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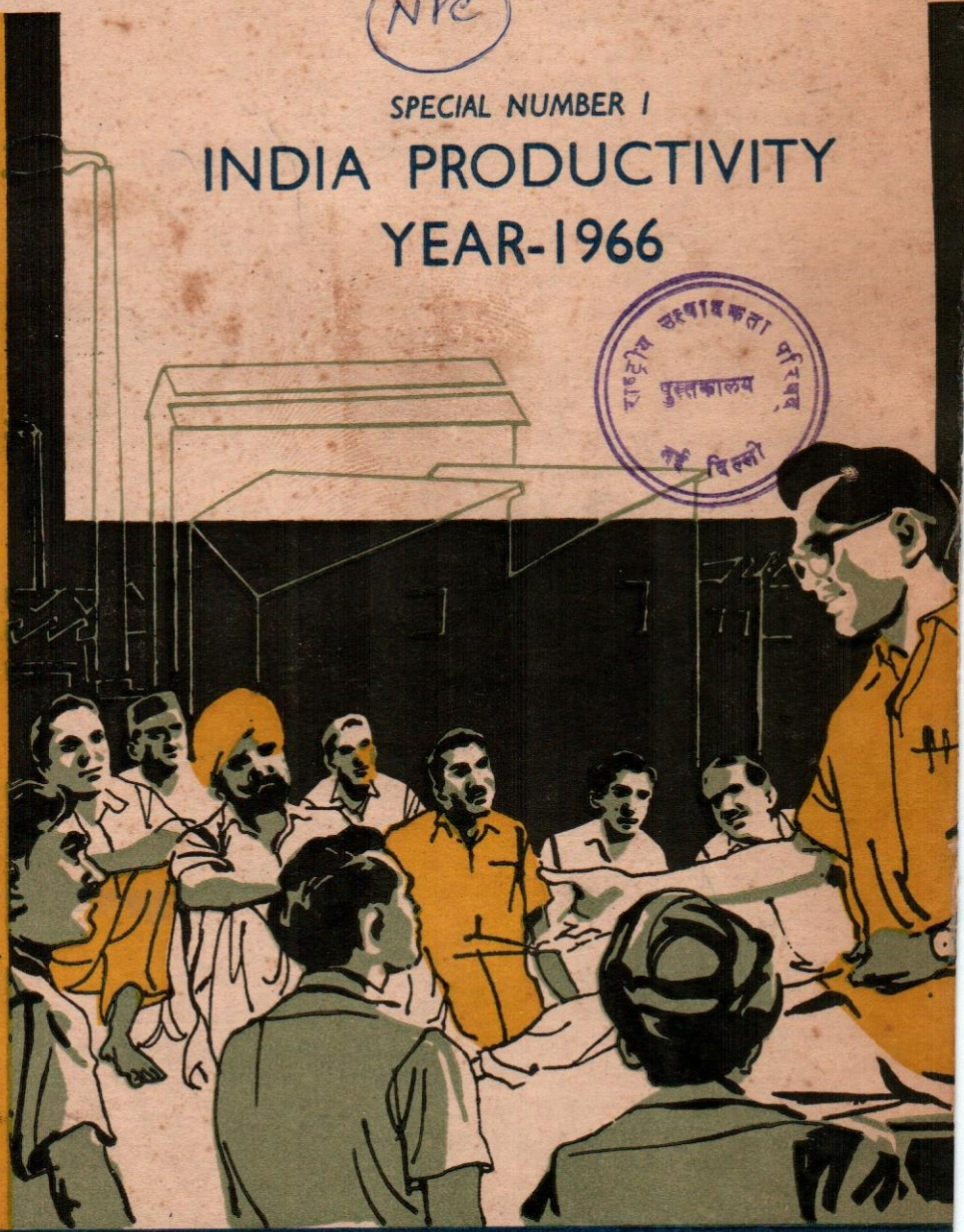
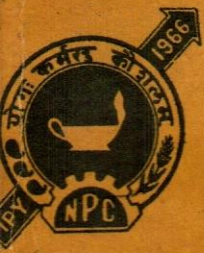
Vol. VII, No. 1, Summer 1966

PRODUCTIVITY

NPC

SPECIAL NUMBER 1

INDIA PRODUCTIVITY YEAR-1966



ATIONAL PRODUCTIVITY COUNCIL JOURNAL

RUPEES THREE

NATIONAL PRODUCTIVITY COUNCIL

The National Productivity Council is an autonomous organisation registered as a Society. Representatives of Government, employers, workers and various other interests participate in its working. Established in 1958, the Council conducts its activities in collaboration with institutions and organisations interested in the Productivity Drive. Forty-seven Local Productivity Councils have been established all over the country and they work as the spearhead of the productivity movement.

The purpose of NPC is to stimulate productivity consciousness in the country and to provide services with a view to maximising the utilisation of available resources of men, machines, materials and power; to wage war against waste; to help secure for the people of the country a better and higher standard of living. To this end, NPC collects and disseminates information about techniques and procedures of productivity. In collaboration with Local Productivity Councils and various institutions and organisations it organises and conducts training programmes for various levels of management in the subjects of productivity. It has also organised an Advisory Service for industries to facilitate the introduction of productivity techniques.

Recognising that for a more intensive productivity effort, the training and other activities of NPC designed to acquaint management with productivity techniques, should be supported by demonstration of their validity and value in application, NPC has decided to offer a Productivity Survey & Implementation Service (PSIS) to industry. This Service is intended to assist industry adopt techniques of higher management and operational efficiency consistent with the economic and social aspiration of the community. PSIS is concerned with the investigation of management and operational practices and problems, measures of improvement and their implementation. NPC has also established at Bombay a special Fuel Efficiency Service.

NPC publications include pamphlets, leaflets and Reports of Productivity Teams. NPC utilises audio-visual media of films, radio and exhibitions for propagating the concept and techniques of productivity. Through these media NPC seeks to carry the message of productivity and to create the appropriate climate for increasing national productivity. This Journal is an effort in the same direction.

The key to rapid economic development lies undoubtedly in productivity, because productivity is an attitude of mind always willing and eager to explore, to initiate and to be restless, to think of new and improved ways of doing things, to be confident of achieving results, to overcome obstacles, to establish harmonious relations, so that the best can be got from all. Productivity stands for justice and for fair and equitable sharing of the gains of increased production. It is a revolutionary concept and has great potentialities. There is a tide in the affairs of nations which, taken at the flood, would, no doubt, carry them to the desired goals ...



Dr PS Lokanathan



...The aim of IPY-1966 is to promote an awareness of productivity as the means of increasing the standard of living of the people...The Productivity Movement has taken firmer roots now ...We want to enlarge the areas of application and expand expertise in the field of Productivity, so that it is applicable to all fields of economic activity, primarily starting with agriculture. We also wish to give an impetus to industry, and make them help themselves by establishing Industry Productivity Councils, and encourage and foster the formation of what we call the Productivity Cells and Departments in each industry...

— Brig. K Pennathur

TIV: 5097

**COVER : On Leadership by Roma Chakravarty
(Special Feature on pp 97-104)**



Vol. VII No. I.

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What They Said of IPY

... The double threat of external aggression and internal food scarcity makes it imperative that we should all endeavour to give our best in order to produce the maximum both in the fields and in our factories... I am sanguine that the nation will rise to the occasion, and in 1966 make self-sufficiency in respect of all our requirements, its basic aim.—**Dr S. Radhakrishnan**, President of India

... 1966 is going to be a momentous year in the history of the country for more than one reason. And one of these is that it will be observed as India Productivity Year. We had recognised the importance of higher productivity in the past, but it could not have been foreseen that it would become so vital for the very survival of the country. Higher productivity during 1966 in all spheres of agriculture and industry, is, therefore, a MUST. There is no other alternative...—**Mr Lal Bahadur Shastri** (late Prime Minister of India)

... *The decision to designate 1966 as India Productivity Year is welcome by all of us who are sharing in India's great development efforts... The IPY aim to make productivity a national concern is an important step towards self-sufficiency, and we, Americans, are happy to be associated with this project...*—**Mr Chester Bowles**, US Ambassador in India

PRODUCTIVITY

NATIONAL PRODUCTIVITY COUNCIL JOURNAL

THE CALL OF THE IPY

INAUGURATING the British Productivity Year, a few years ago, Lord Netherthorpe, Chairman of the British Productivity Council, characterised it as a *blitzkrieg on the public conscience*. This *blitzkrieg* was not for an hour or for a day: for a whole year, industrial firms, commercial concerns and trade unions kept up the productivity drive in the consciousness that Britain's future as a nation depended upon its economy being more productive than the economies of other countries.

We need Productivity more than Britain does, as the only means of retrieving the submerged classes from the subhuman standards of existence. IPY really is the most serious effort of the National Productivity Council at a revival of the national consciousness regarding the level of performance necessary in practically every line of social and economic activity, as the price for the maintenance of freedom and promise of development. It would not be an

exaggeration to say that the **Quality of Life** itself would be a 'function' of its productivity in the coming decade. And IPY will not end with the New Year. It is a continuous call to betterment. We **really** need a decade of IPYs, till it becomes our second nature, a **built-in** part of the social economy and, above all, of its **Administration**.

Really the main functionary in the IPY is the Government itself, and that in a dual way. First, the country's **economy** has been so shaped in the post-Independence period, that nothing works without Government's positive encouragement and support. Secondly, and more importantly, the Administration of Government needs Productivity more than any other institution. Not only IPY needs Government support and encouragement, but Government also must have its own IPY.

Then comes the crucial role of labour, as the main intermediary and beneficiary of productivity. Drawing labour into the IPY programmes through a decisive contribution to the debate on sharing the gains of productivity, through language publications on a mass scale, through publicising of concrete case studies, demonstrating unequivocally the massive benefits to labour of enhanced productivity; through these and other means, it is the acknowledged obligation of NPC to identify IPY with the welfare of labour.

These are fundamentals; and we can forsake them only at our peril. IPY itself must be a continuous reminder to the organisers of the productivity movement that its fruitfulness depends on the goodwill of labour.

Now that we have erected a fairly extensive political framework for the IPY, and drawn a large number of industrial firms not only into the celebration of the IPY but also for making Productivity the basis of their short-term and long-term programmes, it is our obligation to inject massive doses of productivity into all the crucial points of the social structure.

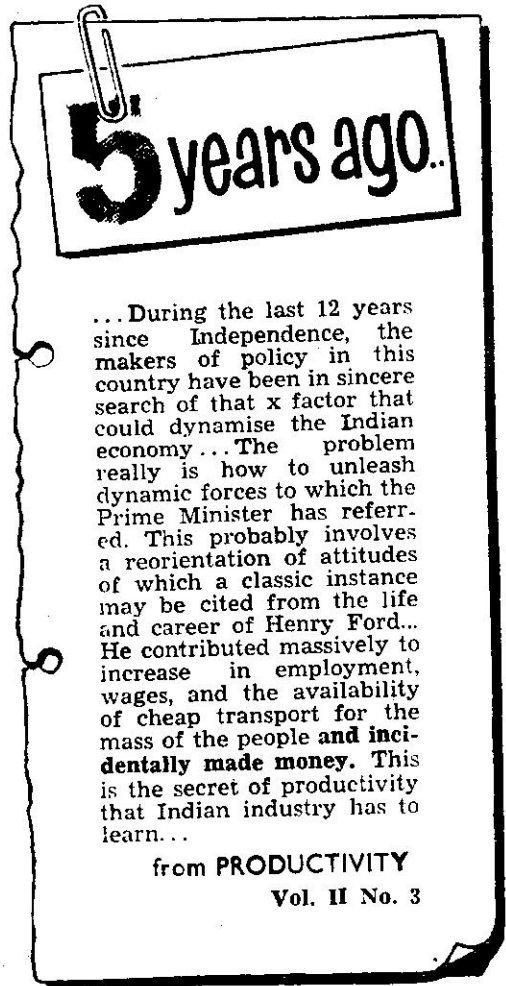
And the circumstances have become more propitious. At the time we launched the IPY, the country had just got out of a war that nearly strangled its

economy; and alongside we had the worst drought in recorded history. We were short of food, short of essential raw materials, short of foreign exchange with which to purchase either. Nobody at the time was prepared to listen to the Call of Productivity, though we called the tune in the name of survival and self-sufficiency.

Things are different now. The rabi harvest is reportedly abundant. The talk of shut-down and lay-off has ceased. The essential imports for Indian industry are probably already in the pipeline. We must, therefore, sound again the Call of the IPY, this time on a happier note, in the hope and belief that if we could get little out of adversity, we shall through the IPY compound the prospect for prosperity.

THIS JOURNAL

WITH THIS issue of the Journal—IPY Special Number I—the **Productivity Journal** enters a new phase of its career; and in view of the fact that NPC has entered the wider and more rewarding field of language publications, a little stock-taking appears called for. When this Journal started in the Winter of 1959, the approach, by and large, was that of a generalist, as contrasted with the intensive but somewhat restricted perspective of the specialist. The idea behind this policy was to cause some sort of an intellectual fermentation so that people should begin to talk and think about productivity; that



NPC should be able to contact and tap intellectuals to bring them into the productivity drive and to persuade industrial technicians to record their experiences so that they could improve upon them.

By the middle of 1961 it was felt that these objectives had been, by and large, achieved. The Journal had acquired an international status, and in the Indian mar-

ket commanded the largest circulation among small periodicals. It was felt that the time had arrived when NPC should help, in a concrete way, in the evolution and application of productivity techniques. In accordance with this policy decision, a comprehensive analysis was attempted in issue after issue of a large variety of productivity techniques—Incentives, Personnel Management, Work Study, Quality Control, Materials Handling, Cost and Budgetary Control, Operations Research, Inventory Control, Inter-Firm Comparison, Preventive Maintenance, Fuel Economy, etc. Besides, contributions to the development of Productivity Literature were made through publication of special issues on Small Industry, Defence and Productivity, Labour and Productivity, Productivity in Engineering, Training, Human Relations, and Productivity in Agriculture.

About the middle of 1962, however, there was a feeling in the Governing Body

of NPC that while the special issue system may continue, there should be some material which may interest the general reader, review the recent literature on productivity, and make a general round of techniques and areas, not covered by the analysis of single productivity techniques.

The demand for the resumption of the general multipurpose issues still persists, and IPY has come as an opportunity. Now that the Productivity Drive has, with the IPY, attained a certain momentum, and there is a general demand for productivity literature, it appears only right that the portals of the Productivity Journal should be thrown wide open to the rich experiences of a wide variety of technicians, labour leaders, industrialists, management personnel, researchers, administrators, and practically everybody else, for productivity has now become, with the IPY, a matter of national concern.

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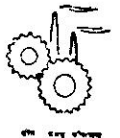
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Ever since its inception in 1958, the National Productivity Council has been vigorously trying to inculcate productivity consciousness at various levels in industry, and, very recently, in the field of agriculture, too. India Productivity Year-1966, launched at the national level on New Year eve, aims at creating among all a proper awareness of the significance of productivity as the harbinger of material prosperity and plenty. The Chairman of the National Productivity Council explains, in this article, the objectives of IPY, and the efforts already made to ensure participation in it of several industrial units, institutions and organisations, including labour organisations representing the major areas of endeavour.

PS LOKANATHAN

*Chairman
National Productivity Council*

We Launched IPY

AS CHAIRMAN of the National Productivity Council, it was a proud moment for me when we launched, on New Year eve, the India Productivity Year-1966, marking the start of the nation-wide productivity movement in order to bring about a wider awakening of the role of productivity in economic development, and to spread the message of productivity to all parts of the country. The NPC has desired to devote the whole year for this purpose.

Productivity has a new meaning and purpose in the present context, and the programmes for productivity, scheduled for the year, have been oriented towards meeting the country's current needs and problems, besides aiming at the long-term

growth and development of the economy. The productivity approach in the India Productivity Year would be weighted in favour of the special measures necessary to quicken the rate of import substitution, to find new uses for existing resources, to improvise in the best possible manner with the available materials, and not to be overwhelmed by the lack of resources; to manufacture a good portion of the spares, components and other accessories as quickly as possible, eliminate waste of all kinds, and to utilise the existing industrial capacity to the maximum extent.

Objectives

We in the NPC are conscious of the challenge which the internal and external forces have thrown on us, and we feel that it is probably more urgent and important than at any time before, that we should express our full faith and confidence, both in words and deeds, in the capacity of productivity to meet the challenge. Indeed productivity comes into its own when we are obliged to make the most of what we have, for productivity consists, in many respects, of those improvisations and adjustments, which convert challenges into opportunities; and that is the spirit of IPY.

**...There is not enough
awareness among the top
people both in industry
and Government of the rich
contribution which
productivity can make
towards development...**

The Productivity Year would, therefore, be utilised for the purpose of bringing together management, technicians and Government, to try to solve through the productivity approach some of the problems created by the Emergency. This is the time when workers' cooperation will be more imperative, because any possible readjustment that may be needed temporarily on account of shortages of raw materials cannot be effected without the fullest cooperation of labour.

We propose, in IPY-1966, to inculcate among our people by every possible means the productivity approach in every sphere of life; and we propose employing all possible means to achieve this on a mass scale: radio broadcasts, theatricals, essay contests (to encourage university boys and girls), rewards for outstanding work in labour and factory management, productivity exhibitions to highlight the benefits from increased productivity; and nation-wide audio-visual shows in English, Hindi and regional languages, depicting the different facets of productivity, particularly the gains to labour.

In this connection we should not forget the fact that mere increases in capital, machinery and supply of labour cannot bring about a rapid rate of growth of Indian economy. Research and experience have shown that a great deal of the present prosperity and high levels of development in the advanced countries are due not only to capital and labour but to what may be compendiously called productivity which would include research, education and training. It is ultimately the way in which human skills are developed to deal with all material matters that bring about prosperity. It is not for nothing that we say that capital itself is congealed (accumulated) labour.

The activities planned for IPY-1966 are scheduled to be carried out in collaboration with several organisations consisting of Local Productivity Councils, individual enterprise, universities, trade

unions, chambers of commerce. All India Radio and professional institutions. They will be invited to participate in and organise productivity fairs, broadcasts, seminars, newspaper supplements, productivity awards, essay competitions, special training programmes, exhibitions of productivity films and achievement of prescribed productivity targets. In respect of such activities, NPC will function as the apex organisation. In other words IPY activities will be invested with a national character.

The IPY will be utilised partly as an educational and promotional year. We

on the criteria of which productivity awards will be given. The targets themselves will be set in terms both of current and long-term needs. For example, import substitution, substitute materials, and avoidance of waste will rank equally with other targets of a long-term nature.

In this national endeavour, it is a matter of pride to record that we will have the active cooperation of both Asia and the West. Thanks to the Government of India, we are active members of the Asian Productivity Organisation and India Productivity Year-1966 is as much an Asian Productivity Organisation Programme

A colour feature—Leadership—appears between pp. 97 and 104. It is Telco's gift for India Productivity Year-1966, and is symptomatic of the big response which IPY has evoked throughout the country. It is not untrue that without sound human relationship, technical prowess is obviously not going to help us much. The feature is designed to help supervisors and others in a proper appreciation of the importance of human relationship in our day-to-day work.

will, of course, use every means of communication to reach the people and tell them of the immediate possibility of improving their life through productivity. With this end in view, we have arranged with a large number of industrial units for meetings to be organised in their factories and offices in which the workers would be fully involved. We shall supply them with simple and easy literature and hope to evoke the interest and emotional involvement of the workers. We are also setting up targets not only for the Local Productivity Councils but for each industry

(though not formally) as that of the National Productivity Council.

At the last International Conference on Exchange of Experience of Productivity, not only was the IPY idea enthusiastically received but the OECD members offered assistance in conducting special training programmes and seminars during IPY-1966. The *Association pour l'Organisation des Missions de Cooperation Technique* (ASMIC) also stated that the French Government would be willing to render assistance to the Government of India in

conducting special training programmes during IPY-1966, in subjects like operations research, marketing, motivation research, MTM, PERT, materials management, and productivity measurement.

An important objective of IPY-1966 is to enter certain areas in depth. In respect of industry, NPC has so far organised a widespread network of training courses and done quite a few productivity surveys of major organisations like the Navil Dockyards, and the Andhra Pradesh State Road Transport. Now the idea of IPY-1966 is that industry should take over its own productivity drive through the establishment of Industry Productivity Councils and Productivity Cells as a part of the internal organisation of every industrial firm. In fact, at this time, a major move is on towards the establishment of a number of Industry Productivity Councils. Their importance will grow in the coming years on account of the fact that there are a number of problems of productivity which are special to each industry. Also each industry can take responsibility for finding solutions to some of its own problems.

Another objective which needs to be particularly mentioned is the need to tone

up the quality of administration at various levels, and IPY-1966 could well be the beginning of a fruitful collaboration in this respect between the Government and the National Productivity Council for it is our conviction that whatever be the other causes of the prevailing malaise, the cure of the administrative disease lies via productivity.

Training and Survey

In this national endeavour, we propose to draw upon the organisational resources of every kind of institution, which serves the public interest in any area of national activity. In the post-Independence period a number of institutions have come up, whose interest in productivity, or at least in some of its crucial and vital aspects, has a claim to recognition. The Indian Standards Institution and the Indian Statistical Institute have to their credit a long and distinguished record of work. Institutes of Management have begun operating at Calcutta and Ahmedabad. The All-India Management Association has become active in the field of training. Several other organisations, such as the Institute of Personnel Management, the Institute of Cost and Works Accountants of India, and many engineering institutions have begun to offer training in the areas of their interest. Private industrial establishments and Government departments have also developed their own training and other facilities. While this calls for a reorientation and reallocation of resources, it is also an opportunity for NPC to collaborate actively with these sister institutions. We will certainly do so on a considerable scale during IPY-1966.

During IPY-1966, we shall of course continue our training and survey activities; in fact, we will intensify and also diversify these activities in the context of new needs and circumstances, as, for example, new programmes for agriculture. Further, with IPY-1966, it would no longer be sufficient

HIGHLIGHTS OF IPY IN PIX

India Productivity Year-1966 was launched, at national level, on Dec. 31, 1965, by the then Minister of Industry and President of NPC, Mr TN Singh. In the following weeks, IPY was inaugurated in the States by Governors and Chief Ministers. A Pictorial Feature -- Highlights of IPY in PIX, -- appears between pages 49 and 56.

“ . . . Any increase in profits which does not come out of improvement in productivity but has its origin in current scarcities and the stresses of development cannot be regarded as a sign of prosperity . . . ”

people both in industry and in Government of the rich contribution which productivity can make towards development. As the Third Plan Report has pointed out, the future prosperity of workers as well as other sections of the community depends upon productivity: “Neither the exercise of their organised strength in industrial conflicts nor laws and intervention of the State can help the workers much in realising their aspirations. Their gains can arise only out of the strength and dynamism of the economy, the enduring sign(?) of which is a rising level of productivity. Any increase in profits which does not come out of improvement in productivity but has its origin in current scarcities and the stresses of development cannot be regarded as a sign of prosperity”. It is this consciousness we want to bring about; and IPY-1966 will certainly be a beginning in that direction.

for us to preach the principles of work study and personnel management. The country not only demands that these principles be practised but also that they yield results in terms of the nation's demand for industrial and agricultural products. IPY-1966 must create an impression in this direction.

In Small Industry

For the benefit of small industry, we will in collaboration with the small industries organisations, try to establish productivity cells in the Industrial Estates. We have also plans to generate a sort of mass movement, a drive throughout the range of small industry by specially prepared programmes for management development, work study, materials handling, quality control, etc. Small industry needs these techniques perhaps more than the other sectors of the economy.

As a firm believer in the role of productivity in accelerated economic development, I feel that there should be better awareness among the top

AS THEY SEE IT

India Productivity Year-1966 has evoked a big response throughout the country. Many industrial units have formed IPY Cells, IPY In-plant Committees, and Productivity Committees, besides setting up definite targets for achievement. The Indian Press, in one voice, has praised the sincerity of purpose behind the movement. Appearing on pages 89-92 is a feature “As They See It” which carries excerpts from editorials appearing in leading newspapers of the country.

K PENNATHUR

National Productivity Council

Management : A New Perspective for Productivity

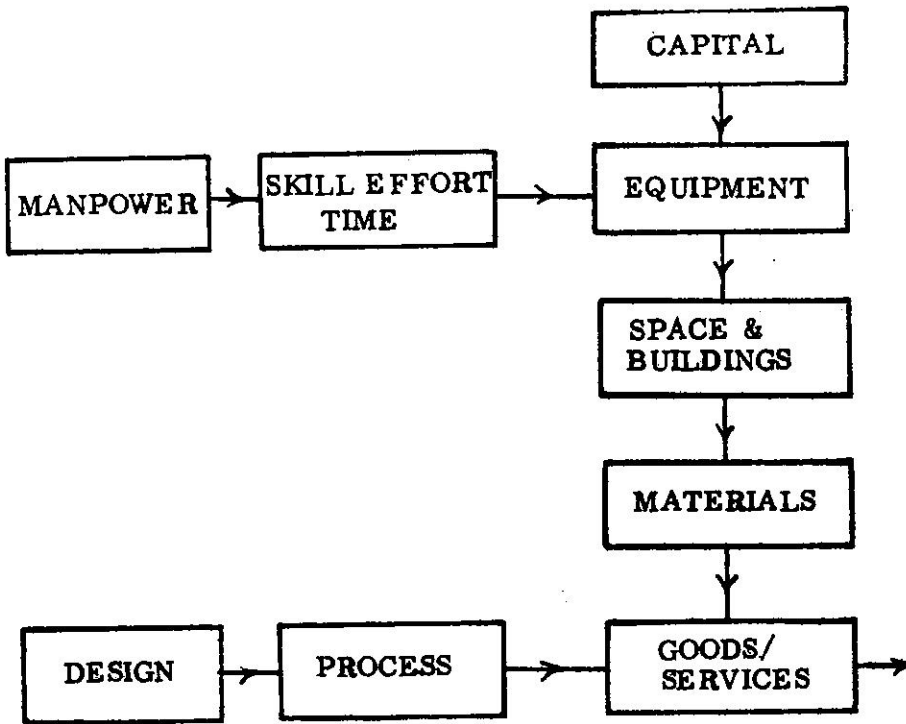
MANAGEMENT has all along been able to hold its own solely on account of its resilience towards the changing patterns of the industrial horizon. One would expect management to persevere in its flexibility and adaptability, but for one strong reason the rate of change in the industrial pattern is not a linear function of time. The quantum of scientific and technological advance achieved over the whole of the last century is but a very small fraction of the innovations brought about during the last decade. In order to keep pace with the fantastically rapid rate of scientific progress, management has to bring about a scientific and technological orientation to its function of decision-making.

Although Productivity is a quest of national concern, it is management who has to give it a concrete shape and form for physical implementation. Let us see what management does in order to produce goods and services for the community.

In Model 1 (page 15), capital ensures availability of resources like equipment, space and buildings and materials. Man-power is engaged and paid for in terms of skill and time. Sometimes, human effort is recognised as a distinct element apart from 'skill' and 'time', and is paid for additionally. Science and technology render possible a good design and an effective process plan. It is presumed that the interaction between these produced goods and services.

Startling Discoveries

It took management quite some time to realise that a man-machine system was not a fully structured one inasmuch as one component, the **human**, was not completely predictable. So the quest for the analysis of the variable, and sometimes unpredictable, elements in a system began. Sociologists, psychologists, biologists and engineers focussed attention on the many



MODEL 1

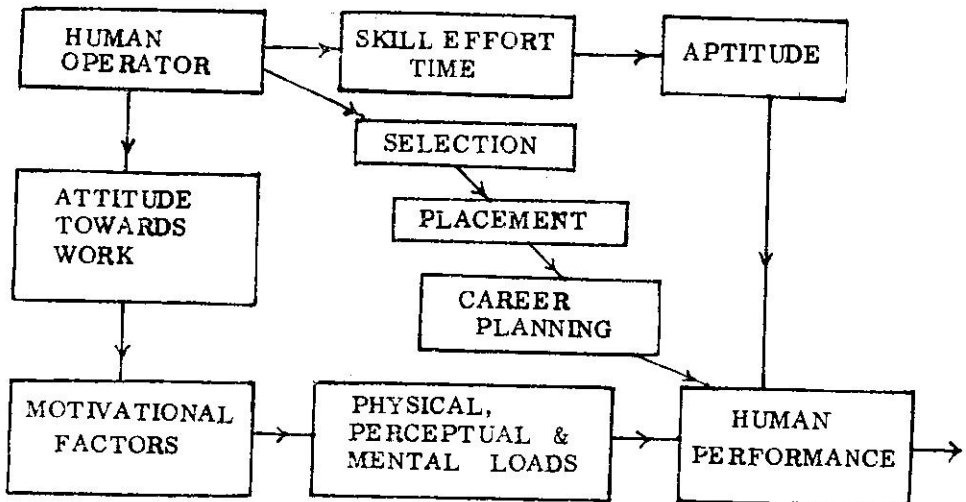
facets of the nebulous problems of **man-machine equilibrium, motivation, and satisfaction at work.** Startling discoveries were made. Man was found not happy unless he was at work—although the work he did might not be what the management wanted him to do. It was realised that money was not the only motivating factor, and thus the theory of the economic man was given the push. It was found that there was a limit to the physical, perceptual and mental loads a normal human being could sustain. Just designing a machine is no longer good enough. It must be fitted to the characteristics and capabilities of the human who is going to operate it.

The human contribution in Model 1 was amplified to take into account known factors. These are represented in Model 2 on page 16.

The new complex outlined in Model 2 highlighted the importance of many new branches of science and technology. Psychology was pressed into service to evolve scientific methods of selection, placement and career planning. Aptitude tests were incorporated at the selection stage. Physiology, psychology and engineering produced a new amalgam—Ergonomics or Human Engineering. Industrial psychology assumed its rightful role in the quest for determining what motivates a worker. Each branch of science started specialisation in depth, not to establish little empires but to offer its significant contribution to the growth of industry through **higher productivity.**

Human Interaction

This is only one aspect of the industrial complex. I chose the human interaction because I, in all humility,



MODEL 2

believe that it is the human contribution that is the most valuable of all. But science and technology began having their impact in each field. In the sphere of finance, mere book-keeping and accountancy were no longer adequate. Financial management or, what is more popularly known as management accountancy, absorbed many sophisticated theories of mathematics and statistics. A farsighted investor would require an assessment of the forecast probabilities of a certain type of economic situation prevailing over the near as well as the distant future. He would then want the break-even probability to be worked out so that he could take a reasonably sound decision.

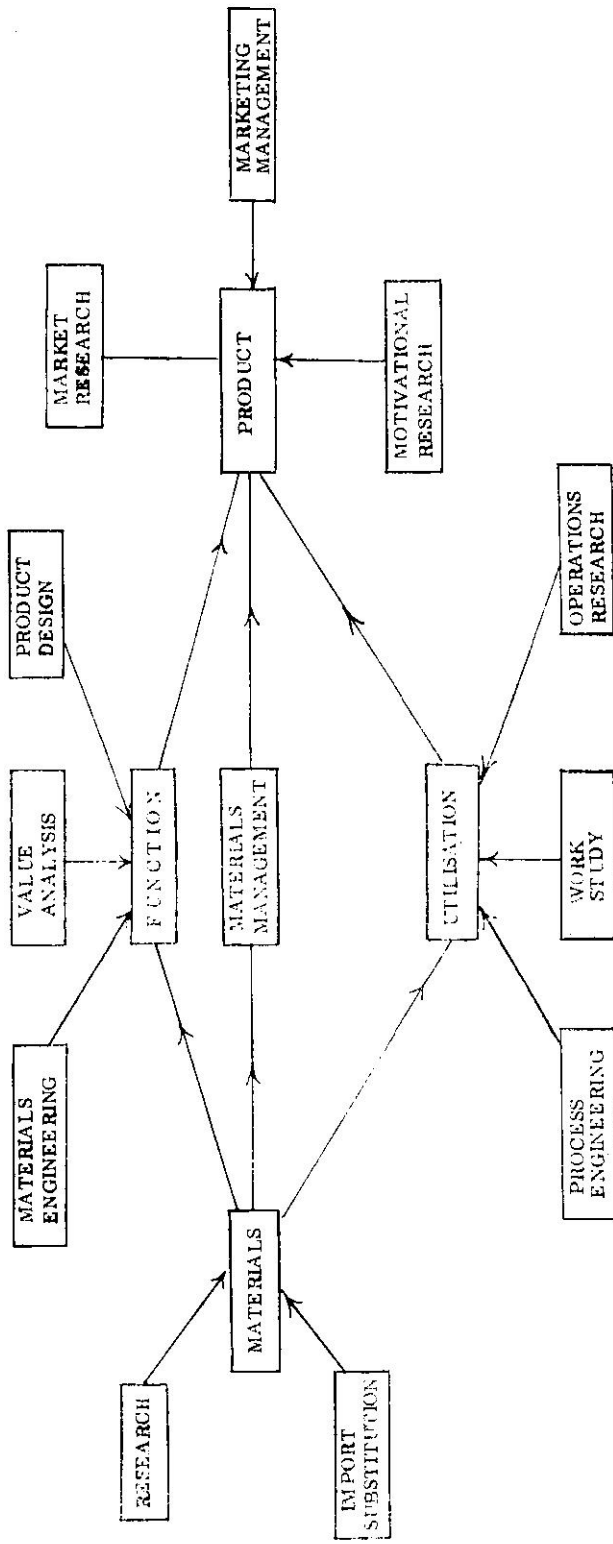
New Upsurge

Similarly, in the field of materials, a new upsurge began. The cost of materials was found to be between 50 and 75 per cent of the cost of the end product. Materials thus proved to be a field worth concentrating on. Fifteen years ago, materials management was treated as a new composite subject. Today, each aspect of it has developed into a specialist subject. The expansion in the sphere of

materials is as in Model 3 (page 17). The volume of data and information available in each subject is so much that each is fast developing as a separate science or technology.

Prior to World War II, Market Research might have been considered new-fangled. But now, mere market research is not adequate because it only tells us what products which type of people buy. Industry is not satisfied with this information alone. It wants to know why different types of people prefer different types of products. The factors motivating the buyers in their preference are of vital importance to the producer in not only deciding what products to make, but also in designing the products and formulating the themes for advertisement and sales promotion.

Going into a specific field, the manufacture of cylindrical containers may appear to be a simple enough job. Although any number of variations in diameter and height are possible for a given volumetric capacity, there is only one height and one diameter for which the consumption of material used to manufacture the container is minimal.



MODEL 3

Magic of Maximisation

Maximisation was a term which conjured up the picture of the best solution to increased profits. Minimisation was the **open sesame** to cost reduction. But the modern trend is to discuss in terms of optimisation. Taking a simple example, human effort is a function of the rate of performance and the number of hours at work. In terms of rate of performance or **output per hour**, the maximum is achieved when the operator works for 40 hours in a week at not more than 8 hours per day. The output per hour drops with an increase in the number of hours worked over 40 hours. In terms of total **volume of output**, a 48-hour week produces the maximum. A slight fall in the rate of output is more than offset by the increase in the **number of hours worked**. Beyond 48 hours per week, the total volume of output drops. The fall in the rate of output per hour is more than the compensation offered by an increase in the number of hours worked. What should be the optimum number of hours at work for achieving maximum output? If only one man who can perform the task is available, then a 48-hour week is the ans-

wer. If more men are available, working each operator over only a 40-hour week would be the solution. This is the basic concept behind optimisation.

New sciences, new concepts, and new techniques are evolving at a rapid rate. Many have a useful contribution to make in increasing industrial productivity. To ignore them by labelling them as new-fangled ideas which will die soon would be grossly unfair to the economic renaissance of our nation. One often hears such comments like "it may be good; but, it is not applicable to me!", "it is just another band wagon", "it is a gimmick, it will soon disappear", "we are not ready for it yet, in our country", etc. There is no rubicon to cross before we can say we are ready for productivity. Productivity does not descend on a nation by pious prayers or pontifical preachings. The measure of productivity is a nation's willingness to take up the challenge of economic survival and advancement. In meeting that challenge, a wise management will press into service all that the recent advances in science and technology have to offer.

People And Consumption

If the world's population of three and one quarter billion people were compressed to a thousand people, only 60 would be Americans, says Mr Victor C. Sturdy writing in "The Management Letter".

He adds: These 60 would receive half of the total income of the world, and own 15 times as much goods as the other 940 combined. The Americans would use 12 times as much electricity, 22 times as much coal, and 50 times as much general equipment as the remaining 940 persons would use. Except for 200 others among the thousand, all the rest would be ignorant, hungry, and sick. Half of them would not be able to read or write. Three hundred and three would be whites, and the remaining 697 would be non-whites. The 60 Americans would have a life expectancy of 70 years, while the rest would average less than 40.

ST MERANI

*Development Commissioner
Small-scale Industries*

Index of Labour Productivity

THROUGHOUT 1966 we shall be intensifying our efforts in the field of Productivity.

Apart from creating the necessary wider consciousness, the objective will be to increase productivity.

We should state clearly, in words which would be specific and meaningful to all concerned, what it is that we are attempting to increase.

Definition: Even today, a large section of the concerned people continue to use "production" and "productivity" as if the two mean the same thing. But when it comes to asking "what is productivity", even some of those who ought to provide the necessary guidance get involved in a long discussion and the subject is reached in a roundabout way.

Output per manhour: In spite of the limitations involved, it is suggested that in order to get moving, we might concentrate on the measurable concept "output per manhour" and project this as a specific, clearly-stated objective. By and large, a great many ingredients will get reflected in output per manhour.

Measurement of Productivity: Having stated our objective, we must take steps to measure it so that every one concerned knows whether productivity is rising or falling, and at what rate.

Monthly Intervals: To have such information at long intervals is not fully rewarding. If one is losing and this is known early enough, steps could be taken to check the situation. If one is gaining, this knowledge could lead to further gains. It would therefore, be advisable to have the information available at monthly intervals.

While longer intervals for the whole industry or the country might be inevitable, insofar as the level at which rise or fall in productivity takes place, the procedure must provide for its measurement at monthly intervals.

Uniform Measurement: It is also necessary that, by and large, the measurement should be undertaken in the same manner at each concerned enterprise. Only comparables can be compared.

As it may not be possible to arrange for the measurement of productivity at all enterprises in all industries throughout the country, we must concentrate on select industries and, again, within the select industries on enterprises of certain size. If this were done, we would have at least a major sector covered effectively.

This would facilitate the establishment of Productivity Targets at the enterprise level which must be recognised as the starting point for effective work.

Guidance at National Level: In view of the importance of the theme, it would be desirable to provide guidance at the national level so that with this as the starting point the enterprise could then commence the measurement of productivity. If any difficulties arise, as indeed there may be, further guidance could be made available.

Size of Enterprises

As part of the guidance provided at the national level, industries should also be selected at the national level. The size of enterprises to be covered should also be determined at the national level.

Index of Productivity: The select enterprises should then need to be persuaded to build up an Index of Productivity.

While the effort should be concentrated on select enterprises, others should also be encouraged by general persuasion to undertake similar effort so that over a longer period of time a large part of industry is covered.

There are obvious limitations and

difficulties in building up an Index of Productivity, but instead of leaving the details vague or uncovered, let some beginning be made so that within a short time the greatest measure of agreement could be reached on how this should be done.

With this object, the following details are offered:

1. *Determination of Base Period:* In compiling an Index of Productivity, the Base Period with which performance in subsequent months could be compared, should first be determined. In order to avoid complications arising from fluctuations from month to month in output as well as in the number of manhours expended, the Base Period should be one year. It will facilitate inter-enterprise comparisons if all enterprises adopt a uniform base year.

2. *Calculation of Output per Man-hour:* Next, output per manhour during the Base Period and in the reference periods, that is, periods for which comparison with the base year is desired, should be calculated. Output per man-hour during the Base Period as well as in reference periods should be derived by dividing the total output by the total man-hours expended. Before doing so, it should be ensured that output during successive reference periods and the Base Period are comparable. Similarly, the manhours expended during successive periods should also be comparable.

3. *Making Output Comparable:* If the output of an enterprise is a single uniform product which could be measured in terms of numbers, length, weight or volume, the calculation of output per man-hour is very simple. The quantity of output is only to be divided by the number of manhours expended.

In most cases, however, the output is complex and products are of different

types, qualities, sizes and specifications. In order to make outputs comparable, they have to be reduced to a common measure and the only appropriate common measure is value. Price fluctuations would again make values incomparable. But this could be overcome by evaluating the products at constant prices. In this manner, the value of output at constant prices will be divided by the manhours expended to calculate output per manhour.

Computing Value of Product

It may happen that a product that has to be reckoned during the reference period did not exist in the Base Period or existed in a different form or model. One method of computing value at constant prices in such cases will be:

- (a) The value per unit measure of new product at the point of introduction should be deflated with reference to the price increase of a comparable product between the Base Period and that point of time. The output of the new product during the reference period should then be valued at the deflated unit price.
- (b) Unit value of an entirely new product, comparables for which were not being produced in the enterprise during the Base Period, may be deflated with reference to rise in the prices of major components and labour cost between the Base Period and the time of first production, giving due weight to the proportionate share of the components and labour cost in the total cost of production.

4. Making Manhours Comparable: Manhours expended should also be made comparable over the Base Period and month by month in subsequent reference periods. This could be ensured by uniformly reckoning comparable sections of the Labour Force in calculating the total number of manhours worked. For practical purposes, all workers as defined under

the Factories Act, 1948, may be included in reckoning total manhours worked.

5. Calculating Index of Labour Productivity:

Index of Labour Productivity

Products	Unit Measure	Quantity Produced in Base Year	Average Quantity Produced per month in Base Year	Gross value of product in Base year	Gross value of average Monthly Production in Base Year	Quantity produced in the ref. month	Production relative in the ref. month	Gross value of production in ref. month of constant prices
1	2	3	4	5	6	7	8	9
Total:								
(Col. 5, 6, & 9 only)								
Step I:	List the various items of production. Products of different types, quality, size and specification, likely to differ in price per unit, should be listed separately (Col. 1)							
Step II:	List unit of measurement against each product (Col. 2) i.e. Tonne, Litre, Metre, etc.							
Step III:	Mention against each product the total quantity produced during the whole of Base Year (Col. 3)							
Step IV:	Arrive at average quantity produced per month (Col. 3÷12). Enter in Col. 4.							

... It is essential that Productivity Targets should be fixed in collaboration with labour. The productivity performance should also be discussed with labour month by month. By doing so, labour will participate in the productivity movement effectively in the various stages involved. . . The whole subject needs to be discussed at the national and industrial levels, almost on a continuing basis. . .

- Step V: Enter Gross value of production in the Base Year against each product (Col. 5). This should be the ex-factory value of each product.
- Step VI: Calculate Gross value of average monthly production in Base Year (Col. 5 ÷ 12) and enter in Col. 6.
- Step VII: Mention quantity of current production (reference

month) against each product (Col. 7).

Step VIII: Calculate Production Relative of each product in reference month (Col. 7 ÷ Col. 4) and enter in Col. 8.

Step IX: Calculate Gross value of Production in reference month at constant prices (Col. 8 x Col. 6) and enter in Col. 9.

Step X: Calculate output per man-hour in the Base Period: Total of Col. 5 ÷ Total man-hours worked during the Base Year. The manhours worked should relate to workers as defined under Factories Act.

Step XI: Calculate output per man-hour in the reference month: Total of Col. 9 ÷ Total man-hours worked in the reference month. The manhours worked should relate to workers as defined under Factories Act.

Step XII: Construct Index of Labour Productivity:

Index of Labour Productivity

$$= \frac{\text{Step XI}}{\text{Step X}} \times 100$$

$$\text{or } \frac{\text{Output per manhour in ref. month}}{\text{Output per manhour in the base period}} \times 100$$

Whatever changes may be considered necessary in the above procedure (in order to reach the greatest measure of agreement) it is essential that agreement should be reached at the national level and all concerned informed of the methodology recommended as a matter of specific guidance on this subject.

Index of Production: Apart from those select enterprises which could be persuaded to maintain an Index of Productivity, others should be encouraged to maintain an Index of Production. Where

cannot have an Index of Productivity, Index of Production would be an excellent first step.

In order that Index of Production should also be maintained in a uniform manner, it is desirable to advocate a certain specific and detailed procedure. There would be limitations in this case also, but with the greatest measure of agreement some procedure should be determined.

The following suggestions are made for establishing a simple Index of Production at the enterprise level.

1. *Determination of Base Period:* In order to compile an Index of Production, the first thing to do is to fix the Base Period so that the production in subsequent months could be compared with production during the Base Period. As production in any particular month may not always be normal for some special reasons operating during that month, it is desirable to take one year as the Base Period and the average monthly production during that year as the basis of comparison of monthly production.

Sometimes inter-enterprise comparisons may be useful and it would be as well that the various enterprises have a common Base Period. This could very well be the period between 1st April 1960 and 31st March 1961, the last year of the Second Plan.

2. *Comparison of Comparables:* It would be necessary to ensure that comparison is made of comparables only.

If the output of an enterprise is a single uniform product which could be measured in terms of numbers, length, weight or volume, the construction of the Index of Production is very simple. The quantity of output during the reference period (namely the month in respect of

which production is to be compared with the average monthly production during the Base Period) is only to be divided by the quantity of average monthly output in the Base Period and the result multiplied by 100 to arrive at the Index of Production during the reference period. In most cases, however, the output is complex and products are of different types, qualities, sizes and specifications. In order to make such products comparable, they have to be reduced to a common measure and the only appropriate common measure is value. Price fluctuations would again make values uncomparable. But, this could be overcome by evaluating the products at constant prices. In this manner value of output at constant prices during the reference period (month) will be compared with the value of average monthly output during the Base Period.

It may happen that a product that has to be reckoned during the reference period did not exist in the Base Period or existed in a different form or model. One method of making comparisons possible in such cases will be:

- (a) The value per unit measure of a new product at the point of introduction should be deflated with reference to the price increase of a comparable product between the Base Period and that point of time. The output of the new product during the reference period should then be valued at the deflated unit price.
- (b) Unit value of an entirely new product, comparables for which were not being produced in the enterprise during the Base Period, may be deflated with reference to rise in the prices of major components and labour cost between the Base Period and the time of first production, giving due weight to the proportionate share of the components and labour cost in the total cost of production.

U.S. Workers Interested in Social Research

How labour is interested in social research is evidenced by the establishment of a research Institute by the United Auto Workers of USA.

A non-profit-making institute of the first of its kind, it is interested in learning what happens to the widows and children of auto workers who die during their productive years, what kinds of social adjustments do they make, what debts do they have, what changes occur in their housing, and the education of the children, etc.

The institute, according to a report in the American Labour Review, has initiated two major projects, the first being a survey of the uses made up of lump sums and monthly benefits paid to survivors of former workers in the automobile industry. The second project deals with the use of services for mental health problems.

The automobile workers feel that such research would result in improving the lot of workers' families, and ultimately result in increased Productivity.

3. Compiling Index of Production:

Index of Production

Products	Unit Measure	Quantity produced in base Year	Average Quantity produced per month in Base Year	Gross value in Base Year	Gross value of average monthly production in Base Year	Quantity produced in ref. month	Production relative in ref. month	Gross value in ref. month at constant prices
1	2	3	4	5	6	7	8	9

Total

(Col. 5, 6 & 9 only)

- Step I: List the various items of production. Products of different type, quality, size, specification, likely to differ in price per unit, should be listed separately (Col. 1).
- Step II: List unit of measurement against each product (Col. 2) i.e. Tonne, Litre, Metre, etc.
- Step III: Mention against each product the total quantity produced during the whole of Base Year (Col. 3).
- Step IV: Arrive at average quantity produced per month (Col. $3 \div 12$). Enter in Col. 4.
- Step V: Enter Gross value of production in the Base Year against each product (Col. 5). This should be the ex-factory value of each product.
- Step VI: Calculate Gross value of average monthly production in Base Year (Col. $5 \div 12$) and enter in Col. 6.

- Step VII: Mention quantity of current production in reference month against each product (Col. 7).
- Step VIII: Calculate production Relatives of each product in reference month (Col. 7 ÷ Col. 4) and enter in Col. 8.
- Step IX: Calculate Gross value of Production in reference month at constant prices (Col. 8 x Col. 6) and enter in Col. 9.
- Step X: Calculate the Index of Production during the reference month.
Total of Col. 9 ÷ Total of Col. 6 x 100.

The Productivity performance should also be discussed with labour month by month. By doing so, labour will participate in the productivity movement effectively in the various stages involved and thus contribute to the growth of the movement.

National Scene: While Productivity Targets must be fixed at the enterprise level, these should be attempted on the basis of overall national and industrial guidance. In the case of Index of Productivity also, while the compilation would be done at the enterprise level, it should be possible to compile an Index of Productivity for different industries. This should be attempted.

The whole subject of productivity targets and productivity performance needs to be discussed at the national and industrial levels, almost on a continuing basis, so that there is total consciousness of what is being attempted and what is being fulfilled. It is amazing what consciousness about the rate of growth in productivity can do to the productivity movement.

Productivity Targets: In addition to persuading select enterprises to compile an Index of Productivity, on an agreed uniform basis, to make comparisons possible, efforts should be made to persuade them to fix Productivity Targets. It is essential that Productivity Targets should be fixed in collaboration with labour.

Just Published

ROLE OF LABOUR IN PRODUCTIVITY

The National Productivity Council's Study Team Report on Role of Labour in Productivity stresses the role of organised labour in the field of productivity, and discusses many important aspects relevant to this role—such as the social and economic conditions in the USA, manpower planning and its effective utilisation, role of trade unions, attitude of management and Government, and problems such as automation and productivity. A comparative study of conditions in the USA and India has been attempted.

Price Rs. 5

National Productivity Council

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FREDIE MEHTA

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Gains of Productivity:

Philosophy of 'Sharing'

THE GOAL of raising productivity in a developing country like India is by now so universally accepted that it would be platitudinous to recite at length the reasons why productivity in our country should be increased as much and as quickly as possible. Our population-growth is increasing so rapidly as to make the most pessimistic forecasts of the past look like optimistic assessments. Our inflation is now threatening to become a regular built-in feature of our economy, and, not the least, both the growing burden of repayments and the levelling-off of foreign aid will make the Atlas-task of financing our huge Fourth Plan imports fall squarely on the shoulders of our exports.

It is difficult to exaggerate the contribution which increased productivity can make towards the solution of these enormous problems. Graham Hutton said, not long ago, that the recurrent British balance-of-payments crises in the post-war period were "the 10 per cent rises". If only, he argued, Britain could produce 10 per cent more with the same volume of men, money, and materials, her entire balance-of-payments crises would disappear. This may or may not have been true; what is certainly true is that in India, if we are resolved to meet the triple challenges of population, inflation, and exports, no way exists to meet these challenges other than that of sizably stepping up our productivity not only in the sphere of industrialisation, but far more importantly in the field of agriculture. To the extent that even today anything between 65 per cent and 70 per cent of our exports are directly or indirectly geared to agriculture, an increase in agricultural productivity would substantially better our export competitiveness.

Yet, our Plans, meticulous as they are in fixing production targets, make no attempt to fix any productivity targets. We import the latest industrial plants, and then proceed straightaway to employ two

to three times the labour force required for identical plants abroad. Next, we proceed to utilise these plants at between 60 per cent and 70 per cent of their installed capacity, largely because of the non-availability of raw materials or fuels, but also partly because of bad or no preparatory planning, and faulty purchasing policies. Again, we import substantial volumes of agricultural products for industrial use expending valuable foreign exchange thereon, when the fact is that with small, but sustained, increases in our agricultural productivity, we could not only do away with these imports but also increase their exports. We produce first-rate automatic looms, and make a third-rate utilisation of them. Whereas other countries use one person for 70 automatic looms, we penalise ourselves by using one person for 17 looms at the very maximum. Thus, the game goes on, punishing ourselves both as consumer and exporters with high costs at a time when we can least afford them.

Productivity-Maximisation Goal

This suggests not so much that our exultations of productivity are so much lip-service and pep-talk, but that our goal of productivity is, in effect, considered by us to be in conflict with our other goals, particularly the goal of maximum employment. How else explain that we insist on employing per industrial plant, or per batch of automatic looms, so many more persons than elsewhere, even after allowing for climatic limitations? Also, our general economic environment of inflation seems to dull our ability to live up to our profession of productivity-maximisation.

For this purpose, it seems to us that our own understanding of, or, at any rate, our capacity to make the public conscious of the gains of productivity is, perhaps, insufficient. The major conflict between the goals of maximising employment and of the goals of maximising productivity,

symptoms of which we have illustrated above, can be resolved in the public mind and in public policy if the long-term and the short-run aspects of the process of the sharing of the gains of productivity is fully understood, and, in turn, made understood to the public at large.

Motivating Instrument

Productivity-maximisation, by raising the incomes of employees through increased wages, and by raising the incomes of consumers through reduced prices, creates a further demand for products and services, which, in turn, can be answered by increased investments on the part of capital and management out of its increased profits from productivity-maximisation. A mutually interacting chain of forces begins to operate in a balanced and beneficial manner by a process in which employees through increased wages, consumers through reduced prices, capital through increased profits, and the society at large through increased tax-revenues all share in the gains of productivity. The process of the gains of productivity thus becomes at once a motivating and integral instrument of the process of economic growth.

To this general proposition, there are, of course, important qualifications. There are bound to be varying time-lags in the enjoyment of the rewards of productivity by the different factors of production; there are bound to be differences in viewing the forms the gains of productivity should take; and there are bound to be variations in the emphasis of the roles, and in consequence of the rewards, of the different factors of production. In viewing these controversial aspects, a democratic society will, or should, weigh the roles and rewards of the different production factors not only with reference to the political ideology of the day, but also to the stages of economic growth through which a developing country is passing. At one such stage, one factor assumes a

...It is in the field of organised large-scale industry that the principle of sharing the gains of productivity can be applied most immediately and fruitfully...Organised industry spearheads technological and managerial progress... and the process of collective bargaining...shows how organised labour can insist, by bilateral agreements with management, on sharing the gains of productivity...

relatively greater importance than other factors (say capital) or one type of sharing the gains of productivity (say shorter working hours) assumes greater popularity

than other types. The situation may change radically with a different stage of economic growth.

Indeed, it may be necessary to increase the long-term share of one factor to increase in the short-run the share of its rival factor. The low share of wages in the national incomes of, say, Germany, Holland, or Japan, in the early post-war period, rendering possible a very high rate of profits, and consequent high capital-formation, has today rebounded in these countries to the benefit of labour, who, as employees, are profiting by increasing wages, and, as consumers, by stable prices of most products. Consumers who, in the initial stages, pay higher prices, invite as an integral element of the price-mechanism a greater production, and consequently lower prices. Higher prices invite higher profits, which lead to higher production, which eventually leads to reduced prices. With a wider time-span taken as a perspective, factors which seemingly are competitive in the short-run may actually be complimentary in the long-term.

Bearing this important perspective in mind, it can be seen that the process of sharing the gains of productivity supplies the motive and the momentum to rapid and balanced economic growth. It gives each sector of the economy a vested interest in economic growth. It diffuses the gains of productivity in the very process that it builds them up. Above all, it incorporates the quest for maximising productivity as a regular built-in and cumulative generator of the country's prosperity.

More a Philosophy

If the Indian economy can be indoctrinated with this approach, a major battle will be won. Each sector stultifies the other by seeking to "monopolise" the gains of productivity, and forgets its own

long-term interests; it fails to realise that a smaller percentage of a dynamically growing "cake" is far preferable from all angles to a larger percentage of a stagnant "cake". There can be no incentive to increasing agricultural production if the peasant finds that half or more than half of his product will not be his; there can be no incentive for capital to maximise production if the State annexes too much of the share by way of increased taxation; and so on. There must be a recognition that sharing of the gains of productivity in an equitable manner is not only good ethics, but also good economics.

Sharing the gains of productivity is, therefore, more a philosophy of industrial relations than a statistical technique of distributing gains. What should count here is perspective, not precision. This is because the subject of sharing the gains of productivity presents innumerable obstacles. The measurement, even of the overall productivity of an industrial plant, is seldom an easy one, but from the point of view of sharing the gains of productivity, the overall productivity can be made meaningful only if the shares of the different factors of production in the increase of overall productivity can be accurately isolated. Even if statistical formulae can be invented which give the rates of increase of such partial productivity indices from year to year (no easy task, especially in multi-product plants), these formulae must be easily understandable both to management and labour (alas, they are often complex!), their various limitations (clearly understood in advance so that their eventual operations do not bring shocks and surprises, and not least, their faith in the honesty and accuracy of these calculations) should at no time be a subject of doubt.

Problem of Calculation

Thus the problem of calculating the gains of productivity, and of the factorial contributions thereof, though statistical

fundamentally, involves relationships between management and labour. Where these are fundamentally good, based as they are on mutual trust, the statistical complexities, howsoever grave, will be treated as a matter of detail calling for rough adjustments and compromises; where the prior background of relationships is one poisoned with distrust, the statistical complexities, however small, will be elevated to difficulties impossible of solution.

While the application and acceptance of this principle of sharing the gains of productivity—or for that matter, of production and profits—to the whole economy could achieve marked improvement of an all-round nature, it is in the field of industry, or organised large-scale industry to be precise, that the principle can be applied most immediately and fruitfully. Organised industry spearheads technological and managerial progress in modern societies; its innovations of today become the routine practices of other industries tomorrow. Also, organised labour here confronts organised management, and the process of collective bargaining so common in most advanced countries shows how such organised labour can insist by bilateral agreements with management on sharing the gains of productivity.

Why Process is Necessary?

Now, we have with us an imposing array of statistical studies which conclusively show that wages are high in countries where productivity is high, and that there is a positive correlation of a very high degree between the two. Indeed, there is no surer and better guarantor of increased wages than increased productivity, as the case of the advanced countries shows. No amount of collective bargaining or industrial adjudication can distribute gains, which are not in the first place created. However, there will be general agreement that this process,

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though certain to operate, will not be as speedy and as diffused as we would want it to be. This point has been well stated as follows :

"The problem of ensuring that workers receive a just share of the benefits of higher productivity (whether this share takes the form of higher wages or lower prices) presents certain special features in underdeveloped countries. It is in these countries, where widespread poverty, ignorance, disease and malnutrition impair the capacity of workers, that it is most important to bring about an improvement in workers' living standards, principally as an end in itself, but also as a means towards building up a stable and productive labour force. But it is precisely in these countries, where labour is usually abundant while capital is scarce and dear, and where trade union movements are in the early stages of development, that improvements in workers' standards of living are least likely to come about spontaneously through competition or by collective bargaining. In such conditions it seems likely that, in the absence of special action, the benefits of higher productivity may not be fully shared by workers".

There is another reason relevant to India. Due to severe inter-union rivalries, we should try as far as possible to institute impersonal formulae for sharing the gains of productivity instead of leaving these gains to be a bone of contention to be fought out each year. Even when the representative union agrees, the other rival unions, aspiring to go one better, create tensions and disturbances. This was one of the most compelling reasons why it was felt that a standard formula for sharing profits in the shape of an annual bonus should be worked out by the Bonus Commission, applicable to the entire Indian industry. This is also the reason why the formula for sharing the gains of productivity should have some measure of standardisation.

Forms of Sharing

The forms in which gains of productivity can be shared by the different

sectors of the economy are a matter of controversy, and in any case each situation will need its solution. The forms in which these gains can express themselves have been tabulated on several occasions in NPC booklets, and can be skipped over here. However, some comments may be made in the form of general principles for developing countries like India.

- (i) While in the affluent societies of the West, there is a case for lesser working hours as an incentive to increased productivity, the stress in developing countries like India should be on direct benefits like increased wages. Affluent societies suffer from over-production; hence productivity should mean lesser hours to produce the same output. Poor societies suffer from shortages of production; hence productivity should mean the same number of hours to produce more output.
- (ii) While wages undoubtedly should constitute the most important form of sharing, in preference to other cash-payment schemes like pension funds, the promise of employment for one's sons or near relatives of the succeeding generation should be accepted as a rational demand in the long-term sharing of the gains of productivity. In a country where employment opportunities are so limited, most workers would gladly accept some restraint in their share if promised employment for their progeny. It would also make the workers have an emotional interest in the prosperity of their concern. Promise of employment must not, however, mean guarantee, but it must mean preference in the weightages used for selection. Programmes of training apprentices could profitably take this point into consideration.
- (iii) While industry as the dynamic element in a developing economy must carry higher rewards to attract talent and stimulate hard work, "it is senseless to restrict our

efforts solely to industry, and even more so to export industries. There is no use in promoting efficiency in the factory if the worker has to foot the bill for inefficiency in agriculture, housing, transport, distribution, social and government services etc."

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2. The Chairman and the Executive Director of the National Productivity Council have rightly and repeatedly stressed that "productivity-maximisation" is a goal that should also be applied to the field of "administration". This advice is particularly welcome in view of the ever-mounting civil expenditures in our economy.
3. Vide: Estimates Committee's Fifty-second Report, 1963-64, on **Personnel Policies of Public Undertakings**: "In this context, the Committee have been informed that in the U.S.A. a one-million-ton steel plant would employ about 6,000 men as against about 19,000 at the Rourkela Plant. They have also been informed that an automatic fertiliser plant would normally employ about 900 or 1,000 men as against about 9,000 employed at Sindri. The representative of the Ministry of Finance has stated during evidence that overmanning was mostly in the category of unskilled labour, and the tendency of employing helpers for every job was responsible for it."
4. To say all this is no way to belittle the tremendous potentialities of maximising productivity in agriculture, which, alas, have failed to receive adequate recognition in both modern economic theory and planning. Even for the U.S.A., whose industrial productivity provides the inspiration to many countries (and to countless productivity-team tours.), the

following remarks of Paul A. Samuelson should be significant: "Though many make the mistake of thinking of farming as a backward business, statistical records show that productivity in American agriculture has increased at a pace even faster than in industrial producti-

vity (in recent years)"—**Economics**, p. 489.

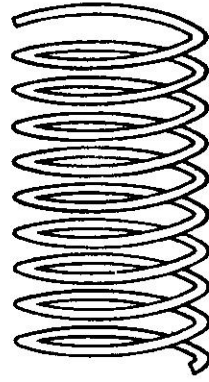
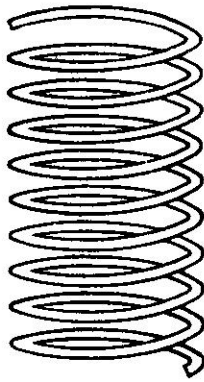
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UK's Automatic Electronic Guidance Road System

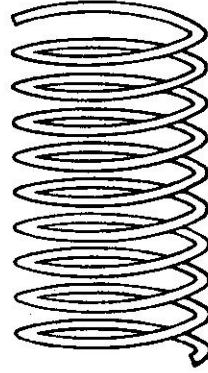
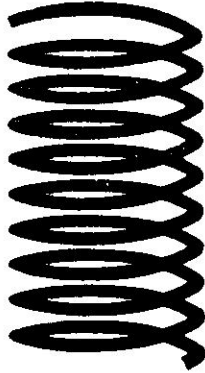
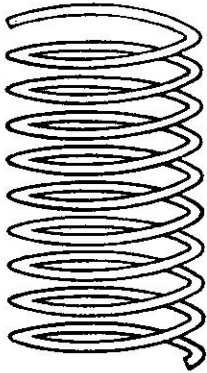
Britain's road and traffic experts are looking to the day when the country's millions of motor vehicles will be "tied" to an automatic electronic guidance road system.

Of the five methods open to adoption, the most attractive, according to a report by the Road Research Laboratory, seems to be a buried cable carrying an electric current. The cable is unaffected by weather, requires only relatively simple equipment in the vehicle, and can be buried far enough below the road to be unaffected by resurfacing.

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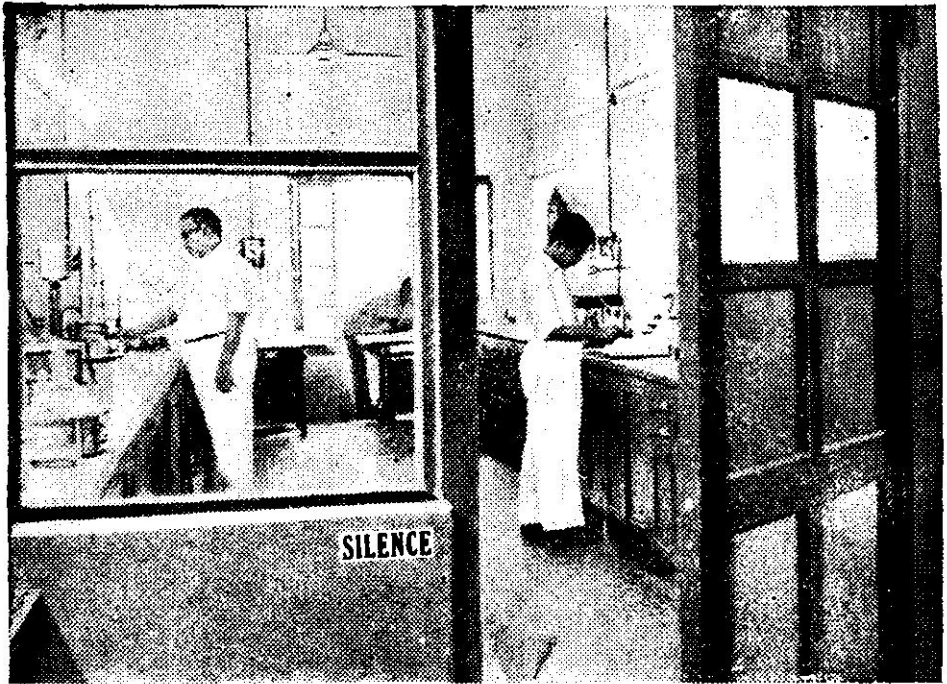


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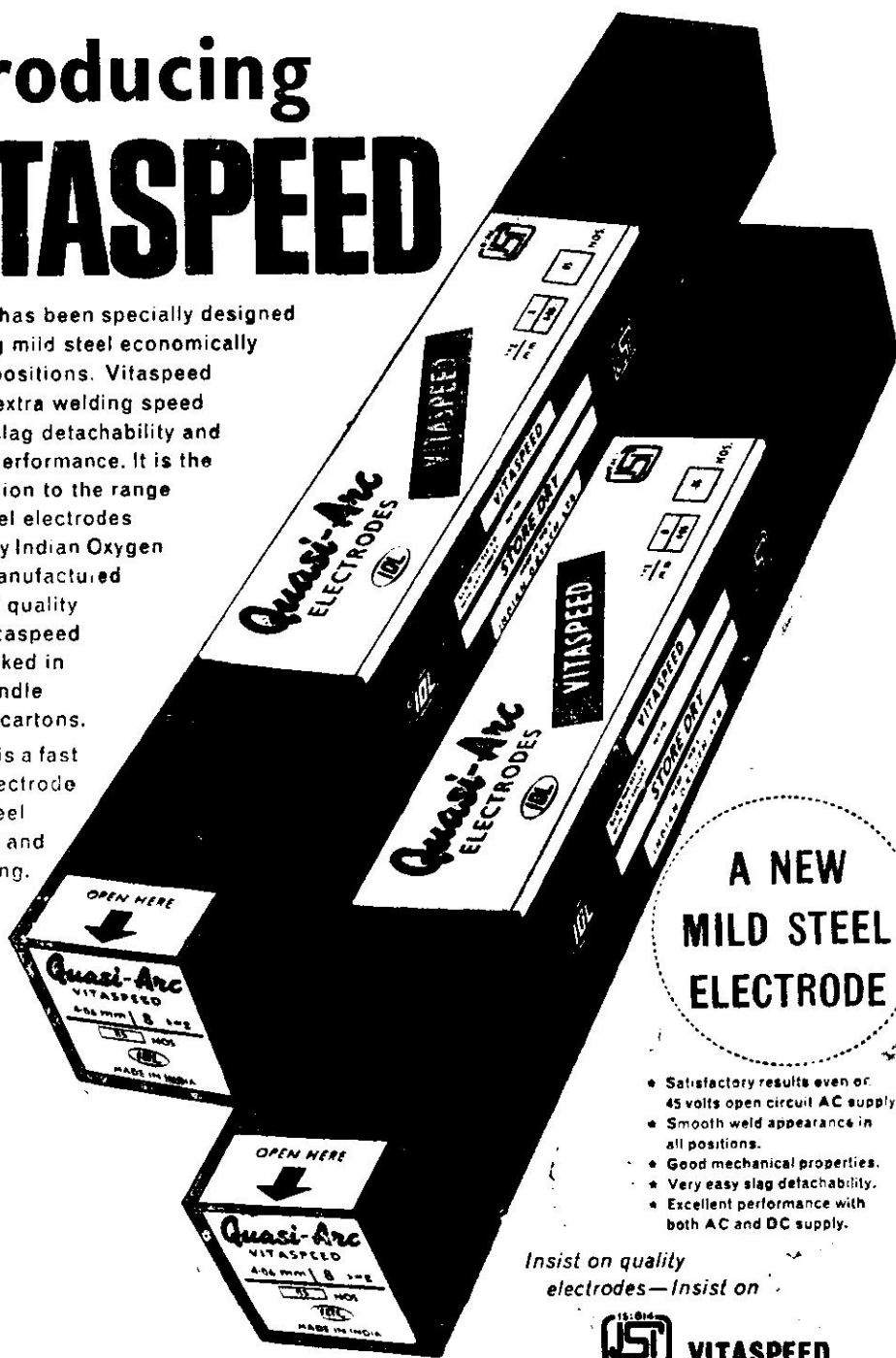
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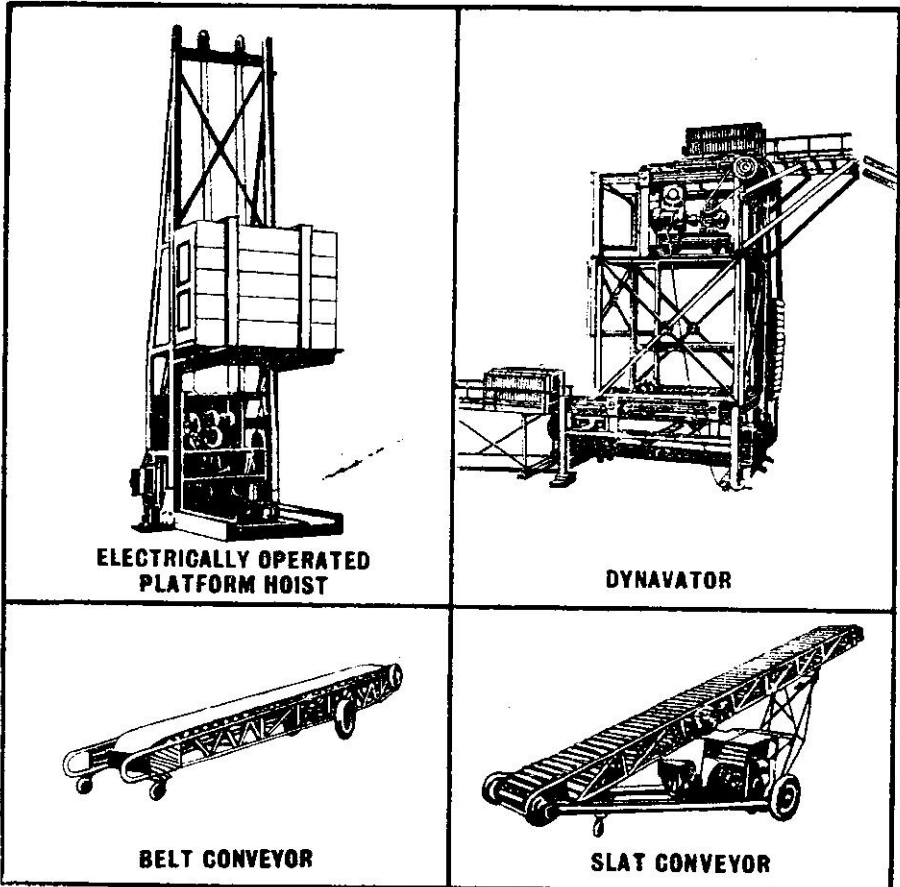
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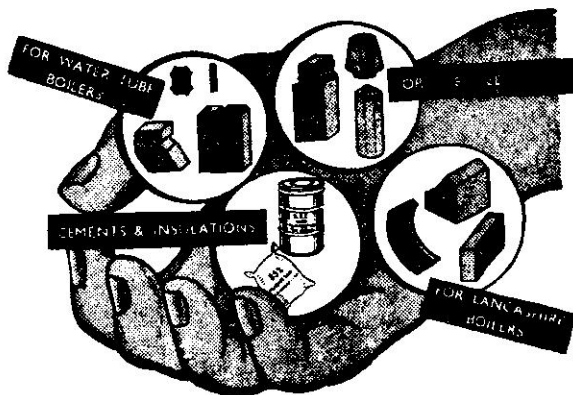
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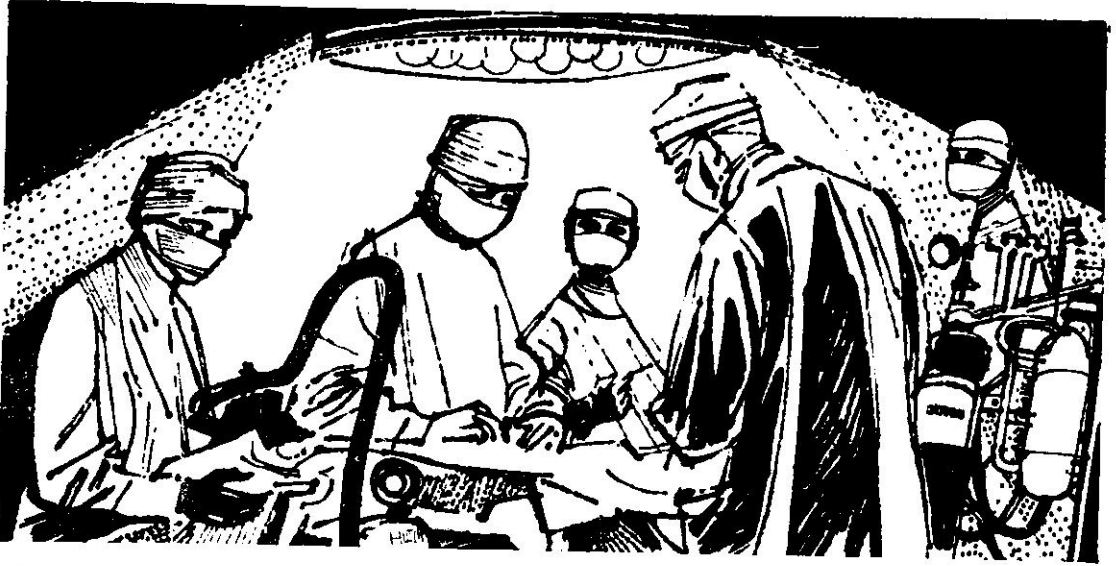
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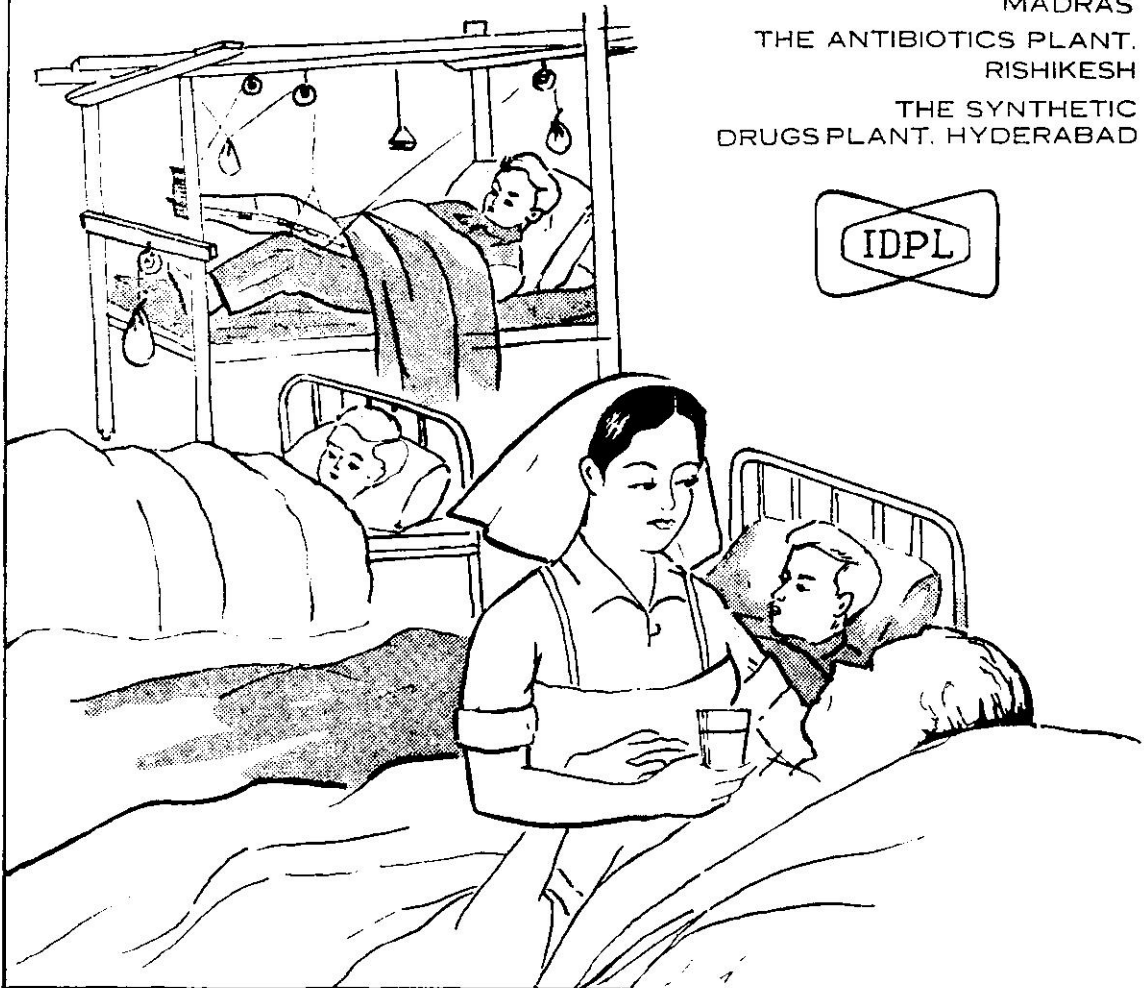
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MANMOHAN SINGH

Defence Institute of Work Study

Motivation in Work Situation

THE AIM of this article is to discuss the various motivating factors involved in a Work Situation. Motivation is, simply, "will to work, and work better". This subject is of vital concern to both the Management and the Work Study Practitioners. It is chiefly through proper motivation that the gap between the workers' performance and their capabilities is bridged towards enhanced productivity. An attempt has been made here to bring to focus that monetary reward alone, though it is quite important by itself, cannot stimulate people to action. Several other human factors are equally important, if not more.

Dr. RF Tredgold, an eminent Industrial Psychologist of England, highlights the problems of motivation thus:

"If workers would work right up to the hooter instead of stopping a quarter of an hour early to wash or to get their coats ready, or just to stop, there would be an increase of 3% a day. But somehow they would not. Why should they?"

"If only workers would not stay away with vague pains in the back, when really there is nothing to worry about, we should put up our production by 5%. But somehow they do stay away. Why shouldn't they?"

The dictionary explains the word 'motive' as something within the individual that incites him to action. Psychologists, however, describe motive as 'a state of tension that can be relieved by some incentives', e.g., hunger is the motive that can be relieved by eating food. Since the days of Adam and Eve, man has been toiling hard to satisfy his basic needs. Thus the problem of motivation is that of identifying these needs of individuals involved in a work situation.

Old Concept

Since time immemorial money or wage has been considered the chief motivating

force. The idea of wage incentive is said to have originated in the Biblical times. The piece-work system of payment was in vogue even in the 13th century, although the first attempt to relate wages to some pre-determined standards was made much later by Winslow Taylor. Even as late as the first quarter of this century money was thought of as the only motivation for work. This idea, probably, took birth with the basic psychological principles of human behaviour: effort begets reward, and reward incites effort. 'Reward' connoted only money. The term 'job satisfaction' was either not known or least understood. As a matter of fact evidence shows that 'job satisfaction' and wage were considered synonymous.

In early stages of the neotechnic era of industrial development, when the Industrial Revolution started in Europe, the management were more concerned with output than anything else. Almost all the work in the field of Industrial Engineering was done towards this aim. Much was stored by the following principles for getting better output and efficiency:

- (a) Selection of the physically best man for the job.
- (b) Determination of the least time-consuming and most economical ways of doing work.
- (c) Incentives in the form of higher wages.

The old concept of motivation was based on the following generalisations:

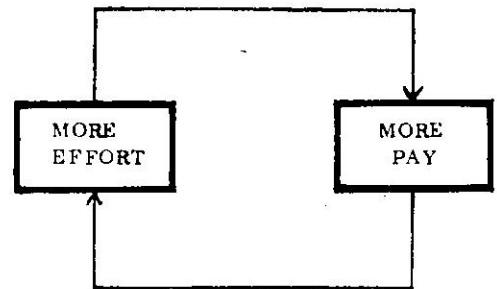
- (a) Man is naturally lazy.
- (b) To him work is distasteful.
- (c) He is solely motivated by higher wage or the fear of punishment and starvation.

The belief was that given the best implements, rigorous instructions and higher wages, physically fit persons would 'go all out' at their work, resulting

in much increased productivity of the plant. Thus the Industrial Psychologists were most concerned with the problems of fatigue, conditions that would reduce fatigue and vocational guidance. This attitude, as discussed earlier, influenced most of the work carried out in the field of Industrial Engineering and Industrial Psychology for quite some time.

One-cause Behaviour Approach

Various erroneously accepted hypotheses, as mentioned in the preceding paragraphs, brought about the notion of 'economic man'. Man was said to work towards only one end—more money. Thus the answer to motivational problem was sought in the one-cause behaviour theory—more pay, more effort. It is a matter of common knowledge that rewarding of a correct behaviour always reinforces that behaviour. Hence, effort was simply a function of wage, as illustrated by the following reinforcement behaviour cycle. Any increase in wage as a result of more effort stimulates still greater effort.



This theory, evidently, is an over-simplification. It virtually implies that a man is merely a slot machine—put in more money and he gives out more work. Of course money is an important factor. But every human being cannot be considered to work for money all the time. Were it true, we would have had no social workers, no Mahatma Gandhi or Pandit Nehru at all. Every

man is an individual, an embodiment of his own sentiments, ideas and values. He is a gregarious being. Unlike machines, he can think for himself, and likes to accept responsibility.

Motivating Factors

It is not so much the attraction of more money, nor the fear of denial of it that provokes in us the desire to work and work better. The desire to succeed in our task, sense of accomplishing something, pride in our work and regard to our fellow beings, winning the respect of colleagues, superiors, subordinates and relatives are overwhelmingly important to us. In the modern democratic set-up (not in any political sense), any Government worth its name is obliged to secure employment to its people and guarantee them their wages. In more advanced countries, like the United States of America and Great Britain, the opportunities for employment are galore. The fear of losing a job or starvation is hardly a problem. Sometimes, as in the U.S.A., those who are unemployed have more to feed themselves than others. The Government gives an allowance to those without job. Even such people continue to seek work. The human nature is complex. So is the problem of motivation.

Elton Mayo, in his famous investigation at the Hawthorne plant, has proved how fallacious this theory is. It is not the wages alone, nor the working conditions that influence the workers to give their best. It is much more than that. Factors like self-esteem, sense of belonging and security at job cannot be ignored as major motivating factors. In a recent research in the U.S.A., a number of workers were interviewed and asked what they wanted most in their job. The findings were revealing. Security, recognition and interest were given the top priority. Wage-rank appeared among the lowest in the list.

However, this theory, inadequate as it is, has provided serious thought on the following aspect of monetary incentives:

- (a) Individual incentive is more effective than group incentive. The monistic theory should confirm that individual incentive is better because the individual effort is proportional to his own pay packet and vice versa. In the group incentive system an individual may not get the financial reward in proportion to his own effort. In this system the total group efforts determine the reward. But still there are a number of instances available where group incentives have been equally successful. As a matter of fact, investigations have shown that output is more a form of social behaviour than the result of pure monetary incentive. Morale and motivation of the group play a great part.
- (b) For an incentive to be effective, payment must be made promptly. Thus it is a matter of dispute whether weekly or monthly payment of bonus is better than the yearly payment.
- (c) The greater the reward for the increased effort the greater will be the stimulus. Thus opinion is divided whether Taylor's differential piece-rate system, which pays higher piece-rate for total output to workers exceeding the standard output is a more effective incentive or the straight piece-rate system; whether straight piece-rate will be better than a 50% bonus system, which shares any savings in wage cost between the workers and management; or whether 50% bonus will be superior to straight hourly pay and so on.

All the above referred financial incentives have been tried at different places. The same system that has proved a great success in one place, has been an appalling failure in another. This is because of the fact that the problem of

**. . . Motivation is a vital
function of any management.

It is not sufficient that a
work situation should
provide to the individual a
way of making a living, but
it is also essential that a
work situation should provide
a satisfying social way
of life as well . . .**

motivation is not that straightforward as a simple one-cause theory like this makes.

Multi-Cause Behaviour Approach

A more complete theory of motivation recognises that individuals work to fulfil a variety of needs, not one kind. These needs can be classified as under:

- (a) **Physiological needs:** food, clothing, shelter, instinct of propagation and so on, which are common to all human beings.
- (b) **Social needs:** desire to belong to a group and the desire to attain a satisfactory position in the status ladder. One such need is that for self-esteem.
- (c) **Ego needs:** the desire to look for such opportunities that would permit an individual to have respect for himself. We all crave for approval of our contemporaries and for recognition of our attainments. The second one is that for self-fulfilment, the desire to find an occupation that will point one to apply his skills and allow him to realise his potentials. An individual who does not believe in what he is doing will lose interest in his task.

As it has already been discussed, it will be a catastrophe to assume that all human beings are alike in motivation. This pluralistic approach to motivation can at best act as a guide. Those who are close to starvation are more concerned with their sustenance needs. Probably, monetary reward is more important to them. A study has revealed that to people of income group below Rs. 400 p.m. financial incentives are more meaningful and with those who draw more than Rs. 2,000 a month these do not cut any ice. The relative importance of these needs differs from individual to individual. The motivation of the higher income group lies in the satisfaction of several other social and ego needs. Such differences in individual needs have to be discovered and clearly understood.

One should not be carried away by the idea that the pluralistic approach has no place for monetary incentives. Monetary rewards help us to meet our subsistence needs. Also money is sometimes a symbol of status and it can help to fulfil several other needs. We can live on much lower pay, though we will not be able to clothe, house and transport ourselves the way we like to do; we will not be able to impress others. Sometimes show-off seems necessary to avoid others' disapproval. Even subsistence is a relative term. The subsistence needs of an American are quite different from those of an Indian. Also, what we consider today essential for our existence, our ancestors could not have even thought of. Perhaps some of today's essentials were their luxuries.

Aspiration Concept

The pluralistic theory of motivation as discussed above has been explained by James March and Herbert Simon in the form of the Model on page 46. The only difference is that they have stressed a psychological concept, 'Level of Aspiration'. Aspiration is the individual's continuous desire, no matter in what field he is engaged, to tower higher than where he is and the longing for higher things of life.

The salient features of this model are:

- (a) If individual's satisfaction of his needs is low, he will search more for alternative ways or better ways of doing things.
- (b) The greater the search, the greater the expected reward. The more one searches for better ways, the higher goes one's expectation of achieving greater rewards.
- (c) The greater the reward, the greater the satisfaction.
- (d) The greater the expected reward, the higher the level of aspiration.
- (e) The higher the level of aspiration, the lower the satisfaction.

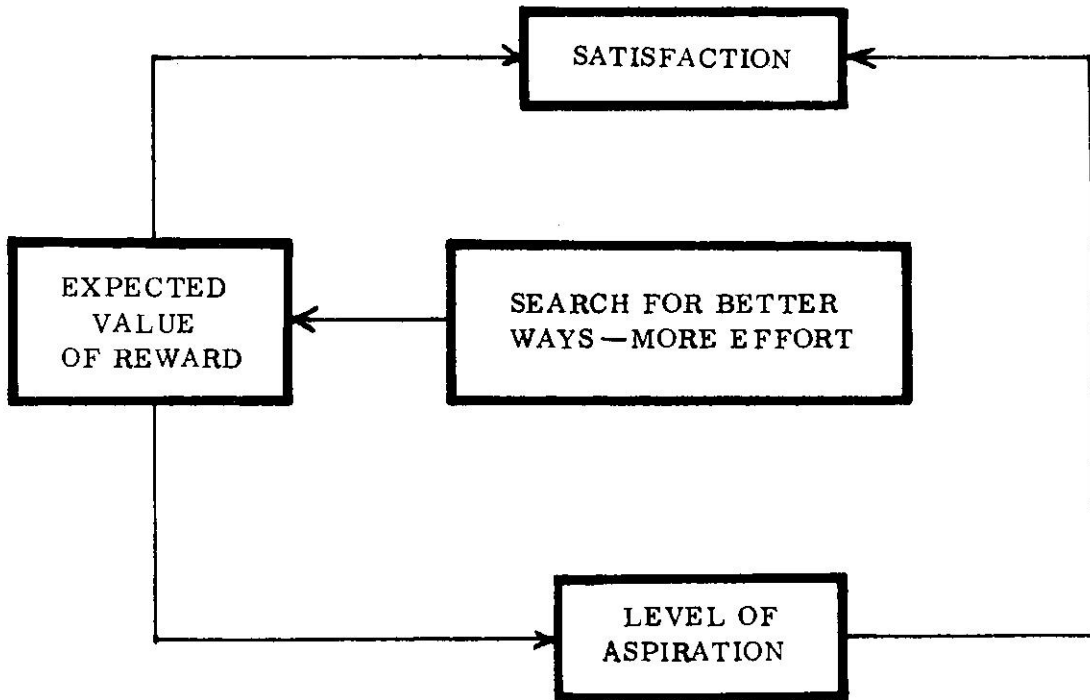
It can be seen from the Model that the higher reward leads to more satisfaction and at the same time it may increase the level of aspiration. The resultant effect of these two depends on their respective rates of increase. If these two rise at about the same rate, the individual will continue to be motivated by his mild dissatisfaction. If the value of expected reward rises at a faster rate, complacency may set in and the individual's search activity declines. If, on the other hand, the level of aspiration shoots up beyond the possible reach of the individual, frustration and neurotic behaviour may result. According to March and Simon's analysis, higher satisfaction does not necessarily stimulate productivity. "Motivation to produce stems from a present or anticipated state of discontent and perception of direct connection between the individual's production and a new state of satisfaction". The individual certainly expects higher satisfaction from the reward of greater effort. This expectation may lead to dissatisfaction with the present wage level and may, therefore, stimulate effort. Whether actual increased satisfaction is achieved or not depends on what happens to the level of aspiration.

Thus, ideally speaking, a good situation for productivity should have the following essentials in order that the employees are neither frustrated nor complacent:

- (a) The employees have enough confidence in the management.
- (b) The employees are slightly discontent with their present lot, monetary or otherwise, so that they keep seeking ways of improving their lot.
- (c) And the ways of improving their own lot should be possible through their own efforts within that organisation.

Motivation and Management

Management has been defined as the



organisation and control of human activities directed towards specific ends. Therefore, organising essentially means creating such a set-up as will ensure attainments of set goals. In organising, the stress is on providing the individuals with such facilities as would help them make full use of their talents, skills and potentials. By organising, it is ensured that each individual is permitted to grow with others. Proper relationship among the personnel and their relative positions are determined. Motivation, on the other hand, concentrates on the attitudes and efforts of each individual separately. The effectiveness and eventual success of an organisation depends on the correct integration of both these factors. Organising and Motivation are very closely inter-linked. Thus the function of organising would ensure properly created structure

where an individual's relative position is conducive to his discovering and making full use of his potential skill and talents.

Shorn of all the embellishment of technical clichés and jargons, motivation is generally thought of in two ways. It is said that managers either motivate their employees or they fail to do so. Motivation implies how superiors influence their subordinates. Motivation can thus be considered as an attitude of mind that helps develop a desire to turn in satisfactory performance on the job. Thus motivation is a vital function of any management. It is not sufficient that a work situation should provide to the individual a way of making a living, but it is also essential that a work situation should provide a satisfying social way of life as well.

Motivation and Work Study

No amount of Work Study will improve productivity if the 'human factor' is not taken into account. Motivation takes care of the human factor. A Work Study practitioner has to understand clearly the various motivating factors

involved in a work situation under study. Currie says that "Work Study problems are 10% technical and 90% psychological."

In all Work Study analysis human beings are given a special treatment. In fact, the technique of Critical Examination lays a great emphasis on personal likes and dislikes, attitude and morale of the people involved. No Work Study recommendation can be of value unless these take care of the aspect of motivation. For this reason alone the whole technique of critical examination, the very crux of any Work Study analysis, is based on the principles of Ergonomics and Human Engineering.

**. . . A motivating force
to one may have no value to
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strong motivation in one
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environment, may fail
altogether to stimulate any
effort somewhere else.**

**What motivates managers to
hard work need not
necessarily spark a worker's will
to work the same way . . .**

The motivational aspect is of very great concern to a Work Study practitioner. The entire basis of Work Study is that a qualified worker will work at a satisfactory rate of performance only if he is adequately motivated. Without this human factor of proper motivation, hoping for satisfactory output will be a fallacy. Therefore, no Work Study recommendation can be implemented if it interferes with the basic needs, both physiological and psychological, of the individuals at work. A Work Study practitioner has to make sure that the alternatives evolved by him do not interfere with the motivational structure of the people at work; the status symbol of the people is not changed. If there is a problem of regrouping or restaffing, the Work Study practitioner should bear in mind that his study does not render anyone redundant, or out of the job in which the individuals have developed pride of their skill. Particular attention should be paid to the sense of belonging and regard for fellow human beings. People who have worked with a particular group for some time develop natural affiliation and attachment to that group.

Conclusion

The above discussion was aimed at highlighting that motivation, the will to

work and continue to work better, can neither be created nor sustained through only monetary rewards. However, money will continue to enjoy a special status in the field of motivation, for it makes possible fulfilment of several social and ego needs apart from the need of subsistence. The desire to be related to other fellow beings, the desire for self-esteem and self-fulfilment, the desire to have a position in the status hierarchy of the society one belongs to, regard for others, security and pride in one's job are as important as monetary rewards, if not more. The motives, however, differ both in intensity and character from individual to individual. Also, these motives change, even for the same person with age and changed environments. Thus, with the rapid growth and advances in modern technology and science, the basic human needs have assumed far larger dimensions than merely that of food, clothes and shelter. The motives that might have

been once important may now be no motives at all. A motivating force to one may have no value to the other. And what is a strong motivation in one region under certain environment, may fail altogether to stimulate any effort somewhere else. What motivates managers to hard work need not necessarily spark a worker's will to work the same way.

The problem of motivation thus really lies in the recognition of the needs of individuals and their aspirations. We should not try to treat human beings as machine mechanism. A work situation should provide to the individuals at work with:

- (a) a way of making a living;
- (b) a satisfying social way of life.

Both a good management and a qualified Work Study practitioner can help create such conditions.

FUEL EFFICIENCY

Whatever the circumstances, it is a gross fallacy that any country can afford to waste fuel. Truth lies in the fact that the economic loss through wasting fuel or energy is greatly in excess of the cost of the wasted commodity. India has only limited fuel resources, but how to avoid waste and conserve fuel is a problem facing many industries. The Special Issue of **Productivity** on "Fuel Efficiency" contains useful articles by Indian and foreign experts on the subject. Copies can be had, at Rupees Three per copy, from

National Productivity Council

38 Golf Links, New Delhi-3

1966 has been designated as India Productivity Year in order to take the campaign for higher productivity from the stage of intention to one of implementation in all the major spheres of endeavour. At a time when the nation is facing shortages all round, especially of foreign exchange and raw materials, a productivity drive in all economic activities has become extremely meaningful.

Focus on India

Productivity

Year

IPY

INDIA PRODUCTIVITY YEAR
INDIA PRODUCTIVITY YEAR
INDIA PRODUCTIVITY YEAR
INDIA PRODUCTIVITY YEAR
INDIA PRODUCTIVITY YEAR
INDIA PRODUCTIVITY YEAR



Scenes of enthusiasm were witnessed at the launching of IPY-1966 at national and State levels. At the inaugural function organised by the National Productivity Council at Vigyan Bhavan, New Delhi, on New Year Eve, Mr TN Singh, the then Union Minister of Industry and President of NPC (ABOVE) declared that the path of self-reliance was not strewn with flowers, and that "self-reliance means *tapasya* by millions". In the INSET, he is seen discussing an important point with Mr D Sanjiviah who has recently taken charge of the Industry portfolio in the Union Cabinet. Top dignitaries from Government, industry, and labour (BELOW) attended the inaugural function.





In the various Indian States, Governors and Chief Ministers exhorted every citizen to participate in the productivity movement, and all sections of labour and management pledged to pitch in to make IPY an outstanding success. On this page are, from TOP TO BOTTOM, Dr PV Cheria, Governor of Maharashtra, delivering the inaugural speech at the launching of IPY in Bombay; Mr VP Naik, Chief Minister of Maharashtra, reading his presidential speech; and Mr HG Guttal, Officer on Special Duty (IPY), fixing an IPY lapel pin on the coat of Mr Naik.

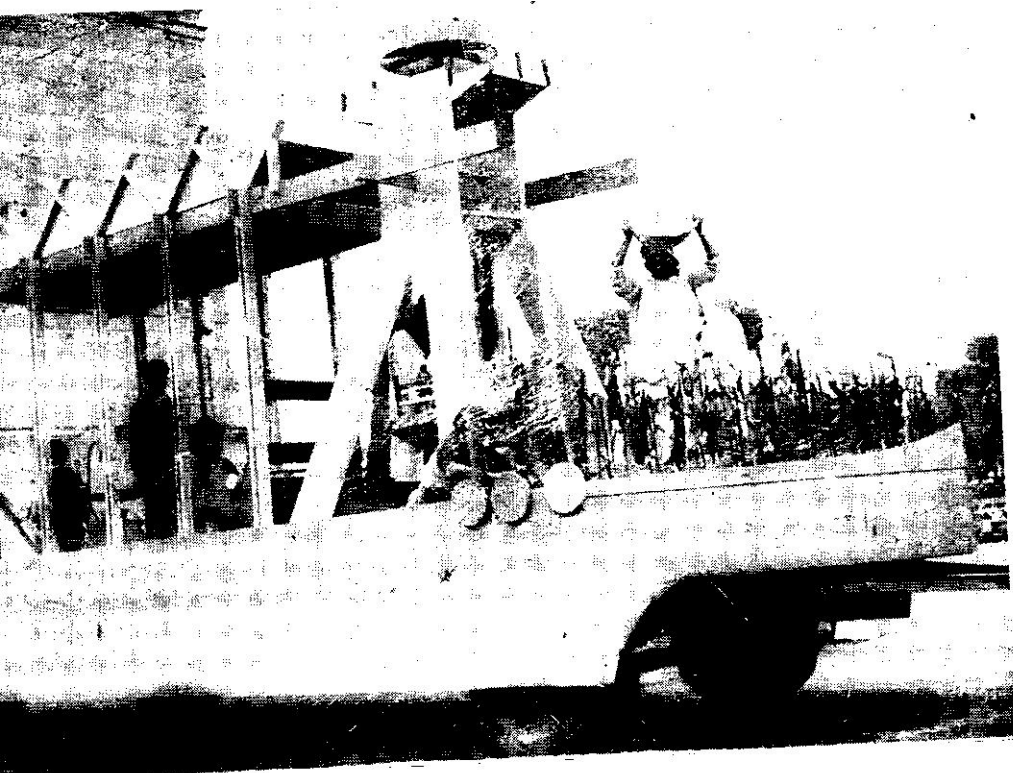
**Focus on
India
Productivity
Year
(Continued)**



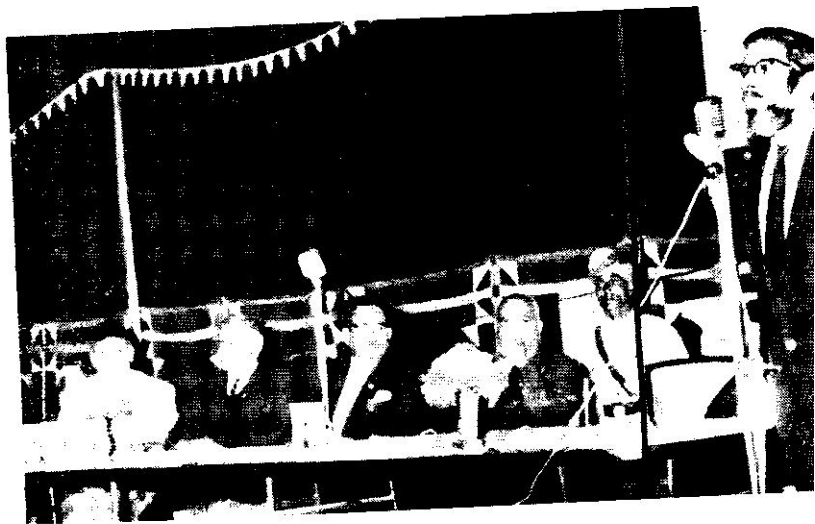


"To improve the country's productivity, managers must manage better...", said Mr HKS Lindsay, President, Associated Chamber of Commerce and Industry (ABOVE), when he inaugurated IPY at Calcutta on Jan. 7. LEFT, The Governor of Rajasthan, Dr Sampurnanand, and BELOW, Bihar's Governor, Mr M Ananthasayanam Ayyangar, inaugurated the celebrations at Jaipur and Patna respectively. Seated (PHOTO LEFT) are Mr Mohan Lal Sukhadia, Chief Minister, and Mr SK Rungta, President of the Rajasthan Productivity Council; and (PHOTO BELOW) Mr KB Sahay, Chief Minister, and Mr SN Sinha, Agriculture and Education Minister.





IPY Tableau (top).
 formed a part of the
 blic Day Parade at
 Delhi, was a joint
 ure of the National
 uctivity Council and
 Delhi Productivity
 ocil. The float, in the
 e of a ship, highligh-
 the importance of pro-
 vity in the major
 res of endeavour—
 culture, research and
 elopment, industry,
 exports. RIGHT: Dr
 rat Ram, Chairman,
 Finance Committee,
 nking at a function
 nised at Najafgarh In-
 trial Estate on Jan. 31.
 ow, a view of indus-
 lists and workers who
 attended.



ore Pictures Overleaf)



productivity exhibitions, one of the media through which the message of productivity can be spread, were organised throughout the country, and these drew large numbers of people. TOP, Sri Shivamuraraswamigalu evincing interest in one of the exhibits at an exhibition organised at Hassan by the Malnad Productivity Council; RIGHT, Dr Channa Reddi, Andhra Finance Minister, at the productivity exhibition organised as part of an all-India exhibition held at Hyderabad on Jan. 22; and BELOW, a batch of students studying some of the exhibits at an exhibition in Tiruchi.



IPY is not just a fanfare. NPC has chalked out a programme at national and regional levels, and the seminars, symposia and training programmes designed by it deal with the practical problems facing industry and agriculture. **RIGHT**, Mr Manubhai Shah, Union Minister of Commerce, speaking at a symposium on productivity organised by the Employers' Association of Jaipur, and **BELOW**, a view of the audience which attended it. The two photos at bottom show **(LEFT)** Mr KP Damodara Menon, former Industries Minister of Kerala, speaking at a seminar held at Ernakulam on productivity and economic survival, and **(RIGHT)** Mr HA Jhangiani, Director of Programmes, NPC, addressing the participants at the special Work Study Course organised by NPC for officers of the Indian Airlines Corporation.

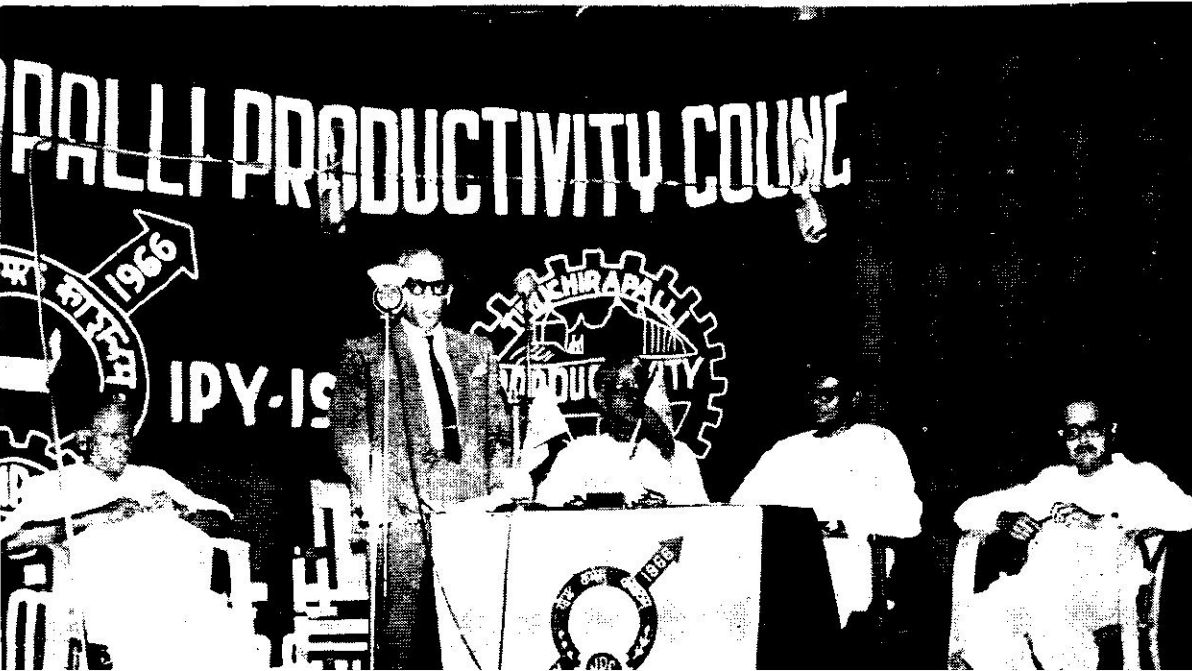
(More Pictures Overleaf)





The response to the call of the IPY has been heartening. Through the magic influence of productivity, which has transformed the world's developed economies, India may by the end of 1966 turn round the corner in the march to the summits of economic development. TOP LEFT

Mr K Sreenivasan, Director, South India Textile Research Association, pleading for a high level of production at a function organised by the Coimbatore Productivity Council; and, RIGHT, Mr K Brahmananda Reddi, Chief Minister of Andhra, making a plea in the same strain at the IPY function at Hyderabad on Feb. 28. CENTRE, Dr M Yoga, Regional Director of NPC at Bangalore, inaugurating the IPY at Mangalore, and BOTTOM, Mr RS Kanitkar, President, Tiruchirapalli Productivity Council, speaking at the inaugural function at Tiruchi on Jan. 27.



AVTAR HS GOSHAL

*Directorate of
Psychological Research*

Assessment of Creativity

ALL WOULD agree that progress and improvement are good, desirable, and beneficial to people. But there can be no progress without change; there can be no change without new ideas; there can be no new ideas without creative thinking. The value of creativity lies in the fact that progress and improvement are dependent on it. The creative or the inventive process is the process through which the mind produces new and useful ideas. It is our capacity to visualise, to foresee, and to generate ideas. The importance of new ideas to the success and advancement of an individual, an organisation or a society cannot be disputed.

Concept of Creativity

Creativity is the bringing into being of something new through the process of thought. This something new may assume different forms. It may be a painting, a poem or a musical composition. It may be a new scientific principle, a new mathematical theory, a new device, or a piece of equipment, a plan for a system, or an article for publication. In technical circles creativity goes beyond the process of logic or experiment, and requires that something new be added.

Creativity, the production of the novel and the unexpected, has long been one of the dimensions of human activity urgently in need of cogent and relevant exploration. The study of the creative or inventive process has largely been neglected since the times of the ancient Greeks, with the exception of some attention by Descartes, Leibnitz, and a few others. Heuristics, as this field of study was known to the Greeks, was well developed in their day, although unfortunately most of the important writings have been lost.

It is only in the last decade or so that social scientists and others have become interested in studying the creativeness of relatively large segments of

population. The early work of a decade ago was concerned chiefly with the creativeness of the artist, the poet and the writer, but the expansion of the scientific research activities since World War II resulted in a strong focus on the creativeness of the scientist. This research has proceeded on two levels. First, on the immediate level, there has been an interest in devising tests. Secondly, on a slightly farther level, there has been a tremendous concentration on the early identification of creative talent in the grade schools and high schools.

Development

The potential for creativity, for generation of new ideas, exists in each of us. However, many of us tend to become reluctant to express our ideas, because of self-criticism, criticism by others, and fear of criticism by others. Children are highly creative, but, tragically, their creativity vanishes some time between adolescence and maturity. So many inhibiting forces in their early environment of home and school act as dampers with respect to creativity. Decrements in creative thinking ability and creative production among American children are found to occur at about ages five, nine and twelve—all transitional periods in educational careers in American society. The few who escape the early restricting influences and the wilting of mental powers seem to continue to improve their creative abilities up to the onset of senility.

Is Creativity Inherited?

Heredity seems to have some influence on the likelihood that one would be creative. In a study of outstanding creative musicians, Scheinfeld found that two-thirds of the group had at least one parent with exceptional musical ability. In those cases where both parents were highly talented, two-thirds of the children were also gifted. When

neither parent was musically talented, only one-fourth of the children could be considered gifted. While environmental factors could account for some of the differences, Scheinfeld concluded that creative musical talent probably called for the presence of at least two dominant genes.

Although curiosity, an important factor in creativity, has long been recognized as a prominent human characteristic, the amount of firm scientific information concerning the nature and development of curiosity is actually rather small. Murphy (1947) defined curiosity as the "tendency to investigate any novelty perceived, tendency to seek information about anything." Murphy regards curiosity as instinctive in the broad sense that one inherits sense organs, a peripheral nervous system, and a brain. He sees curiosity as learned in the sense that the type of objects which stimulate the sense organs, peripheral nervous system, and brain, the type of pursuit of them, and the general tendency to persist in this quest, depend largely on the way the social order treats childish needs of this sort.

Age and Creativity

The most outstanding study dealing with problems of age and creative productivity is Lehman's (1953) pertaining to the age of peak achievement in a variety of fields. He used data concerning the number of contributions, expert ratings of the value of contributions, and such indicators as income and position of influence and leadership. He found that among chemists the greatest contributions had been made between 26 and 30 years of age; among mathematicians between 30 and 40; among musicians between 30 and 40; among authors under 45; among philosophers between 35 and 39 years of age. Movie actors reached their greatest popularity between 30 and 40. Civic and

political leaders tended to achieve eminence between 50 and 55.

In recent years, creativity has been exhibited at increasingly younger ages. Maximum production rate for output of highest quality usually occurs at an earlier age than the maximum rate for less distinguished contribution. The rate of good production does not change much in the middle years and the decline is gradual for the older years. Studies of inventors by Rossman (1963), also indicate that inventors begin their work at even younger ages than do individuals in other fields. Of 710 inventors, 61 per cent made their first inventions before the age of 25. The average age at the time of first invention

was 21.3 years. The most active period of patenting was between 25 and 29.

It has been pointed out by Lehman (1956) that it is not age itself but the factors that accompany age change that bring about a reduction in creative output. Some among the sixteen factors postulated to account for this decrement are: a decline in physical vigour, energy and resistance to fatigue occurring before the age of 40; sensory capacity and motor precision decline with age; glandular changes; marital difficulties; pre-occupation with the practical demands of life among older people; success, promotion, increased prestige and responsibility may lead to less favourable conditions for concentrated

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**... Conformity blocks
creativity, while freedom and
spontaneity foster its
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Individuality must be
encouraged, not stifled...**

work; having achieved those goals, those who desire prestige and recognition rather than the creation of something new, strive less for achievement; easily won and early fame may lead to contentment with what has been done before accomplishing what could be the most creative work; non-recognition and destructive criticism may lead to apathy of older workers; younger people may be better educated and may have lived in a more stimulating environment.

Creativity, Intelligence, & Originality

Thurstone (1951) emphasised that creative talent is not synonymous with academic intelligence. From the studies carried out by Getzels and Jackson (1959) it is increasingly clear that intellectual brightness of the conventional sort is

essential to creative behaviour up to a point roughly around an IQ of about 115. Beyond that point, conventionally understood intelligence and creativity are strikingly independent. Creativity connotes much more than the flash of genius—the lightning stroke—in which Newton discovers the law of gravity or Darwin conceives the theory of evolution. The flash of genius may be incredibly spectacular and beyond doubt it plays a large part in scientific advance. Creativity is related to ideational fluency, inductive reasoning, and certain perceptual tendencies. Non-intellectual and temperamental factors are known to contribute to creativity. For example, a receptive attitude as contrasted to a critical attitude towards ideas may encourage creativity. A relaxed, dispersed attention may be more helpful than active concentration on a problem.

Individuals who are highly creative and those who are highly intelligent seem to differ in their moral and personal values, the ways in which they employ their imaginative capacities, their career aspirations and their family backgrounds. Our understanding of the creative behaviour has been blocked by our success in developing indices of intelligence. Having found ways of assessing the functional capacities of individuals to solve problems according to **consensually validated standards**, we have tended to rely a bit too heavily on this psychometric triumph, neglecting the process by which we conceive problems in new terms and invent new solutions to old puzzles.

A distinction should be made between **Creativity** and **Originality**. Original thinking produces ideas which are new (at least to the individual concerned), even though they are not necessarily useful. The creative thinking differs from original thinking in that the ideas must be **useful** in addition to being **original**. Another major area of confusion in the concept of creativity is the tendency of many people to confuse craftsmanship with

creativity. The fact that a man is an artist does not necessarily mean that he is a creative artist. He may be just an excellent craftsman who follows traditional patterns and thus produces nothing original or creative. One of the distinguishing characteristics of a creative person is the ability to see the potential in a new idea or a new configuration once it is presented to him.

Correlates of Creativity

Donald Walker (1952), at the University of Chicago, devised tests for measuring five specific aptitudes which he felt might be essential to creative thinking, and applied these to large groups of chemists and mathematicians noted for their original contribution. The results were as follows:

Ability	Approximate Percentage with High Scores
Originality of Response	28
Sensitivity to Environment	22
Copious flow of Ideas	33
Flexibility of Approach	55
Ability to Concentrate	39

Basic capabilities found in the make up of a creative thinker have been studied and found to be:

- i) **Knowledge**—Certain threshold level of acquaintance with subject matter is practically essential for creative thought. Wisdom is the foundation of new ideas. Limited knowledge acts as a road block in creativity.

The remedy is simple. When Alexander Graham Bell told Joseph Henry that he did not have the knowledge needed to invent the telephone, Henry replied 'get it', and 'he got it'.

- ii) **Curiosity**—The insatiable hunger to know how and why is another cardinal requirement. This may well be the most valuable trait that a scientist can have.

- iii) **Memory**—Since creativity depends on the ability to bring together factors never before associated, the recollection of past observations and previous ideas may play a large part.

- iv) **Observation**—Also known as sensitivity to environment. A new uncertainty is apt to be more useful than an ancient verity.

- v) **Scepticism**—Must woo the unconventional. He must be an iconoclast, a breaker of ideas.

- vi) **Imagination**—Also known as copious flow of ideas or fluency.

- vii) **Enthusiasm**—Creative thinking is seldom a process of intellect alone. For maximum achievement, the mind has to be inspired by the driving power of the emotions.

- viii) **Dedication**—Implies persistence and the stubborn will to solve the problem despite maddening difficulties and frustrations.

- ix) **Intellectual Integrity**—Is the first quality of the scientific mind. Michael Faraday defined a creative thinker as 'a man willing to listen to every suggestion, but determined to judge for himself'. He should not be a respecter of persons, but of things. Truth should be his primary object.

- x) **Uncommon Capacity for Self-instruction.**

The foregoing capabilities are desirable rather than essential qualities, in creative individuals. Their presence in recognized creative individuals has been found to occur in widely varying degrees.

Measurement

Creativity is a newcomer in the field of testing, appearing on the scene of measurement almost half a century after work on the first tests of mental abilities was undertaken by Binet. Credit for the most outstanding and original

work in this field goes to Guilford. He and his associates, under the auspices of the Office of the Naval Research, undertook most extensive factorial investigation of creativity (Green, Guilford, Christenson and Comrey 1953, Guilford 1954, 1957 & 1959, Kettner, Guilford and Christenson 1956, Wilson and Guilford 1954). Four areas of thinking, i.e. reasoning, creativity, planning and evaluation were studied. Many new types of tests were developed and were administered to groups of students and military personnel. Several familiar factors appeared in the factorial analysis and many new factors were identified.

Factor analysis of batteries of tests measuring various aspects of creativity by several workers (Adkins 1952, Botzum 1951, Corter 1952, Guilford 1954, Marron 1953 and Matin 1954) revealed some

correspondences between factors isolated, although the agreement is far from complete. The factors found to be most closely associated with creativity were fluency, flexibility and originality. These factors come under the heading of "divergent thinking" which Guilford describes as "the kind that goes off in different directions." Such thinking leads to a diversity of answers by permitting changes of direction in problem solving. In contrast, "convergent thinking leads to a single right answer determined by the given facts." The tests heavily loaded with various divergent thinking factors are:

- 1) **Fluency Factor:** Word Fluency Test, Ideational Fluency Test, Associational Fluency Test, and Expressional Fluency.
- 2) **Flexibility Factor:** Hidden pictures, Hidden Figures and Match Problems,

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In all these tests, a good performance requires freedom from persistence of approaches, permitting a restructuring of the given stimuli.

- 3) **Originality:** Free Association Test, Consequences Test and Ingenuity Test.

Taking the lead from the studies of Guilford, a tremendous amount of work has been done at the University of Minnesota. Several tests have been developed (some adapted from Guilford's earlier tests) and detailed scoring systems have been evolved. Tests to measure creativity from Kindergarten to Graduate School have been used on a large scale. Studies undertaken by Donald McKinnon at the University of California and the Arts Education programme of the University of Pennsylvania are some of the other places from where contributions are anticipated on a major scale.

Tests

Non-verbal tests, verbal tasks using non-verbal stimuli and verbal tasks using verbal stimuli have been used to assess creativity. Creativity tests used in the Minnesota studies (Torrance, 1962) are given on pages 64 and 65.

Implications for Parents, Teachers and Society

The educational situation which most effectively promotes significant learning is one in which (a) threat to the self is at a minimum while at the same time the uniqueness of the individual is regarded as worthwhile and is deeply respected, and (b) the person is free to explore the materials and resources which are available to him in the light of his own interests and potentialities. We can make learning for another person possible by providing information, atmosphere, materials, resources and by being there.

Conformity blocks creativity, while freedom and spontaneity foster its growth. When the individual is free to be himself,

his acts are always consistent with his values. Every individual wants to grow towards self-fulfilment. These growth strivings are present at all time. Under threat, the self is less open to spontaneous expression: i.e., more passive and controlled. When free from threat the self is more open; that is, free to be and to strive for actualisation.

Individuality must be encouraged, not stifled. Only what is true and therefore of value to society can emerge from the expressions of one's true nature. All children may need love, safety, belongingness, acceptance and respect as basic conditions to their growth, and when these conditions are provided by the human environment, growth will occur naturally through the person's potential. Adults may offer resources, make available opportunities, and give information and help when it is meaningful to the child, but to force standards, social values, and concepts on the child is to stifle his creativity.

A recent study made on the students of many countries, including India, by Dr E Paul Torrance of the University of Minnesota, shows that the courteous pupil is more admired than the courageous one. The child who obeys rules, gets his work done on time, does and says the accepted things, and does not cause anybody trouble, is most popular both at home and at school. But will the boy who is always polite end up as the most creative member of the society? Hardly. Yet, it is found that the creative child is frequently voted the most troublesome. When asked to list their preferences, a sampling of teachers cited the "ideal" pupil as one who normally conforms. The creative child is too often troublesome and disliked by his teachers.

Creative Relationship

In guiding creative persons, teachers and parents need to develop creative

TYPE OF TESTS	TIME	DIMENSIONS SCORED
A. Non-Verbal Tests		
1. Incomplete Figures Task (Two forms)	10 minutes each form	Originality Elaboration (Complexity) Penetration (closure), and Productivity
2. Picture Construction	10 minutes	Originality Elaboration Sensitivity Communication, and Activity
3. Circles and Squares	10 minutes	Originality, and Elaboration
4. Creative Design	30 minutes	Scoring procedures under develop- ment
B. Verbal Tasks Using Non-Verbal Stimuli		
1. The Ask and Guess Test (Three parts)	5 minutes for each of the three parts	Fluency Adequacy, and Originality under development
2. Product Improvement Test	8 minutes	Fluency Flexibility Originality, and Inventiveness
3. Unusual Uses Task	5 minutes	Fluency Flexibility Inventiveness, and Originality
C. Verbal Tasks Using Verbal Stimuli		
1. Unusual Uses Task	5 minutes	Fluency Flexibility, and Originality
2. Impossibilities Task	5 minutes	Fluency Flexibility, and Originality

relationship with them. The creative relationship requires a willingness on their part to embark upon untravelled pathways. They must be willing to permit one thing to lead to another, be ready to get off the beaten track, or break out of the mould rather than look upon the individual in traditional ways and fail to relate to him as a real person.

As Moustakes (1959) explains, errors or mistakes in the creative relationship are irrelevant. It is a matter of being rather than one of acting and being acted upon. Educators have frequently been puzzled by the outstanding success of some rare teacher or counsellor who seems to violate almost every rule of good teaching or counselling. The errors don't matter. The pupils' creative problem-solving processes continue unimpeded because the relationship is an open, non-threatening and creative one.

In a creative relationship, emphasis is placed on experiencing genuine pleasure in the creative powers of the counsellee as opposed to "strategy of powerlessness", respecting

3. Just Suppose	5 minutes	Fluency Flexibility, and Originality
4. Situations Tasks	5 minutes	Fluency Flexibility, and Originality
5. Common Problems	5 minutes	Fluency Flexibility, and Originality
6. Improvement Tasks	5 minutes	Fluency Flexibility, and Originality
7. Mother-Hubbard Problem	5 minutes	Fluency Quality Responses- Penetration and Sensitivity, and Irrelevant and Fantasy Response
8. Cow Jumping Problem	5 minutes	Fluency Quality Responses- Penetration and Sensitivity, and Irrelevant and Fantasy Response
9. Imaginative stories	20 minutes	Organisation Sensitivity Originality Psychological Insight, and Richness

D. Tasks Under Development

1. Picture Titles	Originality, and Synthesis
2. Make-up Problems	Fluency and Flexibility
3. Filling-in-Gaps	Sensitivity to Problems
4. Creative Activities Check lists	

creative ways of learning; being a helpful guide; engendering genuine empathy rather than stimulating identification process; exploring the positive forces in personality rather than exploiting personality vulnerabilities; mutual searching for the truth; following the lead of the counselee rather than maintaining a single-ness of purpose; providing a friendly environment; making a stand for mutual understanding; and respecting the dignity and worth of the individual.

In the end I would like to sum up by saying that creativity is an important dimension which needs to be assessed fairly early in life so that the creative potential is not stifled due to faulty upbringing, but encouraged to develop in conditions, both at home and at school which are conducive to its fullest development. There is a need to develop instruments to assess creativity. A considerable amount of work in this direction is already under way at a few different research centres and universities in the U.S.A. However, not much has been done in this area in our own

country, but there is an increasing realisation of the necessity of exploring this so far unexplored area. It is realistic to anticipate some contributions in this area from our own psychologists in the near future.

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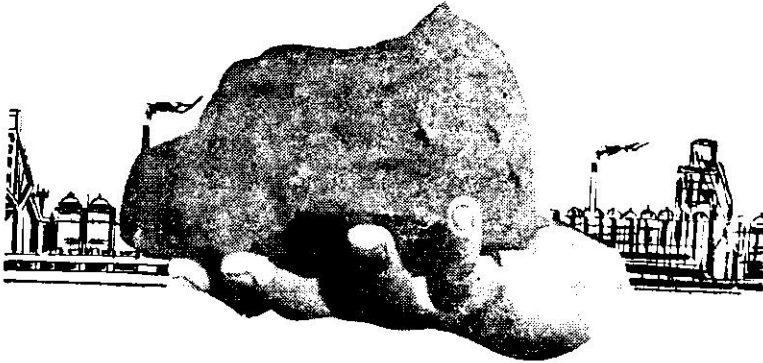
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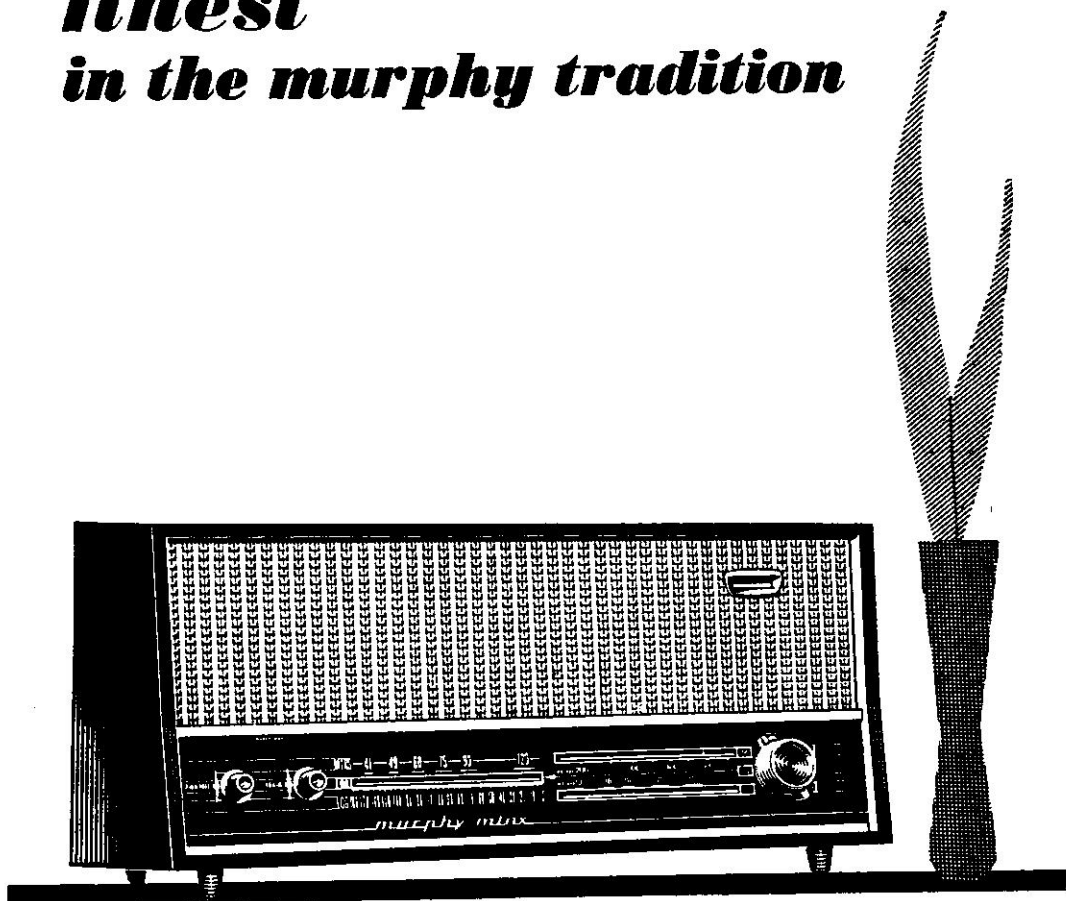
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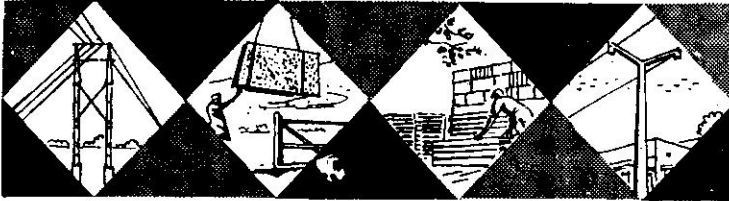


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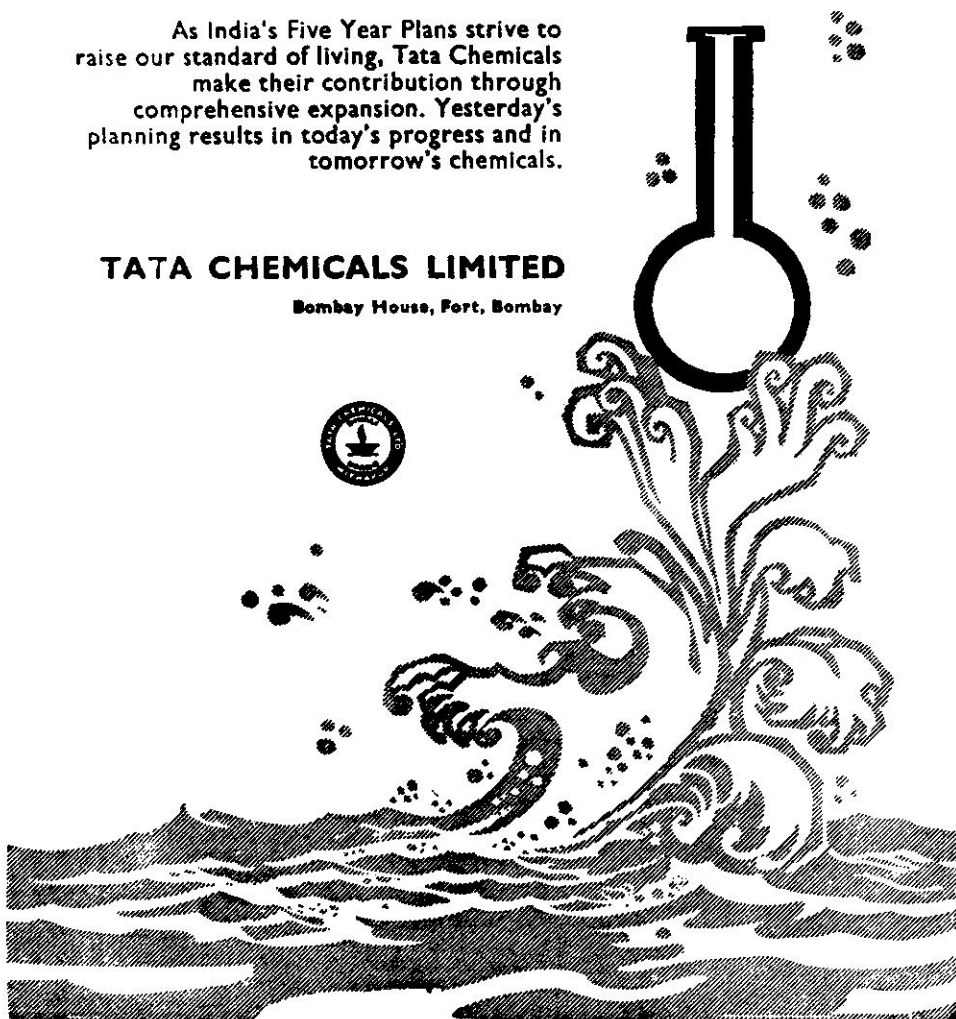
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