the Comparative Rating Model are:

Step 1. Define the problem and determine the objective.

Step 2. Identify the alternatives available.

Step 3. Determine the main attributes/criteria and sub-attributes/criteria in each main attribute/criterion that govern the problem.

Step 4. All sub-attributes/criteria are said to be the lowest level nodes and all main at-

Table 1: Comparative Study of Japanese and Indian Manufacturing
Strategies

Attributes/ sub-attributes	Japanese manufacturing strategies	Indian manufacturing strategies
1. Work force		
• Multi functional workers (Sojinka)	Flexible.	Specialized and rigid
• Attitude	Common values, facilitating cooperation.	Often divergent values, individualism sometimes hindering cooperation.
• Decision making	Collective decision making (ringi) with consensus.	Individual decision making.
	Change by consensus.	Change by edict.
	Involvement of many people in preparing and making decision.	Involvement of few people in making decision and "selling" the decision to persons with divergent values.
	Decision flow from bottom to top and back.	Decision initiated at the top, flowing down.
	Slow decision making, fast implementation of the decision.	Fast decision making, slow implementation requiring compromise, often resulting in sub-optimal decisions.
	Group activities are stressed.	Difficult to organize.
	Japanese disagree with their boss often but politely.	Indians will disagree with their boss rarely but violently.
• Willingness to change	Learn to accept.	Resistance top change.
• Loyalty	Loyal to company. Holistic concern.	Loyal to profession. Segmented concern.
• Employment	Life time employment, dedication and job satisfaction.	Short term employment, Job security prevailing.
• Job design	Non specialized carrier paths.	Specialized carrier paths.
• Training and education	Life time training.	Optimal training to meet immediate job need.
	Training and development considered long-term investment.	Training and development undertaken with hesitation.
	Broad skills.	Narrow skills.
• Motivation	Hard pace.	Easy pace.
• Continuous improvement (Kaizen)	Never rest on laurels.	Often rest on laurels.

2. Organisation		
• Organisational values and culture	Human resource management is connected with individual sense of purpose, emotions and social meanings.	Social and emotional issues are suppressed, politics and power dominates.
	Fix the problem not the blame.	Fix the blame not the problem.
	Saving face.	Fixing blame.
	Mistakes are treasures the study of which leads to process improvement.	Mistakes are inevitable and have to be inspected out.
• Enterprise unions	Labour union is not affiliated to political parties. Labour interest is foremost important during negotiations.	Labour union movement is strong with the unions having affiliation to political parties. Labour interest is subjugated by political parties.
	Union fights management.	Union fights the company.
• Industrial relations	Harmonic industrial relations.	Belligerent
• Empowerment	Employee Empowerment to take right decisions.	Total control to meet production targets.
• Organisational structure	Flat management	Tall hierarchy.
• Respect for human system	No status differentials.	Status symbol pays privilege.
	Respect to humanity and creativity.	Respect to status.
• Profit Sharing	Sharing profit with labours	Making profit for themselves
• Manpower planning	Work force is first built and workers are then placed in business hierarchy according to their abilities.	Required number of slots are created and then filled in.

3. Quality		
• Quality management	Quality is free.	It cost money to make Quality
	Quality is built in.	Quality is controlled.
• Statistical Quality control	Quality at the source is emphasised.	Inspection at large.
	Statistical study of variations to understand causes.	Scoring, reporting and evaluating.
	Process control.	Acceptance sampling.
• Total quality control	Workers are on-the-spot trouble shooters	Quality personnel responsible for quality problems.
• Total Quality management (TQM)	Planning oriented.	Control oriented.

(Contd.)

(Table 1 Contd.)

Item	Japanese	Indian
Strategic quality management	Focused on broader systems, proactive to opportunities, big breakthroughs and small steps.	Focused new product development, reactive to problems, big breakthroughs only.
Visual control	Control chart, poka-yoka system.	Only charts.
4. Plant and equipment		
Group technology (GT)	GT is highly used.	Reluctant to use.
Automation	Automation is valued because it facilitates consistent quality.	Automation is valued because it drives labour out of the product.
House keeping	5's (Seiri, Seiton, Seiso, Seketsu, and Shitsuke) are used.	Comparatively untidy and disorganised work place.
Displays	Light displays to highlight trouble spot.	Not used.
Total productive maintenance (TPM)	Prevention mentality. Preventive maintenance. Maintenance is regular, machine breakdown and tool failure must be eliminated.	Corrective mentality. Breakdown maintenance. Maintenance is done only after failure. Machine break down is not serious because of inventory.
5. Production system		
Priorities	Priorities: limited market.	Accept all orders.
Manufacturing system	Make to order. Kanban (pull system)	Made to stock. MRP (push system)
Standardisation	Standardised output	Customised output
Capacity utilisation	Capacity moderately utilised. Run equipment slow but for 24 hours. Just-in-time productions, no WIP.	Highly utilised. Run equipment fast as long as it runs. WIP is needed to ensure machine utilisation stays high.
Engineering	Incremental design simplify, design for manufacturing, standardised output.	Design from scratch, customised output.
Set-ups	Low set-up time.	High set-up time.
Layout	Flexible layout.	Rigid layout.
Material handling system	Flow: use of gravity.	Less significant.
Customisation	Material handling system: customised, state-of-art technology.	Specific, standard items available in market.
6. Inventory System		
Waste reduction	Inventory is an evil. Inventory is an evil. It hides problems that should be allowed to surface.	Inventory is an asset.
	Every effort must be extended to minimize inventory.	Inventory is useful. It makes production roll along. It protects against forecast error, machine break down, and late deliveries.
Queues	Once in motion, always in motion. Production should be just-in-time, there should be no queues of work-in-process.	Queues of work-in-process are needed to be sure that machine utilisation stays high.
Lot sizes	Keep reducing the lot size. The smallest quantity is desired for both manufactured and purchased parts.	Keep revising the optimum lot size based on some formulas.
7. Purchasing		
Small lot purchasing	Small lots.	Large batches.
Supplier-buyer proximity	Frequent deliveries.	Few deliveries.
Supplier selection	Supplier selection: long term contract.	Short term contract.
Few committed suppliers	Single source supply.	Multiple source supply.
Complimentary concern	Work together to maximize the economies of co-operation.	Reduce supplier power, widen supply base; reduce buyer power, widen customer base.
Buyer-supplier cooperation	Win-win situation.	Playing them off against each other, competitive perspective.
Buyer control over freight	Transportation mode: concern for both inbound/outbound freight.	Outbound freight.
Supplier evaluation	Supply evaluation: includes quality, delivery and price.	Mainly price.
Zero defects.	No rejects acceptable.	Some percentage rejects are permissible.
Supplier as designer.	Loose specification, emphasis on performance.	Rigid specifications, innovations are not encouraged.
8. Product and price		
Product design	Innovations. Customer oriented product.	Imitations. R & D lacking: product design depends upon what is available rather than what the customer demands.
Pricing strategy	Believe in long term gains, low profit margin, sell high volume at lower price to make high profit.	Strive for short term gain, sell at high price to make high profit.

tributes/criteria are the top level nodes. If a main attribute/criterion does not have sub-attributes, it becomes the lowest level node.

Step 5. Assign the weightages to main attributes/criteria according to the comparative rating. Comparative Rating: the attributes/criteria are first sequenced in descending order of importance. The most important attribute/criterion is rated high, say at 10. The remaining attributes/criteria are then rated relative to this. The ratings are normalized.

Step 6. Similarly, assign weightages to the sub-attributes/criteria in each main attribute/criterion. The weightages are normalised.

Step 7. Consider each attribute/criteria of the lowest level node in turn and assign a weightage (comparative rating) for each alternative.

Step 8. Evaluate net weightage as follows:

If main attribute/criteria is the lowest level node, then the net weightage is the lowest level node and is the product of weightage of the sub-attribute/criteria with the weightage of corresponding main attribute/criteria.

Step 9. Evaluate the 'Desirability Index' for each alternative as follows:

Desirability Index for each alternative =

$$\frac{\sum\limits_{\substack{\text{all lowest} \\ \text{level nodes}}} \text{Net weightage} \times \text{weightage for alternative}}{\text{Number of lowest level nodes}}$$

Step 10. Select the alternative with the highest desirability index.

A thorough analysis of the problem is required along with identification of the important attributes involved. The selection of attributes has been determined through literature survey and discussions held with experts during industrial visits. The attributes and sub-attributes used in the comparative rating model for the justification of Japanese manufacturing strategies for Indian industries are:

1. Work force   [WFO]

● Multi-functional workers   [MFW]

● Attitude   [ATT]

● Decision making   [DEM]

● Willingness to change   [WTC]

● Employment   [EMP]

● Job design   [JOD]

● Training and education   [TAE]

● Motivation   [MOT]

● Continuous improvement   [COI]

2. Organisation   [ORG]

● Organisational values and culture   [OVC]

● Industrial relations   [INR]

● Empowerment   [EMP]

● Organisational structure   [ORS]

● Respect for human system   [RHS

● Profit management   [PMT]

● Manpower planning   [MNP]

3. Quality   [QUL]

● Quality management   [QMN]

● Statistical quality control   [SQC]

● Total quality control   [TQC]

● Total quality management   [TQM]

● Strategic quality management   [SQM]

● Visual control   [VIC]

3. Plant and equipment   [PAE]

● Group technology   [GRT]

● Automation   [AUT]

● House keeping   [HOK]

● Displays   [DIS]

● Total productive maintenance   [TPM]

5. Production system   [PRS]

● Priorities   [PRI]

● Manufacturing system   [MNS]

● Standardisation   [STD]

● Capacity utilisation   [CPU]

● Engineering   [ENG]

● Set-ups   [STP]

● Layout   [LYT]

● Material handling system   [MHS]

● Customisation   [CTZ]

parative rating model are:

- A user friendly, interactive software which is menu driven

- The mode of input is direct input on the screen

- The screen input and editing are done on a clearly defined matrix. The editing can be carried out on the screen itself, thus on-line changes are possible

- Graphic display of the calculated weightages for each of the attribute and alternative allows a visual estimation of the data entered by the user. In case of a discrepancy, the user can immediately enter the edit mode, change the data and return to see the result of changes.

Table 4: Desirability Index

| Indian Manufacturing Strategies | [IMS] | 134.86 |
| Japanese Manufacturing Strategies | [JMS] | 212.53 |

Conclusions

Japanese manufacturing strategies have been proved more promising and challenging as compared to Indian manufacturing strategies (practices). It is very evident from the data that the Japanese manufacturing strategies have the larger potential to provide the competitive advantages. One case study is elucidated in order to reinforce the salient features of the concept. The obtained results are quite significant and promising. Comparative rating model is used to justify Japanese manufacturing strategies and confer the adequacy of Japanese manufacturing strategies implementation.

References

Ansari A. (1986), "Survey Identifies Critical Factors in Successful Implementation of Just-in-time Purchasing Techniques", Industrial Engineering.

Bounds G. (1994), "Beyond Total Quality Management: Towards the Emerging Paradigm", TataMcGraw Hill, Singapore.

Byron K.M. (1977), "Japanese Business Ideology and Labour Policy", Columbia Journal of World Business, Spring.

Cheng T.C.E. (1993), "Just-in-Time Manufacturing: An Introduction", Chapman and Hall, London, UK.

Erza F.V. (1978), "Guided Free Enterprise in Japan", HBR, May-June.

Erza F.V. (1979), "Japan as Number One: Lessons for America", Harper & Row, New York.

Harison A. (1992), "Just-in-time Manufacturing: An introduction", Prentice Hall Int. Ltd. UK.

Hays R.H. (1981), "Why Japanese Factories Work", HBR, July-August.

Hays R.H. (1992), "Just-in-Time Manufacturing: An Introduction", Prentice Hall Inc. Ltd., UK.

Howard F.V.Z. (1970), "How to Negotiate In Japan", HBR, Nov-Dec.

John E.R. (1990), "What makes the Toyota Production Really Tick?", IE, Jan.

Monden Y. (1994), "Toyota Production System: An Integrated Approach to Just-in-Time" Chapman and Hall, UK.

Koragaonkar M.G. (1992), "Just-in-Time manufacturing", Macmillan India Ltd, Delhi.

Leavy B. (1994), "Two Strategic Prospectives on the Buyer-Supplier Relationship", Journal of Production and Inventory Management.

Peratec E. (1994), "Total Quality Management: The Key to Business Improvement", Chapman and Hall, UK.

Peter F.D. (1971), "What We Can Learn from Japanese Management", HBR.

Peter F.D. (1978), "The Price of Success: Japan Revisited", Foreign Affairs, August.

Peter F.D. (1980), "Japan Gets Ready for Tougher Times", Fortune, pp. 1-8.

Prem Vrat (1993), "Implementation of JIT in Indian Environment: A Delphi Study", Productivity, Vol. 34.

Richard T.P. (1978), "Zen and the Art of Management", HBR.

Skinner W. (1974), "The Focus Factory", HBR.

Steven C.W. (1981), "Japan Where Operations Really are Strategic", HBR.

Sugimori Y., Kusunoki K., Cho F., and Uchikawa S. (1977), "Toyota Production System and Kanban System: Materialisation of Just-in-Time and Respect for Human System", International Journal of Production Research, Vol. 15, No. 6. ☐

The Future of Petroleum Production in Nigeria

Udosen, U.J.

This research work applies a time series analysis to historical data for prediction of petroleum production in Nigeria from 1998 to 2010. A linear regression line indicating a positive optimistic trend predicts that by 2010 Nigeria will be producing 3.5 million barrels of oil per day. With a current estimated oil reserve of 22 billion barrels, the future of oil production in Nigeria is very bright. By application of SWOT analysis, it is envisaged that for this prediction to be achieved, there should be a sustained political stability in Nigeria, adequate funding and greater participation of indigenous companies in oil exploration and production. Also, efforts should be made towards acquisition of appropriate innovative technologies in the oil industry and training of personnel. Moreover, a lasting solution should be proffered to the crises in the oil producing communities.

Udosen, U.J. is with the Production Engineering Department, University of Benin, Benin City, EDO State, Nigeria.

Petroleum prospecting or exploration began in Nigeria in 1908 by a German Company called the Nigeria Bitumen Corporation. The effort yielded no result due to the First World War in 1914, which terminated the operations. In 1937, Shell Petroleum Development Company of Nigeria (as it is now called) was granted the sole exploratory right over the entire Nigerian territory. The explosion by Shell was short lived due to interruption by the Second World War. However, Shell resumed in 1947 with the discovery of crude oil in the Oloibiri field of the Niger Delta in 1956. Production and exportation from this field commenced in 1958 with an output of about 5,100 barrels of oil per day (bpd). By 1960, production rose to 17,000 bpd.

In 1961, other foreign multinational companies, namely, Mobil, Agip, Safrap (now Elf), Tenneco (now Texaco) and Amoseas (now Chevron) were extended exploratory rights which increased the oil production to 450, 000 bpd in 1966. In 1972, the production rose to 2 million bpd, and in 1979, the production stood at 2.4 million bpd through the combined efforts of these foreign multinationals.

It is obvious that the domination of the Nigerian oil industry by foreign companies has serious economic and national security implications. Recent happenings in the world have shown that powerful nations can influence the United Nations and impose sanctions, trade embargoes, and even unilateral military interventions on less powerful countries whose policies go contrary to their economic interests. If the parent countries of all the multinationals operating in Nigeria withdrew their companies from Nigeria, the economy would grind to a halt since the country derives about 90% of its current foreign exchange earnings from petroleum exports, with the indigenous companies accounting for a paltry 2% of the total production of petroleum.

Nigeria's almost total reliance on foreign multinationals for the development of her vital resources such

as petroleum has serious implications on her economic interests. As viewed by Omu (1993), some of these implications include the following:

- Environmental hazards and consequent ecological security implication due to oil spills, gas flaring and other pollutants released into the environment. Foreign oil companies are out to maximize profits and are not interested in caring for an environment in which they have no direct stake.

- Foreign companies may not perform their petroleum production economically to optimize production, leading to rapid uneconomic depletion of petroleum, with Nigeria being the ultimate loser.

- Foreign multinationals may manipulate the host government to protect their huge investments by subversions and sponsoring of coups at any perceived threat to their interest.

- Unfair distribution of petroleum proceeds coupled with the utter neglect of the oil producing communities by the government and multinationals are bound to generate conflicts in such communities (as currently being witnessed in the Niger Delta).

Realizing the need for effective control of the oil industry due to its strategic importance to the economy, the Nigerian government, as far back as the early 1970s, made concerted efforts to acquire substantial shares and form Joint Venture partnerships with the multinationals. In 1971, the Nigerian National Oil Company (NNOC) was established which later metamorphosed into the Nigerian National Petroleum Corporation (NNPC). Attempts were made in 1968 by the Nigerian indigenous companies to participate in the exploration and production of petroleum. The first prospecting licenses were granted to Henry Stephen Petroleum and Nigerian Oil Resources. Others then followed, until in 1987 the first Nigerian indigenous petroleum producer, Dubril Oil, emerged. A year later, in 1988, the Nigerian Petroleum Development Company (NPDC) was set up, following the reorganization of NNPC. In 1990, the Nigerian Government granted additional licenses to nine new indigenous companies to prospect for oil. By 1997, some 38 local companies had been assigned oil blocks, and by the year 2000, the number was still the same.

The challenges facing oil producing companies are almost universal in nature, and the major problems include funding, community crisis, access to technological know how and skills, risks and uncertainties, instability of crude oil prices etc. The greatest challenge of the oil companies is funding. The capital intensive nature of the oil business makes funding beyond the reach of individual businessmen in Nigeria. For most oil companies, their main source of funding is through bank loans. Okereke (1999) states that the Nigerian financial sector has not joined the global trend where the finance industry is given the necessary liquidity support for financing multi-million dollar projects. Osayameh (1993) remarks that the banks' capital base in Nigeria is very low and are limited in their ability to commit long-term funds to the oil sector. According to Avulu (1997), the only viable option is external financing.

The problem of social unrest in oil-producing communities is progressively becoming a major set back impacting negatively on oil prospecting and production activities. Kalu (1993), traced this problem to environmental degradation of the host communities which involved dislocation of forestlands, rivers, streams, human settlements etc. giving rise to air, land and water pollution which affect agriculture, fishing, manufacturing, trade and other activities. Even though millions of dollars are generated daily as revenue by the oil companies, most of these communities remain without basic infrastructure. The problem is not limited to Nigeria, but in Nigeria it is taking a frightening dimension as the youths resort to hijacking of oil vessels, kidnapping company staff to disrupt oil companies operations, and demanding compensations and ransom. The consequence is colossal financial losses running into millions of dollars by the petroleum producers.

> **Even though millions of dollars are generated daily as revenue by the oil companies, most of these communities remain without basic infrastructures.**

Petroleum exploration and production in Nigeria has shifted from the traditional onshore locations to the more complex deep-sea or offshore environment, requiring the application of innovative technology. According to Onuaha (1999), only operators with the best–integrated technology could maintain a true competitive edge. The oil industry has entered an age of new realities involving additional requirements in the form of aggressive multi-disciplinary teams and the application of leading–edge technologies. There has been a rapid technological evolution in all facets of the industry with seismic technology. Straight–hole drilling operations are now supplanted by horizontal multilateral wells and an innovative laser drilling technique is already being experimented. Conventional

boreholes are now being replaced by smaller and more complex borehole geometries using coiled tubing. Only the big multinationals have the requisite capital outlay and available skilled manpower required to apply these innovative technologies.

Though the indigenous companies are not financially capable, the future of oil production in Nigeria in still very bright. According to NNPC reports (1998), the industry average cost of oil production is $3.5 per barrel of oil (pb). With current oil price hovering around $.30 pb, the industry's average profit is over $25 pd which is one of the highest in the world. There is, therefore, a need for political stability to create the necessary atmosphere needed for investment in the petroleum industry.

This paper examines the production of petroleum in Nigeria by foreign multinationals and indigenous companies together up to the year 2010 by application of time series analysis to predict the petroleum production in Nigeria from available historical data.

Methodology

The secondary data comprising annual oil production from 1961 to 1997 was obtained from NNPC Statistical Bulletin 1998, for the analysis. Various models are available for analysis of the data. These include Hubert Model, time series model, external analysis technique and SWOT analysis. Hubert (1956) developed and applied the Hubert model for analyzing and forecasting U.S. oil production trends. This model has been employed by Abdullahi (2000), to show that Nigerian oil production will drop to zero in the year 2060 by empirically fitting historical data to a symmetrical bell-shaped curve.

The purpose of analyzing data using a time series is to make short-term, medium-term or long-term forecasts from historical data, thus, enabling the management to develop a strategy or alternative strategies. Time series was employed to analyze the data collected in this work. The years are considered the independent variables (X) while the time series historical data are the dependent variables (Y). The predictions are accomplished by a trend line given by:

$$y = a + bx \qquad \qquad \text{...(1)}$$

where,

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - \left(\sum x\right)^2} \qquad \text{...(2)}$$

$$a = \bar{y} - b\bar{x} \qquad \qquad \text{...(3)}$$

and,

x   represents periods (years)

y   represents oil production (in bpd)

n   is the number of years of data collected.

External analysis looks at the industry and gives a macro view to gain future direction and opportunities in the industry by considering the following about the Nigerian Petroleum industry:

- Petroleum production history in Nigeria
- Remaining reserves potential
- Technological development
- Government policy and regulations

SWOT analysis is an acronym for Strength, Weakness, Opportunities and Threat. SWOT analysis is applied in this work to identify the factors favourable to (or adversely affecting) the operations and the viability of the Nigerian petroleum industry.

Results & Discussion

Table 1 presents the average daily oil production from 1961 to 1997 in Nigeria (as barrels per day).

Table 1: Average daily oil production in Nigeria (1961 to 1997)

Year	Daily oil output (bpd)	Year	Daily oil output (bpd)
1961	46033	1980	2055255
1962	67462	1981	1439728
1963	76475	1982	1289554
1964	120210	1983	1235547
1965	272202	1984	1387975
1966	417611	1985	1498865
1967	319324	1986	1466566
1968	141823	1987	1322976
1969	540286	1988	1340000
1970	1084482	1989	1716300
1971	1531175	1990	1726700
1972	1817713	1991	1893100
1973	2056034	1992	1957000
1974	2255673	1993	1905200
1975	1784956	1994	1770644
1976	2071198	1995	1842600
1977	2098778	1996	1863100
1978	1896628	1997	2344483
1979	2304731		

Source: NNPC Statistical Bulletin, 1998.

Table 2: Regression data generated from Table 1

Year	x	y	x^2	xy	Year	x	y	x^2	xy
1961	-18	46033	324	- 828594	1980	1	2055255	1	2055255
1962	-17	67462	289	-1146854	1981	2	1439728	4	2879456
1963	-16	76475	256	-1223600	1982	3	1289554	9	3868662
1964	-15	120210	225	-1803150	1983	4	1235547	16	4942188
1965	-14	272202	196	-3810828	1984	5	1387975	25	6939875
1966	-13	417611	169	-5428943	1985	6	1498865	36	8993190
1967	-12	319324	144	-3831888	1986	7	1466566	49	10265962
1968	-11	141823	121	-1560053	1987	8	1322976	64	10583808
1969	-10	540286	100	-5402860	1988	9	1340000	81	12060000
1970	- 9	1084482	81	-9760338	1989	10	1716300	100	171630000
1971	- 8	1531175	64	-81531175	1990	11	1726700	121	18993700
1972	- 7	1817713	49	-12723991	1991	12	1893100	144	22717200
1973	- 6	2056034	36	-12336204	1992	13	1957000	169	25441000
1974	- 5	2255673	25	-11278365	1993	14	1905200	196	26672800
1975	- 4	1784956	16	-7139824	1994	15	1770644	225	26559660
1976	- 3	2071198	9	-6213594	1995	16	1842600	256	29481600
1977	- 2	2098778	4	-4197556	1996	17	1863100	289	31672700
1978	- 1	1896628	1	-1896628	1997	18	2344483	324	42200694
1979	0	2304731	0	0					

Table 2 presents the regression data generated from Table 1. Since there are 37 years (an odd number), zero is assigned to the 19th year (1979), the middle year, -1 to the year before the middle year and +1 to the year after the middle year and numbered consecutively as given in Table 2, making the sum of x become zero $\left(\sum x = 0\right)$. Therefore, from equations 2 and 3:

$$b = \frac{\sum xy}{\sum x^2} \text{ and } a = \bar{y}$$

$$\sum y = 50958387; = \bar{y}\ 1377254 ; \sum x^2 = 4218$$

$$b = \frac{\sum xy}{\sum x^2} = \frac{285843305}{4218} = 67767.5$$

$$a = \bar{y} = 1377254$$

From the calculations the petroleum production is predicted by the trend line given as:

$$y = 1377254 + 67767.5x \qquad \ldots(4)$$

Using equation 4, the production of petroleum is predicted as presented in Table 3 from 1998 to 2010. The plot of the predictions is given in Fig. 1.

Table 3: Computation of trend values (y = a + bx)

Year	x	y = 1377254 + 67767.5x
1998	19	2664837
1999	20	2732604
2000	21	2800372
2001	22	2868139
2002	23	2935907
2003	24	3003674
2004	25	3071442
2005	26	3139209
2006	27	3206977
2007	28	3274744
2008	29	3342512
2009	30	3410279
2010	31	3478047

The projections indicate that by the year 2010, Nigeria will be producing about 3.5 million barrels of oil per day. This, of course, will depend on the stability of the demand for oil worldwide and decisions made by oil producing countries and regulatory bodies like the Or-
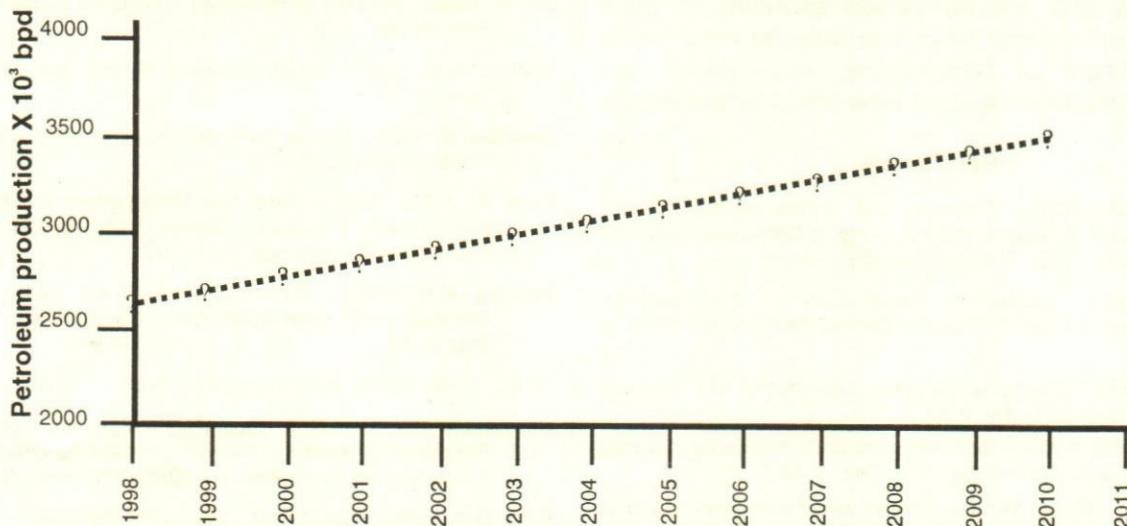
Fig. 1. Projections of petroleum in Nigeria from 1998 to 2010

ganization of Petroleum Exporting Countries (OPEC) fixing production quotas.

The challenges facing the production of petroleum in Nigeria are enormous. By application of SWOT analysis, Table 4 presents the factors which favour (or adversely affect) the operations and viability of oil exploration and production in Nigeria.

Table 4: A Summary of factors identified by SWOT

Strengths	Weaknesses
Relatively low overhead	Low acreage holding of indigenous companies
Revenue generation in hard currency	Low level of production output
	High technical production cost
Availability of seasoned indigenous manpower	Weak financial strength of indigenous companies
Opportunities	**Threats**
Should have greater participation by Nigerian companies	Declining reserves
	Wrong strategy for cost monitoring
There is at present a favourable political climate for investment and growth	Poor contract supervision and administration
	Drilling and production problems
Possibility of getting technical partners	Continuous loss of technical manpower
Availability of unexploited proven concessions	Ever increasing community demands and disruptions
Prospects of allocation of new concessions	Changing environmental requirements
Privatization possible	Instability in crude oil price
	Inflation and rising cost of capital projects
	Dominated by foreign multinationals

The total amount of recoverable oil already found in the world's conventional oil fields amount to about 1 trillion barrels. Nigeria's current oil reserve is estimated at 22 billion barrels. It has been estimated that by 2010, the world's demand for oil will reach about 82 million barrels of oil per day. Given these estimates of world oil demand and production in Nigeria by the year 2010 predicted to be about 3.5 million barrels per day, it is apparent that there is a very bright future for the petroleum business in Nigeria.

Conclusion

This research has revealed that petroleum production in Nigeria has enormous prospects and opportunities for the future. Nigeria is endowed with an abundance of untapped proven oil reserves estimated at 22 billion barrels both onshore and offshore. There is also an increasing global demand for petroleum coupled with a renewed hope for political stability, which incidentally, will create the much needed atmosphere for future investments in the oil industry. Predictions performed using time series analysis prognosticate an optimistic upward trend for oil production in Nigeria from 1998 to 2010. By 2010, Nigeria is expected to produce about 3.5 million barrels of oil per day. However, from SWOT analysis, this will be achieved if there is adequate funding, purposeful acquisition and application of the requisite innovative technologies, coupled with training of staff. Moreover, the practice of assigning depleted blocks relinquished by multinationals to indigenous companies instead of the prolific blocks, should be discontinued to encourage greater participation by the Nigerian entrepreneurs and companies in the oil industry. Problems of crises in the oil producing communities must be properly addressed by the Nigerian

government, and the companies operating in such areas must ensure that the communities benefit in terms of development of infrastructure, employment, appropriate compensations and environmental protection.

References

Abdullahi, S.B. (2000), "Problems and Prospects of Petroleum Production in Nigeria (A Case study of NNPC and Dubri Oil Company)", MSc. Thesis, University of Benin

Avulu, L (1997), "Indigenous Participation In The Upstream Petroleum Industry", Nigeria's Oil and Gas Monthly, Dec., p 26.

Craig, D. (1998), "Changing Perspectives", Journal of Petroleum Technology (JPT) Jan; p 58.

Gustavo, Incarte (1998), "The Viewpoints of El Presidente", Journal of Petroleum Technology (JPT), Dec., p 12.

Hubert, M. K. (1956), "Nuclear Energy and Fossil Fuels", Drill & Prod. Pract, p.7.

Kalu, I. (1993), "Effective Management of Social–Economic Responsibilities To Energy Producing Communities", Energy Policy Agenda for Nigeria, Conference Proceedings, p. 237.

Lukman, R. (1989), "Petroleum Industry and the National Economy", An Address at Staff and Command College, Jaji, Sept. 12, p. 4.

NNPC (1998), "The Role of Petroleum in Nigeria's Economy", NNPC Bulletin, Dec., p. 8.

NNPC (1998), "NNPC Annual Statistical Bulletin Jan – Dec. 1997", June, P. 17.

Okereke, N. (1999), "Energy Banking in Nigeria", Nigeria's Oil & Gas Monthly, May, p. 25 – 26

Omu, P. (1993), "Energy Resources Management and the Imperatives of National Security", Energy Policy Agenda for Nigeria, Conference Proceedings, p.117–118.

Onuoha, K.M. (1999), "Technology and Global Hydrocarbon Exploration in the New Millennium", NAPE Bulletin, Vol. 14/1, May, p. 55.

OPEC (1999), "OPEC Bulletins (1990 – 1999)".

Osayameh, R.K.O. (1993), "Financing Indigenous Companies in Petroleum Exploration: The Roles of Banking Sector", Energy Policy Agenda for Nigeria, Conference Proceedings, p. 226.

Pike, W.J. (1998), "Comments", Journal of Petroleum Technology (JPT), March, p.14.

Rojas, A. (1999), "Managing Non-Technical Seismic Operation Risks In Sensitive Areas", Journal of Petroleum Technology (JPT), Jan., p. 76.

□

> *To be able to concentrate for a considerable time is essential to difficult achievement.*
>
> **– Bertrand Russell**

Employment Generation in Rural Industries of Haryana

Parveen K. Sardana, M.S. Turan & Suman Sardana

This article discusses employment generation through non-farm employment in Haryana. By calculating compound growth rates for different rural industries it is seen there is great disparity with regard to employment in rural industries. Scope and opportunities for policy initiatives in the state to redress these issues is discussed.

Pareveen K. Sardana, is Associate Professor (Agricultural Economics), CCS Haryana Agricultural University, Hisar, M.S Turan is Dean of Management Studies, Guru Jambheshwar University, Hisar, and Suman Sardana is Lecturer (Economics), Dayanand PG College, Hisar.

India has got a major portion of its population based in rural areas. During the recent period, declining dependency of its population on agriculture and a downward trend observed in the contribution of agriculture to total national income has aggravated the unemployment and underemployment situation in rural India. The growth of employment opportunities in agriculture sector has been marred by the declining size of land holding and competition from organized industry. The need for alternative avenues for employment generation in the rural areas brings the development of the non-farm sector into focus.

The Haryana State Economy is peasant oriented and agrarian in nature. Development of a peasant economy involves a three-pronged strategy aiming at simultaneous strengthening of agriculture, livestock and rural industries. The state is well known for attaining a leading position in the first two sectors, while the third sector remains lesser explored. The contribution of rural industries, a main source of non-farm employment (NFE), therefore, assumes paramount importance.

The industrial policy of the state, in consonance with the National Industrial Policy, lays great emphasis on promotion of cottage and small scale industries which are widely dispersed in the rural areas. This is in consonance with the priority for employment generation in order to tackle the twin problems of economic growth and rural poverty. As such, the present study has been undertaken with the object of examining the temporal shifts in the relative share of non-farm employment in the total employment across different districts and rural industries, determining growth of non-farm employment (NFE) and analyzing the determinants of output per worker in rural industries. Such a study would be extremely helpful to policy makers to design appropriate strategies for enhancing the effectiveness of rural industries in increasing the income and employment of the rural poor.
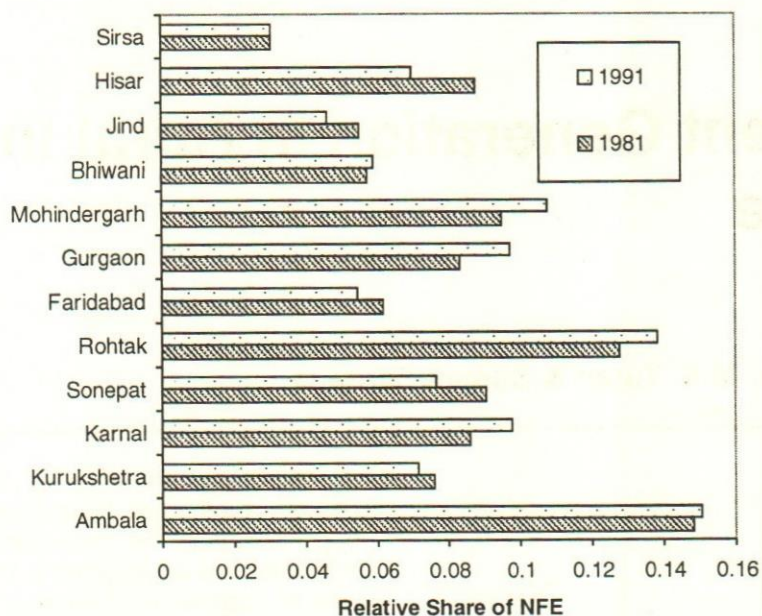
Fig. 1. Districtwise shifts in share of non-farm employment in Haryana
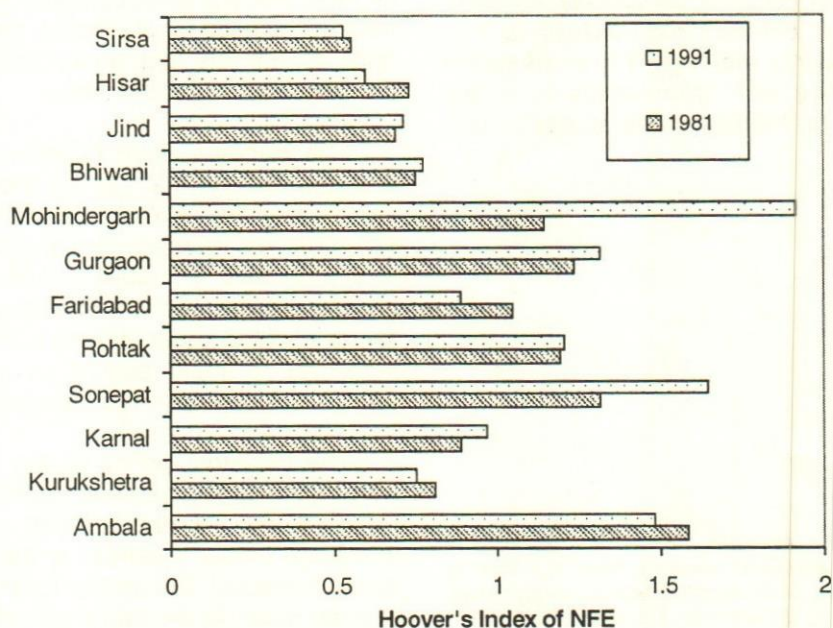
Fig. 2. Districtwise shifts in indices of non-farm employment in Haryana

Methodology

The present study is based on data collected from Statistical Abstracts of Haryana for the period 1971 to 2002. Due to lack of availability of data on non-farm employment for census year 2001, the discussion on its relative share to total employment has been limited upto census year 1991 only. Besides examining the relative share of non-farm employment to the total employment and determining the compound growth rates of production, employment and working capital of rural industries, determinants of output (production) have also been worked out using step-wise regression analysis. Both these analyses have been undertaken using SPSS software.

Results and Discussion

Shifts in relative share of non-farm employment

Ambala followed by Rohtak district had the maximum share of non-farm employment (NFE), while Sirsa had the minimum share in both the years 1981 and 1991 (Fig. 1). The NFE index was the highest in Ambala, which was followed by Sonepat in 1981 (Fig. 2). In 1991, however, these districts swapped their ranks with regard to non-farm employment. Sirsa district remained the lowest in offering non-farm employment in both the years under study. It is further clear from Fig. 1 and 2 that Mohindergarh reported the maximum increase in non-farm employment, followed by Sonepat, Karnal, Gurgaon, Jind, Bhiwani and Rohtak. The five remaining districts experienced a decline in NFE, the maximum being in Hisar, followed by Ambala district. These districts, except Karnal, are relatively backward districts in agriculture and therefore, to keep a balance in the overall development, the Government might have given more allocation in generating non-farm employment in these districts.

Relative Share of different industries in total employment and shifts therein

The relative share of different rural industries in the total rural industrial employment exhibited considerable shifts in each decade since 1970-71 (Table 1). While gur-khandari had the maximum share (41.25%) in 1970-71, its position shifted to second place (29.30%) in 1980-81 and continued to decline during the period under study. In the year 2000-01, gur-khandsari had a meager share of 2.25 percent in the total employment in rural industries in the state. The heavy reduction in total employment in this industry may be attributed to establishment of large-sized mechanized sugar mills in the state during the 1990s and thereafter.

Village pottery exhibited a continuous rise in its relative share in the total employment in rural industries since 1980-81. This industry remained at the highest among rural industries in terms of its contribution to total employment in the state. This may be due to the fact that there are negligible large-size pottery industries in the state and there is growing interest for hand made pottery among urban consumers of the state. Leather, aluminum, fiber carpentry and blacksmithy are a few other rural industries which also exhibited their consistently rising share in rural industrial employment. Khadi industry, though occupying fourth rank in 2000-01 with respect to its contribution to total employment, experienced a reduction in its share from 35.95 percent in 1970-71 to 6.91 percent in 1980-81, and again to 18.71

Table 1: Relative share of different rural industries in total non-farm employment.

Industry	1970-71	1980-81	1990-91	2000-01
Food products (Processing of Cereals & Pulses)	229 (1.55)	612 (1.72)	1589 (3.41)	1648 (3.88)
Oil ghanies	260 (1.76)	141 (0.40)	11 (0.02)	30 (0.07)
Non-edible oil soap	455 (3.07)	365 (1.03)	540 (1.16)	718 (1.69)
Village Pottery	733 (4.95)	13662 (38.48)	16373 (35.11)	13719 (32.27)
Gur-Khandsari	6105 (41.25)	10402 (29.30)	1664 (3.57)	956 (2.25)
Hand made paper	20 (0.14)	73 (0.21)	162 (0.35)	369 (0.87)
Fibre	562 (3.80)	518 (1.46)	2760 (5.92)	2932 (6.90)
Leather industries	925 (6.25)	3621 (10.20)	7971 (17.09)	9252 (21.76)
Khadi industries	5317 (35.93)	2454 (6.91)	8725 (18.71)	4637 (10.91)
Carpentary & Blacksmithy	169 (1.14)	2813 (7.92)	5116 (10.97)	4720 (11.10)
Lime stone industry	15 (0.10)	228 (0.64)	445 (0.95)	2329 (5.48)
Fruit preservation	0 (0.00)	0 (0.00)	863 (1.85)	824 (1.94)
Cottage match industry	10 (0.07)	22 (0.06)	123 (0.26)	77 (0.18)
Bee-Keeping	0 (0.00)	479 (1.35)	77 (0.17)	39 (0.09)
Aluminium	0 (0.00)	116 (0.33)	212 (0.45)	269 (0.63)
Total	14800	35506	46631	42519

percent in 1990-91. The declining and somewhat fluctuating share of khadi industry in total rural industrial employment may be attributed to large-size cotton mills established in the state and fluctuations experienced by them. For example, Hisar Textile Mills faced fair weather till 1980-81 which was followed by a downturn during the 1990s.

A further perusal of Table 1 shows that the limestone industry experienced a gradual increase in its contribution to total employment and fruit preservation is ready for take off in the state. The overall employment situation in the rural industries during the period under study clearly brings out this encouraging position, which is in accordance with the present industrial policy of the government.

major contributing factor to its total output (52%, 97%, 97%, 68%, 62% and 72% respectively). Here also working capital had non-significant impact. Similar to earlier results, here also regression coefficient of employment in each industry describes the amount of output generated due to unit increase in employment.

Capital and employment were both significant factors affecting output in gur-khandasari, hand made paper, leather, carpentry & blacksmithy, limestone and bee keeping industries. They explained 44, 80, 81, 97, and 64 percent variability in the output of these industries, respectively. The negative and significant coefficient of capital in the best-fit equations for leather, carpentry and blacksmithy and limestone industry suggest over-utilization of capital in these industries. A unit increase in capital in these industries would result in decline in output by 3.28, 4.69 and 4.69 units, respectively. In other industries such as gur-khandsari, hand made paper and bee keeping, however, increase in capital or employment, or both would increase the output.

Conclusions and Policy Implications

It is apparent from the results and discussion that disparity exists with regard to employment in rural industries. Since there is ample scope of employment in the industries having lesser share in total non-farm employment, efforts should be made to strengthen them and thus remove the inequity. In order to achieve this objective, there is an imperative need to revive and encourage the hitherto deprived industries. The industries such as gur-khandasari, hand made paper and bee keeping deserve to be tapped by an enhanced investment for their expansion in the state. In the wake of liberalization and in a global market scenario, the industries such as food products, hand made paper, bee-keeping and non-edible oils have a large potential to grow because of their export potential and eco-friendly nature. However, it is equally important that they are enabled to withstand the vagaries of fierce competition in the liberalized system. The production of quality goods supplemented by attractive packaging would help sustain this goal. Besides, the establishment of agro-industries with improved post-harvest systems can be expected to make a significant contribution in this direction. Compliance with conditions set under the sanitary and phyto-sanitary (SPS) agreements that accompany WTO negotiations will be critical for the continued participation of small-scale rural industries in the expanding markets of developed countries. Informed policies and a conducive regulatory environment increase the incentives for rural industries to use the inputs of peasant economy and improve their capacity to meet the product attributes required in a rapidly modernizing marketplace. Forward linkages from the agriculture sector to processing would be required through a focused approach. The state government should continue its commitment to diversification of agricultural research and development, including development of high value crops. □

Mistakes are a fact of life. It is the response to the error that counts.

— Nikki Giovanni

Contract Growing of Broiler Chickens in Tamilnadu

S.R. Asokan & Gurdev Singh

The advantages and disadvantages of contract farming, currently an important mechanism for organising agricultural production in India, is discussed in this article, with reference to the broiler chicken industry, particularly in Tamil Nadu. The expectations of the farmers in terms of government policy initiatives is outlined.

S.R. Asokan is Research Associate and Gurdev Singh is Professor at the Centre for Management in Agriculture, IIM Ahmedabad.

Contracts are becoming an important mechanism for organising agricultural production in India. The New Agricultural Policy (2000) envisages transfer of technology, capital inflows and assured markets for farmers through contract farming. Further, it is viewed as an avenue through which agro processing can be strengthened, thereby augmenting rural employment and income. Contract farming can be defined as a "form of vertical coordination between growers and processors that directly shape production decisions through contractually specifying market obligations such as value, volume, quality and at times price, provide specific inputs and exercise some control at the point of production" (Little and Watts 1994). Contracts allow the companies a degree of control over production without investing in land, hiring labour and managing the operations (Glover and Kusterer 1990). While the firm is assured of a steady supply of quality raw materials at a stable price through contract farming, farmers are insulated against the vagaries of the market and assured of a steady income.

Advocates of contract farming view it as a dynamic partnership between agribusiness companies and small farmers that benefit both without sacrificing the rights of either. It is offered as a vehicle for the transfer of technology and modernisation of peasant small holdings. However, critics claim that it would lead to disruption of subsistence production and the inevitable impoverishment of the rural poor. It has been criticised as being a tool for agribusiness firms to exploit an unequal power relationship with growers (Key and Runsten 1999). Clapp (1994) refers to contract farming as a "form of disguised proletarization" as it secures the farmers' land and labour while leaving him with formal title to both. The control exercised by the company is indirect but effective, the farmer's control is legal but "illusory" making him a "propertied labourer". Contract farming is fundamentally a way of allocating risk between the firm and the farmer, however, the distribution of risk depends heavily on factors like bargaining power, availability of alternatives and access to information.

officials check the water quality at the farm. If it is up to their permissible level they agree to enroll him into their programme. Then the company and the farmer enter into a written agreement on stamped paper. The farmer agrees to construct the shed on his land whose title deeds should be clear and install equipment like feeders and drinkers as per the specification of the integrator company.

The contract explicitly mentioned the responsibility

The method of calculating the grower charges as done by an integrator is illustrated in Table 1. We understood through the discussion that a flock of 6000 is the optimum size that can be maintained by a family of two without hiring any labour. Hence we had taken an example of 6000 birds for calculating the grower charges. The company first calculated the total cost of production by taking into account cost of chicks, feed, medicine and the integration charges. This cost was divided by the weight of the live meat produced to arrive

In India, contract farming is increasingly becoming an important tool for agribusiness firms to organise agricultural production in order to get the raw materials with desired quality and in sufficient quantity for processing. There are several agricultural and horticultural crops such as wheat, basmati rice, potatoes, tomatoes, groundnut, safflower, gherkin, baby corn, rose onions and several medicinal plants produced under some form of contract in different parts of the country. Big corporate houses like Hindustan Lever, Pepsi foods, Thapars, Marico, Mahindras, Dabur and several others are involved in contract production. Besides, agricultural and horticultural crops, broiler chick-

tervals for the entire production cycle. After the birds gained market weight usually in 6 to 7 weeks the company lifted the birds to sell in the market. The farmers were paid growing charges, which accounted for their labour, investment and management. Growing charges were predetermined and was based on live weight of meat produced. The farmer was able to have 4-5 flock rotations thus providing him with a steady income throughout the year. Within a couple of years many farmers took up the activity. Other companies who were in the hatchery or feed mill business began to have their own network of contract farmers. There are 30 integrators operating around Coimbatore who are mem-

at cost of production per unit. The company allowed mortality up to 3 per cent beyond which farmers were penalised with a discount of 0.10 paise per kilo of live weight produced. Cost of production or market rate whichever was higher was charged for accounting of shortage of birds. The standard cost of production of a kilogram live weight for the integrator was Rs 28.50 in this case. The integrator agreed to pay 0.25 paise for every rupee saved by the farmer over the standard price. Similarly 0.25 paise would be charged from the farmers for every rupee that exceeded production cost. In the illustration the cost of producing one kilo of live weight was Rs 28.13 and thus the grower was saving Rs 0.37 and was rewarded Rs 995.94. If his production cost exceeded the standard cost by 0.37 he would have been penalised by Rs 995.94. The tax was deducted at source and the payment made in cheque to the farmers.

Table 1: Method of Calculating Payment to the Farmers by the Integrator

No of birds supplied	6000
Age at the time of liquidation (days)	46
Mortality	210
Mortality percentage	3.5
Shortage	5
Birds Lifted	5785
Live meat produced	10767
Average weight per bird (kgs)	1.86
Feed Consumed (kgs)	20370
Feed Conversion Ratio	1.89
Cost	
Cost of chicks @ Rs 12 per chick	72000
Feed @ Rs 10 per kg	203700
Medicine/vaccination	5700
Integration charges @ Rs 2 per kg of live meat	21534
Total Production cost	302934
Production cost per kg of live meat	28.13
Penalty for excess mortality (3.5-3) .5% (0.5*10767*.1)	538.35
Penalty for shortage of birds (5*1.86*28.13)	261.60
Cost incentive (28.5-28.13)*10767*0.25	995.94
Amount Payable to the farmer	21729.99
Tax deducted at source @ 2.1 per cent	473.12
Net Payable to the farmer	21256.86

The integrators maintained a regular record of the growers and continuously monitored their performance. Farmers whose performance was below par were eliminated and those with good track record were en-

couraged through giving them bonus besides the normal growing charges.

Experience of Broiler Growers

In order to understand the farmers' experience in contract growing of broiler chickens we conducted a survey in five villages of Palladam taluka of Coimbatore district of Tamilnadu. A sample of 32 farmers was randomly chosen and interviewed. The sample farmers were growing 1,10,100 birds at the time of survey. It ranged from 1500 to 24000 birds. The average experience of farmers in contract rearing of broilers was 4.7 years, that is, about 19 batches. The size of the land holdings of the farmers ranged from 1 to 15 acres with an average size of 4.27 acres. This indicated that size of farm was not an inhibiting factor to a farmer in taking up the activity.

The cost incurred by the farmer is calculated from the survey data of the sample farmers for 6000 birds. The farmer had incurred an investment cost of Rs. 3,44,550 (Table 2) on shed and equipment. The commercial bank and the land development bank were financing the activity in the area. The duration of the loan was for seven years. The annual installment worked out to Rs 75,000.

Table 2: Investment Cost (to the farmer) to rear Broiler Chickens (6000 birds)

Tiled Shed $	300000
120 feeders @ Rs 150	18000
60 drinkers @ Rs 195	11700
Chick drinker 90 @ 65	5850
Tank + Pipeline etc	9000
Cost of equipment (3+4+5)	44550
Total fixed cost	344550
Interest @ 12 percent and annual installment +	75000

$ For thatch the cost is 1,80,000 plus roof repair once in 3 years taken into account

+ Seven year is the period of loan

The inputs such as energy (electricity, coal) labour, litter and maintenance were the farmers' responsibility. Though electricity is free for agricultural operations in Tamilnadu, broiler farming was considered a commercial activity and the farmers were charged the commercial rate of Rs 5.50 paise per unit of consumption. So farmers were using charcoal as an alternative to reduce the cost. The company staff administered medicines and vaccination during the initial periods when contract farming was introduced. The integrators later on shifted the responsibility of this crucial task to the growers.

Thus additional expenditure was thrust on the farmers without any compensation. The sample farmers were incurring an expenditure of Rs 10,200 on various inputs but recovered part of it (Rs 2160) by sale of manure and empty feedbags (Table 3).

Table 3: Variable Cost Incurred by the Grower for 6000 Birds

A. Variable Cost	Amount (Rs)
Litter (Gnut shell) 60 bags @ Rs 60 per bag	3600
1-45 days labour (one labour per day) @ 50 per day	2250
Electricity	1050
Charcoal @ 1 bag per 1000 birds at Rs 150 per bag	900
Removing litter, cleaning the shed, feedervand drinkers (lab)	500
Disinfecting and whitewashing the shed	700
Onion, garlic, jaggery etc.	800*
Labour for vaccinating @ Rs 50 per thousand	300
Maintaining the water tank, pipeline, feeder, drinker, broken parts etc.	100
Total	**10200**
B. Cost Recovered	
Income from sale of manure$	1200
From sale of feed bags 320 bags @ Rs 3 per bag	960
Sub Total	**2160**
Net Variable Cost (A - B)	**8040**

$ As there are many poultry farms in the area the manure cost is so low farmers were able to recover just one third of litter cost.

* Incurred when the birds were afflicted with "cold".

The age of birds at liquidation ranged from 42 to 56 days among the sample farmers. The average liquidation age was 46 days. There is a gap of two weeks after each batch to clean and fumigate the shed before the fresh flock is let in. Thus a farmer can have a maximum of five flocks in a year. However, as the decision of the flock rotation rests with the integrator, farmers may not be able to have five flocks in a year. The sample farmers reported normally four batches in a year. They had experienced even lesser rotations, thus affecting their income. The income from four batches worked out to be Rs 52107 and for five batches it was Rs 62205. Thus, those farmers who raised the loans to construct the shed and install the equipment experienced difficulty in the repayment of the loan at the current growing charges of Rs 2 per kilo of live weight. Many farmers reported repaying the loan from other sources of income.

As the farmers had invested in the shed and equipment, the alternative use of which was limited (layer growing had failed in the area) they felt trapped into growing broilers. In order to repay part of the loans or recover some investment in case of using own funds for the purpose farmers continued to grow the chicks.

The sample farmers were not aware of the potential weight the chick would gain in 45 days. The integrators did not enlighten the farmer in this regard. Hence, farmers were not able to know the potential income from a particular batch. Farmers by experience had learnt that a particular variety would gain 1.8 to 2.2 kilos or mortality in a particular breed of chicks would be low.

The integrator liquidated the birds even at less than 40 days when the demand was high otherwise it exceeded 50 days. In both the cases the farmers were at the receiving end. In the former case the bird had not reached the peak and in the latter case the increase in weight was less than proportionate to feed consumption after the peak period, affecting the feed conversion ratio and hence the farmers' income.

Except for one leading integrator in the area who paid the farmers within seven days of liquidation, payment to the farmers was delayed ranging from 40 to 60 days. Some integrators retained the money due to farmers as collateral for the current batch, that is, till the next batch was delivered, the payment for the previous batch was withheld.

Table 4: Income from Growing 6000 Birds for Farmers

Particulars	Amount (Rs)
Live meat (of 5785* birds @ 1.86 kg) 10767 kg (growing charges) at the rate of Rs 2 per kg	21534
Tax deducted at source @ 2.1 per cent	452.21
Income after tax$	21081.79
Income after meeting the variable cost per batch	**13041**
Income from 4 batches in a year	52107
Income from 5 batches in a year	62205

* Mortality @ 3.5 percent and shortage of 5 birds

$ The minor difference in income compared to table 1 is because cost incentive was not taken into account for the sample farmers.

Post contractual opportunistic behaviour defined as unanticipated non-fulfillment of the contract (Williamson 1986) was considered to be a major problem in contractual relationships. The advantage ex-post, that is, after the investment has been made to one party, lead to reneging on the contract and exploiting the other party who was at a disadvantage. In the study area opportunistic behaviour among the farmers was not observed. Since they had made a relationship specific investment

with no alternative use, farmers generally stuck to the contract. Further, if a farmer failed to supply the grown up birds to the integrator he was black listed and other integrators in the area informed. Therefore, farmers by and large honoured the contract. However, the integrators who promised five batches when the scheme was introduced gave only three to four batches affecting the farmers' income and repayment of the loan becomes difficult. Further, the sample farmers reported that the integrators might give five batches but the number of chicks supplied would be less than the capacity of the shed and equipment, again, adversely affecting the income.

Income tax was deducted at the rate of 2.1 percent at source on payment to the farmer. The tax was deducted on the gross income of the farmer. His expenditures on inputs such as electricity, charcoal, labour etc and depreciation and interest on investment in shed and equipment were not deducted for computation of tax. Even though the farmers could get the refund after filing the returns many of them had foregone the claim fearing hassles.

Conclusion

Contract farming of broiler chickens became an alternative source of employment to the farmers around Coimbatore in Tamilnadu. However, the current growing charges offered by the integrators were not sufficient to breakeven and as such the activity was not remunerative. As the possibility of increasing the flock rotations is limited integrators should increase the growing charges in order to sustain the interest of the farmers in the activity. As the survival of the hatcheries and feed mills are linked to the farmers' continued interest in the activity, unhealthy practices such as delaying the payment, reducing the flock rotation or giving less number of birds per batch should be avoided.

The industry expects some policy initiatives from the government that would help sustain the activity. Many vitamins and amino acids for poultry medicines are imported and the companies have to pay import duty. Import of birds for research purposes is cumbersome, involving many procedures. Maize and soy-meal are important ingredients the poultry feed imports of which are restricted. At times of shortages such as the current drought the government should allow liberal imports of these products. As the activity is undertaken by a large number of small farmers, income tax exemption should be given to the farmers or at least the cost incurred by the farmers must be taken into account and the net income taxed instead of the gross income as is being done. Electricity is supplied free to agriculture operations in the state but broiler farmers are subjected to commercial rates. The state government must initiate measures to supply electricity at nominal rates.

References

Clapp Roger A (1994) The Moral Economy of the Contract in Living under Contract, Peter D Little and Michael J Watts, The University of Wisconsin Press, Wisconsin.

Glover D and Ken Kusterer (1990) Small Farmers, Big Business and Rural Development, Houndmills, Macmillan.

Key Nigel and David Runsten (1999) Contract Farming, Small holders and Rural Development in Latin America: The Organisation of Agroprocessing firms and the scale of Outgrower production, World Development 27 (2).

Little Peter D and Michael J Watts (1994) Living under Contract, University of Wisconsin Press, Wisconsin.

Tsoulouhas Theofanis and Tomislav Vukina (1999) Integrator Contracts with Many Agents and Bankruptcy, American Journal of Agricultural Economics 81 (2).

Williamson Oliver (1986) Transaction Cost Economics, the Governance of Contractual Relations in Economic Organisation, Firms, Market and Policy Control, Wheatsheaf Books Ltd, Sussex.

□

Agroforestry & Rural Household Food Security

D. Suresh Kumar

The present study aimed to examine the role of agroforestry in achieving household food security among resource poor farm households in the Western zone of Tamil Nadu. The estimates of calorie consumption function with respect to real income suggest that promoting higher incomes may be an efficient way to improve the standard of living and nutritional security among resource poor farm households. The design of agroforestry systems should take into considerations the objectives of the farmers and the associated changes in terms of crop allocation, input use and nutrition could be analysed before suggesting any particular agroforestry system. Such considerations would largely enhance the success of agroforestry systems among resource poor farm households.

D. Suresh Kumar is Assistant Professor (Agrl. Economics), Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore-641 003.

Agroforestry systems have recently been recommended from the point of view of increasing food security and nutritional status of the rural households. Given the nature and diversity of benefits from an agroforestry system, there is a need to understand the nature and extent of its impact on poor farm households (Babu, 1991). Typically, the by-for maximum economic returns. This in turn influences food security of farm households.

Livelihood can be improved by production of wood, fruits and fodder, either for sale or for increased subsistence use within the family. There is a wide range of tree products which rural people gather, produce and trade in order to derive income, like fuelwood, bamboo, fibres, medicines, gums and wild foods (Falconer, 1989). The main groups of traded products which are processed in the household or small enterprises are furniture and other products of wood, baskets and mats and other products of canes, grasses etc., and handicrafts (Fisseha, 1989).

The tree component introduced in an agroforestry system is a technological substitute for fuel, timber, fodder in many subsistence economies, which could improve farm household food security and nutrition in the following ways. First, its contribution through green manures to increased productivity of agricultural field crops and the associated reduction in the cost of chemical fertilizers. Second, as animal feed in increasing livestock production which could be directly used as food or sold in the market to purchase other consumer goods. Third, by increasing the availability of fuelwood and hence reducing the time and energy involved in collecting fuelwood and the cost of purchased cooking fuel. In addition, increased income from timber production help to earn more income and enable them to purchase consumer goods. Finally, by providing fruits and vegetables directly for improving the nutritional status of the household members (Babu,1994). Besides, the economic rationale of agroforestry lies in cushioning the

$$CALC = b_0 + b_1 \text{ HSIZE} + b_2 \text{ In HIAEU} + b_3 \text{ AAREA} + b_4 \text{ LSTOCK} + b_5 \text{ HEDN} + b_6 \text{ WEDN} + b_7 \text{ D1} \tag{8}$$

Where,

CALC   = Calorie acquisition per consumption unit (Kcal per year)

HSIZE   = Household size in consumption units

HIAEU   = Household income per consumption unit (Rupees per year)

AAREA = Area under agroforestry in hectares

LSTOCK = Number of milch animals possessed

HEDN   = Educational level of the husband

WEDN   = Educational level of the wife

D1   = 1 for the participation in off-farm and non farm activities 0, Otherwise

b_i, i = 0..7, are the parameters to be estimated.

The dependent variable is an aggregation of total calories from all the foods acquired by the household converted into per consumption unit. Since, the household consists of adult male, female and children, it is necessary to convert them into comparable standardised units.

The a priori relationship between the explanatory variables and the dependent variable are indicated below. Household size is generally more closely related to the level of consumption and food expenditure. Given the income, the size of the household may have an inverse relationship with per capita food consumption. Being semi subsistence with low level of income, the resource poor farm households are expected to increase consumption and thereby acquisition of calorie as their income increases. Thus, it is expected that the household income will have a positive relation with calorie acquisition by the households.

A priori, it is expected that the area under agroforestry and number of livestock possessed may positively influence calorie acquisition by the household. Low level of income among resource poor farm households due to uncertain weather conditions, low level of adoption of improved technologies and seasonality in production of agricultural commodities, result in low level of income and food insecurity. Trees and livestock components in the farming system enable the household to derive additional income and that helps the household to enhance their food security. Thus, the area under agroforestry (used as proxy for income from agroforestry activities) and number of

milch animals possessed by the household are expected to positively influence the calorie acquisition by the household. One may expect that the educational level of the household members influence nutritional wellbeing positively. Particularly, the education of the wife is strongly correlated with food consumption. The more educated the wife, the more the nutritional status of the household. Thus, the explanatory variables, educational level of the husband and wife, may have positive relationship with calorie acquisition of the household.

Being bottom of the rural income scale next to landless agricultural labourers, participation in off-farm and non-farm activities by the resource poor farm households may increase household income and nutritional status. Thus, participation in off-farm and non-farm activities is expected to influence positively the household calorie acquisition.

Results and Discussion

General Characteristics of Sample farms

The average size of holding worked out to 1.58 hectares and 1.41 hectares for tree growers and non-tree growers respectively (Table.1). It is interesting to note that the average size of a holding is less in the case of non-tree growers. The area under trees is 0.68 hectares. The estimates of cropping intensity show that it is more

Table 1: General Characteristics of Sample Farms

Particulars	Tree growers	Non-tree growers
Number of respondents	75	30
Farm size (ha)	1.58	1.41
Area under trees (ha)	0.68	0.00
Net cropped area (ha)	1.58	1.41
Gross cropped area (ha)	1.61	1.42
Net irrigated area (ha)	0.38	0.34
Gross irrigated area (ha)	0.38	0.34
Household size	3.57	3.74
Number of workers	2.69	2.83
Cropping intensity (%)	102.39	100.71
Irrigation intensity (%)	100.00	100.00
Percentage of gross irrigated area to gross cropped area	23.60	23.94
Labour force participation (%)	75.35	75.67
Land value (Rs./ha)	113766.67	110500.00

Note: *, ** and *** indicate significantly different from corresponding values of non-tree growers at 1 per cent, 5 per cent and 10 per cent level

or less similar, around 100.00 per cent, for both tree growers and non-tree growers. A similar condition exists for irrigation intensity.

It is evident from the table that the average number of workers is 2.69 and 2.83 out of 3.57 and 3.74 persons for tree growers and non-tree growers respectively. The labour force participation thus comes out at 75.35 per cent and 75.67 per cent for tree growers and non-tree growers. The high labour force participation rate is due to the existence of relatively large size holdings and better scope for livestock activities and other off-farm and non-farm economic activities like coconut breaking, rice and oil mills. It is obvious that the labour force participation rate among non-tree growers is higher implying that the poor resource base compels the households to participate in off-farm and non-farm income activities to derive additional income for their livelihood.

Table 2: Livestock per Household and per Hectare of Arable Land

Particulars	Tree growers	Non-tree growers
Cattle		
Per cent of households	100.00	80.00
Herd size	2.16	1.90
Per hectare	1.37	1.35
Sheep and goat		
Per cent of households	96.66	76.00
Herd size	14.57	13.82
Per hectare	9.22	9.80
Poultry		
Per cent of households	24.00	20.54
Herd size	1.60	1.43
Per hectare	1.01	1.01

Note: *, ** and *** indicate significantly different from corresponding values of non-tree growers at 1 per cent, 5 per cent and 10 per cent level

Livestock Production

Cattle, sheep and goats are maintained as important sources of manure and kept as 'live money' capital reserves as that of trees. Inadequate grazing land and poor resource base for stall feeding persuade them to feed their livestock with green leaves and fodder obtained from the crops and crop residues. As far as cattle are concerned all the tree growers maintain at least one milch animal and the average herd size is worked out to 2.16 (Table 2). The percentage of households possessing cattle is 80 per cent among the non-tree growers. Having a poor resource base combined with little scope for better crop production, these households maintain

mainly milch animals to derive additional income for their livelihood.

> **Cattle, sheep and goats are maintained as important sources of manure and kept as 'live money' capital reserves.**

Sheep are allowed to graze in the farm lands, particularly the land in which acacia is grown. The dried pods of Acacia trees form nutritious feed for sheep. The sheep are used for penning in the farm lands so as to enrich the soil. According to the farmers, where farm yard manure is not applied for crops, the lands are penned with sheep and goats. Also there is a reduction in use of fertilizers by 20 to 30 per cent and increase in yield by 15 to 20 per cent. Livestock management requires considerable labour investments. On an average, 2-3 hours per day are spent to gather fodder and on watering by family labourers. Six to eight hours are spent, particularly by aged male and female family members, to graze sheep. Fodder availability in farmers' land consists of fodder sorghum, groundnut straw and leaves from trees. In times of shortages, farmers graze their livestock in public wastelands. Though tree crops provide feed and fodder for livestock components in the farming system, trees grown under agroforestry are yet to reach maximum stage.

Effect on Family Income

Households need cash income to supplement agricultural production (crop production, livestock and trees) to purchase market purchased commodities, to pay for social obligations, school fees, health care etc. Total cash income is computed at Rs.41261.20 for tree growers (Table 3). The corresponding figures are Rs.28391.55 for non-tree growers. The per capita income seems to be higher among tree growers. In addition to crop and livestock production, off-farm and non-farm activities, tree growing enable the households to derive additional income through the sale of wood, timber, seeds, fruits etc. Livestock production provides a major share in total family income accounting for 41.90 per cent and 52.29 per cent for tree growers and non-tree growers, respectively. Trees account for 24.53 per cent of the total income. Households participate in off-farm and non-farm income activities, particularly during slack periods to get additional income for their subsistence needs. The share of off-farm and non-farm income sources is higher among non-tree growers (33.25 per cent) than for tree growers (20.98 per cent). In order to meet cash expenses, the non-tree growing households participate in off-farm wage labour and non-farm income activities such as employ-

ment in rice and oil mills, coconut breaking etc.

Table 3: Computed Cash Income and the relative importance of Different Sources of Income

Particulars	Rupees per year	
	Tree growers	Non-tree growers
Crop production	5198.03 (12.59)	4104.91 (14.46)
Livestock	17289.44 (41.90)	14846.64 (52.29)
Trees	10119.33 (24.53)	0.00
Off-farm income	2976.00 (7.22)	2160.00 (7.61)
Non-farm income	5678.40 (13.76)	7280.00 (25.64)
Total family income	41261.20 (100.00)	28391.55 (100.00)
Household size	3.57	3.74
Per capita income	11557.76	7591.32

(Figures in parentheses indicate percentage to total)

Table 4: Impact of Agroforestry on Income and Nutrient Availability

Particulars	Units	Tree growers	Non-tree growers	Per cent difference
Farm family income	Rupees	41261.20	28391.55	(+) 45.33
Total availability of nutrients per year				
Energy	('000 Kcal)	3608.86	2721.64	(+) 32.59
Protein	('00 gms)	1277.11	1129.62	(+) 13.06
Calcium	('00 gms)	972.17	880.66	(+) 10.39
Availability of nutrients (manequivalent /year)				
Energy	(Kcal)	2769.55	1993.73	(+) 38.91
Protein	(gms)	98.01	82.75	(+) 18.44
Calcium	(mg)	746.07	645.12	(+) 15.65

Note: *, ** and *** indicate significantly different from corresponding values of non-tree growers at 1 per cent, 5 per cent and 10 per cent level. The nutrient availability is calculated based on the assumption that part of the food crops (sorghum, groundnut, gingelly and milk) and fuelwood are consumed by the household and remaining is marketed and the additional income generated from sale of crop, livestock and fuelwood are utilised for the purchase of rice, the staple food, and other market commodities.

Effect on Household Consumption

Effect on Nutrient availability

It is evident from Table 4 that due to the introduction of agroforestry, the percentage increase in income was 45.33 per cent. This increased income through the sale of wood, timber, seeds and fruits, enables the farm households to purchase the staple food, rice, and other commodities in the market and thereby enhance nutritional security. The nutrient availability for tree growers and non-tree growers and associated changes due to agroforestry were analysed. The total availability of nutrients per year is higher for tree growers when compared to non-tree growers. A similar trend is noticed in per capita per day availability of nutrients.

Fuel Use pattern

Table 5 presents the fuel use pattern in the sample households. Since civilisation began, fuelwood has been the main household fuel and continues to be used in rural areas. With the discovery of coal, oil, natural gas and electricity, these more efficient commercial energy resources in urban areas replaced wood. But still, the biomass resources continue are continued to be the main resource for fuel.

Table 5: Fuel Use Pattern in Sample Households

Particulars	Units	Kgs. per year			
		Tree growers		Non-tree growers	
		Per cent of households using	Quantity	Per cent of households using	Quantity
Fuelwood	Kgs	100.00	630.96	100.00	611.16
Crop residues	Kgs	46.00	182.00	64.00	260.00
Animal dung	Kgs	12.54	104.00	20.24	109.20
Kerosene	Litres	75.30	30.00	66.94	24.00

Note: *, ** and *** indicate significantly different from corresponding values of non-tree growers at 1 per cent, 5 per cent and 10 per cent level

It is observed that fuels used in households include biomass resources like fuelwood, crop residues, animal dung and fossil fuel, like kerosene. The principal end uses of fuel are for cooking, heating, lighting and household maintenance activities. It is found that all households use fuelwood as the main fuel for household activities. The average quantity of fuelwood used works out to 630.96 kgs per year and 611.16 kgs per year for tree growers and non-tree growers, respectively. Tree growers collect the required fuelwood from their own farm trees. Mainly the pruned materials of trees are used as fuelwood. On an average the members of the household spend 2-3 hours per week collecting the required fuelwood. It is interesting to note that the non-tree growers also use more or less equal quantities of fuelwood. Non-tree growers meet their fuelwood requirement by collecting fuelwood from neighbouring common lands. The major tree species

used for this purpose is *Prosopis juliflora*, grown in village common lands. On an average, the members of the households spend 8-9 hours per week collecting the required fuelwood. Time is the major resource for resource poor farm households and the available time could be better used for other economic activities like off-farm and non-farm income activities.

Calorie consumption function

To understand the impact of agroforestry and other production activities on household calorie acquisition, the calorie consumption function was estimated and the results are furnished in Table 6. It could be seen from the table that the coefficient of household size is negative and significant. It indicates that the presence of more family members reduces the per capita consumption and hence the per capita calorie acquisition. The variable household per capita income shows significant positive influence on calorie consumption and as log of income increases the per capita calorie acquisition of the household increases. The explanatory variables, area under agroforestry, number of livestock possessed and participation in off-farm and non-farm activities significantly influence the per capita calorie acquisition. This indicates that households allocate productive time to various economic activities which help increase income and thereby enhance household food security. Increase in area under trees and number of livestock enable the households to derive additional income that is used for the purchase of market purchased commodities, both food and non-food. Educational level of the head of the household is positive and significant. This implies higher levels of education open up avenues for rural non-farm employment and hence enhance household calorie acquisition. In general, increase in area under agroforestry, number of livestock, participation in off-farm and non-farm income activities enable the households to derive greater income and enhance calorie acquisition.

Conclusion

The analysis of impact of agroforestry systems on nutrient availability shows that the total availability of nutrients and annual per capita nutrient availability are higher for tree growers when compared to non-tree growers. The additional income derived through the sale of wood, timber, seeds and fruits improve the purchasing power of farm households.

The estimates of calorie consumption function with respect to real income suggest that promoting higher incomes may be an efficient way to improve the standard of living and nutritional security among resource poor farm households. Area under agroforestry and livestock positively influences calorie acquisition by the household, promoting agroforestry development along with complementary crop and livestock enterprises leading to the development of the rural sector.

Agroforestry systems have a significant impact on farm income. Therefore, alternative cropping pattern of agricultural crops, trees and livestock components with comparable profit should be evolved and demonstrated to the farmers. The design of agroforestry systems should take into consideration the objectives of the farmers and the associated changes in terms of crop allocation, input use and nutrition, before suggesting any particular agroforestry system. Such considerations would largely enhance the success of agroforestry systems among resource poor farm households.

Table 6: Estimates of Calorie Consumption Function

Variables	Estimates
Constant	1724.5930 (3.3866)
HSIZE	−74.2099* (−3.5559)
HIAEU	94.8516*** (1.7523)
AARE	65.6312* (2.5844)
LSTOCK	53.1506* (3.1708)
HEDN	6.9655* (2.6323)
WEDN	8.1707 (1.0560)
D1	105.5997* (3.1810)
R - Squared	0.6145
F - Statistics	15.2567

(Figures in parentheses indicate estimated 't' values)
Note: * = P 0.01, ** = P 0.05, *** = P 0.10

References

Arnold, J.E.M. (1991). "Tree Products in Agroecosystems: Economic and Policy Issues" Gatekeeper Series No.S.A.28, International Institute for Environment and Development, pp: 1-21.

Babu, Suresh Chandra and B. Rajasekaran. (1991). "Agroforestry, Attitude towards Risk and Nutrient Availability: A Case study of South Indian Farming Systems", Agroforestry Systems, Vol.15 No:1, pp.1-15.

Babu, Suresh Chandra, A.Hallam and B.Rajasekaran. (1994). "Agroforestry and Household Food Security Interactions: Implications for Multi-Disciplinary Research Policy", Paper presented at the International Conference on Agricultural Economists, Harare, Zimbabwe, August, pp:1-14.

Chambers, Robert and Richard Longhurst. (1986). Trees, seasons and the poor in Seasonality and Poverty, Richard Longhurst (ed.), IDS Bulletin, 17 (3), Sussex.

Chambers, Robert and Melissa, Leach. (1987). Trees to meet Contingencies: Savings and Security for the Rural Poor, IDS Discussion Paper 228, Institute of Development Studies, Sussex.

Chambers, Robert, N.C.Saxena and Tushaar Shah. (1991). To the Hands of the Poor: Water and Trees, (New Delhi: Oxford and IBH Publishing Co.Pvt.Ltd.,), pp:18-19.

Cooke, Priscilla A. (1998). "The Effect of Environmental Food Scarcity on Own-farm Labour Allocation: The Case of Agricultural Households in Rural Nepal", Environment and Development Economics, 3 (4) : 443-469.

David, S. (1997). "Household Economy and Traditional Agroforestry System in Western Kenya", Agriculture and Human Values, 14 (2) : 169-179.

Dowell, Mc and Hildebrand. (1980). "Integrating Crop and Animal Production : Making the most of Reserves available to the Small Farms in Developing Countries", Paper Presented at the Bellagis Conference, Rockefeller Foundation, New York.

Falconer, J. (1989). "Forestry and Nutrition : A Reference Manual", (Rome: Food and Agriculture Organisation).

Fisseha, Y. "Basic Features of Rural Small Scale Forest based Processing Enterprises in Developing Countries", In Small Scale Forest Based Processing Enterprises, Forestry Paper. 79, (Rome: Food and Agricultural Organisation,1987).

Jodha, N.S. (1997). Trends in Tree Management in Arid Land Use in western Rajasthan, in Farms, Trees and Farmers, (ed.) J.E.M.Arnold and P.A.Dewees, (London:Earthscan Publications Ltd.), pp:43-64.

Roa, V.K.R.V. (1983). "Food, Nutrition and Poverty in India", (New Delhi: Vikas Publishing House).

Scherr. Sara. J. (1992), "Not out of the Woods yet: Challenges for Economics Research on Agroforestry", American Journal of Agricultural Economics, 74 (3) : 802-808.

Shively, Gerald E. (1998). "Economic Policies and the Environment: The Case of Tree Planting on Low-income Farms in the Philippines", Environment and Development Economics, 3 (1) : 83-104.

Stevenson, G. (1989). "The Production, Distribution and Consumption of Fuelwood in Haiti", Journal of Developing Areas, 24 (1) : 59-76.

Suresh Kumar. D and C. Ramasamy. (1996). "Constraints in Tree Growing in Tamil Nadu", Productivity, 36 (4): 668-674. ☐

To do well at a few things, give up many things.

— John C. Maxwell

Book Reviews

"Assessment Centres—Identifying Potential & Developing Competency" *by Nitin Sawardekar,* Response Book, Sage Publication 2002.

In the era of stiffer competition and borderless economy, knowledge and people become necessary for success and growth. Today companies are competing with each other on the basis of how strategically the knowledge and competency of the people is unlashed and utilized. People who are considered as the key to an organization have immense potential, which requires to be explored.

Today a variety of tools is available to assess the employee's potential but the tools having high predictive value, fairness and ability to capture an organization's specific competency is still lacking.

The author tries to focus on the Assessment Centres where on the basis of data people or human capital may be accessed for individual growth. This can be done through performance management, career planning, and succession planning and reward management. The concept of an assessment centre offers the flexibility to managers to use the data as per their need. It provides valuable insight into the employees' potential. Assessment Centers are based on simple precepts and with line manager who are trained as assessors.

This book is divided into 13 chapters. Chapter 1 describes what is an assessment center, along with its characteristics and its origin with a magnificent example from *Kautilya's Arthashatra*. In this chapter the difference between Assessment Centers and development centers is also elaborated. Chapter 2 deals with the decision-making process, implementing Assessment Centres in organizations. It also discusses about the Assessment Centres as a part of HR strategy.

Chapter 3 illustrates the concepts of competencies along with various dimensions of competencies measured by the Assessment. Chapter 4 focuses on design of Assessment Centres by considering variation with work, style, etc. from one organization to another. Chapter 5 describes the design process for Assessment Centres, which include a large variety of exercises, based on necessity. Chapter 6 covers various types of documentation required for an assessment centre like preparatory exercise materials, rating sheet, etc. For an exercise of assessment the competency of assessor is important. In chapter 7 the training of assessors for assessment centres is illustrated. Chapter 8 discusses about the administrative preparation that is required to be made for assessment centres.

The real exercise starts when the actual assessment begins with an assessor who has to follow a set /sequence of activity that is repeated. Chapter 9 deals with this. Chapter 10 deals with the output of the assessment centres, various dimensions of report preparation with feedback, both verbal and written.

Chapter 11, 12 and 13 are basically focused on organizational considerations in the setting up and administering of Assessment centers with particular reference to the Indian context and how this benefits the overall performance of the organizations.

This book is recognized as a potent tool and unique literature has knowledge driven organizations measuring the qualities, competencies and personality traits of human resources working in the organization. This book is of immense importance to HR managers as well as decision makers, researchers, academicians, students who want to understand the concept of Assessment centres and also to establish assessment centres. Line managers in an organization can also get benefited from this book by understanding the methodology and get trained as an assessor for improving the productivity and performance of the organization.

Manoj K. Prasad
Asstt. Director (HRM)

"Geography of Transport Development in India", Edited *by Vaidya. B.C.,* Concept Publishing Company, New Delhi-110 059, 2003; pp. 465, Price Rs. 800.

Transport network plays a pivotal role in reducing the spatial disparities and bringing about a balanced regional development. Transport network is thus, a necessary element of spatial expression. The linkages and flow between centers, their nature and size, function and accessibility is a major consideration in structural aspects in transport geography. Dr. Vaidya has rightly considered in this edited volume thee transport aspect as a spatial expression at national and regional levels besides metropolitan transport system as a factor of commodity and human movement.

The present book studies various facets of road and rail transport with recent statistics that would certainly help to understand transport development in India. This book is divided into three sections. Section one includes five articles on road and rail network in India. Section two comprises of seven articles on *Metropolitan Transport System* in India. Third section includes seventeen articles based on state/regional economies in India. The following paragraphs discuss various articles appeared in each of these sections.

The first section evaluates *Indian Transport System* on various aspects of railway transport and freight rate, road transport, network and social interface and emerging express highways. Dr. Tapati Mukhopadhyay's paper on "Railway Transport Network in India" analysed the growth of both passenger and goods transport during 1970-1998 period. The paper "Railway Freight Rate and Regional Development in India", by Mohindra Dutta and Bupinder Zutshi examined the freight rate changes for bulk commodities between 1948-1992. It is not clear from the paper why the authors have excluded the data after 1992. It would have been appropriate if the recent data also were included in the study. Dr. Arup Khan in his paper titled "Road Transport Network Development in India" analyzed the growth of road network under the five year plans. Whereas the paper "Road Transport network and Social Interface in India" by Sudesh Nangia and L.C. Mahajan analyses the role-played by transport in the socio- economic development if the country. Amresh M. Deshpande and B.C. Vaidya in their paper analyses the Road Network with Special References to Expressways in India: Some Possibilities and Alternatives".

Section two comprises of seven articles on *Metropolitan Transport System* in India. This part explained transport of seven metropolitan cities of India, namely, Delhi, Mumbai, Kolkata, Madurai, Chennai,

Hyderabad and Pune. This part also explains the manifold problems of these cities and suggests improvements by giving transport plans. G. Marthandan and S. Subhiah in their paper "Development of Transport in Chennai Metropolitan area" have highlighted on road and rail network of Chennai. Dr. Tapati Mokhopadhyay's article "Geography of Transport Network — A Case Study of Mumbai Metropolitan Region" has thoroughly studied the transport situation and brought out various interesting features related to road and railway transport. M. Parida and S.S. Jain in their article "MRTS Services of Delhi Metropolitan Area" studied the growth of vehicle population and its increasing problems during 1968 to 1999 period. Dr. Sukla Bhaduri's article "Analytical study of Mass Transport in Kolkota Metropolitan Areas" examines past and present mass transport systems based on state operated and private operated bus services. The paper "A Study of Road Transport and Resource Development in Madurai Metropolitan Area" by Dr. K. Laxmi evaluates functional inter-dependence and complementary character of resources and transport. Dr. Vijaya Bhole's paper "Dynamics of Urban travel and its Impact on Urban Environment — A Case Study of Metropolitan Hyderabad", examines the urban travel pattern and evaluates the impact of urban environment. Dr. Bagade in his paper "Transport Development in Pune Metropolitan Region" studied the development of road scenario around Pune city.

Third section includes seventeen articles based on state/regional economies in India. This section provides an exhaustive study of *Regional Transport System.* Authors have attempted to evaluate transport at state, district and taluka level. Since the number of articles in this section is too large for a detailed discussion, the review is limited to the coverage of these papers. Transport system in almost all major states has been discussed in this section. The states that have been taken up for detailed studies are Rajasthan, Orissa, Maharashtra and Goa. The regions that have been specially analysed for its transport and spatial development are North Eastern Region, Vadodara, Ananthapur District of Andhra Pradesh, Gulmarg and Pahalgaon in Kashmir, Road transport in Magadh Plain of Bihar, Rural transport system of Gorakhpur District of UP, Allahabad district of UP, Ganjam District of Orissa, Burdwan district of West Bengal, railway transport of Brahmaputra Valley and transport network in Amethi taluka of UP. The article on Konkan Railway Transport explains how this network benefited the local people for movement and commodity transport.

Though road and rail are the major means of transport in India one should not neglect air and inland water transport while talking about the transport geog-

raphy of India. Air transport and inland water transport are conspicuous by its absence in this edited volume. Inclusion of these modes of transport would have substantially improved the coverage and utility of this volume.

A number of editorial and typographical errors dilutes the merit of the book. Better language editing would have improved the readability of the volume substantially. Even with all these limitations, Considering its coverage and depth of analysis this book would certainly be a valuable reference for planners, geographers, economists, academicians, researchers and others who are keen to know about Indian transport scene. This book could serve as a single reference point for a number of issues concerning transport geography of India. Given the contents of the volume, the price of Rs. 800/- is quite justifiable.

K.P. Sunny
Deputy Director
National Productivity Council
□

> *Iron rusts from disuse; stagnant water loses its purity and in cold weather becomes frozen; even so does inaction sap the vigor of the mind.*
>
> **— Leonardo da Vinci**

News & Notes

Basic Educational Achievements of Asian Economies

The educational attainment of the East Asian economies and its relevance in contributing to the remarkable growth and development of the last 30 years have been well documented (World Bank 1993, Asian Development Bank 1997). Most Newly Industrialised Economy (NIEs) have achieved high literacy rates, as reflected in the high secondary and tertiary enrollment rates in the more advanced developing Asian economies (Tables 1 and 2 give data for 12 selected countries in the region). These attainments reflect large allocations to educational spending. In Korea, for example, total education expenditure increased from 8.8% of GDP in 1966 to 13.3% in 1998. Illiteracy declined to virtually zero by the late 1990s, primary school enrollment was 100%, and secondary school enrollment was almost universal.

Most Asian countries in the table have achieved enrollment rates of virtually 100% at the primary school level (Table 1). For countries such as Bangladesh, Cambodia, India, or Lao PDR, this represents a very important achievement, as in 1970 this rate was very low. Secondary enrollment rates have increased substantially and in many cases have more than doubled since 1970. Some countries, such as Korea and Malaysia, have achieved virtually universal secondary education. (Tertiary enrollment rates in developing Asia are substantially lower than primary and secondary ratios, except in Korea).

These high enrollment rates do not, however, indicate the length of time that children have actually attended school. Such data on the percentage of students reaching grade 5, although incomplete, indicate that drop-out rates among children entering school are not high in East Asia (Table 2). However, in some countries, they are very high. Neither do enrollment rates provide information about the quality of education offered. An indirect indicator of educational quality is the pupil/teacher ratio. Here there is a marked contrast among the countries in Table 2 between the East Asian economies and, for example, Bangladesh, Cambodia, and India, with the latter group still exhibiting very high ratios, though these are declining.

While India has achieved universal primary education, its educational attainment at the secondary level lags behind that of the East Asian economies (including the PRC). India also suffers from a very high drop-out rate, and rural house-holds see a very low return on basic education, especially for women. The rest of South Asia faces the same structural problems as India but without having achieved the same relatively high levels of tertiary education. The tertiary education stock (defined as the mean number of school years spent at university by the working-age population) of India is very high to the point that one can speak of a "dualistic" nature of education. While large sections of the manufacturing workforce do not have even a basic education due to high drop-out rates, India has a large stock of students with university degrees.

The PRC's situation is slightly different since it has had to make up for the time lost in "the Great Leap Forward" and the Cultural Revolution, when the Government emphasized primary and secondary schooling but neglected university education. Despite the efforts made during the 1980s, in 1990 only 2% of the country's 20-24-year-olds were enrolled in universities.

The Central Asian republics had developed excellent educational systems during the Soviet era. However, with the breakup of the Soviet Union and the political transition, educational provision in terms of both the curricula offered and the physical infrastructure collapsed. These countries need to invest in physical infrastructure and develop new curricula, especially in the social sciences.

The importance of competitiveness in the context of globalization has brought to the forefront again the significance of the role of education. The reason is that, while the East and Southeast Asian economies did very

Table 1: Indicators of Educational Attainment, Selected Asian Economies. Various Years

	1970	1980	1990	1998/99
School Enrollment, Primary (% gross)				
Bangladesh	54.3	61.1	71.6	106.1[a]
India	77.8	83.3	97.2	100.9
PRC	90.9	112.6	125.2	106.4
Cambodia	30.3	138.6	120.9	102.4
Lao PDR	57.1	113.5	105.0	115.3
Viet Nam	–	108.8	102.9	107.7
Indonesia	80.0	107.2	115.2	107.9
Malaysia	88.7	92.6	93.7	101.4
Philippines	108.3	111.9	111.3	113.2[a]
Thailand	81.4	98.9	99.1	93.5
Korea	103.4	109.9	104.9	98.6
Singapore	105.5	107.7	103.7	79.8
School Enrollment, Secondary (% gross)				
Bangladesh	–	17.5	19.0	53.7
India	24.2	29.9	44.4	49.9
PRC	24.3	45.9	48.7	62.8
Cambodia	8.2	–	32.1	17.3
Lao PDR	3.7	20.7	25.2	35.6
Viet Nam	–	42.0	32.0	64.6
Indonesia	16.1	29.0	44.0	54.9
Malaysia	34.2	47.7	56.3	98.8
Philippines	45.8	64.2	73.2	75.9[a]
Thailand	17.4	28.8	30.1	79.0
Korea	41.6	78.1	89.8	97.4
Singapore	46.0	59.9	68.1	–
School Enrollment, Tertiary (% gross)				
Bangladesh	1.9	2.8	4.2	4.2
India	4.9	5.2	6.1	–
PRC	0.1	1.7	3.0	7.5
Cambodia	1.5	0.1	0.7	2.7
Lao PDR	0.2	0.4	1.3	2.9
Viet Nam	–	2.1	1.9	9.7
Indonesia	2.5	3.8	9.2	–
Malaysia	–	4.1	7.3	23.3
Philippines	16.8	24.4	28.2	29.5[a]
Thailand	3.1	14.7	16.7	31.9
Korea	7.4	14.7	38.6	71.7
Singapore	6.1	7.8	18.6	–

- Not available. [a]1998.
Source: World Bank, *World Development Indicators*, available: http://publications.worldbank.org/WDI.

well in providing basic education for their populations, they are now transiting from labor-intensive manufacturing to technology-intensive manufacturing—or have already made the transition. Those that have not will require new FDI inflows and the development of domestic R&D for which an educated workforce is required. In practical terms, this means that they need not only increase the volume of education, but also, and more importantly, raise the quality of the education. The latter particularly requires an emphasis on the relevance to the needs of a modern economy of the curriculum and style of education.

Table 2: Indicators of Educational Attainment, Selected Asian Economies, Various Years

	1970	1980	1990	1998/99
Pupil/Teacher Ratio, Primary				
Bangladesh	46	54	63	59.3[a]
India	41	45	47	43
PRC	29	27	22	19.8
Cambodia	17	44	33	50.1
Lao PDR	36	30	28	30.1
Viet Nam	–	39	35	29.5
Indonesia	29	32	23	22.4
Malaysia	31	27	20	20
Philippines	29	31	33	–
Thailand	35	–	22	20.8
Korea	57	48	36	32.2
Singapore	30	31	26	25.3
Persistence to Grade 5, Total (% of cohort)				
Bangladesh	–	20.5	–	–
India	–	–	–	59.7[a]
PRC	–	–	86.0	97.3[a]
Cambodia	–	–	–	–
Lao PDR	–	–	–	54.2[a]
Viet Nam	–	–	–	82.8[a]
Indonesia	–	75.5	83.6	90.5
Malaysia	–	96.8	98.2	–
Philippines	–	–	–	–
Thailand	–	–	–	97.1[a]
Korea	96.3	93.9	99.5	–
Singapore	–	97.2	–	–

- Not available. [a]1998.
Source: World Bank, *World Development Indicators*, available: http://publications.worldbank.org/WDI.

Excerpted from Asian Development Outlook 2003.

Low Skills, Vicious Circles, and Traps

Countries that try to exploit their comparative advantages based on low labor costs by restricting wages or through devaluations end up sucked into a vicious

circle of low productivity, deficient training, and a lack of skilled jobs, preventing the sector in question from competing effectively in the markets for skill-intensive products. This situation is referred to as the "low-skill, bad-job trap". Bad jobs are associated with low wages and little opportunity to accumulate human capital. Good jobs, though, demand higher skills and command higher wages.

A second trap derives from the complementarities between capital and labor, referred to as the "low-skill, low-tech trap". If workers have insufficient skills to operate modern machines, the latter will be underutilized. Consequently, firms have little incentive to invest in the latest technology. This reduces workers' productivity even more.

A third problem emerges from the interaction between innovation and skills. Innovation is crucial for developing technological capabilities, but it requires well-trained workers. Economies can get caught in a vicious circle in which firms do not innovate because the labor force is innovate because the labor force in insufficiently skilled, and workers have no incentives to invest in (so they do not train sufficiently) because there is no demand for these skills.

Therefore, the relatively low demand for and supply of skills in a country is seen as deriving from rational decisions made by both firms and individuals in the context of the particular legal and institutional framework in which they operate. Countries with a less skilled workforce have greater incentives to produce non-traded services rather than tradables, such as manufactured goods, because the former are relatively protected from foreign competition. This pattern of specialization creates and perpetuates the demand for less skilled labour.

One of the most important consequences of the deficiency in training is the effect on the composition of goods produced in the country; a lack of skilled workers adversely affects product quality. And skill deficiencies lead to producing and exporting relatively poor-quality and low-value products. A businessperson with only an unskilled labor pool available may well consider that any attempt to produce high-value goods will be subject to errors and poor quality. Thus, the labor force will be more suited to the production of a low-value rather than a high-value product, as it is better to risk ruining a low-value than a high-value one. The manufacture of products of high quality requires highly trained workers. But if the country does not generate enough of these workers, firms will be forced to produce low- quality goods; and likewise, workers will acquire little training because few high-quality goods are produced. This leads to a vicious circle because the choices made by

employers reflect the availability of a skilled workforce. Different outputs require different types of training.

Why can the above happen? The reason is that the market does not lead to the best possible out-come because there are differences between private and social returns to knowledge. Individuals are not fully rewarded for the social contribution they make when they invest in knowledge by increasing the stock of knowledge available to everyone. They get no reward for this spillover, and so contributions to social knowledge will be underprovided. In the end, firms' decisions about what type of products to produce depend on the degree to which skilled labor is available. The result is that "in countries that offer little support for education and training and that contain a large proportion of unskilled workers, the market mechanism may reinforce the existing lack of skills by providing little incentive to acquire more; whereas in countries with well-functioning educational and training institutions and large bodies of skilled labor, the free market may do much more to induce people to become skilled".

Breaking out of such traps and vicious circles may require government intervention in subsidizing knowledge acquisition. People will have the incentive to go to school if the country already possesses a high average level of skills, but they will not if skills are still low. Thus a nation with low average skills will be stuck in this position because people do not find it worthwhile attending school.

But what can the government do to remedy the situation? It is difficult for it to know all the aptitudes needed by every single firm and worker. Likewise, government support for training is not cheap and it must finance it by imposing taxes or cutting other expenditures. In other words, substantial public investment will not enable the country to get out of a trap if this investment is financed by a punitive tax on private investment. This implies that the subsidies should be financed by taxes that do not discourage knowledge accumulation, such as taxes on consumption.

One measure that governments can adopt includes training vouchers, financed by government revenues and used to compensate both firms for providing training and workers for acquiring the resulting skills. Another measure is investment tax credits and depreciation allowances.

Source: Snower, Dennis. 1996. "The Low-Skill, Bad-Job Trap". In Alison L. Booth and Dennis J. Snower (eds.), Acquiring Skills: Market Failures, Their Symptoms and Policy Responses, pp. 109-24. Cambridge: Cambridge University Press.

Excerpted from Asian Development Outlook 2003.

□

Productivity

Announces

a

Special Issue
(October–December, 2003)

on

'Automobile Sector'