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Quality—Changing Concept and Scope

DR. K.C. SAHU

The author in this paper discusses the relevance of Quality as a part of productivity movement and presents a strategy for the growth of Quality Movement.

Dr. K.C. Sahu, is President, National Council IIIE and Professor, Deptt. of Industrial Engineering & Management, I.I.T., Kharagpur—721 302.

Introduction

November, 1986 has been observed as Quality Maintenance and Improvement month in our country to spread "Message of Quality", to "Create Consciousness, Commitment and Culture" so that pursuit of excellence becomes a "way of life" and "an article of faith" in our life and work.[1] We also shell celebrate 1987 as QUALITY YEAR, not only to sustain campaign through seminars only, but hopefully, to initiate concrete educational training and administrative measures to innovate, plan, execute and control (i.e. to manage) improvement in Quality.

Going by Japanese experience—providing us and others with obvious inspiration in chasing Quality—a minimum of a decade of dedicated and planned effort at national and organisational levels will be needed to make Quality a 'way of life'. With our size, complexity, low literacy, even more time and effort may be needed.

It is suggested that, we debate, decide and act soon on an Implementable Quality Improvement System from now till 2000 AD. Quality—having significant impact on productivity, cost, consumer satisfaction, and employee motivation, should be most vital core of all over plans - national and corporate. Quality of goods, services, administration, management, etc. are all interrelated. Quality like peace is indivisible. Hence the need for integrated planning and sustained

effort for 10—20 years, to inculcate necessary attitude and techniques to improve and maintain quality everywhere.

The Japanese Experience[2]

During the period 1946-50 Statistical Quality Control (SQC) was brought to Japan by US Army through Dr. D.E. Deming. In 1954, Dr. J.M. Juran, author of firstever, Quality Control (QC) Hand Book[3] was invited to propagate concept and techniques of QC through Education and Training. Between 1955-60, there was Company Wide Quality Control (CWQC) movement for "all employees from Top Management to Foremen and workers to study and apply statistical methods for QC". In and since 1962, Quality Control Circles (QCC) movement has started. There are now over more than one million QCC in Japan, with "total commitment and involvement" of Top Management. Competition for national "DEMING Award" is often the primary first goal of corporations in their endeavours in Quality, which reflects obvious pride and prestige, the Japanese Society, Government and Management attach to excellence & Quality.

Japan sustains these efforts, by observing, each year, October as Standardisation promotion month and November as Quality month. In May, Conferences on Quality are organised. All these efforts are self and voluntarily financed without Government patronisation/funds. Quality creation requires voluntary and sustained perseverence and in depth education and training. These are the lessons from Japanese experience since 1950. Within these 30 years, the image of Japanese 'products' have changed from "Low Price-Poor Quality Reliability" to "Competitively Priced—High Cost & Reliability". It reinforces my pleading for at least a decade of planned effort, viewing it as a very important Capital Investment rather than as an avoidable expense.

Quality of Products—Widening Views

Juran (3) differentiated between 'Quality of Design' and "Quality of Conformance". He also conceptualised an optimum as shown in Figure-1. 'Quality of

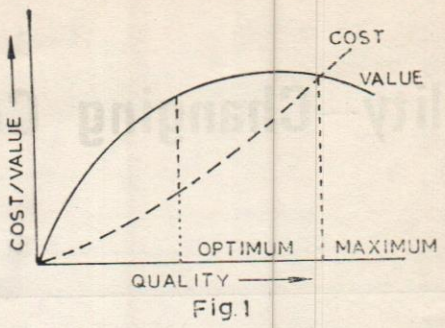

Fig.1

Design' included life, Appearance, Interchangeability, Luxury, Safety, Ease of installation and use, Maintainability and Ability to take unexpected/overloads.

Significantly, he observed that Quality of design usually costs more but Quality of Conformance generally should cost less. 'Safest base' according to him, on which to build QC is the " 'Inspired Quality Consciousness' of Management, Supervision and Ranks in an organisation." No wonder, Japan invited Dr. Juran - the most well-known international authority then, to lay foundation of its Quality Movement in 1954.

Assurance sciences,[4] today reflect the widening concept of product quality. It is conceived to be an Engineering discipline governing Quality, Safety, Economy, Serviceability and Long term dependability consisting of interrelated and interacting fields/functions of Quality Control (1929), Reliability (1957), Maintainability (1954), Integrated Logistic System (ILS) (1964), Safety, Value Engineering, Human Factors and Standardisation often considered unrelated and entrusted, if at all undertaken, to different departments/sections in most organisations even today. In the wider context of Assurance Sciences, Quality is "Extent to which a product satisfies expectation of its customer (not merely standards) and QC is a system of Quality Management for verification and Maintenance of a desired level of Quality, by planning, Inspection and corrective action." Reliability is "Probability of product performing intended function over intended life under operating conditions specified/encountered." Maintainability is a characteristic of design and installation expressed as "Probabi-

lity that an item will conform to specified conditions within a given period of time when maintenance action is performed in accordance with prescribed procedure and resources." Given Mean Time Between Failure (MTBF), Mean Time Between Maintenance (MTBM), Mean Time to Repair (MTTR) and Mean Down Time (MDT), Operational and Inherent Availabilities, and other planning & control parameters, can be calculated.

It may be noted that there is trade off possibility between Reliability (MTBF) and Maintainability (MTTR), between Quality and Quantity. Along with ILS and Life Cycle costing (Terro-Technology) we now can analytically optimise all related subsystems costs and benefit for as long as we can forecast Technology and related environment and estimate cost and effort with reasonable accuracy.

Quality development, maintenance and improvement to produce and distribute economically and to give maximum satisfaction to customers are the objectives of QC now. From inspection of Quality and later, Statistical Quality Control (SQC) the emphasis has shifted to *creation of Quality* as would eliminate reduce need for inspection through programmes like zero defect, by closely monitoring all stages in design and manufacturing covering all aspects—men, material and machines. From "Feed Back", we are moving to "feed forward" System of Control of Quality.

Quality and Productivity

Quality-productivity interaction is deeper than mere Quality-Quantity trade off. Productivity measures inherently should contain Quality of output, working conditions, environment, and economy with a conscious balance between short term and long term measures of private and social cost to create most satisfaction to maximum number of existing and potential customers whose need for product in Question is judged to be most urgent.

Three interacting aspects of Quality, Productivity, Desirability (of output, to customers) and Affordability (Price) are discussed in (5), interestingly reversing the normally held view of treating Quality as a part of productivity.

Pursuit of Profitability, Productivity and Excellence should be viewed as inseparable aspects of total process leading to efficient production and distribution of goods and services of highest possible Quality at least possible price so that most needy can afford it (if needed with subsidy or even free) and all desiring can get it, while conserving scarce input resources to the utmost extent for use by generations to come. Pollution and Ecological considerations are particularly relevant in this context.

Reduction of waste, conservation of energy, optimal use of resources, innovation adaptation and updating of Technology and Management and "Fair and equitable sharing of gains between all including consumers" (5) are cardinal in pursuit of Quality ensuring Productivity.

"Our exports get rejected (5) (e.g. shrimps by Japan/cashew by Tanzania/pulses by W. Germany/oil seed by France and Zip fastneis by USA) due to indifferent non-caring attitude to consumers.

Lack of 'Social and Professional Conscience' and pride, narrow short term get-rich-at-any-cost attitude, protected non-competitive in internal market lead to dumping of substandard products on our own helpless consumers in a 'take it or leave it' arrogance. This danger is greater in monopolies—private or state.

Related to desirability is affordability (Price) in our country with many below poverty line with little financial ability to buy things. The success of our dual pricing (with subsidy element) in essential commodities like cereals, sugar, paper and cement and of administered prices must finally be judged not merely by financial success of related organisations, but by number of needy beneficiaries consuming the product as a consequence and consequent multiplier effect anticipated, impact on Economy, Society and Environment etc. There are hardly any techniques, approaches or even desire to check at the targeted beneficiary levels except perhaps the recent tours

undertaken by Prime Minister himself to remote corners to personally check the trickling down of development from Delhi to remote villages without roads/communication linkages.

The very concept of goodness and 'desirability' customers now look for in inumerable products—consumers & producer, goods used-have undergone significant changes by compulsions of mass production & consumption, of urban living in congested low space per head, spectre of resource shortages etc. Instead of robust, over-designed, & over weight voluminous everlasting, ornamental decorative aspects, we now desire built in specific life, light, functional items in, e.g., furnitures, garments, shoes & many things. This trend is reinforced by frequent fashion changes – real or engineered—because of which, nobody will like to look "out of fashion" in old dresses/shoes. It will be a problem of space if therefore old does not wear out to make room for new. with more, delicate, High-Tech Electronic consumer hardwares—often beyond the S & T knowledge of button pushing, reliability and dependability for prompt efficient, low cost maintenance service from supplier/manufacturer are other desirable aspects of Quality. In sophistication—"modern Electronics Computer Controlled" black boxes—to operate & control complex systems from space craft to "laser beams" might cross the threshold limit of faith & confidence of users, which normally are based on understanding of fundamentals of S & T logic & rationality involved. Consequently, unless, the general level of education in S & T in all is improved or a strong knowledgeable consumer movement gets started a society consuming S & T based sophisticated products are often at mercy of profit chasing producers unconcerned with Quality, Reliability & Maintainability. This is widespread in goods of public or private consumption like : ugly buildings, road with potholes, leaking taps, noisy machines, non-functioning water pumps, ugly furnitures, dirty floors, & walls of offices, roads, parks, trains & so on add infinetum.

Of course, Quality is a relative concept—looking at it from widely varying capacity to consume any product in our Society—with significant proportion below poverty line not having minimal "Quantity-wise" share of basic necessities of food, housing & clothing. For them, concept of Quality is, necessarily reflected in adequate "Quantity" of food to start with—hopefully with 'Quality of nutrition' value—if not taste satisfied. Similarly, small minimal quantity of space (a roof over the head) or clothing—can & should necessarily be kept clean & hygienic—"as if to make up for Quantity", requiring not much of capital but a lot of functional education & an attitude of mind towards "cleanliness" which Gandhiji (12) used to equate with "Godliness".

Quality of Services

In a modern welfare state, citizens not only "consume" a variety of goods but also a large number of "services", like Justice, Health, Education, Banks, Post & Telegraphs, Rail/Road/Air transportation, Electricity supply, Television/Radios, etc. The massive & growing Governmental Administration from Panchayat & Municipal levels upwards interacts with citizens at multiple points of time & space—like maintenance of law & order, tax collection & refund, redressal of grievances, development plans & their implementation, etc.

Much of existing concepts/techniques on Quality have arisen out of & hence are relevant to only products. We must evolve criteria of Quality in Services—general & specific to various types of services—& then improve these wherever necessary. Perhaps most "important' common characteristics of Quality in 'any service' are courtesy, care, concern, & promptness with which service is given to the receivers. Most of our service giving organisations—at the 'customer'/consumer interaction points—are callous & inconsiderate. They behave as if, instead of the existing to provide service to the citizens, it is the other way about. Inaccessibility, insulation & isolation from public gaze, outdated procedure oriented play safe rules breeding more rules, inordinate delay, poor quality of written/oral responses to query —with neither information nor courtesy are common features across nearly all 'windows' catering to all kinds services from ticket counters to project sanctioning. In very essential services like, law & justice—

high cost & delays—much discussed—effectively keep many from getting the benefit at all.

In Health Services, delay, squalor & non-caring attitude to patients & their relations aggravate rather than cure diseases. "Education" is delivered inefficiently, with long delays at all stages of examination processes, not to mention note learning, irrelevant syllabuses, unprofessional teaching & unmindful students.

A set of specific qualitative parameters can be defined for quality of any type of service. For example, in transportation system, like Indian Railways (IR)—"Safety Security & Punctuality" are essential aspects. So are amenities for all existing passengers including, not so much comfort as hygienic conditions. It should be highly cost effective & give service at lowest cost cutting down all wastages & under-utilizations. On more qualitative & positive side, Indian Railways, for example, carries low profit yielding but socially vital bulk commodities like food, fertiliser, cement, coal & steel. Therefore, a mere commercial/financial comparison of IR with career carrying so called high revenue yielding trivialities like cosmetics & cigarette without this qualitative consideration of "What is carried" & to whom, will be meaningless & misleading.

Its services should reach remote corners of our country so that people presently not using it can do so. In fact, in our country, an important aspect of QUALITY of service—these mentioned earlier or any other—is its QUANTITATIVE expansion to benefit 'new' users. This will require cost-effective management to make this service as cheap as possible to reach many. Social cost benefit analysis may justify subsidising pricing—as it now does, for most services like suburban rail passengers or for education or health or any other. But often the public subsidy benefit is cornered only by a small section, some of whom, can pay full cost based prices too, without really reaching those who can not pay any price whatsoever. For example, almost the total benefit of heavily subsidised Education in Engineering & Management go to few Corporate Sector giants who are, by & large, not responsive enough to pay for them directly through Capital grants/endowments/donations unlike their counterparts in developed countries.

Thus, invariably, Quality & Quantity aspects get mixed up—each phenomenon, event & person having both the aspects. A combined yardstick for "What service" & 'to how many & whom delivered' is more rational approach. Inordinate delays in completion of nearly all development projects, tremendous overrun of costs & shoddy workmanship affect both Quality & quantity of goods & services. Effective project management including all three dimensions—time, cost and most importantly Quality of work—should be urgently instituted.

Given our limited physical resources, growing numbers & unsatisfied needs for quality goods & services, we should, in vital services, concentrate more on caring & sharing, equitable distribution, delivery of whatever little service we can with sensitivity, affection & smile rather than endlessly chase physical splendour & plenty of more affluent countries. A smile does not need new investments in crores except for an inner sensitivity & attitude of caring. It is indeed sad that our education system in particular & society in general have failed to inculcate elementary sensitive in all people to all others—living & non-living in all of us. It will be well worth reviewing the reasons for it & rectifying it to create attitude & values conducive to "Quality creation & enhancement"—not merely maintenance & control—in all spheres.

Need for Modern Technology and Management

To create, maintain and enhance Quality of goods/services in all our organised systems—Government, Corporations, Institutions and organisations—we need infusion of more better and uptodate science and technology (S&T) such as Computers, Electronic communication and control, Robotics and Automation to modernise facilities, reduce real resources consumptions, economise project construction to optimise operations and to operate with less pollution and least damage to ecology.

Our management system—hardware and software must also be updated with more computer based information and control systems, more mathematics-

statistics-Computer based decisions (Management Science & Operations Research) and most importantly, by changing our attitudes and values for more appropriate man-management in era of S&T, knowledge and democracy. An internal man-management in a culture conducive to pursuit of excellence and customer/public relations is vital for better management for Quality.

Multiplicity of Organisation/Lack of Team Work & Practice

Since 1948, Indian Standards Institution is "specifying, standardising and enforcing", quality in manufactured goods. Indian Statistical Institution, also spreads Education and Training in SQC. NPC Since inception in 1958 propagate QC as part of productivity. Academic Institutions and professional associations dealing with productivity and Industrial Engineering, Production Engineering and Management are also making efforts. Yet totality of impact is marginal due to lack of co-ordinated effort and coherent integrated comprehensive long term plan and action. As in everything else, in Quality Movement there is no Team work between Institutions and even between parts of same enterprise. Superficial short term interests die down without dedicated effort at building solid foundation of Philosophy, Knowledge, and Professional skill.

Organisations propagating quality or productivity or anything desirable like cost reduction, should, to begin with, be models of what they preach. Without this, the propaganda leaves no impact as it is not convincing. We may search our hearts to find reasons and improve, starting with the huge administrative machinery of Government itself and making it a model of Economy, Efficiency, Productivity and Quality of service in its interaction with citizens, as it is taken as a prototype for most public sector and public financed organisations.

Quality of Life (QOL) : Concepts and an Assessment

Much beyond mere products and services, we now conceptualise and seek through planned effort QOL and Quality of working life (QOWL).

QOL is an all inclusive mixture of, more importantly, Economic Indicators, Standard of living, Life expectancy, Health and nutrition, Employment, War and Ecology. A shorter list of Physical Quality of Life Index (PQLI) includes (i) Infant mortality, (ii) Life expectancy at age one and (iii) Literacy—Combining all of which Index number for India is 41 compared to an average of 56 for 141 developing countries, 82 for Sri Lanka and 48 for Iran (6). This 41 hides the vastly skewed disparity dispersion. Thus PQLI for socially disadvantaged women in some of our villages must be at or near lowest in the world.

We belong to the lowest 10% of countries in food consumption with per capita cereal consumption at 460 gms, pulses—the primary sources of protein at a low 39 gms (from 69 gms. in 1961). 70 million children below 6 and most nursing mothers are undernourished. Most in villages do not and cannot consume even the little milk they locally produce thus giving an artificial sense of plenty in milk to affluent city dwellers, who are beneficiaries of State Subsidised 'White Revolution'. At 2000 calories/day per capita we are significantly below minimum 2400. By end of International Drinking Water Supply and Sanitation decade 1981-91, or so, we hope to solve drinking water problem in 231000 of our problem villages. We hope to have roof over heads, health for all, universal primary education, by the magic year 2000 AD. However, estimates put an increase in slum population at Bombay, from present 52% to a mind boggling 75% by 2000. Our health services—high cost and curative highly capital intensive, like our legal services are beyond the reach of all but top 10% or so. Another estimate predicts that we shall enter next century with highest number of illiterates compared to any country in the world.

Unemployment is a staggering 12.02 million (1980) and increasing in net. NSS estimates 4.5 million bonded labour, Gandhi Peace Foundation putting the figure at 26.17 lakhs.

Most disheartening is the dismal life of 150 million children between 5 and 15 who, often bonded, work for pittance in filthy conditions for long hours in grim "struggle for existence" due to poverty (7).

Top priority in improving 'Quality' of life in our country must be this group of children—working as domestic help or in "match making, carpet weaving and dimond cutting." They must be rehabilitated in completely State managed study cum work centres—learn and earn to supplement family income at existing or even higher levels at least till the age of 15.

We of course destroy forests, pollute water and air – all in name of development. Finally, along with all else in world, we live in fear of nuclear death with over 60,000 nuclear weapons push buttons away.

One specific and major plan of social reform Gandhiji (12) propagated with uncanny sense of priority is cleanliness, in terms of personnel hygiene and at common facilities like roads/ponds, as an important preventive measure to ensure health, which is a very important aspect of our quality of life.

Philosophically & physically, it calls for an "inner look"—a clean mind being essential for a clean body, a cleaner kitchen & latrine being more essential than a mere clean drawing room.

Often tiny & cheap houses/hamlets, in our remote village are kept meticulously clean or at least hyginic, by using locally available near free materials like coloured mud or cowdung. It, however, does require time & human energy which is gladly given. Several of these habits have been sought to be incorporated in our religious & social habits requiring occasional cleaning of houses, villages, frequent baths in a tropical country—(it is not only holy but hygenic too) change/washing of cloths, etc.

Often private and public places being dirty, is an urban disease where everybody, bothers about himself & his family & his little house without the broader civic sense of keeping the front of the door, part of the street or common staircases clean. In a congested living, pollution of air, water & dust, indiscriminate garbage disposal & noise etc. affect everyone, irrespective of how we keep our own little place tidy.

A rising life expectancy of 52 broadening/ deepening base of our economy, infrastructure will trained S & T manpower are positive aspects symbolising a hopeful future. An energetic youthful leadership hopes to harness S & T to solve our problems of poverty, squalor and ignorance—a perfectly feasible proposition if all put in dedicated effort.

Ultimately, QOL is a complex and relative concept. View on QOL will depend on view point and existing state. "To a hungry man, God comes in form of food" (12) symbolising all conceptions on quantity and quality alike. Concretely we must conceive of Quality of what for whom and then act according to priority.

Quality Control Circles (QCC)

Central message of QCC is a culture of participation of appropriately and consciously trained manpower to "draw out their infinite possibility" (2). QCC reflects on attitude of faith, understanding and respect between managers and the managed. In a way, it seeks to question dichotomy of "all thinking" by Managers and "all doing" by workers, in contrast to classical management which assumes that workers are to be told what to do.

There is no end to the process of developing human resources. In Japan, Foremen understand and apply "College level statistics". All workman feel at home with seven tools of QC : Pareto charts/Cause-Effect diagram/Stratification/Check sheets/Histogram/ Scatter diagram and Sheward Control charts.

It underlines the unavoidable necessity of Training and Education for all—from 'Top to Bottom' to which there is no short cut.

Most of our initiative and efforts at QCC—in contrast—rest on less solid foundation of emotion, miracle and superficiality.

More competent and involved human beings, better human and Industrial relation, participative management key aspects of QCC, are bound to combine to lead to more production, productivity, creativity, job satisfaction, motivation, better quality, reliability and less resource consumption, cost, rejections and frustrations.

A key to success in QCC is to introduce them with management commitment, careful ground work and gradually, "without fanfare". (7) We may profitably take note of this guideline.

A faith in self-regulating capability of a semi-autonomous small group for better creativity is the basic concept (8). Small is not only beautiful (9) but also, dutiful (10).

It is a "prevention-is-better-than-cure" approach.

Lastly, Quality is everybody's business and QCC approach is applicable to any situation where people work together—in Administration, in Industries, in all service offering organisations like Government—to produce creative and synergetic effect, harmony and team spirit.

Consumer Development & Sovereignty

Consumer satisfaction, vigilance, involvement and organisations are essential to create competitive and motivational pressure to move from present HIGH COST—LOW QUALITY—BAD SERVICE towards LOW COST—HIGH QUALITY—PROMPT SERVICE. There are too few consumer organisations acting as effective watch dogs.

More importantly, very large number of over population cannot/do not consume due to economic deprivation and high prices. Goods and services must go to all starting with most needy. Scarce inputs of material and energy must reach needy through kind of products services they require. Massive changes in concept and content of plans at all levels will be required. However, quality need not wait to follow quantity and in fact, both are tradeable. High quality in Basic needs such as food, housing, clothing, health and education may ultimately cost much less in long run.

We should particularly be concerned with high and rising costs of goods/services from public undertakings. Administered cost plus pricing involves the risk that seriousness about achieving economy, efficiency, productivity and quality will be lacking. We must in such situations, institute auditing by experts and by representatives of people at much more detail level to supplement efforts of parliamentary committees now doing a very essential job at top level auditing.

Conclusions : Strategies for Quality

Massive renewal of persons through training and education to impart knowledge of science behind work, necessary skill, value and attitude for dedicated work in spirit of service are much more important than mere renewal of upgrading of physical assets.

People must develop through and contribute fully and creatively to the work and derive basic pleasure and satisfaction by involving their HAND, HEAD and importantly HEART in their jobs.

Redesigning jobs to enrich and to cope with modern technologies should be undertaken.

Decentralised participative management keeping a dynamic balance between discipline and creativity will test to the maximum, the proven ability of our excellent Managers.

Management structure and existing pattern of manpower patterns - officer : employee ratios, have to gradually change to have more and more knowledgeable officers & men with knowledge of Science, Technology and Management. There should be less and less of unskilled workers and more "knowledgeable workers" to cope up with onslaught of S & T in all aspects of life.

Massive education and training of existing personnel should be undertaken with separate 5 year plans within 15-20 year perspective manpower plans.

R & D effort—excellent as these are for existing tasks—must be focussed on future seeking/developing new materials, processes, Technology, Control and communication.

Along with hardware, on 'software'—management side, we have to search for new ideas and boldly

experiment with OR and computers as well as with job enrichment/QCC. etc. to "untap full potential of all".

All services must encourage and welcome effective user groups with overseeing powers at all levels to act as quality watch dogs.

The knowledge, experience, skill, wisdom, enthusiasm, team work and most importantly, our positive attitude towards all physical & biological resources, time and sensitivity to feeling & needs of all people—all living beings can only leads us to right end & right means to achieve highest in Quality : non-violence, truth and beauty in everything we do & live for.

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Demand Behaviour—A Modular Approach

R.M. NARCHAL

In this paper an attempt has been made to study the market behaviour adopting a modular approach. The total demand of a product in a market gets influenced by a set of four major feedbacks related by market saturation, capacity, expansion, price fluctuations and motivational efforts which the author discusses in detail.

R. M. Narchal, Director (Corporate Planning), National Productivity Council, Lodi Road, New Delhi.

Introduction

One of the most important factors for the long range policy design for any company is study of the interactions between the company and its market. The growth potential in market allows the company to expand its production activities to satisfy the demand. The total demand of any product, however, also gets influenced by other factors such as product utility and attractiveness, pricing policy of the manufacturers, sales efforts made by the manufacturers, motivational efforts etc. The business decisions about investments for expansion or modernisation in a company have to be guided by the careful study of market behaviour. The imbalances between demand and supply position forces the fluctuations of prices, capacity expansion and investment in research and development. The study of total demand behaviour of any product therefore, plays a very vital role in the long term policy design of a company. This paper attempts to simulate the dynamics created by various factors in the market. The paper lists down the important feedbacks influencing the total demand behaviour of a product in a generalised form. Each of the feedback has been separately discussed to understand the dynamics of total demand as given below.

Structure of the Model

The model structure consists of four separate modules influencing the total demand of a product.

These modules list down the feedbacks which have been modelled in generating the total demand behaviour. These feedbacks have been separately studied to understand the influence of each on the total demand. The feedbacks are also inter-related and changes in one influence the other. The feedback structure developed by combining all the four modules generates the behaviour of the total demand of a product. Each of the modules and the feedback giving the important variables, assumptions and the outputs are discussed below.

(*i*) *Market Growth/Saturation Module*

This module simulates the behaviour of the total demand of product based on the scenarios of purchasing power, population growth, market price and the motivational efforts made by producers. Since the influence of price and motivational efforts on total demand are being studied by separate modules, these two factors have been kept constant in this module. This module indicates that the total demand of a product is generated because of potential buyers in the market. The potential buyers of a product grow or decline based on the growth or decline in population and the utility factor of the product. The potential buyers generate the market demand based on the average purchasing power of the buyer and the market price of the product. (Fig. 1)

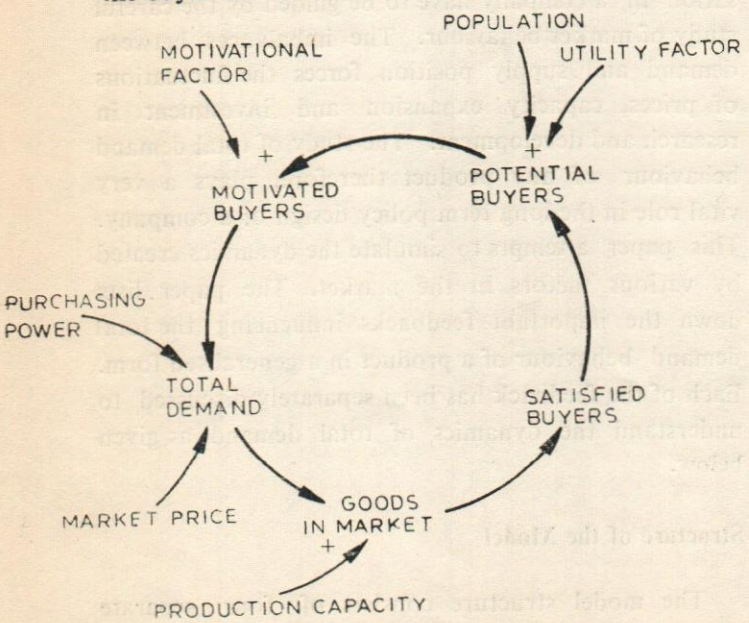


FIG. 1 · MARKET GROWTH MODULE

Depending on the total demand and production capacity the manufacturers supply the goods in market. These goods are purchased by the user who ultimately turn as satisfied buyers. With the increase in satisfied buyers, the potential buyer decrease. The feedback process also assumes that the goods in the market have got a life duration and the demand of the product is regenerated at the expiry of the life. The feedback loop is negative in nature and generates the behaviour of growth in total demand and its Saturation level in relation to scenarios of population and purchasing power with the buyer. Puchasing power available with the buyer is quite an important environmental factor influencing the total demand.

(*ii*) *Investment Module*

This module simulates the behaviour of investment required in relation to gap in demand and supply in product. As the demand of a product rises, the shortages in production capacity forces the enterpreneurs to invest in the industry to meet the market demand. The additional investment generates additional production capacity to meet the demand. The additional capacity however, is generated based on the lead time of conversion of additional investment into additional production capacity. (Fig. 2)

The industry however, has an option to choose its investment policy based on the demand supply gap.

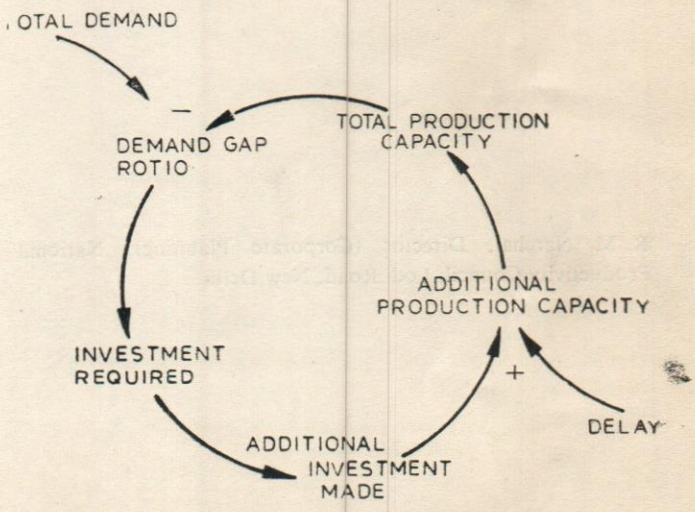


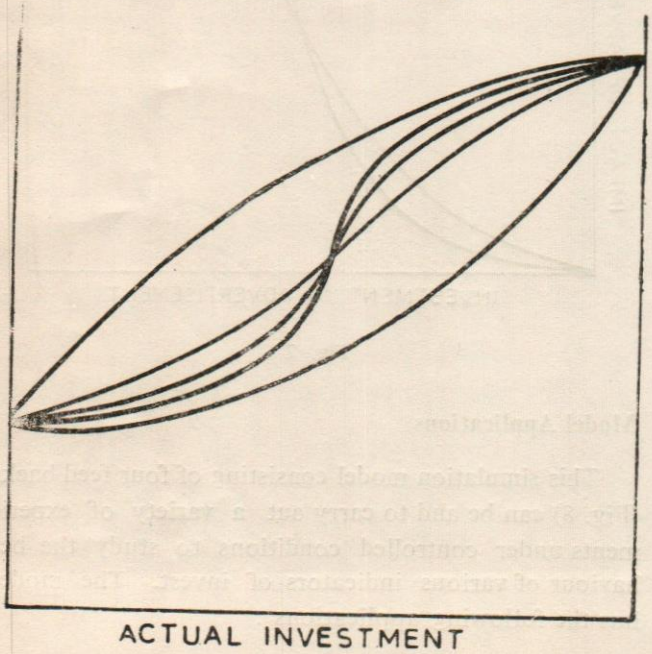
FIG. 2 INVESTMENT MODULE

As the production capacity rises, the total demand decreases. The industry management therefore, has to choose the right type of investment policies to ensure that they do not end up in creating a surplus capacity. In the investment module, the demand gap is measured as a ratio of production capacity to total demand. The investment required to balance the demand gap ratio is measured by investment rate. In case of demand gap ratio greater than one there is no need of investment and the investment rate is zero. In the event of demand gap fluctuating between zero and one, the investment rate indicates the dynamic trend because of the investment policies of the industry. The industry may not like to increase its capacity to such an extent to bring the demand gap ratio to one. The actual investment made for increasing the production capacity, therefore depends on the conservative or aggressive policies of the industry.

Fig. 3 indicate the different types of investment policies, the management may like to choose for making the actual expansion investment against the investment required to bridge the gap between demand and supply as indicated by demand gap ratio.

(*iii*) *Price Behaviour Module*

This module simulates the impact of demand supply gap on the price behaviour. In any consumer product market, whenever the demand of a product is higher than its supply, there is an increase in price and vice versa. The price of any product itself reacts to adjust in accordance with the shortages existing. Fig. 4 indicates the feedback process of price behaviour in accordance with the demand gap rates. As the demand gap ratio rises the price of the product also rises. With the increase in market price, the purchasing power of people goes down whereas on the other hand decrease in price leads to increase in purchasing power generating higher demand for the product. The feedback loop is negative in nature.



Fig, 3

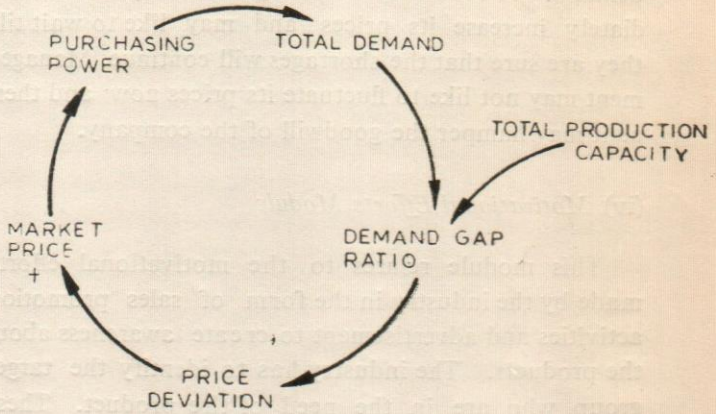


FIG 4 PRICE BEHAVIOUR MODULE

The feedback loop of price behaviour allows the management in deciding its pricing policies of the product with reference to demand gap ratio. Normally the price fluctuations start only after a particular level of demand gap ratio is reached. This phenomenon is shown in Fig. 5.

There is normally a zone in which if the demand gap ratio lies, there is no change on the price behaviour. The zone is called ineffective zone. Once the demand gap ratio increases or decrease further, the industry management tends to increase or decrease its price. The management can simulate the impact of various pricing policies before adopting one. An aggressive management may like to shoot up its prices even when there is a little shortage of product against the

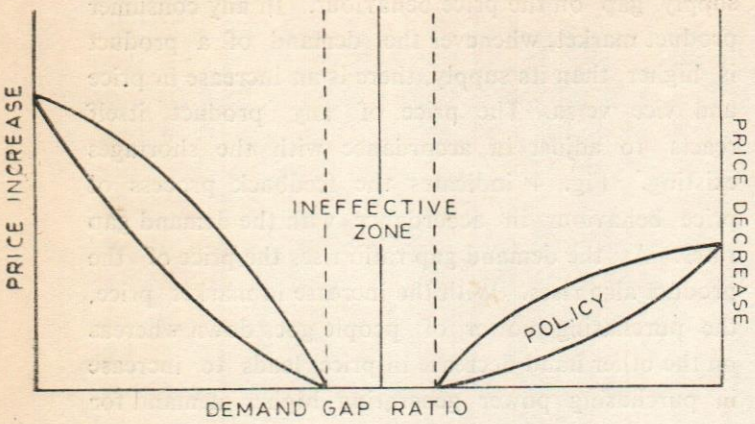


Fig. 5

demand. A conservative management may not immediately increase its prices and may like to wait till they are sure that the shortages will continue. Management may not like to fluctuate its prices now and then as it may hamper the goodwill of the company.

(iv) *Motivational Efforts Module*

This module relates to the motivational efforts made by the industry in the form of sales promotion activities and advertisement to create awareness about the products. The industry has to identify the target group who are in the need of the product. These type of motivational efforts one required to create awareness and knowledge about the product as well as for convincing the individual about the utility of the product. This has to be done keeping in view the needs of the customer. The feedback loop consisting of various variables are given in Fig. 6.

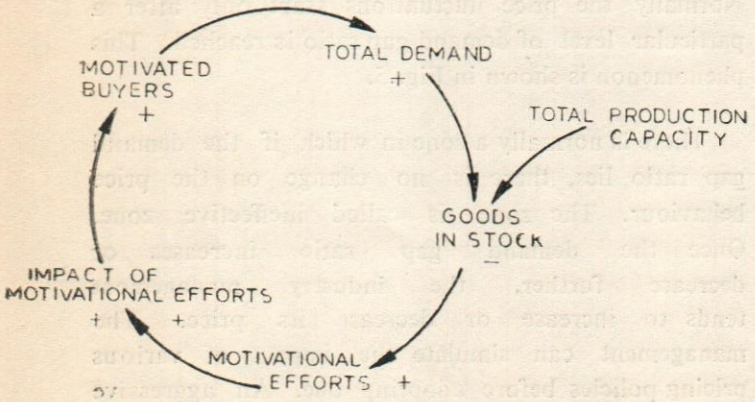


FIG. 6 MOTIVATIONAL EFFORTS MODULE

At any point in time there are certain motivated buyers in the market who are interested in buying the product. The motivated buyers generate the total demand in the market. With the increase in motivated buyers, the total demand increases. Depending on the total demand, the industry supply goods in the market. As the total demand increase the inventory of goods in stock decreases. In the event of a very high goods in stock the industry is required to make motivational efforts to create awareness in the market. This awareness is created by the industry by making investment in motivational efforts. As the investment in the motivational effort increases, the impact of these investments ensures that more and more buyers are motivated to buy the product. The feedback loop is negative in the character and guides the industry in identifying the quantum of investment requirement for motivating the buyers to increase the total demand for a particular level of goods in stock. (Fig. 7)

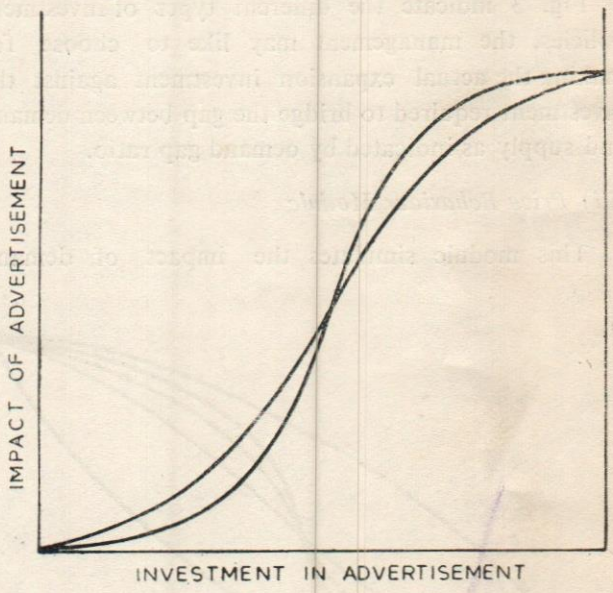


Fig. 7

Model Applications

This simulation model consisting of four feed backs (Fig. 8) can be and to carry out a variety of experiments under controlled conditions to study the behaviour of various indicators of invest. The model has the following applications :

(i) Tostudy: he behaviour of total demand under

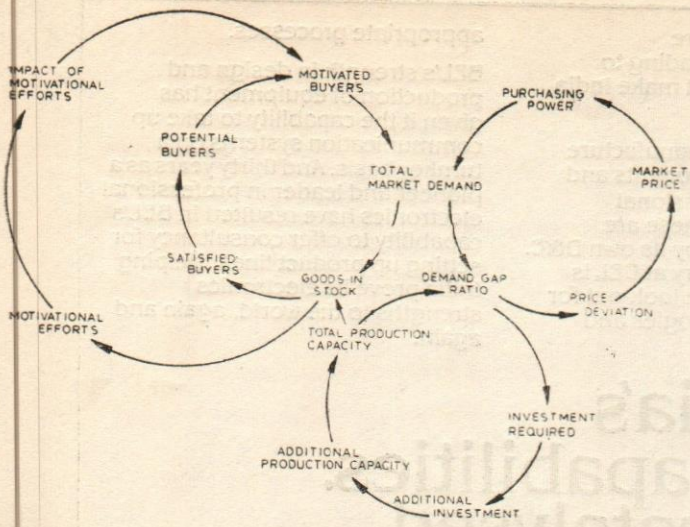


FIG. 8 FEED BACK STRUCTURE

a set of assumptions of population, purchasing power, utility factor, etc.

(ii) The model can be used to design the long term investment policies related to expansion of capacity based on the scenario of total demand behaviour.

(iii) Since the model has a feedback related to market price, it can be used by management in designing its pricing policies for the products under the scenarios of total demand and capacity.

(iv) The model also be used for designing policies related to motivational efforts to boost the sale of its products in the market.

Conclusions

This model discussed above simulates the impact of various management policy decisions related to market and expansion of capacity. It can be used effectively for designing right type of investment, pricing and related policies to meet the demand of a product.

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Cost Reduction and Value Engineering

A.D. GUPTA

This paper presents the systematic application of value analysis techniques for identification of hidden cost or poor value areas, for generating a number of value alternatives and for evaluating them to select the preferred solution.

A.D. Gupta, Assistant Professor, Mechanical Engg. Deptt., Indian Institute of Technology, Hauz Khas, New Delhi-110016.

1. Introduction

Value engineering has become an indispensable tool of cost reduction in the face of growing market competition and high rate of inflation. Value engineering is an organised effort to achieve optimum value in a product or a system, by providing the necessary functions at the lowest cost. The necessary functions include not only the product performance, but also its reliability, maintainability and availability. Better value can be engineered in a product by (i) improving performance at the same cost or (ii) reducing cost for the same level of performance or (iii) improving product performance and at the same time reducing the cost.

The concept of Value Engineering was initiated by L.D. Miles (1) and later on, this concept was developed and put in a quantitative frame work by Mudge(2). A systematic step-by-step procedure known as "Value Engineering Job Plan" has been formulated. According to Mudge, this plan is executed in seven phases which are listed below :

(a) General Phase
(b) Information Phase
(c) Function Phase
(d) Creation Phase
(e) Evaluation Phase
(f) Investigation Phase
(g) Recommendation Phase

The above plan provides a detailed insight into the areas of unnecessary costs which neither improve performance nor quality nor appearance of the product. Such costs are then minimised or eliminated through development and evaluation of value alternatives. The preferred solution checks the product cost and locks in the essential performance features, reliability, maintainability and aesthetic requirements.

2. Case Study

A project was undertaken for the value improvement of antenna's reflector assembly in a communication equipment manufacturing company (3). The product was chosen because of its high cost and poor degree of value assurance. The product consists of 14 different parts and 2 final assembly processes. Out of these, 8 parts are manufactured in company itself and rest are vendor items. For the whole product, detailed analysis was made to reduce its cost while maintaining its functional and appearance characteristics.

After taking all concerned into confidence about the utility of value engineering study, a group of experienced persons was made to provide the necessary dynamic thrust to overcome road blocks to achieve better value results. Necessary data was obtained about the design, manufacturing, application and marketing and cost aspects of all the components of assembly (Ref. 3)

3. Function Phase

The functions ot various components of reflector assembly were represented by two words—a verb and a noun. Functions were classified into primary and secondary levels of importance. This is shown in functional definition worksheet (Exhibit 1). Basic function of an item must be one, whereas secondary functions may be many. After indicating functional levels by (X) mark on the worksheet, function relationships were evaluated.

For evaluating functional relationships, two techniques were used :

A. Function Analysis System Technique (FAST),
B. Numerical Evaluations.

EXHIBIT 1

Functional Analysis Worksheet

Product—Antenna's Reflector

Qty/Assy	Part	Function		Function Level	
		Verb	Noun	Basic	Secondary
6	Profile 1	Provide	Shape	√	
6	2	Provide	Location		×
2	3	Provide	Rigidity		×
		Permit	Interface		×
		Prevent	Corrosion		×
1	Vertex Plate	Permit	Interface (feed)	√	
		Provide	Rigidity		×
		Reflect	EM Waves		×
		Prevent	Corrosion		×
4	Stiffner	Provide	Rigidity	√	
		Prevent	Corrosion		×
2	Mesh	Provide	Conducting Surface	√	
		Provide	Rigidity		×
		Prevent	Corrosion		×
4+4	Diagonal Member 1&2	Provide	Shape	√	
		Provide	Rigidity		×
		Prevent	Corrosion		×
1	Plate	Provide	Rigidity	√	
		Prevent	Corrosion		×
	Fastners	Hold	Parts	√	
		Prevent	Corrosion		×
		Facilitate	Interlocking		×
	Final Assy.	Provide	Shape		×
		Provide	Rigidity		×
		Hold	Parts	√	
	Finishing	Prevent	Corrosion	√	
		Improve	Appearance		×
	Name Plate	Provide	Identification	√	

A. FAST

FAST is a method of stimulating organized thinking about any subject by asking thought-provoking question (e.g. How & Why). It helps organize random listing of functions, check for missing functions, and aids in identification of basic function (4).

For the above problem FAST diagram is shown in Exhibit 2. With the help of this diagram it was found that basic function of complete reflector assembly is "*Direct Waves*", but it is not the basic function of any part when considered individually.

B. Numerical Evaluation

This method for evaluation of functional relationship is capable of determining and/or verifying the basic function, as well as determining the descending order of importance of the secondary functions. Equally important, it provides us with a means of separating those functions which are in the product because of specifications and requirements and those that are there because of the present or earlier approach or design. Numerical evaluation worksheet is shown in Exhibit 3. Each function to be evaluated is assigned a key letter. Each function is compared with all other functions only once, and relative importance is noted in the corresponding cell of the evaluation sheet. If function A is considered more significant than B, the letter A is written in the appropriate cell and this procedure is to be followed for all comparisons. A digit (1, 2 or 3) is now entered after the letter depending upon the difference in functional importance. 1 denotes minor, 2 medium, and 3 denotes major difference of importance. After filling up all the cells, the weightage points for each function are obtained by adding up the numerical

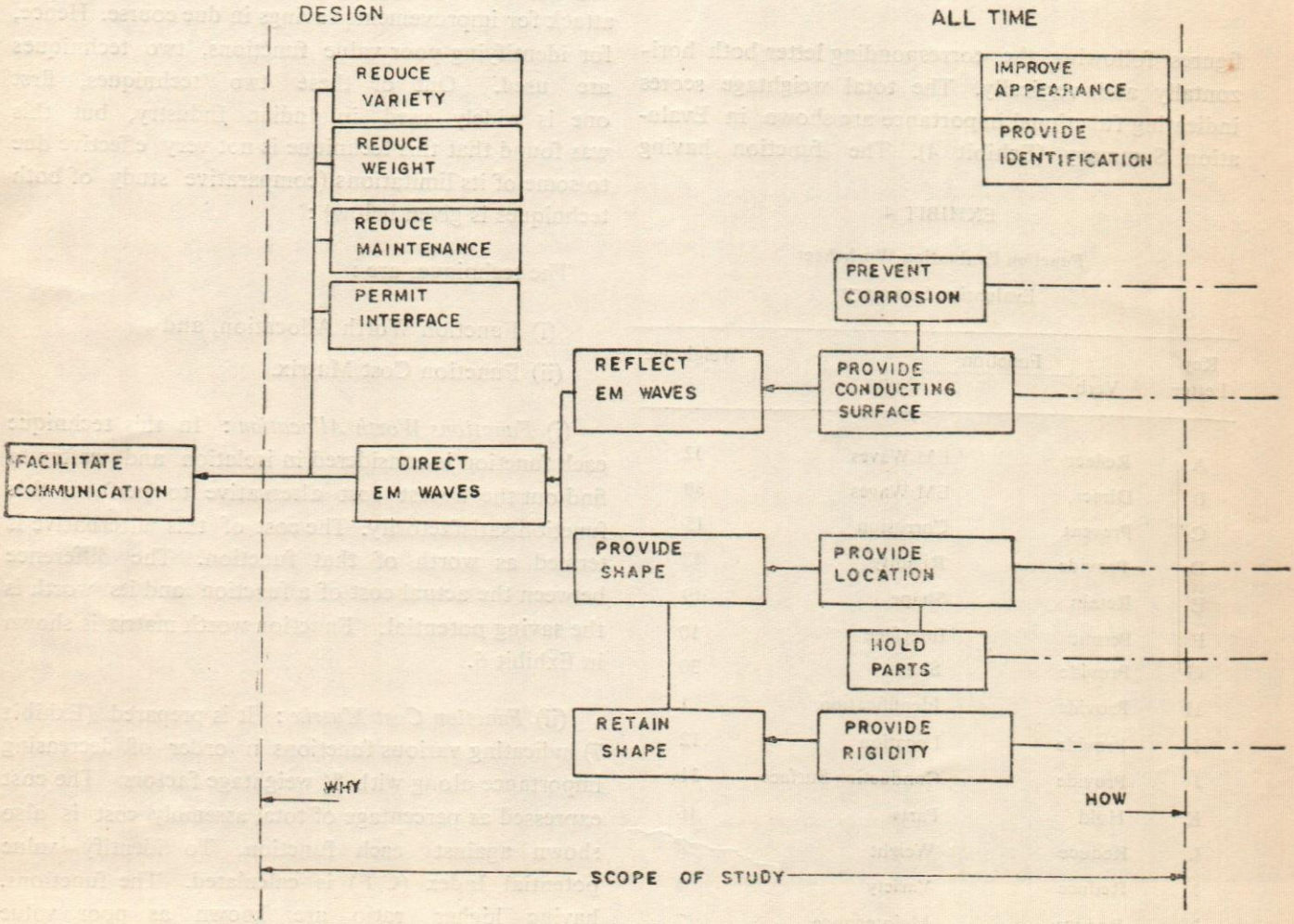

Exhibit. 2 FAST DIAGRAM

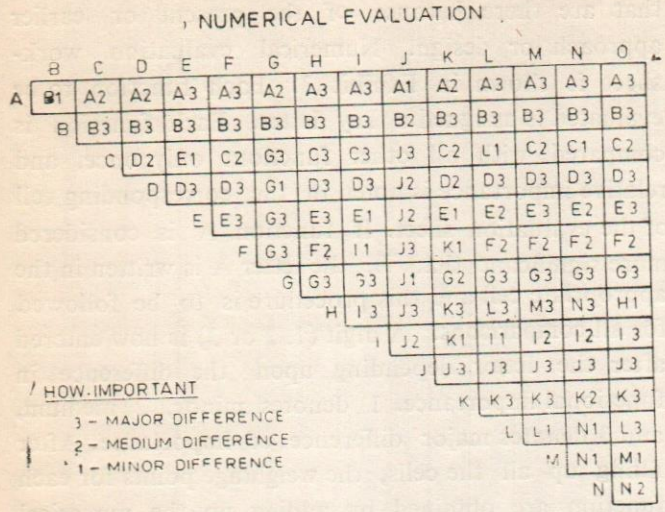

Exhibit 3

figures following the corresponding letter both horizontally and vertically. The total weightage scores indicating functional importance are shown in Evaluation Summary (Exhibit 4). The function having maximum weightage (Direct Waves) is the basic function of the assembly.

EXHIBIT 4

Function Evaluation Worksheet

Evaluation Summary

Key Letter	Function		Weightage
	Verb	Noun	
A	Reflect	EM Waves	32
B	Direct	EM Waves	39
C	Prevent	Corrosion	15
D	Provide	Rigidity	28
E	Retain	Shape	19
F	Permit	Interface	10
G	Provide	Shape	30
H	Provide	Identification	1
I	Provide	Location	12
J	Provide	Conducting Surface	31
K	Hold	Parts	16
L	Reduce	Weight	8
M	Reduce	Variety	4
N	Reduce	Maintenance	7
O	Improve	Appearance	0

The weightage points (in descending order) for various functions are shown graphically in Exhibit 5. The secondary functions are separated from the basic function by the first fall in the graph. The second fall which is of larger magnitude separates the two types of secondary functions i.e. it separates the secondary functions present due to specifications and requirements from those resulting from present design approach.

C. Identification of Poor Value Areas

After establishing functional relationships it is important to identify the function on which we should attack for improvements/savings in due course. Hence, for identifying poor value functions, two techniques are used. Out of these two techniques, first one is widely used in Indian Industry, but this was found that this technique is not very effective due to some of its limitations (comparative study of both techniques is given below) :

The techniques are :

(i) Function Worth Allocation, and

(ii) Function Cost Matrix.

(i) *Functions Worth Allocation* : In this technique each function is considered in isolation and we try to find out the lowest cost alternative to perform this function satisfactorily. The cost of this alternative is termed as worth of that function. The difference between the actual cost of a function and its worth is the saving potential. Function worth matrix is shown in Exhibit 6.

(ii) *Function Cost Matrix* : It is prepared (Exhibit 7) indicating various functions in order of decreasing importance along with % weightage factors. The cost expressed as percentage of total assembly cost is also shown against each function. To identify value potential Index (C/F) is calculated. The functions, having higher ratio are known as poor value functions, and only these functions were selected for next phase.

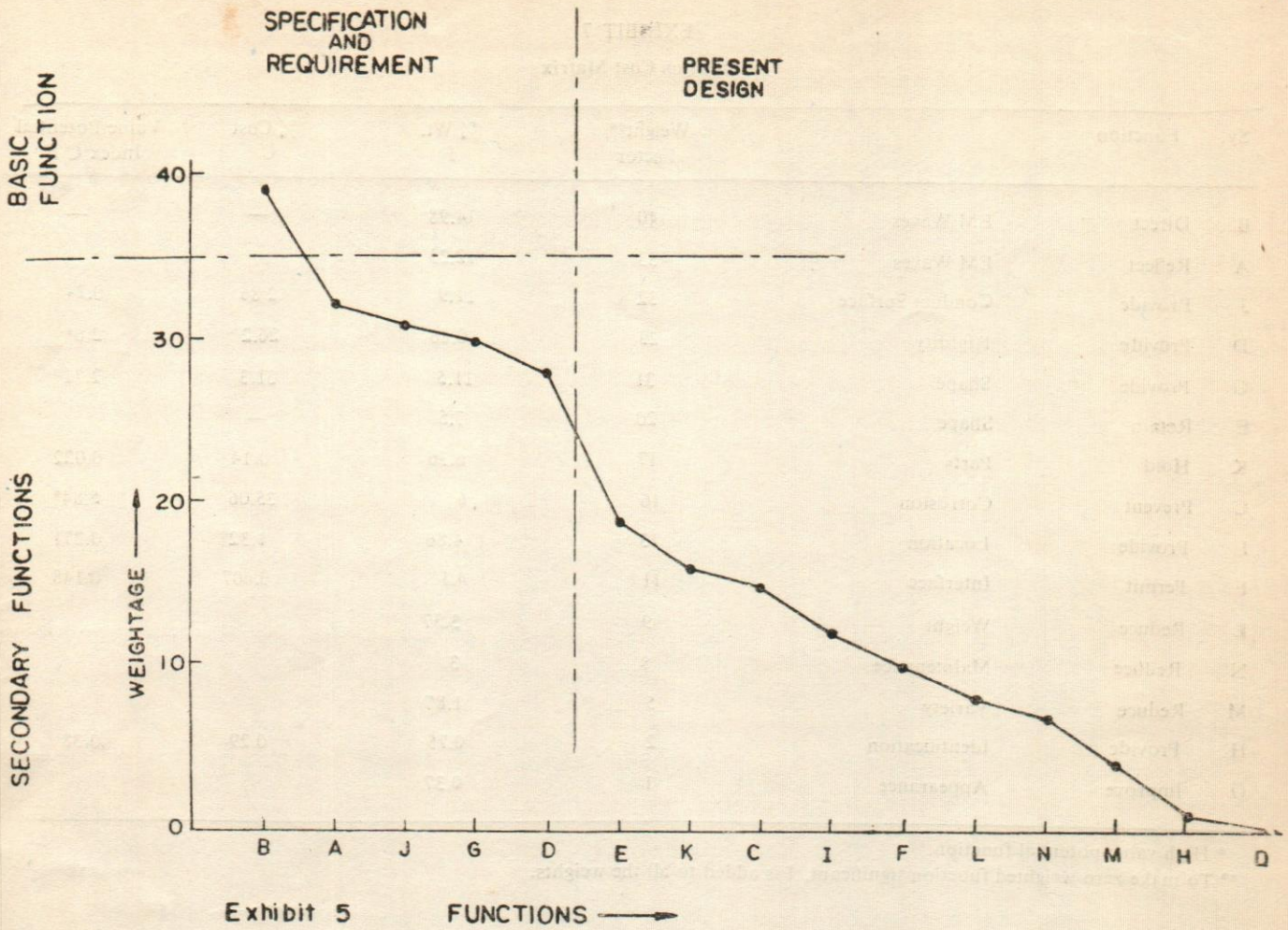

Exhibit 5

EXHIBIT 6

Function Cost Worth

Key Letter	Function	Present cost of Function C	Worth of Function W	Saving Potential C-W
B	Direct EM Waves	—	—	—
A	Reflect EM Waves	—	—	—
J	Provide Conduct Surface	500	100	300
D	Provide Rigidity	4928	3000	1928*
G	Provide Shape	5500	2000	3500*
E	Retain Shape	—	—	—
K	Hold Parts	24	8	16
C	Prevent Corrosion	6122	2600	3522*
I	Provide Location	230		
F	Permit Interface	106	106	—
L	Reduce Weight	—		
N	Reduce Maintenance	—	—	—
M	Reduce Variety	—	—	—
H	Provide Identification	50	10	40
O	Improve Appearance	—	—	—

* High value potential functions.

Comparison of Function Cost Matrix & Function Worth Allocation

1. Both techniques are used to identify lower value function.
2. In function worth Allocation, creativity phase is mixed up with function phase. This is absent in Function Cost Matrix technique.
3. Lowest alternative may not be identifiable during this period.
4. Function worth Allocation becomes useful only when functions are few in number. But Numerical Evaluation (Function Cost Matrix) is applicable to any number of functions.

The following functions representing poor value areas were taken up for creativity phase :

(a) Provide Shape

EXHIBIT 7

Function Cost Matrix

Sy.	Function		Weight** Factor	% Wt. F	% Cost C	Value Potential Index C/F
B	Direct	EM Waves	40	14.98	—	—
A	Reflect	EM Waves	33	12.33	—	
J	Provide	Conduct Surface	32	11.9	2.86	0.24
D	Provide	Rigidity	29	10.86	26.2	2.6*
G	Provide	Shape	31	11.5	31.3	2.71*
E	Retain	Shape	20	7.5	—	
K	Hold	Parts	17	6.36	0.14	0.022
C	Prevent	Corrosion	16	6	35.06	5.84*
I	Provide	Location	13	4.86	1.32	0.271
F	Permit	Interface	11	4.1	0.607	0.148
L	Reduce	Weight	9	3.37		
N	Reduce	Maintenance	8	3		
M	Reduce	Variety	5	1.87		
H	Provide	Identification	2	0.75	0.29	0.38
O	Improve	Appearance	1	0.37		

* High value potential function.
** To make zero weighted function significant, 1 is added to all the weights.

(b) Provide Rigidity
(c) Prevent Corrosion.

Also, about 95% of the total cost is concentrated in these functions.

4. Creativity Phase

The poor value areas identified earlier are put to imaginative thinking to generate new and promising ideas. Judgement, criticism and evaluation are eliminated from the brain storming session to prevent the premature death of potentially good ideas. Exhibit 8-A-B-C shows the creativity worksheets, listing alternate ways of accomplishing the functions.

5. Evaluation and Investigation Phase

This is a phase ot redefinition, refinement and combination of ideas to eliminate unworkable and

EXHIBIT 8—A

Function—Provide Shape

'A Type' Ideas	Total Score
1. Use pipes	46
2. Small st. pieces joint by bolts	13
3. Blanking the ribs	32
4. Use spokes to form shape	16
5. Press forming	21
6. Spinning	5
7. FRP moulding	40
8. Spinning circular shape nibble to square	5
9. Shape tubes to support ribs	40

EXHIBIT 8—B

Function—Provide Rigidity

'A Type' Ideas	Total Score
1. Back up structure	29
2. Reinforce between two faces	5
3. Make from thick sheet	23
4. Increase rib thickness	40
5. FRP moulding	40
6. Spinning	5
7. Use I/L section	35
8. Proper section design	38
9. Provide stopper to arrest deflection	25
10. Use rope as diagonal member	50

EXHIBIT 8—C

Function—Prevent Corrosion

'A Type' Ideas	Total Score
1. Paint frequently	27
2. Use galvanised M.S.	37
3. Use stainless steel	22
4. Anodise plate	39
5. FRP	40
6. Chromate conversion	44
7. Cali plasting by dipping	30
8. Plastic coat by spray	16
9. Non corroding metal	40

uneconomical alternatives from further analysis. For these objectives, two techniques were used:

A. Quick Judicial Screening, and

B. Feasibility Ranking.

A. Quick Judicial Screening

After listing the ideas on creativity worksheet, each worksheet is judicially screened on the basis of acceptability of the ideas by the team. All the ideas were assigned one of the three ratings A (Accepted), AD (Acceptable with Development) and U (Unacceptable) (Ref. 3).

B. Feasibility Ranking

This technique is applied on A-type ideas from the creativity worksheet and during this step, combination of two or more ideas is promoted, which help us in developing practical alternatives. Normally, value teams use at least the following five factors to judge the ideas for feasibility :

(a) State-of-the art (10—off the shelf; 1—new technology)

(b) Cost to develop (10—No cost; 1—High cost)

(c) Probability of implementation (10—Excellent chance; 1—No chance)

(d) Time to implement (10—Extremely short; 1—Extremely high)

(e) Potential benefit (10—High; 1—No).

The above five factors are scored by the team on a 1 to 10 basis. On the basis of this, all A class ideas were ranked (Ref.3).

C. The Decision Matrix

All the competitive alternative solutions are then evaluated quantitatively by the "decision matrix" technique to pin point the alternative with highest value score. There are usually a number of objectives which are met in different proportions by various alternatives and we have to select the one which fits best in the overall frame of objectives.

After careful review, comparison and blending of ideas listed in Exhibit 8, only four were matured to quality for the decision matrix test.

The four alternatives are

A. FRP moulding with Al annular hub and diagonal parabolic profiles.

B. Ribs of present design, but less in number joined by angle plates with chromate conversion of Al.

C. Horizontal ribs of less thickness mounted on two vertical (bigger in dmn.) ribs. Ribs manufactured with bigger dia punch than present one.

D. Complete tabular structure joined by welding but mesh fixed by snap clamps, Galvanized M.S.

The various considerations governing the choice are :

1. Resistance to corrosion
2. Focussing Accuracy
3. Lightness (weight)
4. Maintenance
5. Reliability

The above objectives are weighed by the numerical evaluation technique to determine their relative importance indicated by evaluation points (Exhibit 9).

CRITERIA COMPARISONS

SYMBOL	CRITERIA	SCORE	ASSIGNED SCORE
P	RESISTANCE TO CORROSION	5	6
Q	FOCUSING ACCURACY (RMS)	8	9
R	LIGHTNESS (WEIGHT)	1	2
S	MAINTENANCE	0	1
T	RELIABILITY	6	7

NUMERICAL COMPARISONS

	Q	R	S	T
P	Q2	P2	P3	P/T
Q		Q3	Q3	Q/T
R			R1	T3
S				T3

Exhibit 9

Once the criteria elements and their weights have been established, the next task is to use these in evaluating the alternatives. At this point, it is assumed that all of the ideas that have survived meet the minimal needs or basic function of the user or owner.

The scoring system used in the analyis matrix is to assign 1 to 5 points on a scale of poor to excellent :

Poor—1—P
Fair—2—F
Good—3—G
Very Good—4—VG
Excellent—5 – E

Evaluation matrix is shown in Exhibit 10.

EXHIBIT 10 –

EVALUATION MATRIX

Sl No.	ALTERNATIVES	CRITERIA	RESISTANCE TO CORROSION	FOCUSING ACCURACY (RMS)	LIGHTNESS	MAINTENANCE	RELIABILITY	TOTAL SCORE
		WEIGHT FOR CRITERIA	P 6	Q 9	R 2	S 1	T 7	125
1	PRESENT WAY		VG / 24	E / 45	G / 6	G / 3	E / 35	113
2	IDEA - A		E / 30	VG / 36	VG / 8	E / 5	E / 35	114
3	IDEA - B		VG / 24	E / 45	VG / 8	G / 3	VG / 28	108
4	IDEA - C		VG / 24	G / 27	VG / 8	G / 3	VG / 28	90
5	IDEA - D		G / 18	F / 18	F / 4	G / 3	G / 21	64

ALTERNATIVE	1	2	3	4	5
PERFORMANCE - P	113	114	108	90	64
COST - C	17471	10092	10700	15500	9500
RATIO $\frac{P}{C}$ $\times 10^{-3}$	6.46	11.3	10	5.8	6.73

Exhibit 10

7. Recommendation Phase

The precise and systematic presentation of the results of value engineering study is essential for sell-

ing the preferred solution to top management and to motivate positive actions. The optimum value solution is correctly stated and its advantages in terms of cost, performance, reliability and appearance etc. clearly communicated.

The value analysis study shows that the alternative No. A has maximum expected value and therefore it is recommended.

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Success Amidst Failures

L.R. GOSAIN &
B.S. SAMAT

The authors in this case study focus on the problems faced in a public sector unit and how the problems were overcome.

L.R. Gosain, General Manager, Railways (Retd.). Presently at D-137, Anand Vihar, New Delhi.

B.S. Samat is Chairman, BHEL, New Delhi.

Introduction

India had won its freedom recently. The Five Year Plan had caught the imagination and enthusiasm of the country. A large number of Scientific and Technical Institutes and Public Sector industries with advanced technologies, and foreign collaboration were being set up. A big demand for technically trained men and managers had suddenly sprung up, for manning the new enterprises. The only pools or reservoirs of trained manpower available with the Government of India were its Administrative Services, Railways and Defence. Even these organisations had been hard hit by an exodus of their experienced managers to U.K. and Pakistan and they were, therefore, reluctant to spare any young active hands for the new Public Sector Units. In view of the prevailing conditions, the Government mostly selected, on deputation, experienced managers, retired or shortly retiring from their parent organisation, to man the top management posts of the new Public Sector Units. Luckily, in India today, the position has almost reversed. A large number of Technically qualified and professionally trained personnel are available in India, but many leave the country for other countries like, U.S.A. Canada, Australia, Gulf Countries etc., for better emoluments also since they are not happy with the work environment here.

The Background

For one such Public Sector Unit Mr. Saraswat (retired) was selected and posted as Managing

Director, in 1953. Mr. Srinivasan (about to retire) from the same organisation was posted as Manager (Production) a few months later. Mr. Manmohan Singh, (42 years) a senior engineer from another Public Sector Unit was transferred in 1954, as Asstt. Manager (Production). Later, when the need arose for another Asstt. Manager (Production), services of Mr. Laxman (40 years) were obtained by MD and Manager (Production) from their common parent organisation. Mr. Laxman joined in January 1955.

When Mr. Laxman joined, he was asked to report to the Managing Director at his residence, and not in office, because the factory was on strike. The first responsibility given to Asstt. Manager, Mr. Laxman Rai was to lead a group of 50 managers/supervisors in a bus, through a labour crowd, through the factory main gate to the offices, under police escort. The order was implemented, although the bus was detained and stoned by striking labour. The police used lathi charge and mounted police to disperse the agitating, shouting crowd. The strike was called off two weeks later. According to the grapevine, the strike was called off, because the management gave in, and agreed to most demands—some justified, some unjustified.

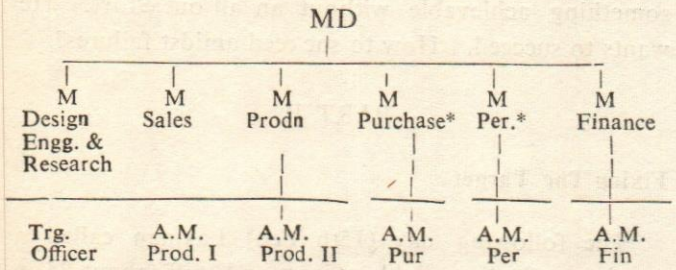
As expected, there was an atmosphere of sullenness and bitterness in the following two weeks and very little attention to duty or work, The middle management, and supervisors, however, tried to bring about a re-approachment and gradually restore normalcy.

During this period, Mr. Laxman had a good opportunity to see the existing factory buildings, existing departments at work, new buildings under construction and planning and production work of his own new Department, much behind schedule. The data collected by him and his observations, were, as follows :—

The Project was designed and planned to achieve full production, approx. 50 crores, in a gestation period of ten years, with the help of a total manpower of about 12,000 men. The Collaborators had given a detailed Project Report, and this Project Report formed the basis of all activities. The Collaborators had given in their Project Report, a dove-tailed time bound programme for construction work, recruitment and training of staff, selection of machinery and equipment required, ordering of machinery and materials – indigenous and imported — to fit in step by step start of production of different products gradually and finally achieving full production and profitability. The Project Report had been accepted by the Govt. of India, the Govt. had, further more decided to give high priority to this Project and placed plenty of funds (including foreign exchange) and construction materials—steel, cement, normally in short supply – at the Project's disposal to be utilised as and when required.

The Managing Director, an experienced Civil Engineer and Administrator felt that the Collaborators and consultants had given an easy going or slow Construction, and subsequent production Schedules. He felt that the Construction could be achieved in $\frac{1}{2}$ or $\frac{1}{3}$rd of the time allotted and targetted production achieved in half the time. The first Department Block was started and built in six months instead of a Year's time allotted. Senior managers under training in U.K. had their training cut short and called back to their posts. Supervisors and artisans under training in the factory Training Centre had their training, similarly reduced to half. Materials, mostly imported and requiring foreign exchange, were ordered three times the requirement for first year's planned production. The materials, inspite of every effort, however, did not arrive any earlier, then scheduled, due to other committed production and delivery schedules of the Collaborators – an international manufacturing & sales giant, Building was ready some machinery received, men available with reduced training but there was no material to work on. The Managing Director, therefore decided to give them some fabrication work for Project Buildings (work diverted from the contractor) of the future Department Blocks. This work, half done or less, was stopped as soon as materials began to arrive, in plenty. Inexperienced men and supervisors got going fast on different operations simultaneously. It resulted in bad work, re-work and high percentage—30 to 50% rejections and scrap.

Several assembly operation could not be carried out satisfactorily and very few products could be fully assembled, tested and passed. The shops were full of new and scrap materials, lying almost helter skelter and accepted by the management as work-in-progress. The Organisation, had the following informal structure:



M = Manager A.M. = Asstt. Manager
*indicate vacancies.

MD and Manager (Prod.) were the first to be in position, and came from the same organisation, while the rest of the Managers came from differing background and organisations. Manager (Purchase) and Manager (Personnel) had not been posted, and Manager (Prod.) was given the charge of these two Departments also. Asstt. Manager (Purchase) and Asstt. Manager (Personnel) therefore reported to Manager (Prod.). In brief, Manager (Prod.), thus became the most powerful amongst the Managers, and most influential with the MD.

Soon after the strike, Govt. of India, deputed a Productivity Expert (PE) to study the progress and performance of the enterprise at site. The P.E., observed, met and obtained the views of maximum possible number of employees, their families, important suppliers and citizens. Mr. Laxman, though interrogated frequently, maintained a tight lip (partly because he himself was new and could not know the exact state of affairs for certain, in this short period), but heard from the Productivity Expert. "Whether we like it or not, there is a generation gap in this organisation. MD works very hard—from 6 A.M. to mid night. He has not taken even a single Sunday off in the last two years of his stay. It is unfortunate that he has little experience of running a large well-established workshop leave alone setting up a new one involving technology new to everybody here. The Production Manager is an experienced manager. MD gives him due weight & listens to him. But heaven knows, why he is inclined to be a yes man and does not advise him correctly on the hard realities of manufacturing processes, planning, programming and production targets. Is it, therefore, any surprise that top management, although working hard and long hours, gets only imitation and flattery but no respect or popularity or results ? Do you agree ? I also understand that you have worked with the present management earlier. I am told you have recently returned from a six month advanced training progamme in Planning & Production, in U.S.A. You have a proven record of excellance, managing independently, and achieving almost 100%. Production targets, of small, old & well organised workshops. Running this new enterprise is, however, likely to be a different kettle of fish. So far there are more failures than successes. I hope, you fare differently."

A Planning Commission member also visited the factory. He made a thorough inspection of the workshop buildings—completed and under erection, and followed it up by discussions with consulants and top management. He asked the MD "Why is the construction work behind schedule?" MD replied "In the first year, we obtained 6000 T of steel straight away. We built the first Department Block six months ahead of schedule. Next year rate of supply of steel decreased to 350 T per month. Even then, we built the second Department Block three months in advance. Now, we have hardly one month stock of steel, on hand. During last three months we have received only 900 T of steel against our requirements of 1350 Tons."

Member Planning "Your last report shows target completion of Deptt. III in October last year—same as was given two years ago. And even today there has been no work done beyond the foundation stage. At this rate, it may be another year, before the building can be completed. Why have you not modified the target completion date and given a practical, more accurate, completion date?"

Member Planning, "This year's target output has

been raised from 40 lacs given by Collaborators to 1 crore. We are in Feb.—only one more month of the financial year is left. So far, not a single product has been completed and shipped. What do you expect your output to be this year? MD, "Approx. 90 lacs. May be some small components or operations will be left but we will complete them shortly afterwards."

MPI., "This means that hardly any products will be completed and shipped." Member Planning turned to the Chief Cansultants (head of Collaborators representatives in India) "Is the target practical & realistic? Why is it not being achieved?" The Consultant said, "We gave a pragmatic & realistic production target. MD, however, felt it was too easy to achieve. He has increased it three times and ordered materials accordingly. We gave the target, based on an experience of manufacturing a new product, involving new types of machinery to be used by young inexperienced operators. You have to absorb new technology. You cannot cut short this time—like it must take nine months for a baby to be born."

MD and Manager (Prod.) called, Mr. Laxman a few days later (Feb.) and said :

"Sorry, we have not been able to see you earlier, due to this strike and many other pre-occupations. You must be aware of. You have a big responsibility to set up Production Department-III. The products are needed by an important customer. The Customer wants 500 units in the coming financial year. The Project Report has given a full capacity of 800 nos. The coming year's target is ridiculous—only 80 nos. I have promised to delivery 200 nos. Now you can get going to achieve this production." Laxman—"But the building for the Deptt. was planned to be completed last October and it has not even started. No material has yet been ordered and some critical components have a delivery period of 12 months. Some critical machines have just been ordered, with delivery periods of 12 to 18 months. Our managers/supervisors under training in U.K. are expected not earlier than three to six months." MD—"These are lame excuses. I have no time for these."

Manager (Prod.)—"I agree with MD. Please get on with the job."

The Problem

Laxman has to fix a Production target. How to do it? What target to fix? What action plan to make to achieve this target? He realises that the target must be practical and pragmatic—neither Utopian nor something achievable without an all out effort. He wants to succeed. How to suc ceed amidst failures?

PART II

Fixing The Target

The following day (15th Feb) Laxman called a meeting of all available officers and staff (about 25 in number) of the Department and said "Gentlemen, you know more about this Department than I do. M.D. has asked me to plan to achieve—during the coming financial year, a production of 200 Units and . . . ." "IMPOSSIBLE" came a voice from the back. A.M. "Why? Be patient. The customer wants 500 nos. badly and M.D. has already promised 200 Nos. So, we should try and carry out the orders." Mukerjee (Planning Officer)" Sir, you can take the path of least resistance, fix these Utopian targets to please M.D. and then blame us for failures. We haven't yet an inch of space for work. Some critical machines are not likely to be delivered during the financial year. Some critical important components have a delivery period of 12 months. Consultants have flatly told us that they cannot give us any more than 40 sets of material." CONSULTANTS. "Yes, I am afraid our factory capacity is fully booked, due to other foreign commitments. We just cannot promise you any more supplies."

Din Dayal (a good artisan). "There are several types of machines, which we haven't even seen. Tool room is not properly organised and cannot produce the requisite quality and quantity of tools and gauges. My friend, in the other department, in spite of being capable, dedicated worker has been punished and blamed for almost 100 % rejections. His persistent efforts of three months get a proper investigation and a fair deal have revealed only yesterday that even Master Gauges supplied by the Tool Room were

defective and had tolerances in excess of those specified in the drawings. I suppose, we will be victimised in the same manner."

Bhowmick. (an Ex Apprentice). "You have been through the strike. One of the causes was that some men with equal academic background and poorer performance during practical training have been placed above us as supervisors. Luckily, we don't have such men in the department, right now and we won't take orders from them, if you post any of them above us."

SUPDT. Jethamalani. "Sir, you have got most of the facts and views. Our full capacity, as per Project Report is 800 Units. We do not have our manufacturing block. I have looked around and I think, we can be given about 1/4 of our total area from the existing buildings. One of my colleagues may also agree to spare some capacity for us, on critical machines, which we may not get in time. Thus, we can achieve reasonable production. I suggest, we form a small committee of five persons, also associate our Consultant, so that we can get full participation of all levels and get the best results.

Laxman. "Agreed. Shall we request Din Dayal, Bhowmick, Mukerjee and yourself Jethamalani to form the Committee to assist me in this task. The Committee will go into all points raised here, and all other aspects of planning and production. We will fix a practical production target and report within fifteen days."

The Committee went to work. Detailed study of floor area, lay-out, availability of machines, availability of materials, production processes and production schedules were made. Planning and process charts were made. A check on the availability of new machines revealed an interesting (and may be shocking) state of affairs. Most of the indigenous machines, required for full production of 800 units had arrived and were awaiting installation. A number of imported, special purpose machines had been ordered late, had long delivery periods of 12 to 15 months. An important imported machine required for the very first operation could not be expected to reach the plant before 15 months from the date of investigation i.e. 3 months after the expiry of financial year for which the target had to be fixed. Laxman approached his counter-part and got an assurance that a suitable machine would be spared from another department to do the required job.

The Consultant, then, was asked to give an assurance that the imported sub-assemblies and components would be shipped and made available in the plant, in time. "How can I give you this assurance" reported the Consultant. "You have not even ordered all the components."

It was finally and quickly agreed that all the components would be ordered within a week, as full details, quotations and foreign exchange were available. One of the major assemblies required at least six months time for purchase of special raw material and components. Its minimum manufacturing cycle was another nine months i.e. a total of 15 months delivery from the date of ordering. Furthermore, on a check being made with the Collaborator's Works, it was found that the factory production was fully booked for exports to another country. The Collaborator's works therefore, advised "No supplies possible in the coming financial year. Earliest delivery is 15 months from date." The Consultant was pressurised to do something and supply some assemblies during the financial year, under consideration. The Consultant finally said "The manufacturing for this assembly is 9 months. Nothing can be done to shorten this. I can request the Works to divert materials, at the utmost, for 40 assemblies from the orders in hand, You, in any case, need another three months to process and cannot produce more than 15 units per months. A production of 40 units during the last 3 months is the most optimistic and reasonable target."

This assessment and the target were accepted by the Committee. The Committee's report in turn was almost unanimously accepted by the whole department. Laxman (A.M.) and Jethamalani (Supdt.) had to take on the uneviable task of reporting to M.D. and Manager (Production) jointly. M.D. almost blew his top off and threatened to suspend Laxman. Laxman, however, maintained a stony silence and took leave,

requesting for final orders. M.D. gave no orders for two weeks. The proposal submitted, therfore, was taken to be accepted and was worked upon. As planned, 1/4 of a building block, was transferred from a sister department, to set up manufacturing facilities. At least, one type of each machine tool was installed straight away and operators allotted for each. Dummy components of almost identical size and shape were fabricated from ordinary steel (in place of original imported ferrous or non-ferrous castings or forgings) and training given to operators to machine them and assemble them to specified dimensions and tolerances. Every single gauge supplied by the Tool Room was checked by the operators, supervisors and Tool Engineers. Approx. 50% had to be rejected, returned to Tool room and got rectified. Two complete sets of the products were imported, to fully acquaint and familiarise the staff. These products were the first to be tested and passed, as expected, in Dec'55. The last batch of imported material got delayed by fortnight. It was decided to take special steps for quick clearance from the port and moving these by road, instead of the normal, but slow rail transport. The 36th Unit was tested and passed on 30th March at 10.00 P.M. with the whole department standing by and anxiously watching the final test.

Conclusions

When the Chief Inspector finally signed the Test Certificate, the Consultant said, "We are sorry, we could give you only 36 sets of components instead of 40 promised. Your product, I assure you, is better than what we are now manufacturing in our works." This brought forth an immense appalause and a call for celebration on the spot, while everybody was enjoying the sweets and cups of tea, Supdt. Jethamalani said. "This is the only department to have "NIL" rejections and achieve 90% of the target. The average achievement of other departments is only about 50%."

"May I say that we have never before felt happier in this organisation. And we are confident of a still better performance in the coming year!" said the artisan Bhowmick. Although spontaneous, but he appeared to be speaking on behalf of everyone in the department!

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Trends in Indian Man-Made Fibre Industry

DEEPAK CHAWLA

The author in this paper focusses on the trends in the concentration and vertical integration in the Indian man-made fibre industries and focusses on some policy implications.

Deepak Chawla is with the Deptt. of Economics, University of Calabar, Nigeria.

Introduction

The foundation for the Man-Made Fibre Industry was laid when the first unit named Travancore Rayon was incorporated to produce viscose filament yarn in 1945. The unit was set up at Parambavoor near Travancore in Kerala. The production commenced in 1950. The second unit namely National Rayon Corporation Ltd., was established in 1946 and it started production of viscose filament yarn in 1951. In 1954, the third unit, namely Sirsilk Limited, started production of Accetate yarn. The production of Viscose staple fibre was also started in the same year by Gwalior Rayon. This unit was located near Nagda in Madhya Pradesh. The rayon unit of Century Spinning and Manufacturing Company was started in 1956. The industry was showing signs of rapid growth and diversification between 1959 and 1963, and almost every year a new unit was commissioned. J.K. Rayon started production of viscose filament yarn in mid 1959; Kesoram Rayon in 1960; South India Viscose and Baroda Rayon Corporation in 1962, and Indian Rayon Corporation in 1963. South India Viscose also started production of viscose staple fibre in 1961. In 1961 and 1962 two units, National Rayon and Century Rayon commenced production of high tenacity rayon yarn for tyre cords.

There was no indigenous production of synthetic fibres up to the end of second five year plan. It used

to be imported. However, demand for synthetic fibre was rising and the need for the substitution of imports led to setting up of new units. Three units namely Garware Nylon Ltd., Nirlon Synthetic Fibres and Chemicals Ltd., and J.K. Synthetic Ltd., started producing Nylon in 1962. As regards Polyester Fibre, a unit, namely Chemicals and Fibres of India was incorporated in 1961 which went into production in 1965. Meanwhile, two more units (Modipon Limited, and Century Enka) started production of Nylon yarn in 1968 and 1969 respectively. Two new nylon producing units viz., Shree Synthetic Limited and Stretch Fibre (India) Limited started production in 1973. Swadeshi Polytex Limited, and Ahmedabad Manufacturing Company and Calico Printing Company Limited started production of polyester fibre in 1974.

The Man-made Fibres can be classified into cellulosic or non-cellulosic fibres (petro-chemical based) depending upon the raw material used. The non-cellulosic fibres can be further classified into Nylon, Polyesters and Acrylic fibres.[1]

It is known that the market structure determines the behaviour of firms in the industry and that behaviour or conduct in turn determines the quality of industry's performance. The structure of an industry can be studied through various indicators viz. concentration, vertical integration, diversification, product differentiation, entry barriers, mergers and other cost conditions. The present work is confined to studying concentration and vertical integration in the Man-Made Fibres Industry.

Objectives

The objectives of this paper are to

(i) study the various measures of cencentration and vertical integration, and

(ii) quantify these measures, examine and analyse their trends for the period 1963-64 to 1977-78.

1. Deepak Chawla, *Performance and Prospects for the Indian Man-Made Fibres Industry* (unpublished FPM dissertation submitted to IIM, Ahmedabad, 1980) pp. 15-16.

Concentration

This aspect of the industrial structure refers to the number and size of distribution of firms producing a particular type of product. This has been of a great concern to the policy makers since it is believed to play a big role in the determination of business behaviour.[2]

Measurement of Concentration

The degree of concentration in an industry can be measured in the following ways.

(*a*) *Concentration ratio*

This aspect of concentration relates to the percentage of industry's total size accounted for by say largest × number of firms. The size variable could be percentage of sales, employment, gross fixed assets, total assets, value added etc.

(*b*) *Gini Coefficient*

This is referred to as a measure of inequality or relative concentration and its quantitative measure takes into account all the firms in the Industry.

The Gini coefficient may be computed as[3]

$$G = \frac{\sum_{i \neq j}^{N} \sum^{M} | x_i - x_j |}{2N^2 \bar{X}} \quad \ldots (1)$$

where

X_i = size of ith firm

$\bar{X}$ = Mean of the size variable

N = Total number of firms in the industry.

2. D. Needham, *Economic Analysis and Industrial Structure*. (New York : Holt, Rinehart and Winston, Inc., 1969), p. 83.

3. J.N. Kapur; and H.C. Saxena., *Mathematical Statistics*, (New Delhi ; S. Chand & Co., Pvt., Ltd., 1972) p. 36.

(c) *Herfindahl Concentration Index*

This is another measure of quantifying the relative concentration in an industry. This measure is due to Herfindahl and can be written as[4]

$$H = \frac{(C^2 + 1)}{N} \quad \ldots (2)$$

where,

C = Coefficient of variation of firm sizes

N = Number of firms in the industry

$H = \frac{1}{N}$ if all the firms are of equal size

= 1 if there is only one firm in the industry.

Vertical Integration

A firm has to carry out various separate processes and activities in order to carry out production and distribution of a particular product. When a firm performs two or more of such tasks which are in the successive stages in the production of a particular product or of performing of a service, it is said to be vertically integrated. The vertical integration is of two types namely backward and forward vertical integration. When a firm performs preceding function, it is called backward integration. If it carries out succeeding function, it is termed as forward integration.

Measurement of Vertical Integration

For quantifying the degree of vertical integration, the following two measures are generally used.

1. The first measure employs the concept of the ratio of value added to sales[5] which can be written as :

$$VI = \frac{\text{Value Added}}{\text{Net Sales}}$$

It is argued that more the successive stages in the production processes that are performed by a firm, the greater will be the magnitude of this ratio.

2. The second alternative measure of vertical integration is as follows:

$$VI = \frac{\text{Value of Inventory}}{\text{Net Sales}}$$

The argument advanced in favour of using this ratio is that longer the production line and more the number of successive stages that are performed by a single firm, higher will be the firm's total inventory and hence the degree of vertical integration, Both the measures of vertical integration suffer from many defects.

Data

The main source of data for the present work was *Bombay Stock Exchange Official Directory* which presented data in the summarised form on Profit and Loss Account and different items of balance sheet of various firms engaged in the production of Man-made fibres. In the present study, the data on 17 firms was collected for the period 1963-64 to 1977-78.

The firms were divided into two groups namely cellulosic and non-cellulosic (petro-chemical based). There were seven firms in the first group and ten in the second group. The problems were faced while using data as given in *Bombay Stock Exchange Directory*. (i) The first problem was that the firms did not have a uniform accounting year. The year ending of the firms are distributed over all the twelve months. For example, one firm may have March as its year ending where as for others it could be September, December, February, etc. To overcome this problem RBI's (Reserve Bank of India) methodology was used.[6] It attempts to find out the coverage in terms of average number of months of firms weighted by their paid-up capital (Equity Shares+Preference Shares) to choose an appropriate closing date. This

4. D.C. Herfindahl, *Concentration in Steel Industry* (unpublished Ph.D. dissertation, Columbia University, 1950).

5. M.A. Adelman, "Concepts and Statistical Measurement of Vertical Integration in G.J. Stigler (Ed.) *Business Concentration and Price Policy*." Princeton, N.J. Princeton University Press, 1955).

6. Reserve Bank of India. *Financial Statistics of Joint Stock Companies in India* 1960-61 to 1970-71. (Bombay ; Director of Statistics for Reserve Bank of India, 1975), p. 14.

was done by taking into consideration various periods and the one which gave the maximum number of average months was taken as the study year. In the present research, the study period, April to March, give the best results. (ii) The second problem was that a firm may change its date of closing accounts from time to time. Therefore, whenever there is a change in a firm's closing date, its next account may cover a period of more or less of twelve months. To overcome this problem, all the items in the profit and loss account were adjusted proportionately to cover twelve months working. However, the balance sheet data were kept unchanged.

Empirical Results and Interpretation

In the present study, quantitative estimates of concentration (both absolute and relative) and vertical integration are obtained for the period of 1963-64 to 1977-78. The estimates are obtained for the whole of the industry (combined group) and also for cellulosic and petro-chemical based fibres, separately.

To compute the degree of concentration, one has firstly to choose the size variable. The size variable can be sales, total assets, gross fixed assets, etc. The present work uses 'sales' as the variable to compute concentration and vertical integration.

The absolute concentration is taken as the share of the 4 largest firms in the total industry's sales; whereas relative concentration is estimated by using the formula of Gini Coefficient and Herfindahl concentration index as given by (1) and (2). The results of the combined group are reported in Table 1.

It is observed from Table 1, that the 4 firms concentration has declined over time. The share of largest 4 firm's in industry's total sales was 86.2 per cent in 1963-64 and it declined to 55.1 per cent in 1977-78. During the intermediate period also there has been a steady decline in the concentration except for 1971-72, 1972-73, and 1975-76. The difference in share in 1972-73 over its previous year was insignificant.

As regards relative concentration, indicated by Gini Coefficient and Herfindahl concentration, a similar trend is observed. The value of Gini Coefficient was 0.46 in 1963-64. For the next consecutive period, there was an increase in its value. But after that it has steadily decline except for the years 1970-71, 1971-72, 1973-74 and 1975-76. The results of Herfindahl concentration index are slightly better—its estimates are consistently declining over time with the exception of 1965-66, 1972-73 and 1974-75.

One interesting feature which emerges by examining Table 1 is that although over period of time (1963-64 to 1977-78) the concentration both absolute as well as relative had declined, the decrease had been faster during the half i.e., 1963-64 to 1969-70 than in the second half viz., 1970-71 to 1977-78. A plausible reason for this could be that during the first half a large number of Man-made fibre manufacturing units came on the stream.

TABLE 1

Trends in Absolute and Relative Concentration of the Combined Group

Year	Four Firm Concentration Ratio	Herfindahl Index of Concentration	Gini Coefficient
1963-64	0.862	0.355	0.461
1964-65	0.801	0.321	0.519
1965-66	0.776	0.351	0.545
1966-67	0.758	0.320	0.508
1967-68	0.689	0.258	0.501
1968-69	0.668	0.230	0.487
1969-70	0.630	0.213	0.466
1970-71	0.629	0.201	0.482
1971-72	0.636	0.198	0.486
1972-73	0.637	0.203	0.478
1973-74	0.606	0.191	0.495
1974-75	0.588	0.202	0.464
1975-76	0.595	0.189	0.516
1976-77	0.567	0.183	0.477
1977-78	0.551	0.174	0.453

It would be interesting to compare the consistency of rankings for the three measures of concentration used in this research. A similar work done in an empirical study on concentration by Rosenbluth where a comparison on the consistency of the rankings of three measures was made using Spearman's rank correlation test by taking two measures would result in substantially the same ranking as any of others.[7] But here, the use of a different statistical test viz., Kendall Coefficient of concordance (W) is made where the consistency of the rankings of all the three measures can be tested simultaneously. It is written as.[8]

$$W = \frac{12S}{K^2(N^3 - N)} \quad \ldots(3)$$

Where,

S = Sum of squares of observed deviations from the mean of Rj, that is $\frac{\Sigma(Rj - Rj)^2}{N}$

Rj = Sum of ranks assigned to each year

K = Number of sets of rankings, i.e., the number of concentration measures used.

N = Number of years.

The above formula can be used when $N \leqslant 7$. In case $N > 7$, the expression given below is distributed as chi-square (X^2) with $N - 1$ degrees of freedom and can be used to test the consistency of the rankings of these measures.

$$X^2 = K(N - 1)W \quad \ldots(4)$$

where W is as defined in (3).

The null hypothesis to be tested can be written as :

H_0 : Three sets of measures don't give consistent rankings against the alternative.

H_1 : Three sets of measures give cosistent rankings.

To test the hypothesis, firstly ranks assigned to various years by three measures of concentration were listed and the value of X^2 as given by (4) was computed. The computed value of X^2 (29.42) was greater than the tabulated value at 1% level of significance thereby indicating the consistency of ranking by 3 measures of concentration.

As regards the trends in concentration in the case of cellulosic fibres, it is observed from the figures in Table 2 that both absolute and relative concentration has declined over time. The share of largest four firms in the industry size was 89.4 per cent in 1963-64 and it declined to 86.6 per cent in 1977-78. During the intermediate periods a similar picture is observed with few exceptions. It may be worthwhile to note that although concentration has declined over time, the quantum of decline has not been very significant. A similar picture is observed in the case of relative concentration as quantified by Gini Coefficient and

TABLE 2

Trends in Absolute and Relative Concentration of the Cellulosic Group

Year	Four Firm Concentration Ratio	Herfindahl Index of Concentration	Gini Coefficient
1963-64	8.894	0.280	0.427
1964-65	0.857	0.277	0.428
1965-66	0.851	0.333	0.503
1966-67	0.865	0.328	0.516
1967-68	0 857	0.319	0.502
1968-69	0.856	0.341	0.511
1969-70	0.856	0.332	0.505
1970-71	0.870	0.326	0.510
1971-72	0.863	0.305	0.487
1972-73	0.861	0.339	0.511
1973-74	0.861	0.361	0.524
1974-75	0.869	0.365	0.519
1975-76	0.899	0.382	0.563
1976-77	0.870	0.357	0.526
1977-78	0.866	0.305	0.476

7. G. Rosenbluth, "Measures of Concentration" in G.J. Stigler (ed.) *Business Concentration and Price Policy* (Princeton, N.J. Princeton University Press, 1955).
8. S. Siegal, *Non-parametric Statistics for the Behavioural Sciences* (New Delhi : McGraw-Hill, Inc., 1956), p. 231, 236.

Herfindahl concentration index. The consistency of rankings of three measures of concentration was tested by Kendall Coefficient of Concordance statistic as given in (4). It was found that these measure give consistent rankings.

The figures of trends in concentration in case of petro-chemical based fibres are reported in Table 3. It is observed that there is a decline in both absolute and relative concentration over time. Further, the decline has been quite significant. This is evident by noting that the concentration ratio was 98.7 per cent in 1967-68 and it declined to 63 per cent in 1977-78. The relative concentration as measured by Herfindahl concentration index indicates quite a similar picture.

TABLE 3

Trends in Absolute and Relative Concentration of the Petro-Chemical Based Fibres Group

Year	Four Firm Concentration Ratio	Herfindahl Index of Concentration	Gini Coefficient
1967-68	0.987	0.291	0.367
1968-69	0.911	0.232	0.445
1969-70	0.917	0 219	0.403
1970-71	0.860	0.205	0.447
1971-72	0.893	0.226	0 495
1972-73	0.849	0 198	0.425
1973-74	0.674	0.145	0.426
1974-75	0.633	0.139	0.382
1975-76	0.631	0.132	0.420
1976-77	0.611	0.132	0.402
1977-78	0.630	0.139	0.415

However, in case of Gini Coefficient no consistent pattern is observed. Here again the consistency of rankings between three measures was tested and it was found that the three measures show consistent rankings at 5 per cent level of significance.

The foregoing analysis indicates that concentration has declined in both cellulosic and petro-chemical based fibres. However, the decline has been faster in case of petrochemical based fibres, where as for cellulosic fibres it was insignificant. This shows that petrochemical based fibres are becoming more competitive, thus making it less monopolistic. This is a desirable trend and would have influence on the conduct and hence performance of the bigger units. The larger units, therefore, cannot charge higher price and make more profit. The decline in the concentration of cellulosic fibres is insignificant. A plausible reason for this could be that hardly any unit came into streamlight after 1963. Further the degree of absolute coecentration is very high which should be a matter of concern; since a high concentration ratio leads to higher know-how barriers to entry.

The trend in the degree of vertical integration for the combined group as given by the two measures is reported in Table 4. The table indicates that there has been a decline in the degree of vertical integration between 1963-64 and 1977-78. The decline has been

TABLE 4

Estimates of Vertical Integration for the Combined Group

Year	Degree of Vertical Integration as given by Value Added/Net Sales	Inventory/Net Sales
1963-64	0.435	0.382
1964-65	0.393	0.362
1965-66	0.389	0. 26
1966-67	0.383	0.279
1967-68	0.404	0.274
1968-69	0.378	0 209
1969-70	0.328	0.194
1970-71	0.348	0.201
1971-72	0.375	0 194
1972-73	0.324	0.197
1973-74	0.346	0.198
1974-75	0 383	0.222
1975-76	0.262	0.223
1976-77	0.241	0.180
1977-78	0.258	0.174

very gradual till 1969-70 except in one case where the ratio of value added to sales increased in 1967-68 over its previous year. From 1970-71 onwards to 1973-74 no perceptible change in the degree of vertical integration is observed. However, the periods to follow showed a decline in the degrees of vertical integration.

The quantification of vertical integration for cellulosic and petro-chemical based fibres was carried out separately. The results are given in Table 5.

TABLE 5

Estimates of Vertical Integration for the Separate Group

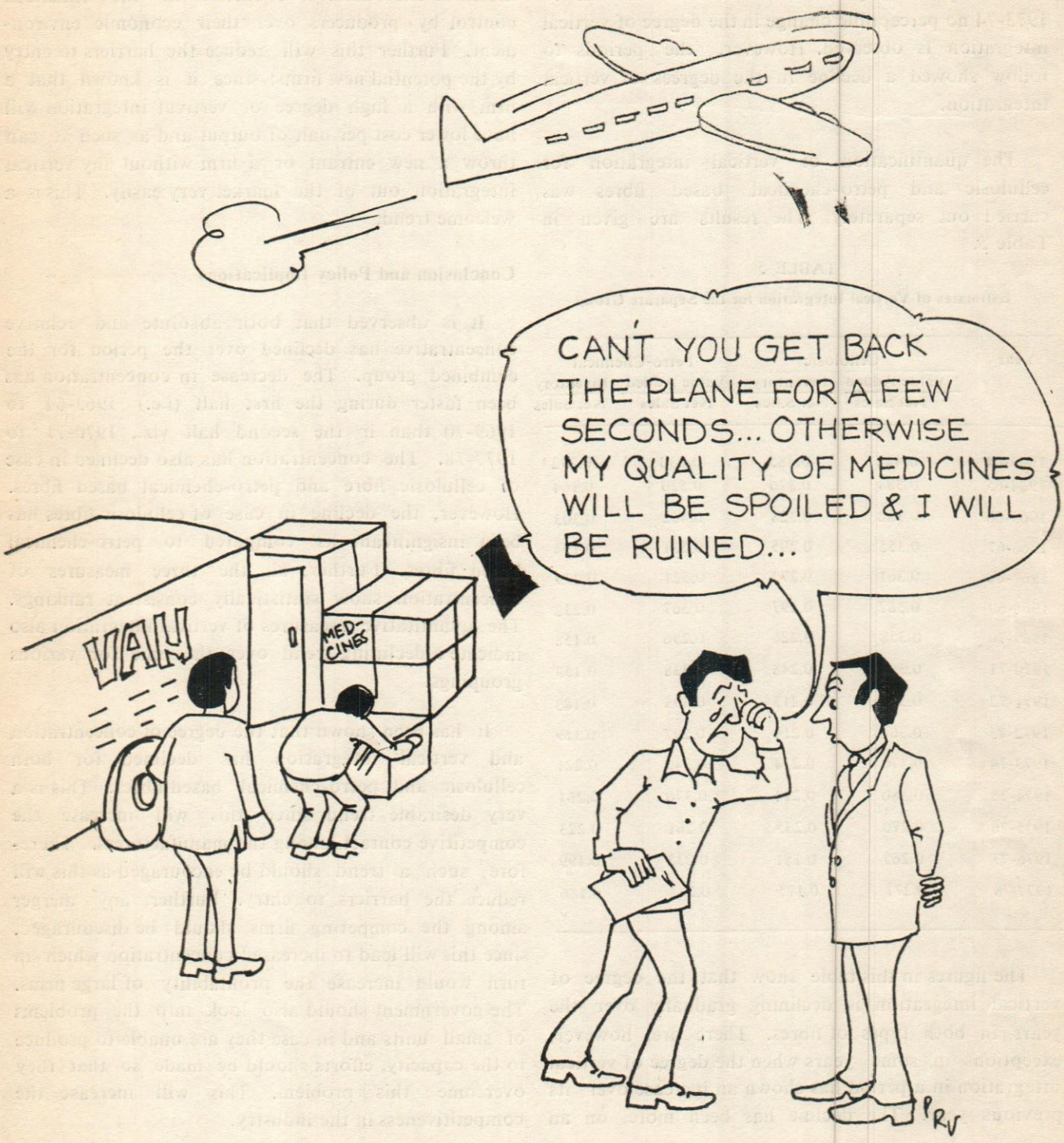
Year	Cellulosic		Petro-Chemical	
	Value Added / Net Sales	Inventory / Net Sales	Value Added / Net Sales	Inventory / Net Sales
1963-64	0.428	0.385	0.630	0.292
1964-65	0.384	0.376	0.520	0.164
1965-66	0.382	0.328	0.462	0.303
1966-67	0.355	0.295	0.531	0.194
1967-68	0.361	0.272	0.521	0.279
1968-69	0.387	0.197	0.367	0.232
1969-70	0.358	0.226	0.296	0.158
1970-71	0.360	0.248	0.338	0.153
1971-72	0.353	0.213	0.398	0.183
1972-73	0.364	0.214	0.297	0.159
1973-74	0.370	0.214	0.340	0.221
1974-75	0.380	0.214	0.370	0.264
1975-76	0.270	0.235	0.261	0.223
1976-77	0.265	0.181	0.233	0.199
1977-78	0.271	0.175	0.243	0.186

The figures in this table show that the degree of vertical integration is declining gradually over the years in both types of fibres. There are, however, exceptions in some years when the degree of vertical integration in a period has shown an increase over its previous year. The decline has been more, on an average, in the case of petro-chemical based fibres than in the case of cellulosic fibres. This decline indicates that there is reduction in the enhanced control by producers over their economic environment. Further this will reduce the barriers to entry by the potential new firms; since it is known that a firm with a high degree of vertical integration will have lower cost per unit of output and as such it can throw a new entrant or a firm without any vertical integration out of the market very easily. This is a welcome trend.

Conclusion and Policy Implications

It is observed that both absolute and relative concentrative has declined over the period for the combined group. The decrease in concentration has been faster during the first half (i.e.) 1963-64 to 1969-70 than in the second half viz., 1970-71 to 1977-78. The concentration has also declined in case of cellulosic fibre and petro-chemical based fibres. However, the decline in case of cellulosic fibres has been insignificant as compared to petro-chemical based fibres. Further, all the three measures of concentration show statistically consistent rankings. The quantitative measures of vertical integration also indicate a declining trend over the time for various groupings.

It has been shown that the degree of concentration and vertical integration has declined for both cellulosic and petro-chemical based fibres. This is a very desirable trend since this will increase the competitive contact among the manufacturers. Therefore, such a trend should be encouraged as this will reduce the barriers to entry. Further, any merger among the competing firms should be discouraged, since this will lead to increased concentration which in turn would increase the profitability of large firms. The government should also look into the problems of small units and in case they are unable to produce to the capacity, efforts should be made so that they overcome this problem. This will increase the competitiveness in the industry.



QUALITY AND TIME WORK TOGETHER

Productivity
1987, XXVIII, 1, 57-64

Scientific Productivity Measurement

DR. S.N. LAHARIA &
DR. Y.P. SINGH

The Present paper examines the different approaches used to measure scientific productivity.

Dr. S.N. Laharia, Joint Director (Ext.), Haryana Agricultural University, Hissar—125 004.
Dr. Y.P. Singh, Head, Division of Agril. Extension, Indian Agricultural Research Institute, New Delhi-110 012.

Research is a complicated process involving several delicate tasks and accordingly, the measurement of scientific productivity is an intricate issue. Meltzer (1956) reported that scientific productivity is a complex phenomenon with a number of inter-related components such as creativity, quality, communicability, etc. and concluded, "it would be a formidable task to combine the various components of scientific productivity into a simple meaningful measure". Ahmad (1966) also asserted that there is neither any quantitative measure of individual's contribution to research nor there is any statistical standard against which it can be evaluated.

Inspite of its complexities, efforts have been made to measure it quantitatively in the studies conducted in this field as shown in Table 1 on the next page.

A perusal of the Table reveals that there are three most popular measurement techniques of scientists' productivity. However, there is a wide variation in the nature of their use and weightage system. Another salient observation is that in most of the studies, two or more than two techniques have been used although in different combinations. In the following paragraphs, these would be discussed in detail.

1. Judges Rating

Though not a sharp measure, yet it has been a widely used technique for evaluating scientists. The

TABLE 1

Techniques Used in Measuring Scientific Productivity

Sr. No.	Author(s)	Techniques Used			Remarks
		Judges Rating	Publications	Patents	
1	2	3	4	5	6
1.	Klopsteg (1945)	—	×	—	Suggested evaluation in terms of human welfare
2.	Maris (1951)	—	×	—	Weightage on the basis of number of pages
3.	Van Zelst & Kerr (1951)	—	×	—	
4.	Meltzer (1956)	—	×	—	Weightage on the basis of number of pages
5.	Grasberg (1959)	×	×	—	
6.	Quinn (1960)	—	—	—	Suggested evaluation on the basis of profit and achievement of public goals
7.	Meltzer and Salter (1962)	—	×	—	
8.	Bloom (1963)	—	×	—	
9.	Knapp (1963)	—	×	—	
10.	Pelz (1963)	×	×	—	Citation count for publication
11.	Taylor (1963)	×	×	—	Rating by different categories of judges
12.	Taylor et. al. (1963)	×	×	—	Rating by different categories of judges
13.	Cammock (1966)	—	×	—	Also rank, salary, involvement in professional societies, etc.
14.	Carter (1966)	—	×	—	Adopted weightage system
15.	Chambers (1966)	—	—	—	Creativity was measured by membership in National Academy of Science, etc.
16.	Chaney (1966)	×	×	×	
17.	Pelz & Andrews (1966)	×	×	×	
18.	Stewark & Spark (1966)	—	—	×	
19.	Andrews & Farris (1967)	×	×	×	
20.	Cole & Cole (1967)	—	×	—	Considered citation counts
21.	Farris (1967)	×	×	×	On the pattern of Pelz & Andrews (1966)
22.	Shaw (1967)	—	×	—	
23.	Strauss (1967)	×	—	—	
24.	Tucker et. al. (1967)	×	—	—	Rating on 19 criteria by Peers as well as supervisors
25.	Crane (1968)	—	×	—	Differentiation of publications as major and minor publications
26.	Friedlander (1970)	—	×	—	
27.	YPMA, Edward G. (1970)	×	×	×	
28.	Smith (1971)	×	×	×	On the pattern of Pelz & Andrews (1966)

rating is generally done by supervisors/seniors and also in some cases by peers and subordinates. The study of Strauss (1967) seems to be the only one, among those under review, which used only rating scores, of course by supervisors as well as by peers. Taylor (1963) developed two scales with Thurstone Technique to measure creativity and productivity of scientists by immediate surpervisors and secondary supervisors. Tucker et. al. (1967), also used only rating system, but they got rating scores on as many as 19 criteria such as creativity, quantity of work produced, skill with people, etc. from supervisors as well as by peers and subordinates. The supervisors' rating on overall performance correlated highly with the supervisors' other ratings such as quality of work ($r=0.91$), skill with people ($r=0.85$), creativity rating ($r=0.54$) and also with likeability rating ($r=0.54$). The peers' rating on overall performance also correlated highly with peers' rating on the quality of work, skill with people and creativity rating ($r=0.94$, 0.71 and 0.80, respectively).

While Tucker et. al. (1967) used several criteria for rating, Taylor et. al. (1963) got the rating scores from different types of judges viz. immediate supervisors, chief of the laboratory, senior scientists, peers, interviewer, and from the scientist himself. Besides rating scores from these sources, they also used publications and office records to evaluate scientists performance. Pelz (1963) used two measures-evaluation by judges and citation within last three years—as indicators of scientists' productivity. Chaney (1966) in his study with 200 British scientists used three different measures to evaluate their performance. Besides supervisory rating on creativity, other two were number of patents, and number of publications. He also reported tetrachroic correlation of 0.64, 0.73 and 0.60 for rated creativity, patents and publications, respectively.

The rating system is being followed by many organisations, but in different forms. Balderstone (1964) reported that at North American Aviation Science Centre, scientists are evaluated on following nine criteria, each on six point scale having different weightage :

(i) Productivity of creative work
(ii) Technical judgement
(iii) Width and degree of knowledge
(iv) Recognition
(v) Scientific leadership
(vi) Interaction
(vii) Initiative and self-reliance
(viii) Responsibility for reporting
(ix) Quality of presentation (both oral and written).

The first two criteria were given the weightage of two each, the third one carried the weightage of 2, while the rest of them were given the weightage of one only. Similarly, Eire Agricultural Institute uses a performance Review Form which has 13 major dimensions besides four general aspects, viz. conduct and punctuality, overall performance on the present post, overall assessment of future potential, and other observations and comments (Arnon, 1968).

Notwithstanding its wide use, its conclusions have generally been considered dubious, Pelz and Andrews (1966) admitted, "it was possible for the evaluators to be influenced by subjective factors, such as the judges' liking for the individual". They also found very low correlation between rating-score and other objective measures. These suspicions have been further cemented by the findings of Tucker et. al. (1967), where they found high correlation between the supervisors rating on overall performance and likeability. Edwards and McCarrey (1973) also felt that high correlations observed in the study of Tucker et. al. (1967) were subject to considerable halo effect which cast doubts on the usefulness of ratings on overall performance, either by peers or supervisors. The ideal procedure in this regard can be evaluation by all the three categories, viz. supervisors, colleagues and subordinates. McDonald (1970) supported this view but he also added that not many researchers have the time and means to obtain ratings from all the three groups.

II. Publications

Publications have been considered as a major index of scientists' productivity in many studies as shown in

the Table 1. Generally one or more techniques have also been used alongwith the publications to measure productivity but in a considerable studies the number of publications has been taken as the only criterion.

Grasberg (1959) reported a high correlation (rho= 0.74) between ratings on overall job performance and average number of publications and pleaded, "it seems reasonable to consider the number of written reports as a measure of productivity for a scientist or for an organisation". Meltzer (1956) got a correlation of 0.51 between the citation count and number of publications and reported that the number of papers written is some indication of the amount of high quality work produced by a scientist. This interpretation is supported by the similar results which have been obtained when analyses using number of papers as a criterion were replicated using number of citations as the criterion. He further added that in another study the rating score of 50 scientists was related with the number of publications and found that a low number of publications does not detract from the performance ratings. However, most of the high publication scientists were regarded as high performers within their laboratories and disciplines.

Inspite of the wide use of this criterion and arguments put forward in its favour, any inference merely on the number of publications sometimes may be misleading. It is evident from the observation of Pelz and Andrews (1966) who got a low correlation (r= 0.15 to 0.39) between overall contributions and number of papers and reports published. Pelz (1963) also observed, "The scientists were quite firm that no quantitative measure such as number of papers could capture the subtelities of real scientific work". Chaney (1956) also reported a very low correlation (r=0.05) between patents and number of technical papers. Klopsteg (1945) also felt, "Number of pages of published results are sometimes used as a gauge of scholarship upon which advancement in professional status depends. To my knowledge, no one has ever found a formula for converting this number of pages to a figure of merit of work setforth in publications". The correlation (r=0.51) between number of publications and citation counts reported by Meltzer (1956) leaves considerable portion of variance unexplained and indicates that it is not proper to operationally define scientific performance in terms of bibliographic counts alone.

Edwards and McCarrey (1973) also felt, "It may be true that contributions of a scientist to his field are judged mainly by his number of publications, but data certainly don't indicate that a scientist's value to an organisation can be judged solely in these terms". Ahmad (1966) also wrote, "Though a genuine indicator of ones research productivity; an evaluation solely based on the number of publications may sometimes be misleading". The reasons for this, he pointed out, are :

(i) In many types of researches, quick publication of results is not possible;

(ii) Such an evaluation does not give weightage to the quality of work.

Further, consideration of mere number of publications would encourage scientists to go for a number race rather than bringing out quality papers. It will also mar the creativity of research workers. They will be motivated to devote their energy in activities having more potentiality of publishing papers rather than in those fields which have more social, economic and technological implications. Considering this limitation with the number of publications, some investigators made attempts to evaluate their quality and give due weightage.

Evaluation of Publications

The ideal way to judge the quality of publications is the evaluation of each publication by a team of experts. However, it is not feasible due to a number of practical problems. Some via-media have been evolved to achieve the objective, which are as follows:

A. Weightage System

Under this system, investigators assigned different weightage to publications on the basis of size (number of pages) or their nature. Both Maris (1951) and Meltzer (1956) considered a book equal to 18 journal articles. Crane (1968) distinguished between major and minor publications on the assumption that a scientist's

work is evaluated chiefly in terms of the major publications. A book was considered to be a major publication and a journal articles over 50 pages was taken to be equal to a book. Also a series of four journal articles, each of which explored some aspect of a single problem was equated with a book. Carter (1966) counted a theoretical or research book as being equal to six articles, a text book as six articles and an edited collections of two articles.

A fundamental defect in all these studies is that none of them had any real empirical basis for using their particular weightage—system. Moreover, in fact, none of them actually gave weightage to the quality of the content. The assumption that bigger the size, better is the quality may not hold true in most of the cases.

B. Judges' Rating

Another approach is the evaluation of the quality of publications on certain dimensions by the judges. Taylor et. al. (1963) used following five dimensions :

(i) Relevance;

(ii) Organization;

(iii) Significance of research publication;

(iv) Elegance-accuracy-exhaustiveness of research report;

(v) Originality

On factor analysis, he found first four dimensions in one group, which he called quality of research report and the last was independent to measure the originality of research report.

North American Aviation Science Centre used a rating scale consisting of nine attributes, each having a graphic scale ranging from 0 to 6 while 0 represented disorganized and 6 representing superb. The rating was done by the supervisors.

Though theoretically it seems to be a sharp approach, but it too has some problems. First is the differentiation between each dimension as Edwards & McCarrey (1973) pointed out, "An examination of the detailed definitions given for other dimensions reveal that there is a quality aspect built into some of them. The recognition dimension, as defined, is very similar to the definitions other researchers have given to the quality dimension and responsibility for reporting specifically include the quality of work reported". Another problem is of finding out judges to rate the publications where number may run into hundreds.

C. Citation Count

A third approach to solve the riddle of quality measurement is the citation count. The assumption underlying this approach is that a high quality paper is cited more frequently than an average or poor quality paper. Miles (1963) has described this technique in detail. Cole and Cole (1967) took the number of citations to represent the relative scientific significance or quality of a paper. They also reported that citations correlate 0.47 with the visibility of a scientist, where his visibility was measured by other scientists on a five point scale ranging from familiar with most of his work to have never heard of him.

Noltingk (1965) strongly advocated the importance of the citation counts and suggested that a 'Citation Index Production Gauge'. He advised that scientists should not only mention the list of their publications, but also, alongwith the list, the number of times each paper has been cited i. e. its citation count should also be reported

The assumption underlying this approach, however, itself seems polemic. What do citations exactly signify? According to Bayer & Follger (1966), "A work may be cited for a variety of reasons, but a reasonable assumption is that it has had an impact on the on-going accumulation of scientific knowledge.. the work has been influential in as much as it has been noticed and related to". The impact can, however, be due to number of factors, not necessarily because of good quality. Edwards and McCarrey (1973) wrote, "It may be safer to restrict the interpretation of citation to the impact that an article has, keeping in mind that a widely read article may have a large impact without being of a high quality as an article in a less popular field which receives fewer citations. It is also essential to keep in mind that impact in some cases may be negative one". Ahmad (1966) also felt, "Through

citation count one can only determine the amount of reaction of the scientific community to a particular piece of literature, not whether the reaction was generally positive or negative or equally both (unless, of course, each reference is thoroughly read and analysed)".

Edwards and McCarrey (1973) reported more problems in the use of citation which are as follows.

(i) Work of the highest significance often becomes common knowledge very quickly and is referred to in papers without being cited.

(ii) Citation may be critical, rather than positive.

(iii) Various scientific fields differ in size which in turn means that there may be fewer 'citers' available for some papers.

(iv) The significance of scientific work is not always recognized by contemporaries.

(v) Only the senior author is credited with the citation.

Noltingk (1965) also pointed out that more cross referencing is to be expected in pure scientific work than in technology. According to Ahmad (1966) citation count can be known only after some time, not immediately after publishing a paper.

There is also a fear of adoption of a policy of mutual appreciation by a group of persons. In that case all the papers of each member of the group will have a high citation count. Further, though the publication of periodical like 'The Citation' and the book like 'Scientific Serials' have greatly eased the problem of knowing the citation count, yet they cover only selected journals. The citations of the articles in other journals would remain unaccounted.

III. Patents

Besides performance rating by the supervisors, peers and subordinates, and publications, a third commonly used indicator is the number of patents. Stewart and Sparks (1966) considered patents as the only indicator of creativity of chemists and chemical engineers. Chaney (1966), Farris (1967); Pelz & Andrews (1966) and Smith (1971) in their studies included rating scores and publications also besides patents.

There are two limitations in the use of patents; first is the basic assumption whether patent is an indicator of creativity or productivity or both? Should creativity be excluded while considering productivity? Another is its limited application. There are various disciplines in basic and social sciences where scientists are not concerned with patents.

IV Other Techniques

In addition to these, some other techniques have also been used in the studies. Chambers (1966) measured the creativity of scientists by membership in National Academy of Sciences or American Philosophical Society, being started in American Men of Science, and, similar recognition for research. Cammock (1966) measured the productivity and achievements by scaling and combining factors such as rank, salary, involvement in learned and professional societies, involvement in graduate advisory committees, etc. besides publications. Quinn (1960) suggested to evaluate the research output from profit and public goals point of view. Though his suggestion is in the background of industrial research workers, yet he advised that even fundamental research should be evaluated on the economic terms. He also felt that research in some fields meant for public good, viz. solar energy, conversion of sea water into pure water, improved soil use, conservation technique, etc. should be judged against the organisation's overall objective and public utility.

A review of various studies done in the field of scientists' productivity, thus, reveals that there are three major techniques of judging the performance of research workers—Judges Rating, Publications and Patents. However, all of these have been used in different forms and different combinations. There is neither unanimity on any one indicator nor any approach is devoid of limitations. Of course, there seems to be a consensus on publications, as 22 out of 28 studies have reported its use. This shows that

number of publications is to be an essential and major component for the measurement of scientists' productivity, although the arguments to make it the sole criterion is weak. Moreover, there is a need to have a simple and quick but reliable system of appraisal of the quality of publications.

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Anatomy of Viable Lending

DR. BIMALENDU MUKHERJEE

Why too many of borrowal accounts turn succor in the eventual course ? What is wrong with our lending practices ? Varied gaps trivially found with creditmen's modalities are analyzed in this paper, which also aims to build up a possible strategy for bridging them over.

Dr. Bimalendu Mukherjee, Management Consultant is at 42/24, Nakin Chandra Das Road, Calcutta-700 090.

The most conspicuous trend entering into the process of today's credit decisions is quite logically grooved in the concept of lending by viability.[1]

Lending by viability is not a mere jargon. Neither can its intrinsic worth be simply undermined as being tautological to veering of some mystic thoughts into the credit profiles of the banking system. The concept may better be recognised as a newer—but inevitable-dimension of thrust emerging into the basic philosophy of lending anywhere in the world,[2] though its conceptual basis may be considered to have been coined originally by the Mac Millan Committee as far back in 1931 in England.[3]

The concept of lending by viability rests on a simple premise. It means that the lending function needs to be so geared as to ensure eventual success of the project that is proposed to be financed. This is of paramount importance because, after all, it is the viability of a project that counts as the linear

1. Mukherjee Bimalendu, "Percepts Influencing Credit Extension Decisions", LOK UDYOG, August, 1984, pp. 21-32.
2. (a) Casson DH, "The Changing Face of Lending—a Personal View", Journal of the Institute of Bankers, August, 1977, pp. 139-40.
   (b) John D. Mangels, "Philosophical Context of Banking in the 80s". Bankers Monthly, November 1981, pp. 21-22.
3. Report of the Committee on "Finance and Industry", London (HMSO), 1931, pp. 169-71.

condition for continuance of a business. The degree of the project's success would determine the unit's on-going appetite. If the appetite is strong, it will remain healthy; and in this continuum, borrowing covenants will be presumably fulfilled by the loanee. The banker in the ultimate event, in turn, can expect to remain in a safe position. Conversely, the real ordeals may stem out when a major set-back forces the unit's way and affects its functioning on healthy course. In this consequence, repayment of matured obligations is not expected to flow in the normal course.

Purports behind the concept of lending by viability, as it would appear, aim to strike the continuum of banker-borrower relationship in the contour of mutually satisfying interests. But there is yet another dimension of significance inherent with this approach. It stimulates growth of industrial activities on safer footing and, in a broader context, tends to contribute towards development of the economy as a whole.

It is perhaps, a misconception that the approach towards lending by viability dispenses with the connotation of "assets-banking" that might be available to the provider of finance. In true sense of the term, it is "asset-based" lending[4] that tends to be procastinated in this strategistic approach,[5] and certainly not the banking of assets which would be created out of the finance obtained by the loanee and which the lender can retain as a means in the process of its subsequent control mechanism of the loan that would be granted.[6] The ultimate consideration of the proposal for the loan would, of course, accentuate on viability of the project as has been already emphasised.

The intrinsic value of the concept is well recognised now by the banking community. In the course of its translation into reality, however, it is not always that the trend of action moves towards the right direction. The paper seeks to highlight the existing gaps in lending practices and to enlighten on the needed technicalities of bridging them over.

To build framework of the proposed tasks, a case is presented as a first step. The case is hypothetical, but drawn from real-life situation in the operational discipline of banking.

Trivial Scenario

DOMESTIC APPLIANCES PRIVATE LIMITED was formed by Mr. Dhiraj Seth and his brother Mr. Suresh Seth—both qualified engineers—and was registered as a private limited company four years ago with an aggregate capital contribution of Rs. 6 lakhs to manufacture and market water heaters of their own design. The Company had been doing brisk business since inception. A year later, it shifted to its own freehold factory premises, which it purchased for Rs. 4.6 lacs. Periodic irregularities in the bank account started featuring soon thereafter. Eighteen months ago, the brothers developed a design of pump-set which could be sold cheaper than existing models. To achieve annual production target of 10,000 units of the new product the company decided to extend the factory premises and approached the bank for loan of Rs. 4 lacs to cover the cost. The company already made arrangements to obtain necessary machinery on hire purchase.

4. This signifies the traditional concept of lending against security, carrying the theme: Lend money when security is available and lend the quantum asked for if it is covered by value of the security offered. Security in this conception, in other words, forms the barrometer for credit.
5. William H. Rentschler, "Banks Should Change Their Thinking on Asset-Based Lending", ABA Banking Journal, April 1982, pp. 107-8.
6. For a detailed account of how assets-backing renders help to the lender in its post-disbursement control mechanism of the loan and in recovery proceedings in the event of non-compliance by the loanee of the borrowing covenants, See :
   (a) Garry Nemer, "Analysis of Problem Loan Alternatives for Secured Lenders", The Journal of Commercial Bank Lending, October, 1982, pp. 38-52; and
   (b) Bernard Wilson and Larry Huizing, "Improving Recovery Systems", The Canadian Banker & ICB Review, June 1982, pp. 24-26.
   (c) Stephen C. Diamond, "How to Succeed as an Asset-Based Lender." Journal of Commercial Bank Lending, May 1982, pp. 18-22.

The profit on each pumpset was projected at Rs. 40/-, which would enable them to clear the bank loan in 3 years. A mortgage was offered over the factory which the Directors said would be worth Rs. 10 lacs on completion. The bank granted the advance.

Soon thereafter, the company encountered difficulties. First rate components were not available in sufficient quantities and the quality of product suffered. Too many resources has to be diverted to the repair of machines and production fell short of target. Sales declined very sharply. The directors now decided to turn back to manufacture of water heater. Further assistance was sought from bank, which it readily agreed in view of the supposed adequacy of security.

It was soon realised that pressures for the company were too severe to survive and finally, it went into liquidation owing the bank nearly Rs. 6 lacs. The factory is professionally valued at Rs. 7 lacs, which meant that the bank should ultimately emerge without loss, but the best offer to date is Rs. 4.6 lacs.

Where it Went Wrong

It is worthy of analysing the sequence of events that led to the unit's unfortunate fate, and to see how the banker's decisions acted as contributory to it.

What is the proximate cause of the bathos? Ostensibly, it is non-availability of first rate components for the new product. Quality of the product suffered as a corollary. Consumers' resistance developed as a result and in consequence, sales fell short of expectations. The flasco ended with cash losses. A fervent attempt is now on to strive hard for survival through the vanguard of the original line of activity once again now.

This is not, anyway, the conclusive background. A little insight into the affairs of the unit at the point the new project was embarked upon, would have thrown up a totally dsfferent dimension of signals altogether. True it may be that the project was taken in hand at a time when the unit was doing 'brisk business' under the stewardship of 'qualified' team of management; but nevertheless, a few of its undergoings must not have been overlooked.

* Resorting to too big a project in relation to the existing resources of the unit;[7]
* taking up of the project at a time when 'periodic' irregularities in the bank account has already become prominent, suggesting the presence of strain on liquidity;[8]
* diverting substantial amount of working funds for acquisition of capital assets;[9]—Rs. 4.6 lacs, in fact, is spend to acquire 'own freehold factory premises' alone against the feeble capital base of Rs.6 lacs only.
* stretching the gearing rather beyond proportion[10]

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7. A big project is not, necessarily bad, as a matter of fact, but if its size is too big in relation to the unit's overall means, it may then be taken as a sure danger signal. See, Mukherjee Bimalendu, "Industrial Sickness—Propensities and Prevention", Journal of the Indian Institute of Bankers", April-June, 1982, pp. 77-81, provides analysis of the event in a dynamic setting.
8. Borrowers' bank accounts provide a treasure of multi-dimensional information to the lending banker. For details, see, Clemens JH, "Bank Lending", Europa Publications, London, 1973, pp 87 & 174-80.
9. Directing a part of working capital, to meet growth funding is a prudent tactical decision, nevertheless, it is economical, too, in the sense that it reduces the maturity obligations of term borrowings. Diversion of working funds may, thus, be resorted to with full safety so long as it does not affect current liquidity needs of the unit. See,
   (a) Mukherjee Bimalendu, "Interpretation of Working Capital-Interposing Paradoxes", Research Bulletin of the ICWAI, July, 1984, pp. 264-70; and also,
   (b) David D. Harrison and William H. Hernander, "Measuring the Impact of Inflation of Working Capital", Harvard Business Review, January-February. 1983, pp. 28-35 for a clearer picture of the effects of inflation on Working Capital components and potential liquidity.
10. Gearing, by itself, is not deliterious. Debt can help boost a company's value because of the tax-advantaged status of interest costs; but employing it too aggressively may weaken a business's position during hard times and foster over-dependence on unstable sources of capital, Refer—
   (a) Thomas R Piper and Wolf Aweinhold, "How Much Debt is Right For Your Company ?" Harvard Business Review, July-August 1982, pp. 106-14; and
   (b) Mukherjee Bimalendu, "The Debt-Equity Dilemma—a Re-look", The Chartered Accountant, July 1983, pp. 7-11.

– deferred loans from banks, for exemple, were pushed up to Rs. 4 lacs, besides the arrangements to obtain necessary machinery on hire purchase; the obligations involved for this latter cluster of funding is not readily known, but must it be substantial with any measure of guesswork.

A little pragmatic evaluation would have shown also that the project was not financially viable, ab initio. Profit at full capacity was worked out at Rs. 4,00,000 (covering 10,000 units @ Rs. 40 per unit). With the existing gearing, interest charge alone consumes the major chunk. After paying taxes, very little is left over to meet the hire purchase obligations. How the bank's loan-instalments will then be paid ? Even with the verbatim fulfilment of forecasts (not done, indeed, realistically) things were not at all wholesome. In the event of probable adversities of business climate, or in the event of some unforeseen snags developing with the project in future, what course of turn the things would take was not anticipated at all; apparently, the whole world of attention centred round the book value of tangible assets covered as security against the lending.

Trap for the Unwary

This, in effect, is a glaring instance of asset-based lending that tends to invite perils in the event of the things into the mantle of the unit going wrong. And, things will certainly be having greater propensity to turn wrong in the absence of proper planning and control.[11] That lending must be based on the principle of viability, though recognised on record, is scarcely followed in practice; and, in cases where such attempts are formalised, the endeavours are not unoften cut-flanked by lack of pragmatism. The tendency stems from the complascence that the lender has realisable assets in his hands which he can dispose off in endeavour to recover his dues. This is an illusion but there remains a fantacy for relying safe on what is called secured lending. The conviction is that holding of charge on assets facilitates lender's control function over the loan in several ways which has to be exploited meaningfully wherever and whenever occasion arises during the course of post-disbursement follow up. Overstress, however, on tangible assets is not only unethical in the face of changing philosophy of lending, but also unwarranted in the interest of the lender's own safety. The following observation is noteworthy for purpose of elucidation on this aspect.[12]

"Secured lending often causes first principles to be forgotten. Many situations lend themselves naturally and soundly to it but due trap is sprung whenever the banker relies on the fact of security, or on the capital value of an asset, rather than on an identifiable source of repayment.

"Mos sound secured lending falls into one of two categories. It is either self-liquidating in the traditional sense or, in a rather long-term sense, from specific (if narrowly based) cash flow generated by the item or project financed. In both cases, the source of repayment is clear, and a pledge is taken to avoid diversion to another use. The assets generating the cash may be pledged as secondary security, but danger arises where their capital value is taken as the main justification for the loan. If the asset fails to generate cash, the capital value disappears."

The whole gamut, therefore, riverberates on the need for appraising and making measurement of the company's viability as a going concern. This requires the lender, to be exposed to and evaluate a wide range of factors that determine the eventual course of a business.

Vital Points

The spectrum of factors, that emerge from the foregoing, may be presented in the form of a check-list as under :

1. What is the product ? Has it adequate demands ? Do market research, costings and

11. Arneson George S, 'Perils of Plunging into Bankruptcy Without Planning', Journal of Commercial Bank Lending, March 1982, pp. 55-61, gives an account of experiences in this context.

12. Donaldson TH, "Banking for a Going Concern—Principles of Sound Lending", Journal of the Institute of Bankers, February 1977, p. 13.

projections demonstrate new venture to be viable ? Who are the competitors ? What is its competitive strength for sustaining ? Do economic trends indicate maintenance of demand ?

2. What is the management structure and culture? Management resources in terms of technical and financial expertise commensurate with nature of the product ?

3, What is the present infrastructure ? If factory space repuires to be extended, then whether for new product, or increased demand for old ? Is land already owned ? Cost of acquisition, if not ? Has planning permission oeen obtained ?

4. Total cost of extension and the sources of finance ? How much is customer contributing ? Is the leverage on the high side ? What is the mix of the debt and who are the contributors ? Is bank's stake reasonble in relation to the total contribution ?

5. What is the present position of construction ? Building contractors technically capable and financially sound ? Fixed price contract ? If not, allowance made for escalating building costs ?

6. Arrangements for additional machinery ? Credentials of the supplier ? Terms of supply ? How the liquidity is likely to be affected for supply under deferred payment terms ?

7. What are the production inputs ? Supply of raw materials assured ? Can additional labourers be recruited locally ? Higher labour costs allowed for in cost projections ? Supply position of other inputs ?

8. What will be the additional working capital requirements ? How this is to be raised ? Are the sources assured and adequate ?

9. What is the past record ? Do the financial statements show satisfactory position and trends ? What is likely to be the impact of the project on the future balance sheets ? Does projected balance sheet show movement of figures in healthy directions ? Does the projected financial structure show any tendency to incubate potential causes of vulnerability ?

10 Profit and Cash flow projections realistic ? Continued flow of liquidity assured ? What is the margin of safety in terms of liquidity needs and liquid flow ?

11. What would be the rate of repayment to the bank ? Is the period envisaged satisfactory to the bank ? Whether the repayment obligations are in consonance with the cash flow forecasts ?

12. How the company is likely to stand against a bad weather ? What are the possibilities of securing alternate supports in the event of an unforeseen financial disaster ?

Catalyzing Roles

Studies of viability lend themselves in the ultimate analysis of two broad areas of concerns : first, the available infrastructural facilities and second, the anticipated results of operations. The interposing vital ingredient, of course, is the supply of managerial resources commensurate with needs of the subject case.

With given infrastructure and the available managerial inputs, the rest of the dimension of concerns relate to the unit's successful operation as a going concern, for which the lender should consider the change (over time), in sales, in profits at various levels and in each major type of cost, providing an idea of predictibility, stability and sustainability of earnings in the context of the likely economic and market conditions, It requires proper orientation and a pragmatic forward—looking approach of the credit evaluator.

Contextually, the following cautionary words of the Industrial Credit & Investment Corporation, London is worth noticing :[13]

"For a business to be successful (and in many instances merely to survive) it must be :

Profitable
Cash generating.

13. ICFC Management Series, 'Profit and Cash Flow Forecasting', Industrial and Commercial Finance Corporation, London, p. 1.

These two aspects of a business do not always go hand in hand; although profitability is the principal engine of a business's success (and lack of it, of its failure) the immediate cause of most business failures is insufficient cash to meet commitments as they fall due. Wages and creditors cannot be paid with profits. Cash is a scarce resource which should be managed with particular care.

In recent years, businesses , . , . have operated against a background of declining real profitability and inflation, with its effects on fixed and working capital needs.

In these conditions, businesses which make no attempt to forecast the outcome of trading in both profit and cash terms put their survival in jeopardy, because they do not know where they are going in financial terms. Forecasting, which requires businesses to try to predict the financial outcome of future trading, is, therefore, a vital element of normal control procedures."

Here a bank Manager can play a vital role. "The bank Manager can help the owner-manager by showing him how to develop a simple budget, but (at the same time) . . . . must warn managers . . . . that budgetary control cannot really control a business if it simply consists of looking at last month's figures".[14] Budget figures are useful only when they are properly used. What is needed is "a feedback comparison of actual results with budgeted expectations. . . . . The analysis and follow-up of variances are the keys to successful management control. Variances provide clues, job memories, and open pertinent avenues for management investigation. If managers do not do anything with the variances, then either the reporting system needs overhauling or the managers need to be educated and convinced of the benefits, that can be derived from a careful analysis of the variances."[15] The modern management accounting tools, in other words, could have lent a very effective role in enhancing the quality of credit, but unfortunately this potentiality remains unexplored in the banking system till today.[16]

One pertinent point of relevance in particular is that banking's commitment to the small business is being increasingly recognised throughout the world as such, including the industrially developed nations like the U.K.,[17] the U.S.A.,[18] and Canada,[19] besides the the often-cited unique case of Japan. Highlighting the banks' newer roles in this respect one study concludes :[20]

> ". . .banks were the only organisations capable of doing something to help the small business sector. The relationship between banker and customer is unique and has a vital part to play in bringing about an increase in the birth rate and a slowing down of the death rate of small business. After all, the small firms born today could well be the large firms of tomorrow."

This hinges on a dual role which the banking system is expected to achieve in relation to the small sector; one, catalyzing its growth and appetite through promotional measures; and, two, coming in their

14. Wood Geoff, 'The Branch Banker—small firm's friend', The Banker, August 1974.
15. Horngren Charles T, 'Introduction to Management Accounting', Prentice-Hall, 1980, pp. 188-89.
16. For details on how bankers can benefit from use of management accounting in lending propositions, see :
    (a) Bryant Roger, Using Management Accounts Effectively in Bank Lending", Journal of the Institute of Bankers, London, June 1982, pp. 88-90;
    (b) Mukherjee Bimalendu, "Cash Budgets : Beyond Ritualistic Exercises", The Economic Times, August 3, 1983 (Special Bulletin), p. IV; and
    (c) Mukherjee Bimalendu, "Hidden Wealth in Operating Budgets", Economic Times (Special Bulletin), July 4 and August 1, 1984, p. IV.
17. Turner Alan. "Small Business Looks at the Banks", Journal of the Institute of Bankers, August 1982, pp. 120-21.
18. Petor Gillette, "Revatalizirg the American Dream : Banking Commitment to Small Business", Journal of Commercial Bank Lending, June, 1982, pp. 2-9.
19. Jim Hatch, et. al, "Bank Loans to Small Business", Canadian Banker and ICB Review, February 1982, pp. 6-8 & 11-14.
20. Leslie Chadwick and David Ward, "Bank Managers—Old School or New Breed", Journal of the Institute of Banker, August 1982, p. 117.

rescue in succour through working out of the needed package of control measures.[21] The branch managers could be the nucleus in these processes, with their active involvement in varied ways. At the organisational level, as well, the specialised cells which the banks have now established can explore the possibilities of affording accounting, technical and consultancy services, besides formulating result-oriented innovative schemes for financial assistance for much units. Some recent developments in U.K. in this direction should provide impetus to our country's banking stewards. To quote a few from the editorial of Banking World : [22]

> "Barclays Bank has added an extra dimension to the service it offers to small business customers, alongside its quasi-consultancy visits. Scattered throughout local head offices and big branches, there are now between 100 and 150 Apple Computers which can be used to run through companies' budgetes and cash flow forecasts. Different assumptions on pricing margins and the like can be entered."

> "Lloyds Bank has introduced an accounting system called CARL to their small business customers. . . .the system is a fairly modest entry into this market, but a logical extension of its other activities."

The developments are fairly significant in that they are worthy of emulation in our own conditions.

What Should be Done

When a unit starts faltering, the financiers come out with a tendency to blame its management as being deficient and/or inefficient or even delinquent and/or devoid of sanctity in the discharge of managerial functions.[23] There is nothing uncommon with this tendency in a country which suffers in a big way from dearth of entrepreneural skills and acumen. But let it be also stressed that the financiers, too, is expected to be equally concerned with the unit's undergoings and take steps to maintain the continuum of on-going health, Steps may relate not only to the profile of management but also its operational aspects, such as, production, marketing, cost, profitability and so on. Steps may sometimes relate even to decisions concerning expansion, modernisation, diversification, or even in the scale of operations.

Evidence also is enough to show that, many a times not dearth of efficiency, nor managerial obsolescence or misfeasance, but a kind of flamboyancy in the psychological make-up of the stewards that imbibes the seeds of eventual disasters[24]—the problems, in a great majority of cases, stem out of acute liquidity crisis pressed through fast excrescence in the activity level without serious financial planning.[25] The financiers often tend to overlook this arcane threat, and, in the course of events, find themselves to be plunging down to the world of despondencies alongwith the borrowers.

On the other hand, experience shows, as a matter of the common triviality, that the credit needs of the prospective borrowers are not assessed with realistic considerations, and truely speaking, the credit quantum is decided upon on some vague idea of ad hocism. Result ? Either of the two consequences would certainly follow : (a) Underfeeding the unit, making it to starve from liquidity, or (b) providing

21. Paul R Blair, "How Bankers Can Assist Developing Companies in Growth Management", Journal of Commercial Bank Lending, June 1982, pp. 36-44.
22. Reported in Banking World, August 1983, under title "Banks Offer Accounting Service", p. 6.
23. Shetty Majur C, 'Evaluation of Management in Project Appraisal (Proceedings & Papers of a Seminar)', Management Development Institute, New Delhi, 1979, p. 66.
24. Mukherjee Bimalendu 'Evaluation of Management—needs objectivity in bankers' approach', Journal of the Indian Institute of Bankers, October—December, 1981, pp. 210-15.
25. (a) Simha SLN, 'Sickness of Industrial Units : Some observations' Institute for Financial Management and Research, Madras 1977, p. 7-10; see also,
    (b) Thomas O'Hanlon, 'Less Means More at Firestone' Fortune (Chicago), October 20, 1980, pp. 114-20;
    (c) Tom Lee, 'Laker Airways—the Cash Flow Truth', Accountancy : Journal of the Institute of Chartered Accountants in England and Wales; June 1982, pp. 115-16; and
    (d) Dyer Stuart, The Causes of Business Failure, Journal of the Institute of Bankers, London, April, 1981, p. 48.

finance more than what was needed, and thus, creating avenues for syphoning of funds, Both are, evidently, serious. A further addity in the process of credit evaluation is seen to be the undesirable dimension of time element taken to complete the deal. Many a times the time-lag is so unusually long, that the unit by then would have landed into a difficult situation for financial constraints. And when the finance was made available after long series of negotiations, possibly, the perspective of the unit might have changed so drastically to its detriment that the money wanted for productive purposes originally, will now have to be pipelined towards the needs for rehabilitation. Inordinate delay in credit disbursement is a formidable background for making too many units' survival at stake in the country, though it is to be recognised as well that the slow response of the other counterpart in meeting information needs of the bankers is also a contributory cause for the delay in credit flow.

Often than not, non-compliance of loan construes to be—as the tautology goes—an unpalatable price paid for a phlegmatic style that has got crystallised in the management of our credit portfolio, which has been following the pattern of assets-based lending traditionally. It is only naive that a tendency towards security orientation in lending inhibits the skills and intelligence of the working force to develop and practice newer techniques of control. A positive breakthrough is needed.

Assets-based lending as well as the myth of depending on tangibles as cushion of safety is eroding with the changed philosophy of lending; but the fact remains that the flaws still predominate our lending practices. Alleviating this subjectivity would require a further long way to travel and the sooner this is achieved the better for the mutual interests of the lender and the loanee. Concept of leading by viability is no misnomer. What is inevitable is the concept's verbatim translation in reality for mutual interests of the lender and the loanee.

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Wage Discrimination Against Women

DR. P. SUBBA RAO &
K. LAKSHMINARAYANA REDDY

The paper focusses on the wage discrimination between women and men workers in the agricultural sector. The authors suggest some policy measures to eliminate the same.

Dr. P. Subba Rao and K. Lakshminarayana Reddy, are with Shri Satya Sai Nilayam, Prasantha Nilayam-515134 (AP).

Sharing of economic activity by women is as old as mankind. But the prevalent socio-economic and political conditions in the country controlled the magnitude of their involvement in economic activity though equality of women is one of the important principles of democracy and respect of human rights is also of the most important conditions of social progress.[1] The labour legislation in India has been designed in such a manner as to protect women from exploitation. Further Articles 16 (1) and 16 (2) of the constitution grant the right of equal opportunities in regard to employment to women without any discrimination.

But wages of women workers have been lower than those of men. However, the differences have tended to narrow down mainly due to fixation of statutory minimum wages and standardisation of wages for different jobs.[2] This is true in public sector and in organised industrial sector. But the position in informal sector particularly in agricultural sector is altogether different even to-day.[3] And women workers in agriculture were paid relatively low wages compared to those of men workers,[4]

1. "Women in Industry", "Labour Bureau, Ministry of Labour, Government of India, 1975, p. 1.
2. Ibid., p. (iii).
3. Subba Rao, P., "Wage Differentials in Agriculture Sector—A Study" p. 31.
4. Ibid.

despite the enactment and enforcement of laws.[5] Hither to bulk of women workers in rural areas have been engaged in agriculture and allied activities.[6] According to 1971 census 54.39 per cent of total women workers were employed in agricultural sector. Further 2.56 per cent of total women workers were employed in allied activities of agriculture like live stock, forestry, fishing, hunting and allied activities.

Wage differentials and income inequalities resulting from sex discrimination are symptoms of chaotic labour market. Differentials not only perpetuates and deepens social satisfaction but also reduces national income, reinforces income inequalities and culminates in under utilisation of manpower resources. In view of these factors an attempt is made in this paper, to compute the degree of wage differentials in agriculture sector between women workers and men workers in three villages of Andhra Pradesh.

Sample and Methodology

Three villages with different types of land;[7] different types of characteristics, irrigation facilities, soil—fertility etc., but growing almost the same crops are selected for this study. Those villages are (i) Ragolapalli (dry land) and (ii) Kunaradevam (wet land) in West Godavari District and (iii) Vangalapudi (garden land) in East Godavari District. Wage differentials of women workers and men workers (casual workers only) engaged in various operations,[8] of paddy crop, Tobacco crop and Sugarcane crop are dealt in this paper.

Stratified random sample of 50 women workers and 50 men workers engaged in all specified operations of specified crops from each village are selected to collect the data and opinions for the study. Thus 300 casual workers of all categories ($50 \times 2 = 100 \times 3 = 300$) are taken up as sample from employees group. Stratified random sample of 150 farmers (50 from each village) of different groups are selected from employers group to collect the data and other opinions.

Recourse is made to interview method in order to collect the levels of wages and to appreciate and understand the opinions about the wage levels and wage differentials. Interviews and discussions with all the 300 workers and 150 farmers from three villages have been organised with the help of two separate questionnaires to draw upon their opinions.

Wages of agricultural workers vary widely depending upon the day to day conditions in different seasons. Hence the average wages (in Rupees) for each of the specified operations received by women workers and men workers are separately computed after giving due weightages based on the information collected from workers and farmers. Further the amount of wage received by the workers is adjusted to nearest rupee.

Findings of the Study

Wage Differentials in Different operations of Paddy Crop :

Table 1 presents wage rates of women workers, men workers (with discrimination coefficients) employed in specified operations of paddy crop in wet land, dry land and garden land areas during Kharif season and in wet land and garden land areas,[9] during Rabi season. It is observed from this table that though the women workers are more skilful and as competent as men workers in performing the operations of planting the seedling in the main field and cutting the crop,[10] they are paid below those

5. This statement is based on two tables presented in "Women in Industry" Labour Bureau, Ministry of Labour, Government of India, 1975, pp. 221-224.
6. "Women in Industry."
7. Different types of land are (i) wet land, (ii) dry land, and (iii) garden land. Here garden in a particular village includes part of wet land irrigated with canal water and part of dry land.
8. Only those cperations where both women and men workers are employed are covered in this paper.
9. Paddy crop in dry land area (under study) has not been grown during Rabi season owing to lack of water facilities.
10. Opinion expressed by 88 per cent of the farmers interviewed.

TABLE 1

Wage Rates and Discrimination Coefficients (Paddy Crop) (Wage Rates in Rupees)

Sl. No.	Operation	Type of Land, Season and Workers																	
		Wet Land						Dry Land						Garden Land					
		Kharif Season			Rabi Season			Kharif Season			Rabi Season			Kharif Season			Rabi Season		
		W	M	DC	W	M	DC	W	M	DC	W	M	DC	W	M	DC	W	M	DC
1.	Maintaining Seed beds	6	7	0.17	4	5	0.25	3	4	0.33	—	—	—	5	6	0.20	3	4	0.33
2.	Planting the seedlings in the main field	8	9	0.13	6	7	0.17	4	5	0.25	—	—	—	5	6	0.20	5	6	0.20
3.	Weeding out	6	7	0.17	5	6	0.20	3	4	0.33	—	—	—	4	5	0.25	4	5	0.25
4.	Cutting the crop	8	9	0.13	6	8	0.33	4	6	0.50	—	—	—	6	8	0.33	5	7	0.40
5.	Drying	6	7	0.17	4	6	0.50	3	4	0.33	—	—	—	5	7	0.40	4	5	0.25
6.	Heaping	8	10	0.25	7	10	0.43	4	6	0.50	—	—	—	6	8	0.33	6	8	0.33

Note : W = Women Workers; M = Men Workers; DC = Discrimination Coefficient.

$$\text{Discrimination Coefficient} = \frac{\text{Wage rate of men workers} - \text{Wage rate of women workers}}{\text{Wage rate of women workers}}$$

of men workers in Kharif season in wet land area. However the degree of differences in this case is low as the discrimination co-efficient is 0.13. The discrimination coefficient is 0.17 for the operations like weeding out and drying and it is 0.25 for the heaping operation during Kharif season in wet land area. Discrimination coefficient of wage differentials between women and men workers varied between 0.17 and 0.50 during Rabi season in wet land area. Thus wage differentials during Rabi season are very acute compared to those during Kharif season in wet land area.

In dry land area the wage differentials between women workers and men workers are more acute as the discrimination coefficient is above 0.33 in almost all operations during Kharif season. It is also observed that the discrimination coefficient is highest (0.50) regarding the operations of cutting the crop and heaping as the performance of these two operations require more physique.

Women workers are paid lower wages comparatively to those of men workers in the operations of maintaining the seed bed (discrimination coefficient is 0.20 in case of Kharif season and 0.33 in case of Rabi season), and planting the seedlings (discrimination coefficient is 0.20 in case of Kharif and Rabi seasons) and weeding out (discrimination coefficient is 0.25 in case of both Kharif and Rabi seasons) as the performance of these operations requires more skill compared to physique.

High degree of wage differentials are observed in the operations like cutting the crop (discrimination coefficient is 0.33 in case of Kharif season and 0.40 in case of Rabi season), drying (discrimination coefficients are 0.40 and 0.25 in case of Kharif and Rabi seasons respectively) and heaping (discrimination coefficient is 0.33 in case of Kharif season and Rabi season) whose performance normally require more physique compared to skill.

Operation-wise Analysis : The analysis of operation-wise wage differentials in different land areas shows that the degree of wage differentials is low in case of those operations whose performance require more skill and less physique like maintaining seed beds (discrimination coefficient varies between 0.17 and

0.33), planting the seedlings in the main field (discrimination coefficient varies between 0.13 and 0.25) and weeding out (discrimination coefficient varies between 0.17 and 0.33). Contrary to this, the degree wage differentials is high in case of those operations whose performance require more physique and less skills like cutting the crop (discrimination coefficient varies between 0.13 and 0.50), drying (discrimination coefficient varies between 0.17 and 0.50) and heaping (discrimination coeffiient varies between 0.25 and 0.50).

It is observed from the analysis[11] of type of land-wise and operation-wise wage differentials that the degree of wage differentials is more acute in case of those operations whose performance requires more physique and less skill and it is less acute in case of those operations whose performance requires more skill and less physique.

Wage Differentials for Different Operations of Tobacco Crop

Wage rates for women workers and men workers for different operations of FCV and country tobacco crops in dry land area and garden land area are presented in Table 2.

FCV Tobacco Crop—Dry Land : It is observed from this table that the degree of wage differentials is low (discrimination coefficient is 0.20) in case of the operations like plucking of leaves and arranging the leaves in the barren as the performance of these operation require more skill[12] and less physique.

TABLE 2

Wage Rates and Discrimination Coefficients (Tobacco Crop) (Wage rates in Rupees)

Sl. No.	Operation	Type of land, crop and workers											
		Dry land						Garden land					
		FCV Tobacco			Country Tobacco			FCV Tobacco			Country Tobacco		
		W	M	DC	W	M	DC	W	M	DC	W	M	DC
1.	Forming Seed beds	4	5	0.25	4	5	0.25	6	7	0.16	5	6	0.20
2.	Irrigation	4	5	0.25	4	5	0.25	6	7	0.16	5	6	0.20
3.	Pulling out the seedlings from seed bed	6	5	—0.16	6	5	—0.16	7	6	—0.14	7	6	—0.14
4.	Planting the seedlings in main field	4	5	0.25	4	5	0.25	6	5	—0.16	5	6	0.20
5.	Weeding out	3	4	0.33	3	4	0.33	4	6	0.50	4	5	0.25
6.	Applying Manure	4	5	0.25	3	4	0.33	5	6	0.20	4	5	0.25
7.	Plucking of leaves	5	6	0.20	4	5	0.25	6	7	0.16	4	5	0.25
8.	Arranging the leaves in the barren	5	6	0.20	—	—	—	7	8	0.14	—	—	—
9.	Grading	4	5	0.25	—	—	—	5	6	0.20	—	—	—
10.	Stitching and Hanging the leaves	—	—	—	3	4	0.33	—	—	—	4	5	0.25

Note : W = Women workers; M = Men workers; DC = Discrimination Coefficient.

$$\text{Discrimination Coefficient} = \frac{\text{Wage rate of men workers} - \text{Wage rate of women workers}}{\text{Wage rate of women workers}}$$

11. This analysis does not take the demand and supply factors and other local factors in the three villages in to consideration.

12. It is felt by 92 per cent of the farmers interviewed that women workers mostly possess the skills required by those operations.

Further it is observed that the degree of wage differentials is medium (discrimination coefficient is 0.25) in case of the operations like forming of seed beds, irrigation, planting the seedlings in the main field, applying manure and grading as performance of these operation also require more skill and less physique. Another observation is that the degree of wage differential is high (discrimination coefficient is 0.33) in case of weeding out operation whose performance requires more physique relatively to skill. The discrimination coefficient is negative (i.e.,−0.16) in case of the pulling the seedlings from the seed bed. This is probably due to the fact that the operation of this function requires mostly skill rather than physique. Women workers are paid more than that of men workers in this operation as they are treated as skilled workers by the farmers (86 per cent) in performing this function.

FCV Tobacco—Garden Land

It is observed from Table 2 that the degree of wage differentials is low in case of the operations like arranging the levels in the barren (discrimination coefficient is 0.14), forming seed beds, irrigation, plucking of leaves (discrimination coefficient is 0.16) and applying manure (discrimination coefficient is 0.20) as the performance of these operation require more skill and less physique. It is also observed that the degree of wage differentials is high in case of the operation of weeding out (discrimination coefficient is 0.50) though the performance of this operation requires more skill relatively to physique. It is further observed that the discrimination coefficient is negative in case of the pulling the seedlings from the seed bed (discrimination coefficient is−0.14) and planting the seedlings in the main field (discrimination coefficient is—0.16) as the operations are better performed by women workers in garden land area.[13] Hence women workers are paid more than those of men workers.

13. Farmers of garden land (96 per cent) that the operation of planting the seedlings in the main field in addition to pulling the seedlings from the seed bed requires more skill and less physique and women workers are most suitable to perform these operations.

Country Tobacco—Dry Land and Garden Land

It is observed from Table 2 that the degree of wage differentials is less in case of the operations like forming seed beds, irrigation, planting the seedlings in the main fields and plucking of leaves (discrimination coefficient is 0.25) compared to those operations like weeding out, applying manure and stitching and hanging the leaves (discrimination coefficient is 0.33) in dry land area similar nature of observations are made in case of garden land area regarding certain operations but with varying discrimination coefficients like low degree of wage differentials in respect of forming seed beds irrigation, planting the seedlings in the main field (discrimination coefficient is 0.25). Further it is observed that women workers are paid more wages comparatively to those of men workers in respect of pulling the seedlings from the seed bed both in dry land area (discrimination coefficient is 0.16) and in garden land area (discrimination coefficient is—0.14) as women workers are most suitable in performing this operation.

Operation-wise Analysis

Operation-wise analysis of Table 2 reveals that the degrees of wage differentials as either low or medium in respect of all operations except the operations of weeding out. The discrimination coefficient of all operations except weeding out varies between (0.16 and 0.25) and that of weeding out varies between (0.25 and 0.50). Further it is observed that women workers are paid more than that of men workers in dry land and garden land areas for FCV Tobacco crop and Country Tobacco crop relating to pulling the seedlings from the seed bed and for FCV Tobacco crop in garden land area for the operation of planting the seedlings in the main field as the women workers are most suitable than the men workers to perform these operations.

Wage Differentials for Different Operations of Sugar Cane Crop : Table 3 presents the rates of women and men workers (including discrimination coefficients) for various operations of sugar cane crop in wet land and garden land areas. It is observed from this table that the discrimination coefficient is low (0.16) in case of the operations like preparing sets, propping and

TABLE 3

Wage Rates and Discrimination Coefficients (Sugar Cane Crop) (Wage Rates in Rupees)

Sl. No.	Operation	Type of land and Workers					
		Wet Land			Garden Land		
		W	M	DC	W	M	DC
1.	Securing Seeds	5	6	0.20	4	5	0.25
2.	Preparing Sets	6	7	0.16	5	6	0.20
3.	Planting	6	8	0.33	5	7	0.40
4.	Weeding out	5	6	0.20	4	5	0.25
5.	Earthing up	5	6	0.20	5	6	0.20
6.	Propping	6	7	0.16	5	6	0.20
7.	Cutting and Removing leaves	6	8	0.33	6	7	0.16
8.	Crushing and process	6	7	0.16	6	7	0.16
9.	Packing	5	6	0.20	4	5	0.25

Note : W=Women Workers; M=Men Workers; DC=Discrimination Coefficient.

$$\text{Discrimination Coefficients} = \frac{\text{Wage rate of Men workers} - \text{Wage rate of Women workers}}{\text{Wage rate of Women workers}}$$

crushing and process in wet land area as the performance of these operations require more skill relatively to physique. The discrimination coefficient is medium (0.20) in case of those operations whose performance require more or less same degree of skill and physique like securing seeds, weeding out, earthing up and packing. The discrimination coefficient is high (0.33) in case of planting and cutting and removing leaves as the performance of these operations require more physique relatively to skill. Similar observations are also made in case of garden land area relating to crushing and process operation, earthing up operation and planting operation. In case of the other operations the discrimination coefficient is high compared to those in wet land area. The operation-wise analysis also shows that the discrimination coefficient is low where the performance of operations requires more skill rather than physique and it is high where the performance of the operation require more physique and less skill.

Conclusion and Suggestion

The above analysis reveals that the women workers are paid more than the men workers only in a few operations whose performance require high skills, where the discrimination coefficient is negative but low in degree. Women workers are paid low compared to those of men and discrimination coefficient is positive and low in degree where the performance of the operations require more skills and less physique. Coefficient is positive and high when the performance of the operation require more physique relative to skills. It is felt by most of the farmers interviewed that women workers are better suitable compared to men workers to perform those operations requiring high skills. It is pertinent to observe that women workers are paid low compared to men workers for those operations requiring high skills to those operations requiring more physique than skills. Thus it can be said that most of the wage differentials are based on sex.

Wage discrimination based on sex in these days is unjustifiable, illegal, unconstitutional and against to the object of socialistic pattern of society. Hence the farmers may be advised to pay equal wage to women workers and men workers for the same operation. Trade unions in farm sector which are now in the development stage may have the "equal wage for equal work between women and men workers" as an objective and strive to achieve the same. The Government may also use its machinery effectively and ensure the eradication of wage discrimination based on sex gradually in agricultural sector besides enacting legislation and fixing up of wage rates.

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Tea Industry and Productivity

MAHENDRA P. LAMA

The world famous tea industry of Darjeeling has been languishing since long and more acutely in the last decade or so. An attempt has been made in this paper towards suggesting some measures to improve productivity of the same.

Mahendra P. Lama is with Research and Information System for the Non-aligned and other Developing Countries, 40-B, Lodhi Estate, New Delhi-110 003.

Tea Industry is not only the mainstay of the hill people of Darjeeling but also the backbone of the hill economy. Darjeeling produces the finest tea in the world. It still fetches the highest price in the world tea market. There are at present ninetyseven tea estates. The area under tea cultivation in Darjeeling hills is 19,239 hectares which is about 6 per cent of the total area under tea production in India. But with a vacancy of about 20 per cent, the effective area under tea will not be more than 14,400 hectares. The total production per year in Darjeeling hills is about 11-12 million Kgs. In the last two decades it is invariably noticed and perceived that this industry has been infested by many diseases varying from low productivity to labour unrest and industrial sickness to final close down of the tea gardens. There have been ample discussions on various aspects of this industry's problem but little have been thoughtfully discussed and presented on the arena of tea productivity which is the most crucial subject in today's context. This paper ventures to initiate a discussion on the diverse aspects of tea productivity in the Darjeeling hills.

There are various determinants of the level of productivity. These include the available supplies of skilled labour, land, raw materials, capital facilities and mechanical aids of various kinds, technology, methods of organizing production, the energy and enterprise of managers and workers, and a range of social, psychological and cultural factors.

In the context of Darjeeling tea industry, land has been taken as the sole factor used in measuring overall productivity. Other factors like capital, labour technological impact etc. have been considered as some sort of sub-sets. Within the land productivity, it is ventured to put forward five major determinants of productivity. There are no grounds for assigning casual priority to one or a few variables or factors. All interact naturally to determine the outcome. These determinants are (1) capital, (2) replantation and extension, (3) bush care and plucking, (4) infrastructure and other inputs and (5) labour and management. The climatic and other natural factors have been deliberately excluded as they are beyond our direct control.

Land Productivity

In the Darjeeling hills productivity per hectare has been less than half of all India levels. Though over the years it has increased from 473 kg. per hectare in 1951 to 543 kg./h in 1961, 564 kg./h in 1971 and 635 kg./h in 1981, it appears very marginal as against the all India average of 1415 kg./h in 1981. This has pulled down the West Bengal average to 1365 kg. per hectare making it lower than that of Assamese average of 1581 kg. per hectare in 1981.

Land Size—Productivity Study

An inference drawn by the National Council of Applied Economic Research (NCAER) on the basis of a sample study shows that the yield per hectare has a positive correlation with the size of the tea estates. This study found out that 41 per cent of the total estates in the Darjeeling hills have areas more than 200 hectares and have comparatively high productivity (two-thirds of the All India average). But it has been pulled down by the low productivity of the estates having areas below 100 hectares particularly and more acutely by the estates having areas less than 50 hectares. These estates are found to be operating under great diseconomies of scale.

This NCAER finding is further corroborated by the fact that the Dooars region (another prominent tea growing areas in Bengal) where the yield rate has been higher than all India average, about 50 per cent of the tea gardens have areas more than 400 hectares whereas in case of Darjeeling the number of tea gardens falling under this category is hardly 8 per cent.

Data collected by Agricultural Economics Department, Tocklai for the year 1970-76 of yield under different sub-areas in Darjeeling, in which 38 tea gardens responded, revealed, that the average yield in the 38 tea gardens as a whole has been 674 kg. per hectare. The overall increase in productivity during this period was of the order of 13.9 per cent. This included an increase in productivity of as high as 28 per cent in some tea gardens and as low as—2.9 per cent in other tea gardens.

Recently, a fascinating argument has been flown into the arena of productivity. This relates to the view that the average productivity has been shown so low in case of Darjeeling hills as compared to the All India average mainly because that this estimate usually includes the performance of sick and already closed gardens also.

Whatever may be the extent and credibility of these arguments, it is an established fact that the productivity in case of Darjeeling tea industry is shockingly low and disappointing.

In this backdrop, this paper tries to explore some of the areas where the real strands of factors constraining higher productivity are located, the possible areas which if efficiently and effectively improved upon, can help in overcoming the present low productivity.

(1) *Capital*

Explanations of long term productivity changes in an industry usually stress technological change and as an adjunct, changes in the quality and quantity of capital. When technological change occurs, the quality of capital improves and the amount available to each worker usually increases. This coupled with strength of ontrepreneurial motivation i.e. labourer's willingness to adopt would bring about a perceptible change in the current low productive character.

(a) Technological Aspect

The technological innovation at the stage of processing even while keeping the existing orthodox method unchanged may be done on a massive scale, discussion of which is beyond the scope of this paper. However, in the past it has been deeply experienced and felt the need of some basic technological improvements at the initial stages of production say at the level of cultivation, bush care and plucking.

The past experience shows that the use of same spraying machinery in the plains as well as in the hills has not been so effective in the hills because of difficult terrains. These machineries have not been able to reach the chemical to the thick and impenetrable top hamper of the China bushes and are also not easily portable. There is a strong need to device a new set of machineries suitable for the hills.

The overall productivity can be increased through other technological progress such as equipping the labourers with better weeding, manuring and cleaning machineries. A major breakthrough can be made only if technological progress in the field or irrigation and power generation suitable to these areas can be made.

(2) Replantation and Extension

Darjeeling tea industry extraordinarily lags behind in the replantation, extension and infillings of the vacancies schemes. The major reasons attributed to the low productivity in this region is the old bushes and decreasing fertility of soil. Nearly 80 per cent of the total bushes are more than 50 years old. The proportion of area under young bushes (upto 10 years old) is only 4 per cent. Tea bushes after 50 years are generally characterised by diminishing returns and replete with frames riddled with pests and diseases. If we study the mean yield at different age level it would reveal that the highest yield is given by the tea bushes within the age of 30-50 year old. Only 7 per cent of the total tea bushes of Darjeeling hills fall under this age interval.

In the last 30 years the replantation rate has been less than 2 per cent. As far as extension is concerned, during 1951-82, the area under tea in the Darjeeling hills increased by 18 per cent whereas in the same period in the Terai it increased by more than 44 per cent. The NCAER's study concluded that infilling is not a common practice among Darjeeling tea planters. The vacancy percentages are in fact quite high.

The insignificant progress in replantation and extension work has been mainly attributed to the financial constraint faced by the planters community. The Tea Board provides financial assistance in the form of replantation subsidy, plantation finance and hire purchase of machinery.

(a) Replantation Cost

The replantation cost per hectare calculated by a veteran tea planter late G.D. Taylor upto the fifth year of replantation comes to about Rs. 47,000 at 1978-79 prices. In the backdrop of this staggering cost, the subsidy of Rs. 5,000 as cost of replanting per hectare extended by the Tea Board appeared very meagre and unattractive. The planters always preferred to go without it. Most of the individual owners of tea estates, looking for quick and short period profit, did not dare and like to face the loss of crop emerging out of the period between uprooting of the old bushes and commencement of harvest from the new plants. A few planters who were really concerned about the future of their gardens were also discouraged by the prevailing acute sickness of the industry, fiscal structure, internationally, low prices for the final products, high cost of production, increasing labour unrest and other technological drawbacks.

But there is no escape from the present situation. The issue of replantation should be given utmost priority and importance at any cost.

(b) Rejuvenation Scheme

The announcement by the Union Government of a sum of Rs. 43 crores as a rehabilitation scheme for Darjeeling tea industry is a big relief to these poverty ridden tea gardens. Under this scheme which is jointly

implemented by the Tea Board and the National Bank for Agricultural and Rural Development (NABARD), the developmental loans to the Darjeeling tea industry will be available at 7.4 per cent interest rate against the usual 12.5 per cent. Every tea garden should take advantage of this facility mainly towards the replantation and extension work.

Besides, the management should resort to ploughing back of their profits as they are now substantially relieved from the onslaught of commercial banks who used to lend them at 18-19 per cent compound interest rate. Internal mobilisation of resources would free these gardens from the long run debt burden.

(*c*) *New Clones*

A significant progress has been made on the new high yielding varieties of clones. At least, 12 approved clones (such as A.V. 2, T.78, T.383, T.135, B.157, B.777 and B.668) are there at present possessing Darjeeling character and high yielding potential. Some of them have the yield rate of 4,000 kg. per hectare after the sixth year of planting. These are indigenously developed at Tea Research Association's Proving Station at Ging Tea Garden in Darjeeling. They can be increasingly made use of depending on their suitability and adaptability in different gardens.

If yield per hectare could be increased as envisaged by the quality of high yielding variety clones, then it will easily off set the loss of crop resulting from replantation. Doubtlessly, in the long run, it will bring forth a healthy mobilisation of resources.

The only fear in the minds of those planting clonal varieties is the plant's questionable longetivity and in some stray cases the cause of immature deaths.

During the replantation period there are certain crucial aspects which are generally overlooked. Some suggestions are put forth on the basis of the findings of experts.

(i) After uprooting the old roots of tea, all the necessary measures should be taken to ensure the quality of soil. The contour drains are important in order to minimise the soil erosion which is quite acute in some of the tea estates. Further the planting of rehabilitative crop such as soyabean, napier grass would provide relief to the soil erosion.

(ii) The most suitable time for planting in Darjeeling is in June. Planting during July-September are adversely affected by heavy rainfall. In order to minimise this vulnerability a massive irrigational facility should be developed which can make the planting possible during the dry season of October to March. This time labour availability is also at its peak. A constant supervision of managerial staff and other expert labourers are highly essential during the first two years of planting.

(iii) The research conducted by the Tea Research Association of India has revealed that the application of inorganic fertiliser though proved to be highly favourable in this region is astoundingly low. The degree of application is much below the recommended optimum dosage. This is generally because of high prices of fertilizer. A fertilizer package at a subsidised rate from the governmental side will be strong boost to increasing the productivity of these tea gardens.

(*d*) *Extension Scheme*

The severely limited available land has made the extension of tea industry virtually impossible. A study reveals that the extension is at the rate of 0.2 per cent per annum which is by any measure insignificant and uneconomic. It is the opinion of the experts that the soil fertility in the old tea gardens is increasingly declining. This calls for an immediate extension programme which would restore the fertility of a high degree.

Tea could not be planted in whole of Kalimpong as the Government's policy was to reserve that area for forest and for cropping. In a hilly region, area under forest, act as anchors to the thin cover of the soil. But now because of massive deforestation the considerable portion of hill flanks are bared of their vegetative cover bringing about a severe ecological disbalance.

After such a massive deforestation the deserted areas of Kalimpong and some other areas of Darjeeling hills stand to be most potential areas for the extension of tea estates subject to climatic and geographical feasibility. Though the initial cost of opening new tea gardens in virgin hills will incur a high cost of production, in the long run it would be more profitable than the cereal cropping and afforestation. The tea industry if given proper care is ought to embrace a long term economic viability and create more economies of scale. It is certainly much better than the subsistence farming—the very substance of agrarian structure in that area. Besides creating huge employment opportunities, the forward and backward linkages created by this industry would expedite the process of development in these neglected areas.

(3) *Bush Care and Plucking*

The planting of HYV clones and the mere use of fertilizer would not yield any fruitful results until and unless gardens go for proper bush care, efficient plucking and strict managerial supervision. The labour attitudes and performance of labour cannot be overlooked.

From the very inception, the tea *Bachabaris* (nurseries) play a prominent role. It is experienced that nurseries are sometimes neglected and built at inapproachable location. An appropriate location of nurseries and a constant and expert supervision would enhance a probability of getting maximum number of healthy bushes. Expert opinion favour the North facing nursery sites as in this case the cutting can be set straight into tubes under low shades which will reduce costs.

The yield should have been higher in the light of the longer pruning cycle in Darjeeling as compared to the Terai. But it is not so, mainly because a systematic and scientific pruning is not done in all the gardens. This leads to various bush sickness like creation of Knots (due to continuous pruning at the same height) on the hamperage causing construction of the flow of the sap. This further results into disproportionate return of the crop in comparison to the inputs applied. The up and down pruning usually undertaken in South India may reduce the present flaws in pruning in Darjeeling tea gardens.

Bush sanitation is another major aspect generally not taken care of in the various tea gardens. Tea bushes can be healthy and yielding only if they get rid of knotting frames, congested top hamper mosses and lichens and other obnoxious grasses. Since these tea gardens start getting rainfall quite early and end quite late, the grasses around the tea bushes become a regular phenomenon which if not uprooted or eliminated would hamper the smooth growing.

Plant protection can be ensured through cleanliness of the tea sections, proper drainage, effective soil culture and proper shading of the area and required spraying based on seasonal needs with appropriate chemical application and correct dose.

Soil erosion is another hazardous phenomenon in Darjeeling hills. This is mainly because of excessive rainfall which saturates the upper mantle of the soil. This, however, can be prevented to a large extent by a scientific pruning method. The bushes should be slope pruned and made to touch each other so that all beating action of the rain directly falling upon the exposed soil surface can be checked.

A substantial quantity of crops is lost because of the estates' inability to pluck. This low plucking occurs mainly because of ineffective management and lacking devotion of the labourers. There are examples that some of the tea gardens in Darjeeling have improved their productivity simply by more careful and concentrated plucking. Plucking should take care of two things. Firstly the pluckings are done of maximum quantity of leaf of the desired quality and secondly, it does not adversely affect the health and vigour of the bush. According to tea experts, an adequate number of permanent leaves is essential for the productivity and survival of a plucked tea bush. These permanent tea leaves are called maintenance foliage. It is always important to pluck only three leaf and a bud as far as practicable for the quick development of the bushes. The reason is to ensure sufficiently mature stems for the effective and quick

growth of new shoots from the axil of the leaves below the tipping points.

(*4*) *Infrastructure*

The infrastructural bottlenecks faced by this hill tea industry is not a new problem. The topographical variation in the region has made the accessibility poor. There is tremendous lack of transport and communication, energy and irrigation which have profoundly hampered the productivity in these tea estates.

Transports system are still at its nascent stage, some terrains are still inaccessible. This makes the task of reaching (in some areas) adequate bush care varying from manuring to managerial supervision almost a formidable venture. The underdeveloped nature of roads and communications have made the cost of production extra-ordinarily high in these areas. Besides, this has a negative impact on the health, psychology and socio-economic welfare of the poor labour class.

The international upheaval in the prices of crude oil have an adverse impact on these languishing tea gardens. The expensive fuel (petroleum and coal) along with the record power crisis in West Bengal, in the last eight years have virtually made some of the systems and operations redundant. Now no tea garden can rely on this ever fluctuating supply. It is high time to explore the possibility of harnessing the perennial rivers of the hills like the Rangeet and the Teesta for multipurpose projects. The can be a major source of energy.

A rational freight equalisation policy for coal and petroleum for Darjeeling, and introduction of coal dumps in Kurseong and Darjeeling, would give further relief to the acute energy need of this industry.

Besides, tea gardens situated by the side of streams and waterfalls can always test the feasibility of exploiting them for power water driven turbines.

Further, it is quite essential on the part of the management to find out the possibility of developing water reservoirs by tapping the nearby seasonal streams and rivulets which could help in irrigating the gardens during the dry season. This way they can intensify the cropping pattern.

As far as the financial resources is concerned, the best alternative is to adequately exploit the Central Government's rehabilitation scheme.

Another alternative would be to make a Hill Tea Gardens Common Fund on the basis of size and production of the estates. This can be made by pulling together all the estates who would contribute as per their sizes and incomes. This fund, in times of extreme necessary or any major financial disbalance can lend money to the deserving gardens This is more realistic in the backdrop of the present costly borrowings from the banking and the non-working financial intermediaries.

(*5*) *Labour and Management*

There is nothing like human capital in this universe. Labourers are not only the vital instruments of tea economy. Whatever technological progress, improvement in seed varieties may be made, they will bear the least fruit in the absence of effective participation by the labourers.

Labourers play a significant role in enhancing overall productivity in the tea industry as they are involved at every stage of production starting from nursery development to the final preparation of tea packets.

Strictly speaking, the labour force is not a homogeneous entity. It is made up of a range of skills and specialities that embody varying amount of education and training. So, it is reasonable to suppose that their contribution to the productive process vary accordingly.

(*a*) *Labour Productivity*

It is a well known fact that the productivity per labour is comparatively very low in Darjeeling hills. For the year 1981, the productivity per labour in Darjeeling was 271 kg. as against 683 kg. of Dooars and all India average of 660 kg. This has been mainly

attributed to the factors like inadequate training to the workers, socio-economic backwardness of the workers, lack of technological and technical aid to the workers, existence of a huge surplus labour force in the form of disguised unemployment, the increasing bandhs and violence by the labourers resulting into dimunition in working desire and quality, effort and psychological depression.

The violence against the management has not only mentally tortured the management but has also created a sense of fear psychosis which has hampered the managerial skill and their willingness to do more investment in this industry.

(*b*) *Views of Management*

Management are usually of the view that the labourers have been increasingly displaying negligence on the part of their duties. The available sample of a study revealed that the time that should have been spent on plucking by the labour in peak period is spent on something else. The result was that in a day of 8 to 9 hours in some gardens 3.6 to 3.7 hours was spent on actual plucking. The rest was wasted.

Another study revealed that a worker in Darjeeling plucks on an average 6 to 8 kg. of leave daily as against 20 to 22 kg. in Dooars and Assam. Even allowing for the difficult terrain in the gardens in Darjeeling, the out put of work here is critically low.

This is generally accepted by the workers also. They attribute this slackness mainly to the unattractive incentive in the form of money and other facilities from the management side. The monetary incentive on the extra leave plucked (*ticca*) over and above the allotted task (*hazira*) is generally found to be much lower in the hills than in the terai gardens. Further, this is made more difficult by the increasing politicisation of the labourers and their upward participation in the local politics.

(*c*) *Trade Unionism*

Why labour disputes take place? Why bandhs occur? The financial bankruptcy is only a facet of these multi-dimensional problem ridden gardens. In the wake of wretched and inadequate conditions of basic amenities provided to the labour class in some tea gardens, the political overtones and tensions are quite natural and sometimes inevitable. However, they could be presented through a proper forum. But in the past, these genuine interests of labourers are invariably exploited by politically vested interests which divided a single family into different shreds of political affiliation. This has only led to intra and inter family clash sometimes leading even to brutal and inhuman killings.

Trade Unions have been there in this tea industry. But they have failed to be effective instrument of representing legitimate and genuine interests of the labour class. A simple example would make amply clear the direction of the trade unions in this industry. More than 60 per cent of the total gardens are defaulters in payment of provident fund and other retiring benefits. The trade unions have failed to give any resistance to this unethical practices. Significantly, not a single trade union movement in the hill area, has been started on this particular issue. These Unions have more or less become the ploys of intensive political hobnobbings and have blurred the existence of real Unions.

Trade Unionism is a prerogative in a democratic nation like ours. The duties of a trade union are not simply limited to pressurise management to fall in the lines of fulfilling workers demand. Trade Unions have to be more dynamic. In other words, they have to make labour class aware of not only their socio-political and economic rights but also of their duties, discipline and devotion to their professions. Trade Unions should educate the labour class on the line that they are as vital as management in any tea gardens and about their role in increasing the productivity in the gardens.

(*d*) *Role of Management*

Management have to reorient their strategy if they want a quick rejuvenation of their tea gardens. This includes not only the fulfilment of labourers genuine demands but a new socio-economic orientation. They

should open up more and more training institutions in all phases of tea production. By organising training camps and other technical demonstrations they can give a scientific and more advanced orientation to the labour productivity. The concept of industrial democracy should be introduced so as to provide labourers with the sense of belonging and ample scope for their participation.

The reduction of the excise duty (in 1984) from a heavy amount to Rs. 1.33 per kg. to a meagre 20 paise per kg., upto December 1986 by the Centre and State Governments' relief in the rural employment cess, would certainly encourage the management as it would reduce the overall cost of production and at the same time fetch a higher profit margin. This dividend must trickle down to each labour household. The Government should extend this relief at least as long as the financial crisis is overcome.

One of the most critical problems faced by this hill tea industry is the onslaught of labour supply. This has not only upset the whole economic structure but have also led to huge health and unemployment problem. The qualitative dimension of this growth has caused even greater concern. This is the steady deterioration of the physical and mental calibre of labourers through persistent ill health and undernutrition afflicting large proportions of successive generation of their children, during the crucial years of their growth and development. This frightening scenario is not an isolated case. It is an impact of the general deterioration in the national health and nutrition scene only difference being the magnitude of its impact.

It is unexpected from a labourer having impaired physical stamina and poor mental abilities to provide a high productivity in his performance.

The number of women labourers are quite high in the hill tea gardens of Darjeeling. Most of them are educationally backward and superstitious. It is an established fact that higher the literacy rate among the women folk, the lower the birth rate. This is amply proved by the experience of Kerala. Their backwardness along with many socio-cultural reasons, these women labourers preferred to ignore the governmental family welfare measures thereby putting spurt in the population pressure.

The management with the help of governmental machinery should open up more and more schools and health amenities in the gardens. Special programme for female education right upto high school level and other adult education facilities should be introduced. The labourers should be increasingly made aware of importance and incentives of family welfare measures floated by the government. As the labourers become more educated the probability of their resorting into violence and getting misguided would be drastically reduced. Because, if we analyse the present scenario the clashes and brutal killings are mainly on petty issues generally misguided and instigated by some vested interests. This is a sheer waste of human capital. This exacerbates the whole society creating a permanent disunity and feeling of animosity. The weak and minority labourers get frightened, the majority get overwhelmed and in both the cases, they will lack their interest and effective participation in tea production further affecting the productivity.

So, the productivity in the labour front can be increased only if there is adequate promotion of harmonious labour management relations, adequate economic incentives, avoidance of multiplicity of trade unions, encouraging participative process, eliminating fear of retrenchment and exploitation of the labour class and by setting up of the more and more technical, health and educational institutions for the toiling class and of course the motivation to adopt newer technologies.

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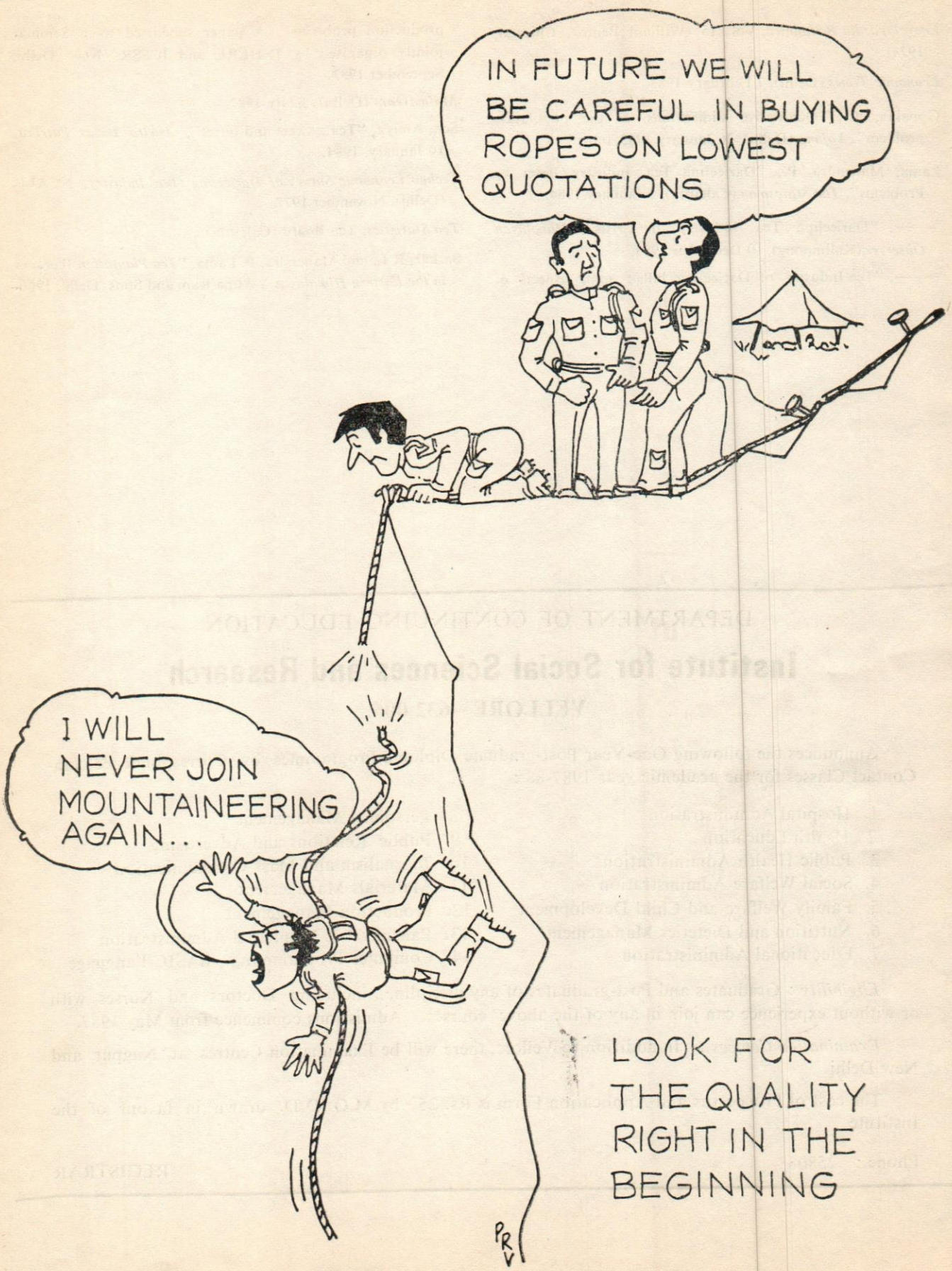
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LOOK FOR THE QUALITY RIGHT IN THE BEGINNING

Productivity
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EXECUTIVE READINGS

IRDP in South India An Evaluation
R.N. Tripathi & Others

Published by :
National Institute of Rural Development
Rajendra Nagar
Hyderabad-500 030

Reviewed by :
Prof. J.S. Sodhi
Sri Ram Centre for Industrial Relations and Human Resources
5, Sadhu Vaswani Marg, Pusa Road
New Delhi-110 005

IRDP has been attracting the attention of the policy makers for some time now. The guidelines emphasize that the programme should be evaluated from time by the autonomous research organizations. A large number of evaluation studies have, therefore, been conducted. NIRD has been taking a lead in this direction and the present book is based on one such study in four Southern states (Andhra Pradesh, Tamil Nadu, Karnataka and Kerala) of India.

The scope of the book, therefore, is quite exhaustive. Apart from the four states, the study covers eight districts (two in each state), 16 blocks (two in each district), 1600 sample beneficiaries and 800 non-beneficiaries (100 and 50 respectively in each block), officials involved in the functioning of the programme (103 EDs and other equivalent ranks and VLWs/VDOs/VEOs) and the non-officials (94 elected and 19 informal leaders). The data pertains to 1982 with 1980 as the base year. The analytical framework has also been designed to get a comprehensive picture of the programme. Information is collected and presented on various facets of the IRDP including income impact of the programme, the level of income in-equality and the poverty levels. The order of chapterization is mixed with the responses of the beneficiaries and non-beneficiaries (Chapters II, VII, IX, X and XI) and secondary information (Chapters III, IV, V, VI and VIII).

The characteristics of the sample beneficiary and non-beneficiary respondents are presented in Chapter II. These information are generally collected to get, a background profile of the group under study, the distribution of benefits to the right group and a comparative picture of the two groups under study. The book has collected detailed information on sex, age, education, caste, occupation and per-capita income of the sample beneficiaries and non-beneficiaries. However, the analyses to get answers to the other questions has not been attempted in the book. Nonetheless, the comparisons, as attempted by the reviewer, show that a larger proportion of the non-beneficiaries had lower per-capita incomes than the beneficiaries. The anatodaya approach in the selection of the beneficiaries has, therefore, not been followed. Moreover, there has been a spillover of benefits as households having per-capita income of Rs. 700 and above during the base year, have also been assisted.

The study expectedly finds that income generation due to assistance varied considerably from state to

state because of the package of schemes and different social and economic base of the beneficiaries. The average additional income due to assistance in all the four states was Rs. 1,035/- p.a., with highest in Andhra Pradesh (Rs. 1,891/- p.a.) followed by Kerala (Rs. 930), Karnataka (Rs. 663) and Tamil Nadu (Rs. 653 p.a.) The book faithfully describes the tables but the specific reasons for varying performance are not highlighted. The identification of the factors facilitating or retarding the performance and expected increases in income would have been useful for the policy makers.

Additional increases in income have their relevance in the context of these beneficiaries households being able to cross the poverty line. This is also the most important objective of programme. The study points out that 20 per cent of the beneficiaries in Andhra Pradesh, 17 per cent in Tamil Nadu, 14 per cent in Karnataka and 34 per cent in Kerala had crossed the poverty line. For the Southern Region as a whole, 21 per cent of the beneficiaries did move above the poverty line. This analysis, however, does not tell us about the contribution in the IRDP assistance in increased incomes. Also, the comparative analyses with the non-beneficiaries, which has not been attempted, would have given a better picture of the exact contribution of the IRDP in bringing about upward shifts in income.

It has been observed that research studies of this nature generally do not undertake any further income analyses. It must, however, be said to the credit of the authors that in addition, it has attempted an inequality analysis as well as the regression analysis, where critical factors having a positive and negative influence have been identified. Useful information on the social impact, as perceived by the beneficiaries has also been presented in the book.

The book highlights the planning, implementation and the monitoring process of the IRD programme in the study areas. The hinderences and suggestions in this regard, as reported by the sample respondents, are however of elementary nature and perhaps were already known.

The authors have collected a lot of data with the help of a very meticulously designed analyses plan. Young scholars, in particular, would greatly benefit from this. With such an analyses plan, a deeper analyses of the phenomenon was expected. Research studies of this nature would be more meaningful if these help the policy makers (the project officers incharge too) in improving the working of the programme and its impact on the beneficiaries.

Statistical Methods : Concepts Applications and Computations
Y.P. Aggarwal

Published by :
Sterling Publishers Private Limited
New Delhi
Edition : 1986
Price : Rs. 175/-
PP : 376

Reviewed by :
Arvind Seth
Indian Statistical Institute
7 Sansanval Marg
New Delhi-110 016

This book, is divided into 14 chapters. It describes the various statistical concepts and techniques which are applicable to fields like education, sociology and psychology. The examples considered are mainly from the field of education. Topics covered include both parametric and non-parametric methods. Each chapters contains exercises for practice on the topic described and answers have been provided for numerical exercises. It also contains a list of bibliography and statistical tables. However, bibliography on the subject is limited to pre 1970 days. The latest references have not been included which give wrong impression to the students. The author claims that book is meant for student and research worker from different fields including experimental medicine and biological science. However, the approach adopted does not justify this.

Some of the concepts and definitions lack clarity and precision. The book contains numerous printing errors and even simple formulae for calculating standard deviation and correlation coefficient have not been stated correctly. This is bound to mislead the students who are new to the subject. The book contains fundamental mistakes.

Chapter one briefly describes the role of statistics. Chapter two is

devoted to summarisation of data in the form of frequency distribution and graphical representation. Measures of control tendency described in chapter three include mean, median and mode both for grouped and ungrouped data. Different measures of variability are covered in chapter four. Formulae for calculating standard deviation on page 68 and 69 are not correct. On page 67, the divisor of the formula for calculating standard deviation is missing, on page 68, the term fx^2 should be fx'^2.

Chapter 5 describes measures used for finding relative position of an individual within a group and their calculation. Chapter 6 gives a brief introduction to probability and its calculation. Two distributions namely binomial and normal distributions are discussed. Concept of random variable is not mentioned. On page 110, the term $(p+q)_{10}$ should have been $(p+q)^{10}$. The ordinate of normal curve on page 115 and 116 is not correct and its interpretation is wrong.

Chapter 7 explains the concept of coefficient of correlations. The formulae given on page 146 are not correct and formulae 7.6 and 7.7 tend to convey wrong meaning. The interpretation of coefficient of correlations is also incomplete. Chapter 8 and 9 are concerned with testing of statistical hypothesis and some of hypothesis are not stated correctly. t-test is used for testing the equality of variations ! Chapter 11 is devoted to analysis of variance and analysis upto three way classification is given. Chapter 14 covers regression analysis and predictions. Methods of least squares used is not explained and normal equations given on page 307 are not correct.

The book contains printing mistakes, imprecise statements and wrong formulae. It can not be recommended for any Library or research work. The cost of book is priced Rs. 175/- which is very high by Indian Standards.

Handbook on Project Appraisal & Follow-Up

D.P. Sarda

Published by :
Govind Prakashan
204, Saraswati Kunj
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Goregaon
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Edition : 1986
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PP : 155

Reviewed by :
Ajit Singh
Director
National Productivity Council
New Delhi-110 003

It has been well recognised that the economic development of a nation largely depends on the effective implementation of projects. Efficient project management is influenced by a number of factors such as personnel, organisation structure, monitoring system, resources planning etc. Translating an idea into an actual project has to be done with utmost care so that the project objectives are realised on completion. An industrial project to be viable has to manufacture products or offer services at a level sufficient to provide adequate returns. Financial institutions and banks play a very important role in the development. They provide financial assistance and assist the entreprenure during all phases of a project, viz, identification, selection, appraisal, implementation and follow-up.

The book under review attempts to focus on the project appraisal to examine the viability of a project before the financial institution provides financial assistance. The author clearly defines the subject of project appraisal in this handbook on Project Appraisal and Follow-up. The book is divided into fourteen chapters. A project should satisfy the test of technical, commercial, financial, economic and managerial feasibilities. These aspects of project appraisal have been discussed in the first eleven chapters. These chapters discuss all the techniques of project appraisal alongwith a case study.

Technical appraisal has been discussed by the author with respect to various types of manufacturing situations and size of plants. It includes selection of plant & machinery, plant layout, location and availability of infra-structure. Commercial Appraisal consists of major headings of demand, supply, distribution and pricing and other techniques. It provides a useful list of publications on various aspects of marketing. Financial appraisal is the key analysis presented in the book, including financial projections, ratio analysis, Break-

even analysis, Discounted cash flow etc. Economic Appraisal and appraisal of Management has been discussed with check-lists. Two chapters on Disbursement, Supervision and Follow-up and Special Features of Financing Small Scale Industries will prove to be very useful to entrepreneurs. A good finishing touch has been given by the last chapter on Rehabilitation of Sick Units.

Attempt has been made to cover, in brief, almost all types important aspects of project apprasial and follow-up. The book will be serving as a practical guide to officers in banks and financial institutions for appraisal of projects. It is expected to be useful to merchant bankers, consultants and entrepreneurs for selecting the right projects and implementing them. It will also help the students of commerce and financial mangement to undestand the practical aspects of development banking.

Marketing Research—Text and Cases (Sixth Edition)
Harper W. Boyd
Ralph Westfall and
Stanley F. Stasch

Published by :
All India Traveller Book Seller
D-2/15, Krishna Nagar
Delhi-110 051

Reviewed by :
R. Chalapathi Rao
Deputy Director (Marketing)
National Productivity Council
Bangalore

Of late the Indian Market is flooded with a number of new products especially in consumable and consumer durable sectors. This phenomenon is posing many problems to the marketer of the established products as well as the new products. The high failure rate of new products and the increasing consumer awareness of their rights as well as the proposed consumer protection legislation bring home the importance of marketing research; as a tool to bridge the gap between what is desired by the markets and what they are served with.

The book under review which is the Sixth revised Edition as well as the first Indian Edition is much of relevance in the above context. This book, presented in four parts and 23 Chapters is a compendium of various marketing research techniques and extensively deals with various stages of the marketing research process. The authors have taken pains to explain various intricate issues through examples and by drawing extensively from American Marketing research studies of recent past. The book contains 41 cases (13 are newly added in this edition) which are very useful for classroom discussions. The students as well as researchers find the four appendices as useful reference.

The major emphasis of the book is on 'Conclusive' Research. However the 'Exploratory' research area needs to be dealt in more detail. The one-on-ones/motivation research methods require elaboration. Some tips on conducting 'Depth' interviews as well as focus group interviews will be of much use to the professionals as well as students.

As mentioned in the book, marketing research is the final link in the communication channel through which consumers communicate with the company. This book helps researchers to perform their role in reducing the communication gap between consumers (also middlemen) and marketers. This book will be of great help to all those who want to equip themselves with the knowledge of marketing research and is highly recommended for the management students.

"Not by Bread Alone"
Dr. Baldev R. Sharma

Published by :
Shri Ram Centre for Industrial Relations and Human Resources
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PP : 206

Reviewed by :
D.P. Upadhyay
Director
National Productivity Council
New Delhi-110 003

This title is a study of organisational climate and employer-employee relations in India. The author by the title itself wants to communicate that issues related to creation of conducive climate in an organisation and sound industrial relations are not related to economic dimensions only but more to the psychological and human side

of the organisation. It is worthwhile to quote his own words from the 7th chapter:

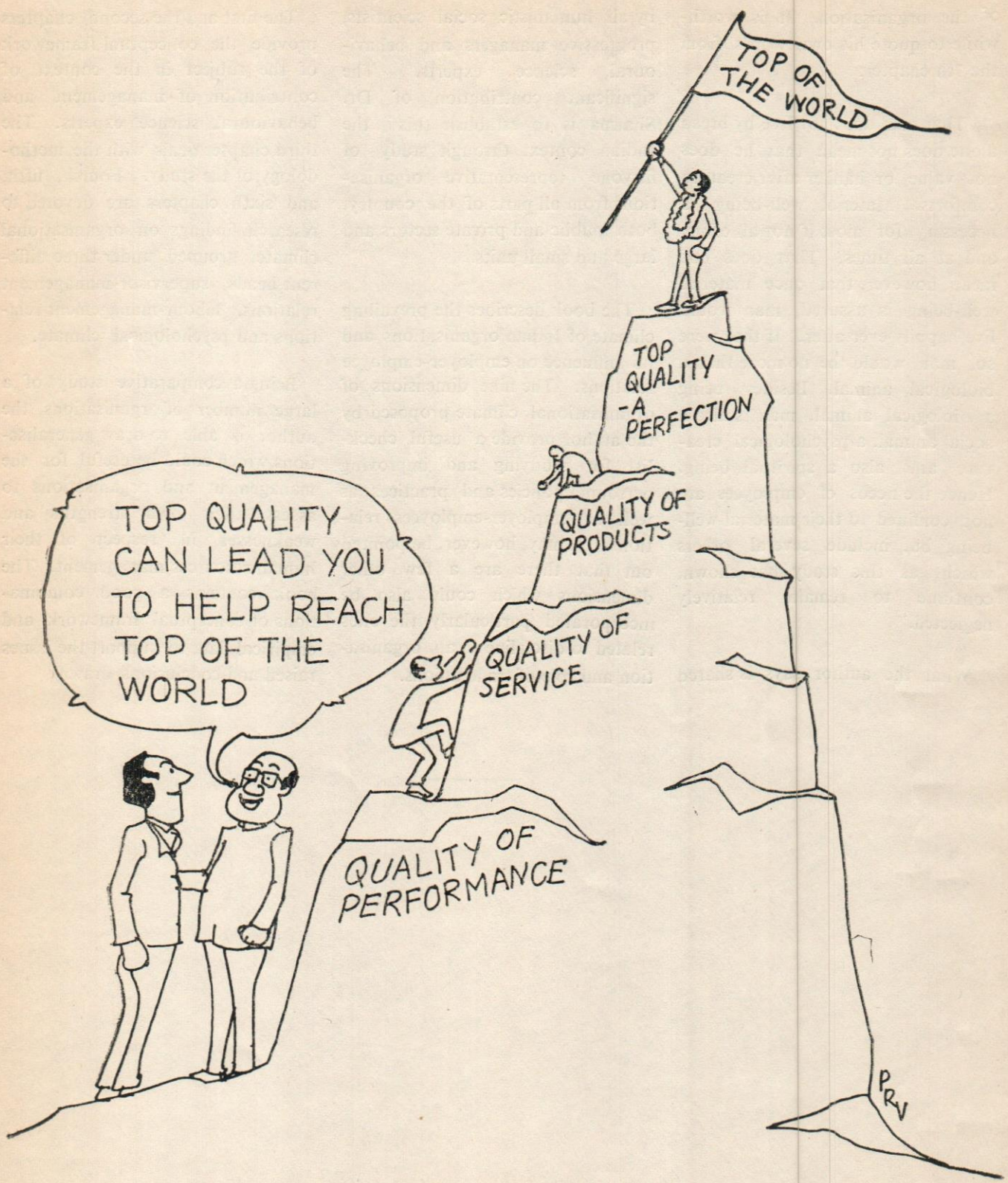
"That man does not live by bread alone does not mean that he does not value or hanker after creature comforts. Material well-being is necessary for most if not all of us, and at all times. That does not mean, however, that once material well-being is assured, man would live happily ever after. If that were so, man would be no more than a biological animal. Besides being a biological animal, man is also a social animal, a psychological creature and also a spiritual being. Hence the needs of employees are not confined to their material well-being but include several others which, as this study has shown, continue to remain relatively neglected."

What the author says is shared by all humanistic social scientists, progressive managers and behavioural science experts. The significant contribution of Dr. Sharma is to establish this in the Indian context through study of fiftyone representative organisations from all parts of the country, both public and private sectors and large and small units.

The book describes the prevailing climate of Indian organisations and its influence on employer-employee relations. The nine dimensions of organisational climate proposed by the author provide a useful checklist for studying and improving personnel policies and practices as well as employer-employees relations. It may, however, be pointed out that there are a few other dimensions which could also be incorporated particularly the ones related to discipline in an organisation and role of trade unions.

The first and the second chapters provide the conceptual framework of the subject in the context of contribution of management and behavioural science experts. The third chapter deals with the methodology of the study. Fourth, fifth, and sixth chapters are devoted to research findings on organisational climate, grouped under three different heads, supervisor-management relations, labour-management relations and psychological climate.

Being a comparative study of a large number of organisations, the author is able to draw generalisations which could be useful for the management and organisations to assess their own strengths and weaknesses in respect of their human resources management. The book contains a good combinations of conceptual framework and empirical data to support the issues raised and conclusions drawn.



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Strategic Planning & Management

S.N. VIG*

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* S N Vig is Documentation & Information Officer, National Productivity Council, New Delhi 110 003.

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