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PRODUCTIVITY

Recession and Productivity

FOR THE FIRST TIME IN THE HISTORY OF THE PRODUCTIVITY MOVEMENT—IN FACT FOR the first time since 1939, when the Second World War began—*both Industry and Government are in a productivity mood.* **Money on tap** being no longer available —thanks to the determined anti-inflationary policies of Government—Ministries and Men in Industry have to earn their bread; and productivity comes into its own, for no longer are its gains overwhelmed by the fortuitous gains of the market place. No longer can managements get off with *drinking to the health of Productivity :* they need it for survival; and NPC has now got the opportunity of its life time, thanks to the *Katharsis of Recession.*

And the Tragedy is truly Aristotelian, for we have got the equipment, but its effective utilisation varies from 50 to 70 per cent and is under serious decline in the Heavy Engineering sector, with its large multiplier possibilities in either direction.

In fact, the economy has been in reverse gear for quite some time. Apart from the catastrophic fall in agricultural output due to natural calamities, there has been a marked decline in recent years in the growth rate of industrial output. During 1961-63, industrial output increased by 8 to 9 per cent per year. The increase was only 5.36 per cent in 1964, 2.46 per cent in 1966 and 1.13 per cent during the first quarter of 1967. Commercial journals record an actual decline in industrial output in recent months ; however that may be, the fact is that for the first time since we embarked on the programme of Economic Development, the latest (seasonally adjusted) index of industrial output is actually 2½ per cent below the level of last year.

Naturally, the decline in industrial production has had its repercussions on the employment situation; and it is estimated that the current recession has led to the lay off in different industries to the tune of about 200,000 workers, which is roughly 4 per cent of the registered factory employment.[1]

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[1] Official statistics indicate a far greater worsening of the employment situation, for over the year the live register of the Employment Exchanges has recorded an increase of 1.3 million to a level of 2.63 million.

As the recession in wholesale prices[2] is of a much higher order—black market prices having for the most part disappeared, *the impact of the recession has been cushioned by mounting inventories, which thus become the first focal point of the application of Productivity Techniques.*

In fact, we now have Inventory Control in the Reverse Gear, for instead of maintaining inventories at the most economical levels through the mechanical application of the EOQ formula, industry, working under an enormous social obligation of at least maintaining the current levels of output, employment and wages, has been accumulating inventories against the background of falling orders.

While the paying capacity of industry has diminished and cost reduction has become, through dire economic necessity, instead of the form and fashion that it used to be, a matter of life and death for industry, it is working under strain on account of substantial increases in costs through the maintenance of large inventories : costs in terms of space, staff and capital locked up; *hence from a broad economic standpoint, it would be in the interests of industry to liquidate its inventories at prices corresponding to the cost of production minus the savings that would be effected as a result of the reduction in inventories.* The other alternative is to continue to incur the huge costs of abnormal inventories against no return whatever.

And this would serve a number of important objectives of social policy; for the goods that are now locked up in inventories would begin moving through the pipeline to their natural destination of ultimate consumption; and an equilibrium flow would once again be established, so essential to the basic health of the economy; the wheels of industry would start moving at the pre-recession speed, if not a little faster, leading to a fuller utilisation of men and machines.

Further, the unloading of these inventories would drain the price level of its inflationary content. Government and industry would be rid of the perpetual bugbear of a wage-price spiral. It is true that the illicit gains of the black market and the unconscionable gains of monopoly would diminish or disappear; but the gains of productivity would become prominent and practicable which will be an enormous social gain; and NPC would be in a position to prove its metal, for we have widely advertised for the last several years that our main function is to maximise the utilisation of the available resources of men and machines and thus help secure for the people of this country a better and higher standard of living.

Thus the Recession with its cutback in employment and in capacity utilisation should be to us, in the productivity movement, a blessing in disguise; for we have toasted productivity in seminar after seminar and conference after conference. Now industry is calling out frantically for cost reduction and the country is calling out for goods. And industry has the capacity to produce the goods. The men and the machines are there. Industry wants the productivity techniques and is now psychologically disposed to accept and to use those techniques which would enable them to get the best out of the men and machines. *The time is, therefore, opportune and propitious for putting productivity on to the moving car of the economy, for through a conjuncture of circumstances, we are at the 'stop' signal. When the 'GO' sign appears, we may have lost the bus.*

[2] The impact on retail (consumer) prices is not yet evident at the time of writing, except in soaps and oils; and there has also been a softening of the free market prices of cereals. It is, however, only a matter of time, unless some other crisis supervenes.

Basically, our economy is not in bad health. There has been even in foodgrains over the last 20 years atleast a 20 million tonne increase in the annual average level of output. Industrial output has increased by 150 per cent; and what is more important, whole new industries have come into being. And even as this is being written, the Heavy Engineering Corporation with full capacity to manufacture whole steel plants, is nearing completion, with 12000 workers trained, ready and waiting for orders! We have made an aggregate investment in industry alone of nearly Rs. 5000 crores, since we launched the First Five Year Plan. All this equipment is available with us and all that we have to do is to ensure its maximum utilisation and maintenance. Manufacturing industry itself has at constant (1961) prices nearly quadrupled 'the value added' during the last 15/16 years.

There is, in fact, no comparison in political and economic terms, in the situation as it now obtains as compared to the time when the British left us. For decades in the British period, it is significant that not only our foodgrains output but our steel production was static. We were hardly a machine manufacturing country and the electricity we generated lighted—comparatively speaking—a few homes (considering the magnitude of the population) and a few industries in the main metropolitan areas. Now we generate over 36 billion kwh of electricity as compared to 6 billion during the British period: and we are currently engaged on a massive rural electrification programme. We have 70 million children in schools as compared to 20 million when the British left us and the increase in technical education facilities is far greater.

The point then is that large industrial capacities having been established, alongside substantial technical education facilities, it is for the community to so organise itself that the people get the benefits of all these investments in machines and men.

The issues involved are vital, for the main handicap of the Indian people has been the abnormally low productivity potential of the economic organisation as we have inherited it from the British : a bit of large industry, a disabled handicraft sector and the large sink of agriculture. It was the uncanny insight of Mahatma Gandhi who perceived immediately that this type of economy was totally out of alignment with our peculiar resource-endowment; and *a productivity programme is nothing but a particularly dynamic type of resource-mobilisation, considering all the circumstances of the case, for maximum mass welfare.* In fact one of the major obstacles to the realisation of a massive increase in productivity in this country is the failure to think it out in terms of the basic facts of the Indian economy, the most important and intractable being a large population, nearly 450 million at the moment growing at the compound rate of nearly 2½ per cent per annum. As such, *a productive development of small industry is as it were written into the very facts of the Indian economy.*

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Very obviously, productivity now comes into its own, provided the makers of policy make it the central plank of their organisation and the practitioners of productivity bring to bear on the task, moral and intellectual resources commensurate with the enhanced possibilities of a bonafide productivity programme.

With an abundant harvest estimated at 90 million tonnes of foodgrains, which may well be improved upon through a large outturn of the Rabi (winter) crop on account of larger sub-soil water reserves due to heavy monsoon and floods, the economy may well now turn a corner; and if the resources of NPC are deployed with a missionary zeal, it may be possible to hitch our wagon to the star●

LORD KEYNES ON RECESSION AND UNEMPLOYMENT

"If the Ministry of Finance were to fill old bottles with currency notes, bury them at suitable depths in disused coalmines which are then filled up to the surface with town rubbish, and leave it to private enterprise on well-tried principles of *laissez-faire* to dig the notes up again (the right to do so being obtained, of course, by tendering for leases of the note-bearing territory), there need be no more unemployment and, with the help of the repercussions, the real income of the community, and its capital wealth also, would probably become a good deal greater than it actually is. It would, indeed, be more sensible to build houses and the like; but if there are political and practical difficulties in the way of this, the above would be better than nothing.

"Ancient Egypt was doubly fortunate, and doubtless owed to this its fabled wealth, in that it possessed two activities, namely, pyramid-building as well as the search for the precious metals, the fruits of which, since they could not serve the needs of man by being consumed, did not stale with abundance. The Middle Ages built cathedrals and sang dirges. Two pyramids, two masses for the dead, are twice as good as one; but not so two railways from Delhi to Calcutta. Thus we are so sensible, have schooled ourselves to so close a semblance of prudent financiers, taking careful thought before we add to the 'financial' burdens of posterity by building them houses to live in, that we have no such easy escape from the sufferings of unemployment.

"Pyramid-building, earthquakes, even wars may serve to increase wealth, if the education of our statesmen on the principles of the classical economics stands in the way of anything better..."

—*General Theory of Employment, Interest & Money*, 1960 Edition (Macmillan), pp 129-131.

Job Evaluation in Hindustan Steel[1]

PK Das & OP Khetan

The history of job evaluation in Hindustan Steel is a story of joint search by Management and Labour for industrial peace in the steel plants at Rourkela, Bhilai, Durgapur and Alloy Steels. It is the story of the application and progressive refinement of the job evaluation system with the use of advanced statistical techniques, to deal with human relations problems. It is also a story which shows how the electronic computer can be used effectively and quickly to solve complicated problems involving human relations.[2]

IN EVERY INDUSTRY AND EVERY UNDERTAKING, wage disputes are common. In India, a recent analysis indicated that wage disputes accounted for 33% of the total man-days lost. A very large percentage of wage disputes arise from preconceived notions about the comparative worth of one job in relation to another, e.g. in relation to Job 'A' which carries a wage 'W', Job 'B' is considered equal to/more difficult/less difficult and has therefore to have a wage equal to/higher than/less than "W". Wage problems in Hindustan Steel have been no exception to this general rule.

Job Evaluation is a systematic approach to determine the relative worth of a job with respect to other jobs. It is the evaluation of a JOB and not the MAN doing the job. Assignment of money values to the job is a subsequent process known as wage determination and may depend on the existing wage structure or a structure developed as a result of collective bargaining.

There are various systems of job evaluation viz., ranking, classification, factor comparison and point rating. The last named is most commonly used for industrial jobs. The point rating system measures the relative variations in the factors of skills, efforts, responsibilities and working conditions in each job by assigning a total point value to each factor and then determining the relative presence of each factor in the job by allocating a point value within the total points assigned to that factor. The points allocated to each factor are added together to arrive at the total point value for the job. Jobs are then ranked in the

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[1] This is a collaborative research piece on which the two authors worked at Hindustan Steel in its Manpower, Wages and Productivity Division at Ranchi. Mr. P.K. Das is at present Director, Institute of Applied Manpower Research, New Delhi.

[2] There is no reference in the text to any human relations problem having been solved through the instrumentality of the Computer. The only references in the text to the uses of the Computer concern the solution of 360 equations involving 27 unknowns in four different ways (page 351); locating an appropriate value for the coefficient of correlation (page 351) "This would have been a practical impossibility for a human being, but the Computer did the job in a very short period and worked out the values of the unknowns and of 'r' the correlation coefficient in each of the four cases." (page 351). This enabled the authors to build up quickly the mathematical base for their Job Evaluation Manual; and this in turn enabled human relations problems to be solved at Hindustan Steel, quickly and effectively! In this context, the reader would be interested in a number of articles printed in this issue of the Journal on Computerisation, Automation, etc. etc. and one particular point is probably worth emphasising: "*...it (the Computer) will do only what it is asked and programmed (and fed) to do...*" Please see the article on "The Pros and Cons of Automation" by S.K. Warriar, page 381.—**Editor**

ascending order of their point values and slotted into job classes.

Job Evaluation in Hindustan Steel

Why did Hindustan Steel require Job Evaluation? To answer this question it will be useful to briefly recollect the history of the HSL Wage Structure. The company had been established in 1955 to set up and operate three steel plants and ancillary facilities. Sometime in 1958, the wage structure for non-executive jobs in HSL was worked out on the basis of the wage scales in an older Indian plant, with certain adjustments. Subsequently, as the need arose, some more scales of pay were added and one or two scales were bifurcated. There were generally ten standard scales covering unskilled, semi-skilled, skilled, highly skilled and first-line leadership jobs.

From the very inception, the company tried to fix pay scales in all the plants on a uniform and systematic basis. However, the fitting of jobs to scales of pay was done more or less on the basis of job titles. At that time neither conditions were appropriate for Job Evaluation nor had HSL the time or the resources to undertake it. Conditions were not appropriate because job contents had not stabilised by that time. The HSL Board, therefore, did the next best thing. They appointed a high-level Committee consisting of the representatives of the Head Office and plants to lay down uniform pay scales. This Committee could, however, cover jobs only in the major departments of the steel plants. Subsequently, powers to create posts and change the organisation pattern were delegated to General Managers. The number of workers in each department and section began to vary and the job contents for hitherto "similar" jobs began to change between the three steel plants without change in remuneration.

In the meantime several isolated demands for upgradation of pay scales for certain jobs or groups of jobs were being made by workers. In 1961 the workers of the whole L.D. convertor section in Rourkela Steel Plant demanded higher scales in relation to the workers of the O.H. furnaces section of the steel melting shop. In order to solve this dispute, it was decided that the disputed jobs along with some related jobs in the O.H. furnaces section should be evaluated by an independent agency. The services of the Productivity Centre, Bombay, were obtained for this purpose. They developed a manual and evaluated 48 jobs from the SMS Department. As a result of this job evaluation work some adjustments in pay scales applicable to a few jobs in the SMS Dept. were made.

However, demands for upgrading continued to pour from the other two plants and even from other departments of the Rourkela Steel Plant. These were being dealt with mainly on a general inter-plant comparison basis in the absence of any systematic procedure regarding job evaluation. Each of the three steel plants also developed or adopted a different job evaluation manual for their own purposes.

In 1962 the Government of India constituted a Central Wage Board for the Iron and Steel Industry to work out a wage structure for manual, clerical and certain grades of supervisory posts in the entire steel industry. In 1964 the Central Wage Board decided to make a job evaluation study of selected jobs at all the steel plants, both in the public and the private sector. This study was carried out by an Expert Committee of representatives from HSL, TISCO, IISCO and MISWL (Bhadravati). The Expert Committee completed the job evaluation study covering a total of 120 selected jobs at each of the six steel plants. They also determined the existing wage lines of the different steel plants. The Wage Board took this study into consideration while fixing the minimum wage, DA rates and revision of general pay structure in the various steel companies but they could not do much about individual wage rate inequities.

While implementing the Steel Wage Board recommendations in Hindustan Steel, the Management as well as the Unions were conscious of the fact that since the overall wage structure was to remain unchanged for some years, individual employees and groups were likely to press forward demands for upgradation and improved earnings. A machinery and a procedure were therefore necessary to deal with these demands on a systematic basis. It was decided to include a clause in the agreement signed between managements and unions in August 1966 to implement the Wage Board recommendations, to the effect that a Joint Standing Committee on Wage Differentials would be established to deal with such disputes.

While informal consultations were being carried on with the Union leaders regarding the structure of the Committees and methods of work, it was felt that the time had come to agree to or evolve one job evaluation manual for the entire company.

A meeting of the Chief Industrial Engineers was therefore convened at Ranchi in Nov. 1965 to decide this issue. Rourkela and Bhilai had been using the manual developed by the Productivity Centre, Bombay, with minor alterations. Durgapur was using the Cooperative Wage Study (U.S CWS) Manual and the Expert Committee of the Wage Board had used a different manual which was somewhat similar to the TISCO manual. The question was : which manual to adopt for HSL as a whole, and why ? There were several differences between the three manuals. For example, the Rourkela and CWS used twelve-factor manuals; the Expert Committee had used a thirteen-factor manual[3].

Dimensions of the Problem

While the advantages and disadvantages of adopting each manual were being discussed, a study was made of the procedure adopted by other organisations and in particular by the Cooperative Wage Bureau (a joint organisation of the steel companies in the United States of America) in developing their manual.

A point-rating system of job-evaluation has several variables. The number of *factors* (covering skills, efforts, responsibilities and working conditions), number of *degrees* (one, two, three, etc) and *weightages* allocated to factors and degrees, are items of decision in drawing up an evaluation manual. Determination of the number of *factors* to be included in the manual depends on whether these factors exist as identifiable traits in the jobs to be studied, and whether each of these factors would measure separate traits. Determination of the number of *degrees* for each factor depends on the extent of variation of the job contents of the jobs to be studied and the possibility of locating identifiable levels in this range of variation. Determination of factor and degree *weightages* depends on the value allocation in the community to these traits. For example if no weightages are given to the various factors, then theoretically, one job which requires the highest level in education (and no other qualities) will be equated in terms of money value to another job which requires the highest level in physical effort (and no other qualities). This is seldom so in existing value systems in a community and hence

[3] This is interesting, for the difference between a 12 point and 13 point Manual may not be of any vital public interest, may in fact be of little significance even in purely arithmetical terms either for the employer or for the employee. It would in fact be easy to break up even these 12 or 13 points into a hundred points, including one involving Responsibility for the Soul of the Employee, as the German philosophers would say! We could thus infinitely create or at least improve employment opportunities for intellectuals by intellectual hair-splitting. In Gulliver's Travels a full-scale war was caused by the differences regarding the various advantages and disadvantages of breaking eggs either at the Big End or at the Small End.

—Editor

the need to allocate weightages to different factors. Similarly it may also be necessary to allocate different weightages to different degrees within a single factor. For example, suppose there are four degrees within the factor "Education" as follows :—

Degree	Description
1	Receives verbal instructions only; therefore no knowledge of reading, writing, etc. required.
2	Required to read, write numbers, letters, and simple instructions and count.
3	Reading of average engineering drawings, measuring tools, etc. and undertaking simple mathematical calculations.
4	Detailed understanding of applications of technology and engineering principles.

It is quite possible that the difference in values which the community allocates between degree 1 and degree 2 is quite different from that allocated between degree 3 and degree 4. Thus a system of weightages between various degrees of a given factor may also be required.

While the manner in which the number of factors was determined for the HSL manual will be discussed later, it is necessary to discuss the theory behind the determination of number of degrees and the weightage system, because it is here that the major experimental work was involved in HSL.

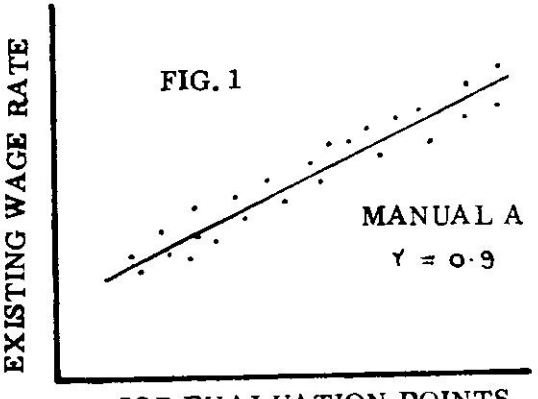
In contrast to the usual approach to job evaluation, which tries to "correct" a wage structure through the application of a manual with preconceived factor weights, it was decided to find out and use the community's concept of the weightage system as determined by an examination of the relative values of various jobs in the HSL which have been accepted over a period of years and use these factor weights in the Company's new manual.

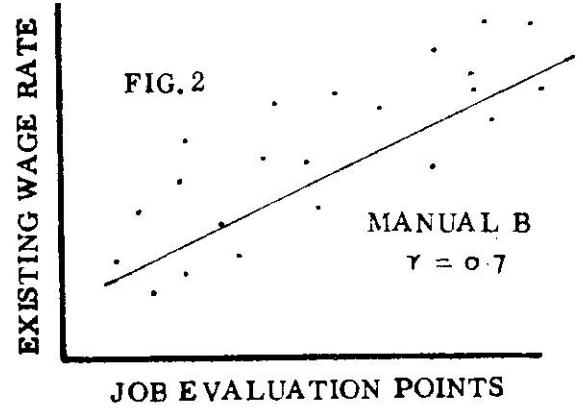
This approach does not represent as radical a departure from accepted practice as might first appear. Actually the factor weights of any plan need not be considered as given and not subject to modifications. Factor weighting is a trial and error process. Even in conventional job evaluation practice the bench mark jobs are evaluated against a set of factor weights and the correlation of the best fitting line determined with its scatter. The trial and error process is continued with different sets of factor weights with the intention of improving the correlation of the best fitting line. The reason for using that set of factor weights which gives the best correlation is that when the jobs are evaluated on the basis of a manual containing such weights, the deviations to be corrected are minimum. Consider for example two sets of factor weights A and B as shown in *Table 1*.

Table 1

Factor	Maximum factor weights A		B	
1. Education	10		12	
2. Experience	9		8	
3. Initiative	9	33	6	33
4. Manual skill	5		7	
5. Physical Effort	3		5	
6. Mental Effort	10	13	10	15
7. Responsibility for Tool & Equipment	13		10	
8. Responsibility for Materials	5		8	
9. Responsibility for Pace of Production	10	42	15	40
10. Responsibility for work of others	9		5	
11. Responsibility for safety of others	5		2	
12. Hazards	5		7	
13. Surroundings	7	12	5	12
Total	100	100	100	100

Suppose 25 jobs are evaluated on the basis of manual A as well as manual B and suppose after evaluating these jobs we plot the points scored by each job with respect to its existing wage rate in separate diagrams for the two manuals, like *Fig. 1* and *Fig. 2*. Out of these two systems of factor weights A and B, system A is better because if this system is adopted in practice, there will be less variations in the wage structure to be corrected. There is no other criterion in the two systems which might show the preference of one system over the other.





The primary aim of any Job Evaluation programme is to maintain or bring about industrial peace. Therefore that set of factor weights is considered best which can bring the jobs in line, with a minimum number of upgradations and down-gradations. The parameter which determines these upgradations and downgradations is the correlation coefficient 'r'.

It might be useful to briefly discuss here what the coefficient of correlation represents. Consider, for example, two sets of data like the height of residents of a locality and their corresponding average weight: if any increase in height goes along with an increase in the weight, then we say that the two sets of figures are positively correlated. When there is a perfect correlation, the value of 'r' is 1 as shown in *Fig. 3 (a)*. When any increase in one set of figures results in a decrease in the other set of figures as shown in *Fig. 3 (b)*, we say that there is a negative correlation and the value of r = —1. When the scatter diagram is of the type as shown in *Fig. 3 (c)* the value of r = 0 and there is no correlation. When the diagram is of the type of *Fig. 3 (d)*, it shows an imperfect correlation and the value of 'r' will be somewhere between 0 and +1. It is this last type of correlation that is mostly encountered in practice.

In the present case our aim was to determine that system of factor weights which gives the highest positive value of 'r'.

One way was to follow a trial and error method, with the purpose of continuously improving the coefficient of correlation 'r' with each trial. There were difficulties in this approach. First, we did not have a basis to move from one set of factor weights to another so as to get a higher value of 'r'. Granting that a subsequent trial on a set of factor weights might give a lower value of 'r' there will be no end to the trial and error process. Secondly, even if after successive trials and errors we obtained a fairly high value of 'r' we could not be sure that a still higher value of 'r' was not possible. We would thus not know where to stop the trial and error process. Thirdly, the process would be extremely time-consuming.

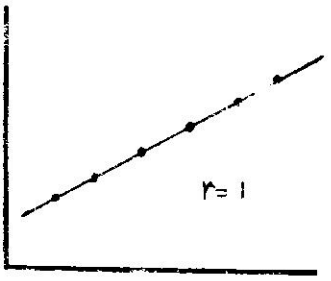


FIG. 3a

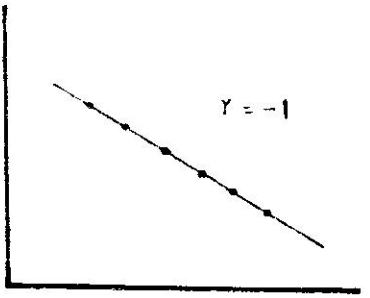


FIG. 3b

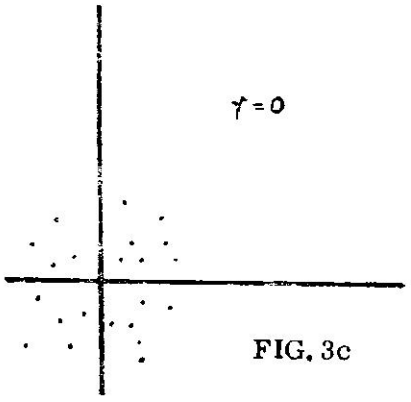


FIG. 3c

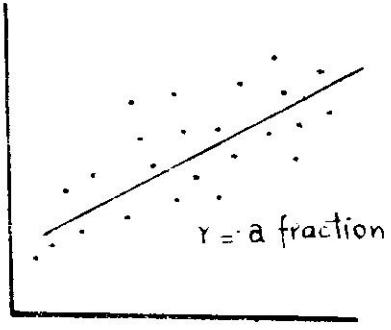


FIG. 3d

It was, therefore, decided to solve the problem mathematically. This involved advanced statistical techniques and it was estimated that the calcultations would be so large that it would be practically impossible to do it manually. It was, therefore, decided to solve the problem on a computer. The Indian Statistical Institute, Calcutta, was approached and the problem was solved on their computer.

Rationale for Determination

To understand the theory of determination of the best system of factor weights from a given wage structure, let us take a simple example. Suppose we use a three-factor manual and divide each factor into five degrees. Let us also assume that $5x_1$, $5x_2$ and $5x_3$ are the maximum unknown factor weights for these three factors. The manual will, therefore, look as shown in Table 2.

Table 2

Factors	Factor Weights for Degree				
	1	2	3	4	5
1. Skill	x_1	${}^2x_1$	${}^3x_1$	${}^4x_1$	${}^5x_1$
2. Effort	x_2	${}^2x_2$	${}^3x_2$	${}^4x_2$	${}^5x_2$
3. Responsibility	x_3	${}^2x_3$	${}^3x_3$	${}^4x_3$	${}^5x_3$

Let us further suppose that we select any five jobs which have no dispute about their existing wage rate. We shall discuss later the question of selecting undisputed jobs and will show that in the development of the HSL manual we eliminated the effect of a possible incorrect selection.

If we evaluate these five jobs on the basis of the three-factor manual, then the total points scored by each of the jobs would be given in unknowns x_1, x_2 and x_3. As the existing wage rate must correctly reflect job evaluation points we may equate the job evaluation points with existing wage rates as indicated below:

Job No.	Job Evaluation points	Wage Rate (W)	
1	$x_1 + 2_{x_2} + 4_{x_3}$	= 200	(1)
2	$3_{x_1} + 3_{x_2} + 2_{x_3}$	= 250	(2)
3	$5_{x_1} + 4_{x_2} + 5_{x_3}$	= 450	(3)
4	$2_{x_1} + x_2 + x_3$	= 150	(4)
5	$4_{x_1} + 5_{x_2} + 3_{x_3}$	= 350	(5)

These five equations with three unknowns can be solved by the method of multiple linear correlation, which consists of determining three "normal equations" with the three unknowns x_1, x_2 and x_3 and their simultaneous solutions. The three normal equations will be given by :

$$W = x_1 a_1 + x_2 a_2 + x_3 a_3 \quad (6)$$

$$a_1 W = x_1 a_1^2 + x_2 a_1 a_2 + x_3 a_1 a_3 \quad (7)$$

$$a_2 W = x_1 a_1 a_2 + x_2 a_2^2 + x_3 a_2 a_3 \quad (8)$$

where W is the wage rate and a_1, a_2 and a_3 are the known coefficients of x_1, x_2 and x_3.

By applying the values of constants the three normal equations become :

$$1400 = 15x_1 + 15x_2 + 15x_3 \quad (9)$$

$$4900 = 54x_1 + 53x_2 + 49x_3 \quad (10)$$

$$4850 = 53x_1 + 55x_2 + 50x_3 \quad (11)$$

By solving these simultaneously, we get :

$$x_1 = 57.4 \text{ or } 57$$

$$x_2 = 10.3 \text{ or } 10$$

$$x_3 = 25.6 \text{ or } 26$$

If these values are substituted in our three-factor manual, it will look as shown in Table 3.

Table 3

Factors	Factor weights for Degrees				
	1	2	3	4	5
1. Skill	57	114	171	228	285
2. Effort	10	20	30	40	50
3. Responsibility	26	52	78	104	130

This simplified example shows how to derive mathematically the factor weights from the existing wage structure. It also gives an idea of the parameters and the advance information needed for determining factor weights from the existing wage structure, viz.,

(1) The number of factors to be used

(2) The number of degrees in which each factor should be subdivided.

(3) Degree classification information for a fairly large number of representative jobs, regardless of actual weightages. For example in our familiar three-factor exercise the

degree classification information required is given in Table 4 below :

Table 4

Job No.	Factors 1	2	3
	Degree scored in each Factor		
1	1	2	4
2	3	3	2
3	5	4	5
4	2	1	1
5	4	5	3

Number of Factors

As mentioned already, twelve factors were used in the CWS and Rourkela manuals and thirteen factors in the Wage Board Expert Committee manual as shown in Table 5.

The main difference was that while the Expert Committee had used five responsibility factors, the CWS and Rourkela manuals used only four responsibility factors. The responsibility factors used by the Expert Committee were for : (1) Materials, (2) Pace of Production and (3) Work of Others. But CWS combined Pace of Production and Work of Others in "Operations" whereas Rourkela combined

Table 5

	CWS	Rourkela	Expert Committee
Knowledge and Skill	1. Pre-employment Training	1. Education	1. Education
	2. Employment Training & Experience	2. Experience	2. Experience
	3. Mental skill	3. Mental Skill	3. Initiative
	4. Manual skill	4. Manual Skill	4. Manual Skill
Effort	5. Mental Effort	5. Mental Effort	5. Mental Effort
	6. Physical Effort	6. Physical Effort	6. Physical Effort
Responsibility	7. Responsibility for Materials	7. Responsibility for Materials	7. Responsibility for Materials
	8. Responsibility for Tools & Equipment	8. Responsibility for Tools and Equipment	8. Responsibility for Tools and Equipment
	9. Responsibility for Operations	9. Responsibility for Work of Others	9. Responsibility for Pace of Production
	10. Responsibility for Safety of Others	10. Responsibility for Safety of Others	10. Responsibility for Work of Others
			11. Responsibility for Safety of Others
Working Conditions	11. Hazards	11. Hazards	12. Hazards
	12. Surroundings	12. Surroundings	13. Surroundings

Materials and Pace of Production in "Materials".

The question was whether to use the 12-factor manual or the 13-factor manual. The test used for deciding the issue was whether the 13th factor measured a trait significantly different from those measured by the other 12 factors. Fortunately for us the Expert Committee classifications were available for all the 13 factors. If the 12-factor manual was to be adopted, then the traits "responsibility for work of others" and "responsibility for pace of production" were more likely to have measured the same job contents. In the Expert Committee classifications we looked into the degree scored against these two factors for various jobs and found that they did not have a high degree of correlation between them. That meant that the factors "Responsibility for work of Others" and "Pace of Production" measured different traits. It was therefore decided to use a thirteen-factor manual.

Number of Degrees

The number of degrees used by the CWS, Rourkela and Expert Committee manuals were also different. CWS and Expert Committee manuals used a variable number of degrees, varying between three to nine and five to six respectively: whereas the Rourkela manual used six degrees consistently for all factors. The Expert Committee manual had used also the concept of half degrees. The question was, how many degrees to adopt for the new HSL Manual? As the statistical study was to be based on the degree classifications of the Expert Committee manual, a maximum of only six degrees was to be used. As the sixth degree was generally applicable to executive jobs which were not proposed to be studied on the basis of the manual to be developed, the number of degrees was uniformly fixed as five for all factors with the provision that wherever after final analysis the curve showing the distribution of weightages in the various degrees within a factor became horizontal or developed a negative inclination, the higher degrees would be dropped from whichever degree the curve became horizontal or had a negative inclination.

Preliminary Job Classification Information

As the Expert Committee had evaluated 120 jobs each from Bhilai, Durgapur and Rourkela Steel Plants, degree classification information for a total of 360 jobs was available. For determination of factor weights for 13 factors, the degree classification information for 14 jobs would have been enough if the weights within a factor were distributed in a linear manner, and if these 14 jobs were chosen in such a manner that their existing wage rate was correct.

Fourteen jobs were considered necessary and sufficient as each of these would give an equation of the form

$$\text{Job rate} = K + D_1X_1 + D_2X_2 + D_3X_3 \ldots\ldots + D_{13}X_{13} \quad (13)$$

where K was the unknown constant, X_1 is the unknown factor weight for factor No. 1, and D_1 the degree classification of the job in factor 1, X_2 the unknown factor weight for factor 2, and D_2 the degree classification of the job in factor 2 and so forth.

It was found difficult to decide which 14 jobs were correctly paid for; and if only 14 jobs were used in the study there would be considerable chance of error in the placement of an individual job in a given factor, since personal judgment was involved. If only 14 jobs were used, such errors in judgment would have considerable effect upon factor weights. The use of all the 360 jobs would reduce the importance of individual errors in judgment to a point where they would have no significant effect upon the final results. It was, therefore, decided to use all the 360 jobs for the study.

Distribution of Factor Weights

In our familiar 3 factor manual we assumed that the factor weights would be distributed in the various degrees in a linear form as given by the equation :

$$\text{Factor weight} = a + bx \qquad (12)$$

where x is the number of degrees and 'a' and 'b' are constants.

For example if a=10 and b=2 then the factor weights for the various degrees would be as shown in Table 6.

Table 6

Degree	1	2	3	4	5
Factor weight	12	14	16	18	20

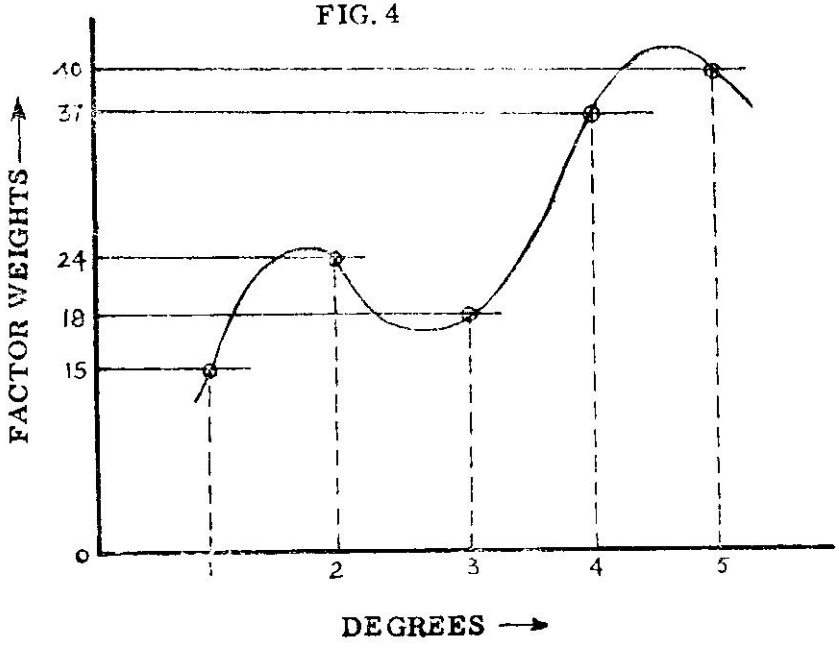
Instead of following a linear form it is quite possible that the best set of factor weights might be distributed in the various degrees in a non-linear form, as in Row 3 of Table 7. For comparison, Row 2 of Table 6 is retained.

Table 7

Degree	1	2	3	4	5
Factor weights :					
Linear	12	14	16	18	20
Non-Linear	12	13	17	22	30

The assumption of linear distribution for factor weight within a factor might therefore mean imposing a restriction which may prevent the determination of best results. But what type of distribution within a factor should we assume ? Should it be a second degree curve or a curve of higher order? Theoretically as we were using five degrees in our manual, a curve of fourth degree would be the best. This would mean that the factor weights of the five degrees would be completely independent of each other. This curve may take several shapes, one of which is shown in *Figure 4.* However it was

FIG. 4



decided to assume only the second degree curve because even if we used a higher order curve and get the factor weights as shown in Figure 4, it would be difficult to justify and use such factor weights in the manual because in such an arrangement some of the higher degrees would carry lower weight than the lower degrees.

For example, in Figure 4, degree 2 would carry a factor weight of 24 while a higher degree 3 would carry a factor weight of 18 only. This would be contrary to the accepted principles. The factor weight distribution curve should be of a rising nature as shown in *Figures 5 (a), (b)* and *(c)*.

This shows that the assumption of a curve of higher than second degree was not only unnecessary, but was also impossible to use in practice. It was therefore decided that the distribution of factor weights in the various degrees within a factor would be assumed to be in a curvilinear form of second degree of the following form :

$$\text{Factor weight} = a + bx + cx^2 \ldots\ldots\ldots (13)$$

Where x is the number of degrees and a, b, and c are constants.

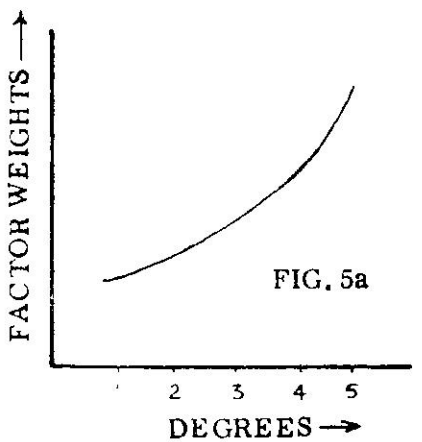


FIG. 5a

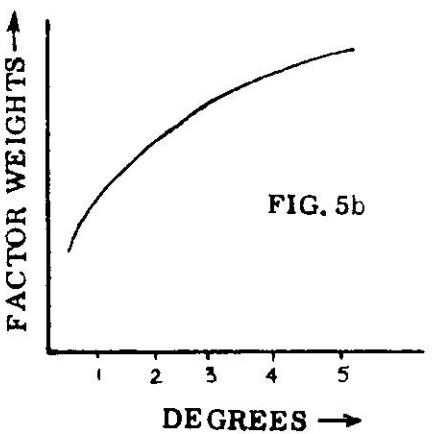


FIG. 5b

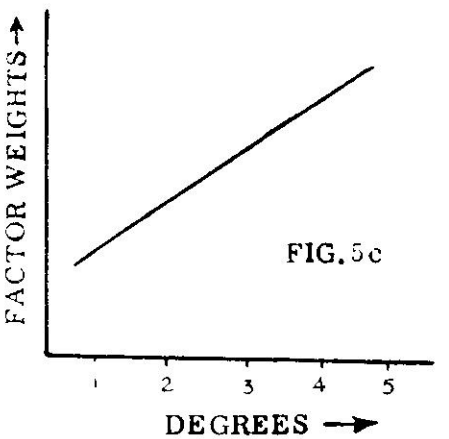


FIG. 5c

In this equation if constant 'c' is zero then the curve becomes a straight-line and therefore in this assumption of second degree curve even linear distribution is covered.

The assumption of distribution of factor weight in a curvilinear form of second degree necessitated a change in the form of the equation for each of the 360 jobs. The equation now becomes :

$$\text{Job Rate} = K + (a_1 + b_1 x_1 + c_1 + x_1^2) + (a_2 + b_2 x_2 + c_2 x_2^2) + \ldots\ldots + (a_{13} + b_{13} x_{13} + c_{13} + x_{13}^2) \ldots\ldots (14).$$

The constant $K, a_1, a_2 \ldots\ldots a_{13}$ could be combined into one constant C. The equation then becomes :

$$\text{Job Rate} = C + (b_1 x_1 + c_1 x_1^2) + (b_2 x_2 + c_2 x_2^2) + (b_3 x_3 + c_3 x_3^2) + \ldots\ldots (b_{13} x_{13} + c_{13} x_{13}^2) \ldots\ldots (15)$$

Where C is the unknown constant, b and c, the unknown constants which determine the distribution and factor weight of factor 1; and x_1 the degree classification of the job in factor 1. b_1 and c_2 are the unknown constants which determine the distribution and factor weights of factor 2; and X_2 is the degree classification of the job in factor 2, and so forth.

In this equation which represents the rate of a given job, there are 27 unknowns—the common constant C and two constants for each factor. The 360 jobs give 360 such equations with 27 unknowns.

Wage or Job Class

Before we come to the solution of these equations there is one more point to be discussed. So far in framing our equations we have equated job evaluation points to the wage rate. What should this wage rate be ? HSL uses incremental scales. In addition there is Dearness Allowance which is lower at the lower level of basic wage and higher at the higher levels. There is also an Incentive Scheme in force which gives the workers incentive earnings.

How should the wage rate be worked out ? One way would be to take the mid-point of the pay scale and add D.A. rates to it. For the 13 basic pay scales in our Works Departments, it is as in Table 6.

Table 8

Job Class	Pay Scale	Mid point of pay scale	D.A.	Job Rate
(1)	(2)	(3)	(4)	(5)=(3+4
W 1	70-85	77.5	60	137.5
W 2	80-90	85	60	145
W 3	84-100	92	60	152
W 4	88-114	101	60	161
W 5	98-113	105.5	60	165.5
W 6	113-147	130	60	190
W 7	135-175	155	65	220
W 8	156-221	188.5	65	253.5
W 9	168-290	229	65	294
W 10	210-365	287.5	65	352.5
W 11	260-295	327.5	70	397.5
W 12	325-475	400	75	475
W 13	350-575	462.5	75	537.5

If we use the figures of job rate as given in column 5 of Table 6 above, this would mean that factor weights would be evolved on the basis of existing pay scales and DA rates. There were two objections to this approach. Firstly the factor weights developed on the basis of existing wage scales and DA rates would not remain the best factor weights when in future either the wage scales or the DA rates underwent a change. As the job evaluation manual was meant for long-term use we did not want it to be linked to any particular set of wage scales or DA rates. Secondly,

our existing 13 wage scales were not according to any scientific pattern. They were evolved historically and *ad hoc* changes were made from time to time. In course of time, the scales may have to be brought into a scientific pattern and therefore we decided that in developing our job evaluation manual we should not use the existing pay scales as the basis.

Fortunately for us another alternative was available and that was to use job class numbers as shown in column 1 of Table 6 instead of wage rate. This would keep our factor weights independent of the existing wage scales and DA rates.

The equation was therefore rewritten in the following form.

$$\text{Job Class} = a + (b_1x_1 + c_1x_1^2) + (b_2x_2 + c_2x_2^2) + (b_3x_3 + c_3x_3^2) + \cdots\cdots + (b_{13}x_{13} + c_{13}x_{13}^2) \quad \ldots\ldots(16)$$

Job of the Computer

Actually speaking as we did not know as to what might be the difference in the value of correlation coefficient 'r' in case we used job class or wage rate, and if the use of job class gave a very low value of 'r' and the use of wage rate gave a very high value of 'r' we might still prefer to use the factor weights obtained on wage rate basis; it was decided to solve the 360 equations by using wage rate as well as job class separately. This would give us two sets of factor weights and we could choose one of these, taking all other points into account.

We have already discussed the reasons for using the curvilinear distribution of factor weights within a factor. However, as most of the other manuals had used a linear system which would be more simple, it was decided to solve both the systems of factor weights separately and make a choice later, if there was no significant difference in the value of the correlation coefficient 'r'. So instead of one solution of 360 equations, we desired four sets of solutions as shown below :

Set 1	Linear factor weight with Wage Rate
Set 2	Curvilinear factor weight with Wage Rate
Set 3	Linear factor weight with Job Class
Set 4	Curvilinear factor weight with Job Class

The computer of the Indian Statistical Institute was given the complex task of solving 360 equations involving 27 unknowns in 4 different ways. Though a practical impossibility for a human being, the computer did the job in a very short period and worked out the values of the unknowns and of 'r' (the correlation coefficient) in each of the four cases as follows :

Case	Value of 'r'
Set 1	0.9108
Set 2	0.9279
Set 3	0.8925
Set 4	0.9087

During the period the electronic Computer was making the analysis, the thinking had also crystallised that as our manual would be of a permanent nature, it should not be based on the existing scales. Having thus limited our choice to the job class solutions, and as the curvilinear factor weights gave a higher value of 'r' it was decided to adopt this solution.

Negative Factor Weights

By using the values of 27 unknowns given by the Computer, when we worked out the actual factor weights for the various factors and their distribution within each factor, it was found that

i) Some factors showed negative factor weights in all the five degrees.

ii) Some factors had negative factor weights in the lower degrees and positive factor weights in the higher degrees; and

iii) Some factors had increasing factor weights in the initial degrees and decreasing factor weights for higher degrees.

According to established practice, negative factor weights had never been used; nor was it logical. Similarly it was also not possible to adopt a system of factor weights where higher degrees carried lower factor weights than the lower degrees. It was, therefore, decided to convert the negative factor weights into positive and have all the factor weight curves of a rising nature in such a way as to make minimum reduction in the value of 'r'. It was obvious that any change in the best system of factor weights given by the computer would mean a reduction in the value of 'r' but the objective here was to get all the factor weights into positive with the minimum reduction. This was done by a method of trial and error,* each time finding the value of 'r'. The final solution adopted by us gave the value of 'r' as 0.8788

Obtaining Job Class from Evalution Points

As in the solution of unknown factor weights, the job class was equated to the job evaluation points in the form of unknowns. It was envisaged that the total of job evaluation points would itself give the evaluated job class, not requiring any conversion table, fractional values of job evaluation points being rounded off to the nearest whole number. However as our job classes ranged from 1 to 13, the manual, when constructed, carried weightage factors into decimals. During negotiations the Labour Unions, however, felt that the weightage factors may preferably be converted into whole numbers so as to keep the manual simple, and if necessary a job evaluation point to job class equation may be provided.

The factor weights as worked out by the Computer gave zero weight to the first degree in all the factors. The labour unions also felt that psychologically, it would be preferable if the first degree of each factor also carried some weight instead of zero weight.

In order to accommodate these two points of the Unions the factor weights as given by the Computer were replaced by a new set of factor weights by using the conversion equation

$$A = 10 + 20C$$

where A = the actual factor weights used in the manual and
C = the factor weights as given by the Computer

This conversion, however, did not affect in any way the accuracy of the manual. All that it did was that instead of the total of job evaluation points giving directly the evaluated job class, it required a conversion table to determine job class from the total score of job evaluation points.

Conversion Table

Total Score	Corresponding Job Class
Up to 179	2
180—199	3
200—219	4
220—239	5
240—259	6
260—279	7
280—299	8
300—319	9
320—339	10
340—359	11
360—379	12
280 and above	13

Concept of Half Degrees

We have already mentioned that in the Expert Committee Manual each factor had been divided into six degrees. In addition they had also used the concept of half degrees. Even though the definitions were given only for full degrees in the manual, they had found this concept convenient,

* Later on in collaboration with I.I.M., Calcutta, we worked out a mathematical basis of obtaining only positive factor weights and rising factor weight curves. It was found that if the following restrictions were imposed on the values of the unknowns a, b_i and c_i then the values of factor weights would be in the desired form :

$$a \geq 0$$
$$b_i \geq 0$$
$$b_i + 10c_i \geq 0$$

as in many cases when the job seemed to fall in between the two degrees, it could be slotted into the half degree in between the two degrees.

While negotiating the manual with the labour unions the advantages and disadvantages of using half degrees were discussed and ultimately it was agreed that while for the time being the half degree values may be interpolated, all attempts would be made to evaluate the jobs with full degree and not use half degree values.

Conclusion

The development of the HSL Job Evaluation Manual was all the way a search for a rationale to solve problems which had evaded solution. The labour unions themselves had expressed a desire for finding a solution both in the various evidences before

Table 9

SYSTEM OF WEIGHTAGES FOR FACTORS & DEGREES

Factor	Degrees								
	1	1.5	2	2.5	3	3.5	4	4.5	5
I. Education	10	24	32	38	44	50	56	—	—
II. Experience	10	22	30	36	40	44	48	—	—
III. Initiative	10	12	16	20	24	29	34	41	48
IV. Manual Skill	10	12	14	15	16	18	20	23	28
V. Physical Effort	10	13	14	15	16	17	18	—	—
VI. Mental Effort	10	20	28	34	40	48	46	48	50
VII. Responsibility for Tools and Equipment	10	16	24	33	44	55	68	—	—
VIII. Responsibility for Materials	10	13	16	18	20	22	24	26	28
IX. Responsibility for Pace of Production	10	28	36	42	46	47	48	49	50
X. Responsibility for Work of Others	10		12	—	22	—	32	—	44
XI. Responsibility for Safety of Others	10	13	16	18	20	22	24	—	—
XII. Hazards	10	11	12	13	14	16	18	22	28
XIII. Surroundings	10	12	14	16	20	26	36	—	—

the Wage Board as well as at the time the Wage Board recommendations were implemented. The system of factors, degrees and weightages in the manual, finally negotiated with the Unions, for evaluating jobs in Bhilai, Durgapur and Rourkela Steel Plants and Alloy Steels Project appears as Table 9 on page 353.

An agreement was signed with the Unions setting up a Joint Standing Committee on Wage Differentials for the whole of the company and Plant Level Committees for each Plant, to deal with disputes regarding wage differentials on the basis of this manual. This agreement marks a new era in the history of industrial relations in Hindustan Steel and is a step forward in the direction of mutually solving problems on a rational basis.

EDITOR'S NOTE

This is an intellectual exercise of considerable industrial importance; and the authors who are obviously intellectuals of a high order have spent quite a good bit of the Company's research resources in making out a job evaluation manual which they thought would be of long-term significance or that it would at least furnish a rationale to solve problems which had so far evaded solution. Apart from the difficulties in framing a logically valid job evaluation manual on a long-term basis in the context of rapid technological and economic changes, as a result of which several jobs just cease to be and several new jobs continuously appear and disappear, it would be interesting to follow up this research piece, how far, as posed in the opening paragraph of the article, it has really contributed to industrial peace at Hindustan Steel, since the time the Company accepted it. As a purely intellectual effort, however, this is a remarkable piece, as exemplifying the possibilities of the mathematical approach in case of major problems of real social importance, now that the Computer can do in minutes what used to take as many years in the pre-computer era.

That Reminds Me of Innovation Management

"This being the India Productivity Year, I am thinking of a blending of productivity and family planning. Let us have twins and then not have any more children. It will help the cause of family planning. At the same time, the 'delivery cost' per child, the 'Labour' pains per child and the 'overhead' troubles per child, will be the minimum. Above all, your mother will come here and stay long only once in the guise of helping me."

—*Femina*, Aug. 11, 1967

Work Simplification Applied to an Accounts Office

Srivathsa VSR Subramaniam

Every business organisation is, or ought to be, interested in the optimal utilisation of its staff and office space. In established offices carrying on routine work, the management may not even be aware of the potentiality of simplification through better and smoother flow of papers and documents. Usually a 'Systems and Methods' unit is assigned this responsibility in modern organisations.

How could work-flow be studied, simplified, and the seating arrangement of staff members altered, to result in better space utilisation ? The author made an actual study, followed by application in the Accounts Division of a reputed firm, which desires to remain anonymous but has permitted the publication of this study, with, however, all rights reserved !

THE ACCOUNTS DEPARTMENT OF THE FIRM IS housed in a hall of 52′ × 34′ and accommodates 44 members of the department. The work-heads could be divided as :

(a) Accounts Payable, comprising indigenous and foreign purchase sections

(b) Sales

(c) Cost Accounts

(d) Internal Audit, and

(e) Sales Tax.

The Chief Accountant felt and expressed the need for about six additional clerical staff, based on the estimate of increased work-load in the department. As the hall was already packed with the existing staff, the problem was how to accommodate the additional hands in the same area. To arrive at a solution, a work-flow study was made, with the following objectives :

(a) providing proper seating arrangement for everybody, leaving room for reasonable expansion;

(b) keeping the paper handling and movements to the minimum possible;

(c) eliminating congestion;

(d) providing enough, but not too much, space for table work;

(e) eliminating, improving or confining operations or work with objectionable features; and

(f) bringing together the section personnel and section heads of similar work, for easy control and supervision.

The study was in three steps :

Step 1: A department layout was made to a scale of 1"=10'. All the tables, chairs and other objects in the area were recorded in their existing positions to the same scale. Then, the names of persons occupying the respective seats were noted in the same layout. It is shown in Exhibit 1A.

Step 2: The work-flow sequence was then recorded under the existing responsibility heads :

(a) Accounts Payable
(b) Sales
(c) Cost Accounts
(d) Internal Audit, and
(e) Sales Tax

Care was taken in recording the workflow so that even minute details were not missed.

The nature of department work was then brought under certain standard nomenclatures and proper codes were selected, as shown on page 358.

These codes were used to record the work-flow sequence in the department, as shown in Exhibit 1B.

Step 3: The next step involved the incorporating of the distance through which each paper or document moves between distinct work functions. To do this, the name of the person doing each work function was noted.

EXHIBIT 1A. EXISTING SEATING ARRANGEMENT

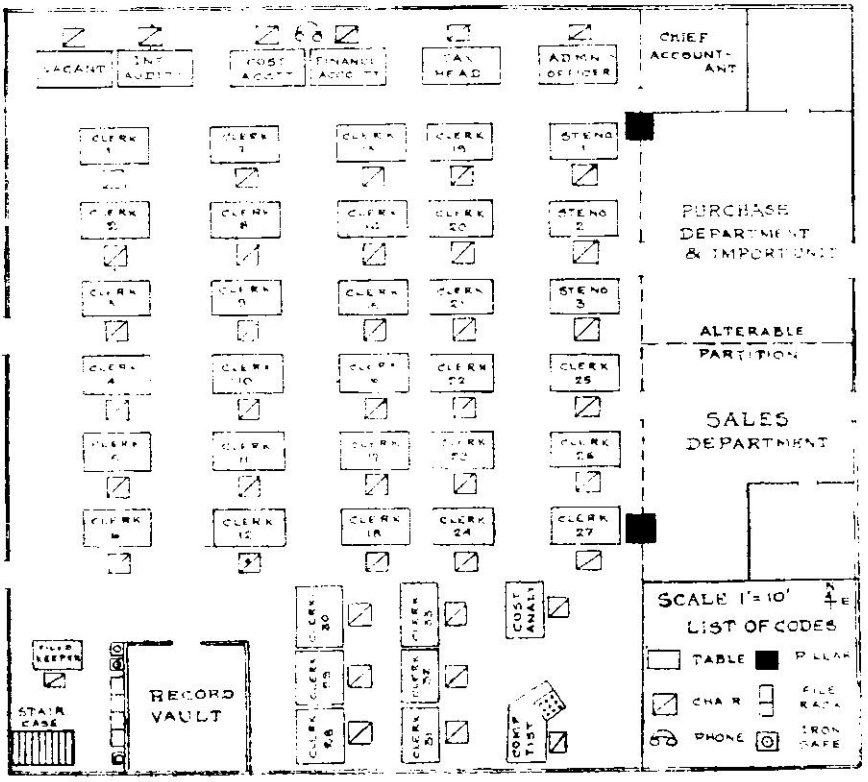


EXHIBIT-3 PROFORMA W

ACCOUNTS

FINANCIAL ACCOUNT

SALES HEAD

1. INVOICES 3 ALLOCATION LIST
2 DESPATCH NOTE 4 GATE PASS
IN CHARGE
A-10 E-34'
COMPTIST CHECK
A-2' E-2'
FEEDBACK TO SALES
A-2' E-2'
LEDGER POSTING
A-2' E-2'
JOURNAL ENTRY

INDIAN PURCHASES

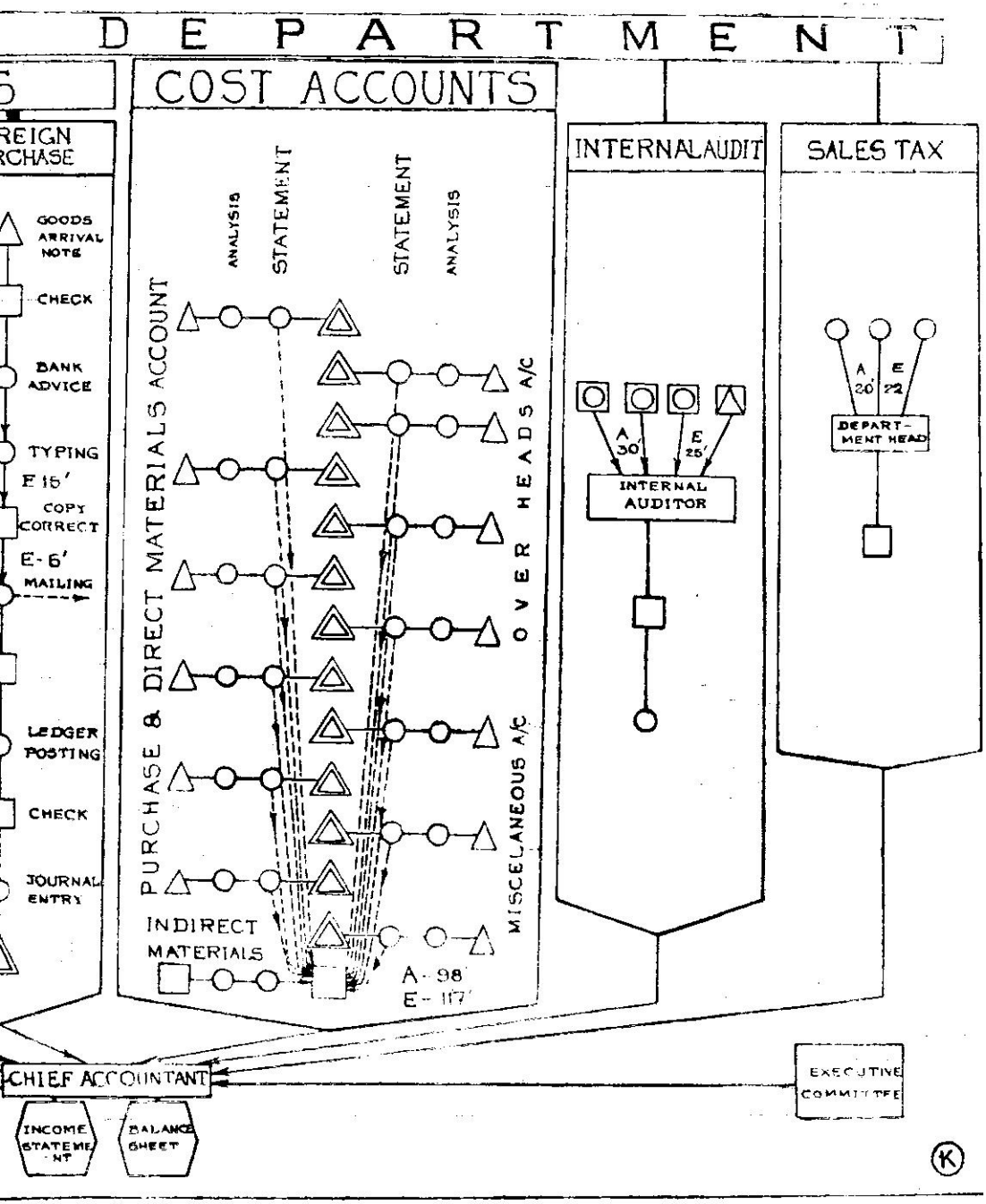
INVOICE
1 ORDER COPY 2 GOODS RECEIPT NOTE 3 INSPECTION NOTE
IN-CHARGE
SAFETY TRI-CHECK
IN-CHARGE
A-10' E-5' COMPTIST A-5' E-5'
O.K A-7' E-2' ERROR
REJECTION FILE
DEPART-MENT HEAD SIGNATURE DEBIT NOTE
A-7' E-2'
PURCHASE INVOICE SERIAL NO
LEDGER POSTING
JOURNAL ENTRY

BOARD OF DIRECTORS

PAPER FLOW IN FEET
A-AXIAL LAYOUT
E-EQUATORIAL LAYOUT

SOURCES OF INFORMATION

ORK FLOW PATTERN UNDER THE PROPOSED SYSTEMS



(K)

EXHIBIT-2A
AXIAL
LAY-OUT

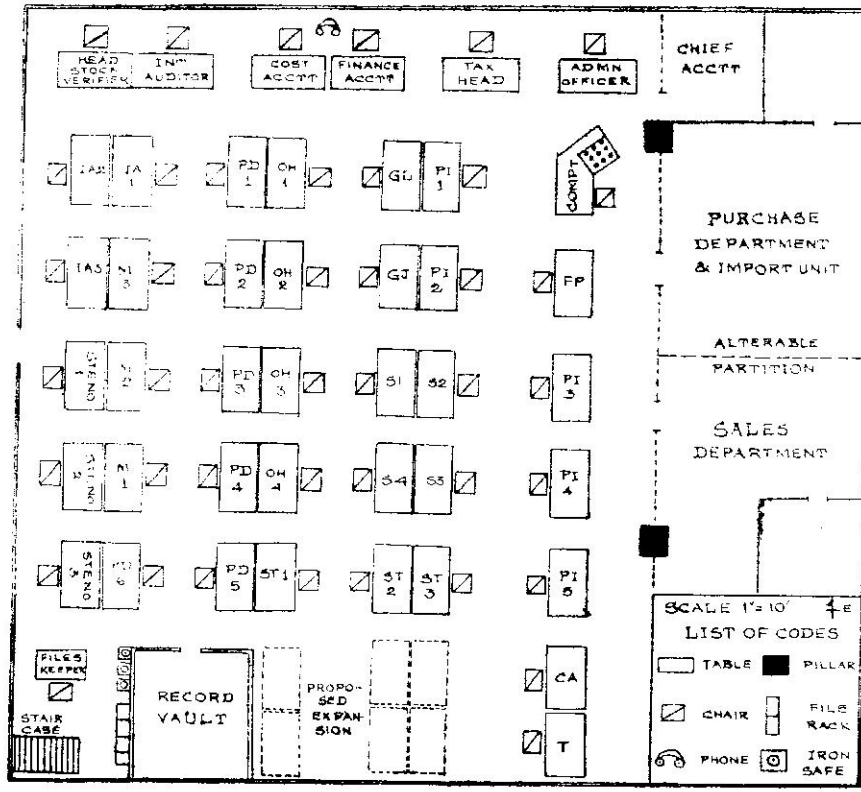
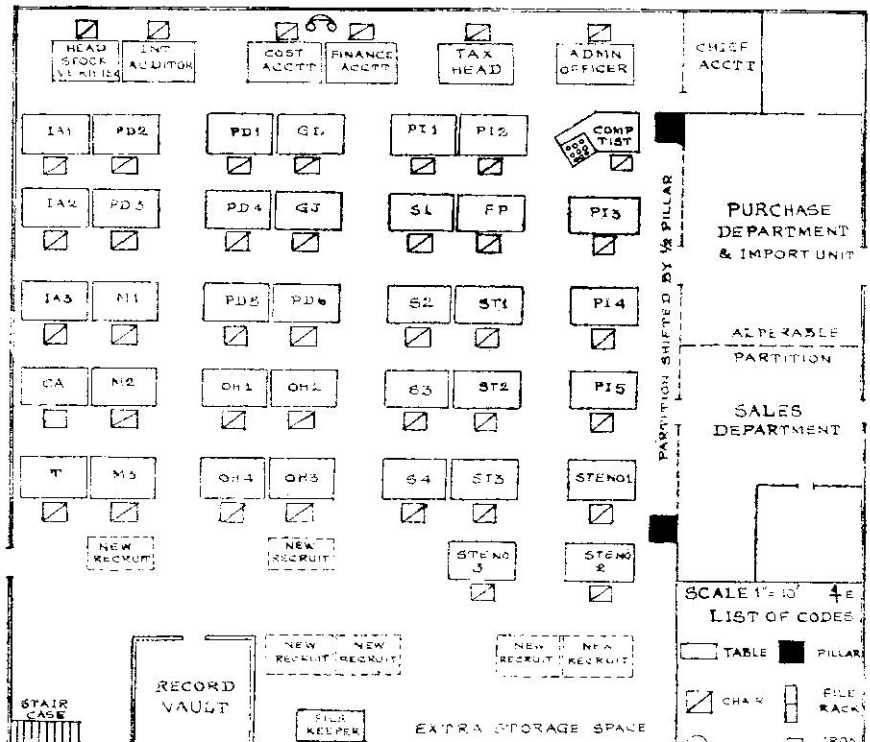


EXHIBIT-2B
EQUATORIAL
LAY-OUT



Code	Significance
——→	Regular Flow
- - - →	Periodic Flow
△	Temporary Storage of papers
□	Inspection of documents
○	Entry
◯	Book entry (Check)
▽	Stores Verification Report
▽	Final Filing Work

With the help of the layout (Exhibit 1A) and the work-flow sequence (Exhibit 1B) all persons were located. The distance between persons doing consecutive work functions was measured through the nearest path. The actual distances were calculated at 1″=10′ and incorporated in Exhibit 1B.

Analysis

The work-flow chart (Exhibit 1B) was analysed, and the following features were noted :

1. The total distance through which all the documents in the section move was 629′, of which about 53% was contributed by the Accounts Payable section. This was because the persons connected with similar work were scattered.
2. The section heads were seated away from persons working under them.
3. Persons connected with consecutive work were not put together, and this did not give an idea to an individual about what his colleague was doing.
4. Persons who performed service functions such as the Comptist, were not centrally located.
5. Inspection and Entry functions could be combined in the Accounts Payable, Sales, and Cost Accounts sections.

To achieve these objectives, two new layouts within the space available—Axial and Equitorial—made to a scale of 1″=10′ (Exhibits 2A and 2B) were designed, providing room for expansion in work.

Appraisal

With the work-flow analysis and the two new layouts, a 'five-point appraisal' scheme was designed as follows:

1. Work Aspect: Making use of the work-flow chart shown in Exhibit 1B, a pro-forma chart was made as shown in Exhibit 3. The latter indicates the optimum work-flow, after eliminating, confining or improving operations with objectionable features, arrived at as a result of the analysis. For each work function, a Seat Allocation was made as shown in Table I printed on next page, indicating the positions shown in Exhibits 2A and 2B.

As explained under Step-2, the distances through which documents move, are incorporated in Exhibit-3.

The functions and the paper movement distances are brought under a comparative study under Exhibit-4.

From the work aspect, the Axial layout shown in Exhibit-2A was found convenient for paper movement. However the Equatorial layout shown in Exhibit 2B was found to reduce the distance through which papers move, to a considerable minimum. The nett differences are shown in Table II printed on the next page.

TABLE I
Seat Allocation

Section	Work Functions	No. of Persons	Work Flow in Exhibits 2A & 2B From	To
Financial Accounts	Indian Purchase Head	5	PI 1	PI 5
	Foreign Purchase Head	1	FP	—
	Sales Head	4	S 1	S 4
	Internal Audit	3	IA 1	IA 3
Cost Accounts	Purchase and Direct Materials	6	PD 1	PD 6
	Overheads	4	OH 1	OH 4
	Miscellaneous	3	M 1	M 3
	Accounts Check	1	CA	—
General	General Ledger	1	GL	—
	General Journal	1	GJ	—
	Additional Clerk	1	T	—
	Typists, Steno, etc.,	10	As shown	
New Hands Expected		6	Space for Expansion Provided	
Section Heads		4	As shown	
Total		50	—	

TABLE II
Differences in Distance

DATA	Existing Layout	Proposed Layout AXIAL (Exhibit 2A)	Proposed Layout EQUATORIAL (Exhibit 2B)	Expected Reduction
Total paper travel distance in feet	629	366	359	57.6%
Total work functions	100%	87%	87%	13%

2. Space Distribution : Space distribution decides the convenience of the working staff and hence the effectiveness of the new layouts. From a study of the convenience of working persons, it was established that the minimum area required for an individual to work easily with the existing tables and chairs, was 25 sq. feet.

The available and unusable floor spaces were measured from Exhibits 1A, and 2B and tabulated in Exhibit-5.

Taking care that the proposed layouts should accommodate 50 persons (the existing 44 plus the additional 6), the two proposed layouts offer a per capita floor space of 26.7 sq. ft. and 26.1 sq. ft. respectively. As these are above the minimum decided level of 25 sq. ft., the layouts were considered convenient.

3. Administrative and Control Aspect : The Proposed layouts keep the section heads in the existing positions as they are located near the cabin of the Chief Accountant. Also, the key personnel and persons of higher responsibility were brought together and located near the section heads. This was expected to train the second line staff by 'physical proximity' and day to day 'functional contacts'.

The section heads were consulted as to their opinion on the administrative and control aspect of the proposed layouts; they preferred the 'Equatorial' arrangement (Exhibit 2B).

4. Human Relations Aspect : It was understood that shifting of tables and chairs and combining responsibilities should also be viewed as affecting relative social status, which may lead to objections being raised. The 'Group Behaviour' of persons in the Accounts Department was observed and analysed. The following key factors were found to exist :

a) Persons were intensely job-conscious.

b) They possess an affinity to the present direction of their seats and tables.

c) Members connected with the treatment of similar documents liked to have the same person in case of any re-arrangement.

Exhibit 4

WORK DISTRIBUTION ANALYSIS OF PRESENT AND PROPOSED LAYOUTS

SYMBOLS	FUNCTIONS	EXISTING LAYOUT						PROPOSED LAYOUT (Axial & Equatorial)					
		Purchase or Accounts Payable	Revenue or Sales	Sales Tax	Internal Audit	Cost Accounts	Total	Purchase or Accounts Payable	Revenue or Sales	Sales Tax	Internal Audit	Cost Accounts	Total
——→	Regular Flow	16	5	3	5	2	31	11	2	3	5	1	22
- - - →	Periodic Flow	—	1	1	1	13	16	—	—	1	1	14	16
△	Temporary Storage	4	2	—	—	11	17	3	1	—	—	13	17
□	Inspection (Check)	10	3	—	1	5	19	8	2	1	1	5	17
○	Entry	12	3	3	5	23	46	10	3	3	5	14	35
◎	Book Entry (Check)	—	—	—	3	—	3	—	—	—	3	—	3
⧋	Stores Verification Work	—	—	—	1	—	1	—	—	—	1	—	1
◬	Final Filing Work	9	4	—	—	10	23	9	4	—	—	13	26
Numbers	Total Functions	51	18	7	16	64	156	41	12	8	16	60	137
Feet	Total Paper Flow Distance*	345	48	26	24	186	629	$^{172}/_{157}$	$^{46}/_{38}$	$^{20}/_{22}$	$^{30}/_{25}$	$^{98}/_{117}$	$^{336}/_{359}$

* In the proposed layout columns upper half are for Axial layout (Exhibit 2B) and lower half are for Equatorial layout (Exhibit 2C)

Exhibit 5

FLOOR SPACE DISTRIBUTION ANALYSIS OF THE EXISTING AND PROPOSED LAYOUTS

Estimated Minimum Area required for an individual to work comfortably with the existing tables and chairs (per capita floor area) = 25 sq. ft.

DATA	EXISTING LAYOUT (Exhibit 2A)		Proposed Layouts			
			Axial (Exhibit 2B)		Equatorial (Exhibit 2C)	
	Actual sq. ft.	%	Actual sq. ft.	%	Actual sq. ft.	%
1 Total Area Available	1855.0	100.0	1855.0	100.0	1908.0	100.0
LESS						
Area in Passages & Gaps	447.9	24.1	262.5	14.2	342.0	17.9
Area Occupied by Vault	143.5	7.7	143.5	7.7	143.5	7.5
Storage Area	55.7	3.0	55.7	3.0	57.2	3.0
Area Unusable (due to corners)	52.0	2.8	52.0	2.8	52.0	2.7
Area Covered by Pillars	4.5	0.2	4.5	0.2	6.8	0.4
2 Total Unusable Area	703.6	37.8	518.2	27.9	601.5	31.5
3 Nett Area Available (1—2)	1151.4	62.2	1336.8	72.1	1306.5	68.5
4 No. of Persons	44		50		50	
5 Per Capita Floor Area (3—4)	26.2	—	26.7	—	26.1	—

These gave an important clue that the 'Accounts Group' would prefer the 'Equatorial layout (Exhibit 2B).

5. Cost Aspect : Whenever a change in the existing system is made, it is essential to estimate the cost implications and see whether it falls within the means. The proposed layouts were confined to the present working area, and it was found that the re-layout could be effected after 1.30 p.m. on a Saturday (as the department closed by that time on Saturdays). Based on the existing overtime rates, the cost of effecting the re-layout was estimated to be about Rs. 25 only.

Implementation

Based on the 'five-point appraisal' the following method of implementation was recommended.

1. A conflict due to a fear in the 'increase of work-load' is expected to arise among staff members, on introducing the new layout. This should be avoided by explaining the need and the objective of work simplification well in advance.
2. The Equatorial layout (Exhibit 2B) should be taken for implementation.
3. The same tables and chairs should be given to the persons in their new locations.
4. The same persons should be allocated to the disposal of given documents, taking care of the new work flow pattern shown in Exhibit 3.
5. The re-layout should be effected on a Saturday evening after office hours.

It was also suggested that the 'number of papers disposed per day per head' could be used as a measure of efficiency. Taking care of any improvement in the overall work, it was also decided to re-assess additional staff requirement.

Conclusion

The above approach, analysis, and appraisal were found to work successfully for a given type of work, environment and selected group. However, it should be possible to make use of the work-simplification technique on the same lines, by studying any organisation, and selecting the proper units of appraisal to fit into the given situation.

THE SCIENCE OF GOVERNMENT

"The Czarina Catherine of Russia (who refused to recognise the first independent Government of the United States as being too revolutionary) sought advice on the Science of Government from a number of distinguished European intellectuals. Among these great gentlemen invited to Moscow was one Mercier de La Riviere, the author of *L'Ordre naturel et essential des societies politiques;* and the following conversation transpired between this gentleman and the Czarina Catherine :

Catherine : "Sir, can you tell me the best way to govern a State ?"

Mercier de La Riviere : "There is only one way, Madame. Be just, that is to say, uphold the constitution and observe the laws."

C. "But on what basis should laws be made ?"

M. "On one basis only, Your Majesty, on the nature of things and of men."

C. "Most certainly. But when one wishes to make these laws what rules should be observed ?"

M. "Madame, to give laws to mankind is God's prerogative. How can mere men venture on such a task ? By what right would he dictate to those whom God has not placed in his hands ?"

C. "To what then do you reduce the Science of Government ?"

M. "To study the laws which God has so manifestly engraven in human society from the time of its creation. To seek to go beyond this would be a great mistake and a disastrous undertaking."

C. "Sir, it has been a great pleasure to meet you. I wish you good day."

—*Souvenirs de Berlin*

PC MAHESHWARI

Professor of Economics
St. John's College, Agra

Size-Efficiency Relationship

In the present analysis, the author has made an attempt to determine the relationship between size and efficiency. This paper deals first with the theoretical considerations, second, the methodology, supplemented by technical notes on the measurement of efficiency, and third, an empirical study of the major industries of India.

POPULARLY, THERE ARE THREE SCALES OF production—large, medium and small, with inter-degrees between large and medium, small and medium, etc. In some industries the predominant size of production is large while in others it may be medium or small. In every industry, however, we may find all these scales. Since the optimum size is not definitely ascertainable, it would be difficult to pinpoint the departure from the optimum. Though assuming a determinate optimum, such departures would be quite common.

The question is, what determines the size of the most efficient unit? Decisions as to the optimum or the most efficient size cannot be made on the basis of intuition or theoretical prejudgement; it can only be on a measurement of the costs and the benefits of various alternative sizes that are met with or are practicable, technically and otherwise.

It is commonly assumed that the optimum size is likely to result from the free play of economic forces. These are: (i) Technology (ii) Finance (iii) Managerial Talent (iv) Market (v) Business Risks on account of fluctuations in demand, etc., (vi) The External Environment.

Technological innovations have a marked effect on the size and character of equipment, its speed, its servicing, etc. Corresponding to each stage of technology, there is an optimum size in terms of equipment and the quantum of engineering it continuously requires. With changes in the size of equipment and in the speed of machines and with acquisition of new knowledge, the optimum size of the industrial units also varies from time to time.

The Financial forces also influence the optimum size of a unit. In practice, the task of raising capital exerts important influences both upon the size, as also upon the structure of units. The amount of capital which a firm can raise and the rates of interest payable by the firm on varying amounts of capital are limiting factors of extraordinary strength, in respect of the size of its operative units.

Variations in managerial and administrative capacities have also to be taken into account. All managers do not possess all

the qualities needed for efficient management. One man may be a splendid organiser, another a technical genius and a third an expert financier. If a concern can employ all these three persons on its managerial staff, it can get the best or the most efficient management in all respects. But the cost of all these managerial skills may be out of proportion to the scale of output, present or prospective. Thus managerial costs—and returns also—would be a factor determining the optimum size of the unit. Also, managerial efficiency in coordinating all the aspects of the concern declines beyond a certain size of the concern.

Marketing conditions affect the size of the business unit in two ways. Firstly, in buying of raw materials, stores and spare parts, and secondly, in the sale of products. How much quantity of raw materials can be purchased, at what cost, very obviously influences the size of the producing units; and efficient buying may make as much difference to final profits as efficient manufacturing. On the selling side, the market must be of sufficient size to absorb all that is produced in the establishment; hence the quantity of goods a concern can sell at a price covering all its costs, leaving a reasonable margin of profit also determines the optimum size of the units.

The market obviously is the most powerful factor, for the real optimum size is the one with the greatest power of survival in the face of industrial vicissitudes. Generally, the demand fluctuates in three ways. It may be permanent due to a decline or rise in the popularity of the product, or temporary due to a rise or fall in the purchasing power of the community, or it may be seasonal as the commodity produced satisfies needs, which arise only at certain periods of the year. Therefore, the optimum size is one which can easily adjust its output to fluctuations in demand.

Then there are powerful external forces, such as the economic and the fiscal policies of the State. Even as it is, apart from the relative impact of its taxes, Government is at present the largest and most influential party in the market. Its policies may compel disintegration of large units or integration of small units. Thus the optimum size would be determined by these external factors also.

Taking all these factors into consideration, it is possible that in certain cases the operation of each factor may lead to approximately the same optimum size. There may also be cases, where the advantages of growth on the technical side may balance the difficulties of management in the efficient handling of too large a unit. In point of time, a size which may be optimum for the Boom may be too large for the Depression. Mr. E.A.G. Robinson has put it very well : "...The optimum firm itself may be in equilibrium, either because by some such devices the managerial optimum and the technical optimum have been reconciled with each other and with the survival optimum, so that for all three the optimum has become the same, or it may be in equilibrium because the gains from growth are balanced by the losses which will arise from such growth. The equilibrium may be similar either to that of the tug-of-war rope which is motionless because no one is yet pulling in either direction or to the tug-of-war rope which is motionless because the two teams are for the moment equally matched."[1]

Standard of Measurement[2]

The real difficulty arises mainly in the task of selecting a suitable standard of measurment. The suitability of any unit of measurement depends on the meaning and significance of 'efficiency'. If industrial efficiency consists, as Prof. E.A.G. Robinson says, "in trying to do with eight men what we have hithereto been doing with ten men",

[1] The Structure of Competitive Industry by E.A.G. ROBINSON, Page 17.

[2] Structure of Indian Industries by M. M. MEHTA, Page 16.

labour productivity or "labour productivity per man-hour" (P.M.H.) may be regarded as the criterion for measuring efficiency. If, however efficiency means 'securing the greatest results at least cost', cost of production per unit of output becomes the standard of measurement. An industrialist, however, views efficiency from his own standpoint. His aim is to maximise profit : thus the rate of profit becomes the standard for measuring 'efficiency'. If, however, 'efficiency' is used in its widest sense, connoting a higher standard of living for the workers, lower prices for the consumers and greater returns to investors, the standard alters significantly. As these objectives are often in conflict, there cannot be a common standard of efficiency for all purposes.

Thus we see that the standards of measuring efficiency vary according to the purpose in view, and none of the above methods can, in itself, be considered adequate. If all these criteria are used, there is a possibility that the distortions attributable to any single criterion can be easily set off. Moreover, if the application of these standards reveals the dominance of the same tendencies, the general conclusions can be further verified and confirmed.

While trying to find out the size-efficiency relationship, it is necessary to choose some scientific tests by which efficiency could be statistically measured. Often, it has been questioned whether the efficiency of an industrial unit could be quantitatively measured. While it is certainly difficult to measure efficiency in absolute terms, relative efficiency of units of different sizes can be measured with a reasonable degree of accuracy. The following coefficients for measuring relative efficiency have been suggested :

(i) Output per worker
(ii) Value added per worker
(iii) Output per unit of salaries and wages
(iv) Value added per unit of salaries and wages
(v) Capital per unit of wages and salaries
(vi) Labour costs per unit of output
(vii) Output per unit of input
(viii) Value added per unit of input

Regarding profit as the criterion of efficiency—industrialists and investors would have it as the only criterion—it may be said that it is not a good test from the social standpoint, for it may be earned by exploiting customers or owners of productive factors who have to accept a bad bargain because they have no alternative to turn to. On the other hand, we have used 'value added' as measurement of efficiency in relation to labour and other input factors. This procedure would give us a measure of the net contribution of the particular establishment and would view costs in the proper perspective. In fact, 'value added' is the more scientific measurement of productivity, compared to output per worker. Value added per worker means the net output per worker, that is, the value created by the worker in concert with other factors of production. Its variations within different units make it possible to assess the comparative costs of input factors and compare efficiency in the use of labour resources in different sized units. The higher the value of this coefficient in any unit, the greater must be its efficiency.

Relative efficiency may also be measured by the output per unit of salaries and wages. The higher this output, the higher would be the efficiency. It implies that wastage and spoiled work arising from inefficiency in the application of labour and costs of administration, training and turnover of labour should be as low as possible. Further the correlation between work and wages is direct and obvious. The terms of payment should be such that each man knows exactly how his pay is related to the effort and skill he puts into the job and is easily able to understand the "wage bargain". The wages should adequately compensate the worker for his time, effort and skill. Thus a unit is an efficient one if it gives a fair reward to its worker, yet its costs are covered through more output per unit of salaries and wages.

Value added per unit of salaries and wages is only a corollary of 'value added

per worker' : it indicates the industrial income generated per unit of salaries and wages. The higher the value of this income, the greater must be the industrial efficiency.

The above criteria are measurements of industrial efficiency through the various facets of productivity. We now take up for analysis the criteria relating to technology, costs of production and profit. We may consider 'capital per worker', or better still, capital wage coefficient because of the lack of homogeneity in the number of persons employed. Actually, it reflects the technical conditions of production and may be referred to as the factor combination proportion which is responsible for the creation of the final product. Differences in the relative costs of the factors of production have a specially marked effect on the scale of production. In underdeveloped countries like India where wages are low and capital is relatively costly, the best use of resources may be achieved by less capitalisation in the same line of production than in the developed countries. If in any unit the value of capital wage coefficient is small and output per worker is high then we can easily say that this unit is comparatively more efficient.

Labour Costs per unit of Output

Businessmen, however, ascertain the relative efficiency of their own enterprises through calculating labour costs per unit of output. The lower the labour costs per unit of output, the greater, in the opinion of the Business Manager. is the efficiency attained by the unit.

Probably it should be better to calculate the coefficient by dividing the gross output with total input, that is, the costs of raw materials. fuel, electricity and other direct expenses. This coefficient can be used to compare the level of efficiency as between different size-units in an industry. The higher value of this coefficient implies proportionately lower value of input, that is, lower production costs. The lower the unit cost of production, the greater is the profitability. Efficiency is implicit in such a measure.

In this analysis of size efficiency relationship, we may consider the combined effect of all these coefficients because a single coefficient may not give a correct measurement of industrial efficiency. It is quite possible that a unit may be considered as an efficient one if its output per worker is very high in comparison to other units; on the other hand, if the output per unit of input is not so high in comparison with other units it will be considered as less efficient or inefficient; hence the distortion caused by any single criterion may be removed if all these criteria are used as 8 points scale of measurement of efficiency.

In the following Tables, we give the values of all these coefficients for Iron and Steel, Cotton Textiles, Sugar and Jute industries, based on the data given in the Census of Indian Manufactures.

Note : Abbreviations used in the tables –

$\frac{OT}{ET}$ = Output per worker

$\frac{VA}{ET}$ = Value added per worker

$\frac{OT}{SW}$ = Output per unit of salaries and wages

$\frac{VA}{SW}$ = Value added per unit of salaries & wages

$\frac{TC}{SW}$ = Capital per unit of wages and salaries

$\frac{LC}{OT}$ = Labour Costs per unit of output

$\frac{OT}{IT}$ = Output per unit of input

$\frac{VA}{IT}$ = Value added per unit of input.

Adopting a simple method of ranking we have tried to summarise the results in Tables 5, 6, 7 & 8. In preparing the tables, the following considerations have been taken into account which are expected to reflect the efficiencies of the industries by size: If in a unit of particular size the output per worker, value added per worker, output per unit of salaries and wages, value added

TABLE 1

VALUE OF ECONOMIC COEFFICIENTS IN IRON AND STEEL INDUSTRY BY SIZE

Size (as denoted by the workers employed	OT/ET	VA/ET	OT/SW	VA/SW	TC/SW	LC/OT	OT/IT	VA/IT
Below 20	7031.88	1054	7.71	1.16	10.86	.13	1.19	.18
20—49	15926.92	2115	14.99	2.00	6.42	.07	1.54	.15
50—99	16831.04	2106	13.60	1.70	5.21	.07	1.13	.14
100—249	12863.12	2116	11.28	1.57	8.79	.09	1.16	.16
250—499	13849.61	3093	9.98	2.20	7.82	.10	1.28	.39
500—999	16047.87	3184	11.49	2.23	3.37	.09	1.06	.25
1000 – 1999	16823.26	5322	7.66	2.43	4.60	.13	1.46	.46
2000—4999	9129.00	2202	5.20	1.27	2.22	.19	1.32	.32
5000 & above	13993.33	6047	4.99	2.15	8.99	.20	1.80	.80
All sizes	13828.28	5217.79	5.56	2.13	6.48	0.12	1.59	0.65

TABLE 2

VALUE OF ECONOMIC COEFFICIENTS IN COTTON TEXTILES INDUSTRY BY SIZE

Size (as denoted by the workers employed)	OT/ET	VA/ET	OT/SW	VA/SW	TC/SW	LC/OT	OT/IT	VA/IT
Below 20	4206.18	(—)394	5.82	(—).54	34.80	.17	.91	(—).08
20—49	6535.96	1450	7.89	1.88	3.62	.13	1.29	.29
50—99	7436.12	1537	3.52	.77	3.20	.28	.27	.27
100—249	6775.31	1462	9.48	2.04	12.14	.11	1.29	.28
250—499	6862.66	1687	6.91	1.69	6.38	.15	1.33	.32
500—999	6180.08	1594	5.36	1.36	4.54	.19	1.35	.31
1000—1999	6227.56	1850	4.15	1.28	3.00	.24	1.27	.42
2000—4999	6386.06	2177	3.76	1.28	2.52	.26	1.52	.52
5000 & above	6449.84	2289	4.71	1.32	2.23	.27	1.53	.54
All sizes	6376	2060	4.01	1.21	8.05	0.20	1.47	0.47

TABLE 3

VALUE OF ECONOMIC COEFFICIENTS IN JUTE TEXTILES INDUSTRY BY SIZE

Size (as denoted by the workers employed)	$\frac{OT}{ET}$	$\frac{VA}{ET}$	$\frac{OT}{SW}$	$\frac{VA}{SW}$	$\frac{TC}{SW}$	$\frac{LC}{OT}$	$\frac{OT}{IT}$	$\frac{VA}{IT}$
Below 20	—	—	—	—	—	—	—	—
20—49	—	—	—	—	—	—	—	—
50—99	4550.42	1097	4.94	1.19	1.00	.20	1.32	.32
100—249	—	—	—	—	—	—	—	—
250—499	6443.35	2627	5.41	2.22	23.23	.19	1.70	.70
500—999	4110.32	1094	3.85	1.03	1.64	.14	1.36	.37
1000—1999	4801.69	1339	4.22	1.18	2.25	.24	1.38	.39
2000—4999	5484.46	1813	4.75	1.57	2.71	.21	1.49	.50
5000 & above	5784.30	1871	4.68	1.57	2.60	.21	1.48	.48
All Sizes	5432.06	1749	4.65	1.50	5.57	0.20	1.48	0.48

TABLE 4

VALUE OF ECONOMIC COEFFICIENTS IN SUGAR INDUSTRY BY SIZE

Size (as denoted by the workers employed)	$\frac{OT}{ET}$	$\frac{VA}{ET}$	$\frac{OT}{SW}$	$\frac{VA}{SW}$	$\frac{TC}{SW}$	$\frac{LC}{OT}$	$\frac{OT}{IT}$	$\frac{VA}{IT}$
Below 20	8828.28	1932	24.10	5.27	13.87	.04	1.28	.28
20—49	3167.69	244	12.37	.95	4.65	.08	1.08	.08
50—99	2345.41	450	7.98	1.53	4.65	.13	1.24	.24
100—249	4442.50	—	5.88	—	41.16	.17	.86	—
250—499	13709.88	4538	12.80	4.24	16.58	.08	1.49	.49
500—999	11054.10	3034	10.74	2.95	9.45	.09	1.38	.38
1000—1999	9159.14	2257	9.58	2.36	7.28	.10	1.33	.33
2000—4999	8433.71	3380	8.17	2.08	6.93	.12	1.34	.34
5000 & above	—	—	—	—	—	—	—	—
All Sizes	10120.66	2673.83	10.19	2.69	13.07	.10	1.36	.36

TABLE 5

RANKING OF THE SIZE GROUPS BY THE EIGHT CONSIDERATIONS IN IRON & STEEL INDUSTRY

Size (as denoted by the workers employed)	Rank in Consideration								Total Rank Score
	I	II	III	IV	V	VI	VII	VIII	
Below 20	9	9	6	9	9	7	6	6	59
20—49	4	7	1	5	5	1	2	8	33
50—99	1	8	2	6	4	2	8	9	40
100—249	7	6	4	7	7	4	7	7	49
250—499	6	4	5	3	6	5	5	3	37
500—999	3	3	3	2	2	3	9	5	30
1000—1999	2	2	7	1	3	6	3	2	26
2000—4999	8	5	8	8	1	8	4	4	46
5000 & above	5	1	9	4	8	9	1	1	38

TABLE 6

RANKING OF THE SIZE GROUPS BY THE EIGHT CONSIDERATIONS IN COTTON TEXTILES

Size (as denoted by the workers employed)	Rank in Consideration								Total Score
	I	II	III	IV	V	VI	VII	VIII	
Below 20	9	9	6	9	9	4	6	6	58
20—49	4	7	1	5	5	2	2	8	34
50—99	1	8	2	6	4	9	8	9	47
100—249	7	6	4	7	8	1	7	7	47
250—499	6	4	5	3	7	3	5	3	36
500—999	3	3	3	2	6	5	9	5	36
1000—1999	2	2	7	1	3	6	3	2	26
2000—4999	8	5	8	8	2	7	4	4	46
5000 & above	5	1	9	4	1	8	1	1	30

TABLE 7
RANKING OF THE SIZE GROUPS BY EIGHT CONSIDERATIONS IN SUGAR INDUSTRY

Size (as denoted by the workers employed)	Rank in consideration								Total Score
	I	II	III	IV	V	VI	VII	VIII	
Below 20	4	5	1	1	6	1	5	5	28
20—49	7	7	3	7	1	3	7	7	42
50—99	8	6	7	6	2	7	6	6	48
100—249	6	8	8	8	8	8	8	8	62
250—499	1	1	2	2	6	2	1	1	17
500—999	2	3	4	3	5	4	2	2	25
1000—1999	3	4	5	4	4	5	4	4	33
2000—4999	5	2	6	5	3	6	3	3	33
5000 & above	—	—	—	—	—	—	—	—	—

TABLE 8
RANKING OF THE SIZE GROUPS BY EIGHT CONSIDERATIONS IN JUTE INDUSTRY

Size (as denoted by the workers employed)	Rank in consideraion								Total Score
	I	II	III	IV	V	VI	VII	VIII	
Below 20	—	—	—	—	—	—	—	—	—
20—49	—	—	—	—	—	—	—	—	—
50—99	5	5	2	4	1	3	6	6	32
100—249	—	—	—	—	—	—	—	—	—
250—499	1	1	1	1	6	2	1	1	14
500—999	6	6	6	6	2	1	5	5	37
1000—1999	4	4	5	5	2	6	4	4	35
2000—4999	3	3	3	2	5	4	2	2	24
5000 & above	2	2	4	3	4	5	3	3	26

per unit of salaries and wages and output per unit of input are high but at the same time capital per unit of wages and salaries and labour costs per unit of output are low in comparison with other units, then it may be said that this size group is favourable to that industry and it may be the probable optimum size. Based on these considerations an attempt is made to adjudge the most efficient sizes of industrial units in the major industries in India.

The ranking plans as presented in Tables 5, 6, 7 and 8 are based on commonsense. In case of output/value added per worker, output/value added per unit of salaries and wages, output/value added per unit of input the ranking is in descending order, whereas in the case of capital per unit of salaries and wages and labour costs per unit of output, ranking is in ascending order.

To further simplify the analysis the total of the ranks given under each consideration for each industry in each size is represented in Table No. 9 The industry getting the minimum score under a given group is the most efficient. With the rise of the score, efficiency is considered as decreased. In this way, industrial efficiency is judged in a better way than that by any single consideration. These eight considerations may thus be able to help in finding out the most efficient, efficient, and less efficient sizes of industrial units. On the other hand, if we take into account each consideration separately, then different sizes will be most efficient on the basis of each consideration. A unit may be the most efficient from the consideration of output per worker but it might not be the most efficient from the view point of output per unit of input.

The total rank scores of different size groups in each industry are given in Table 9.

TABLE 9
TOTAL RANK SCORE FOR EACH INDUSTRY BY SIZE

Size (as denoted by the workers employed)	SCORE			
	Iron & Steel	Cotton Textiles	Sugar	Jute
Below 20	59	58	28	—
02— 49	33	34	42	—
50— 99	40	47	48	32
100— 249	49	47	62	—
250— 499	37	36	17	14
500— 999	30	36	25	37
1000—1999	26	26	33	35
2000—4999	46	46	33	24
5000 & above	38	30	—	26

For purposes of readability, Table 9 may be re-written as Table 10.

TABLE 10
EFFICIENCY RANKING BY SIZE

Size (as denoted by the workers employed)	SCORE			
	Iron & Steel	Cotton Textiles	Sugar	Jute
Below 20	10	7	3	—
20—49	3	3	5	—
50—99	6	6	6	4
100—249	8	6	7	—
250—499	4	4	1	1
500—999	2	4	2	6
1000—1999	1	1	4	5
2000—4999	7	5	4	2
5000 & above	5	2	—	3

It is clear that in the iron & steel industry and in cotton textiles, the size group employing 1000 to 1999 workers is the most efficient scale of production, while in the sugar industry and in jute textiles it is the group employing labour between 250-499. The next efficient size groups are 500-999 in iron & steel and 5000 and above in cotton textiles and 2000-4999 in jute textiles. The smallest size group employing less than 20 workers is the least efficient in iron & steel, also in cotton textiles, while in sugar it is 100-249 and in jute textiles it is 500-999.

Though the above analysis indicates the most efficient sizes of industrial production in investigated industries, it does not mean that only those size groups are the optmium scales of production. There are so many economic forces, difficult to measure, which determine the optimum size of the industrial unit. Various possible criteria have been taken into consideration while dealing with the most efficient size, but there are always some limitations and reservations in every analysis. The only conclusion which we can draw from this is that these size groups are most economical and conducive to greater efficiency in working.

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The All India Management Association (where Sri K Pennathur, formerly of NPC, has gone) advertised for an Executive Director. One of the applications received was as follows :

Dear Sir,

1. **I like to join as an Executive Director**
2. **I pray for a minimum salary of Rs. 10,000 per month**
3. **My age is 37 years 4 months**
4. **Please test me for this job**
5. **I am a Bengalee unmarried**

Some informations about me—

1. **My colour is Black, eyes Black**
2. **I am 5′ 8″ tall**
3. **I know English quite all right**
4. **I did not marry yet**
5. **I know the meaning of business is busyness**
6. **I got training under 3 Directors for 9 years (All I.A.S.)**
7. **I like to eat fruits only and only fruits**
8. **My selection for cinema star is Asha Parekh**

1.4.67
Calcutta

(Reprinted from AIMA Journal, **Indian Management,** *July-Aug. '67, page 41)*

GOVERNMENT OF INDIA

MINISTRY OF COMMERCE

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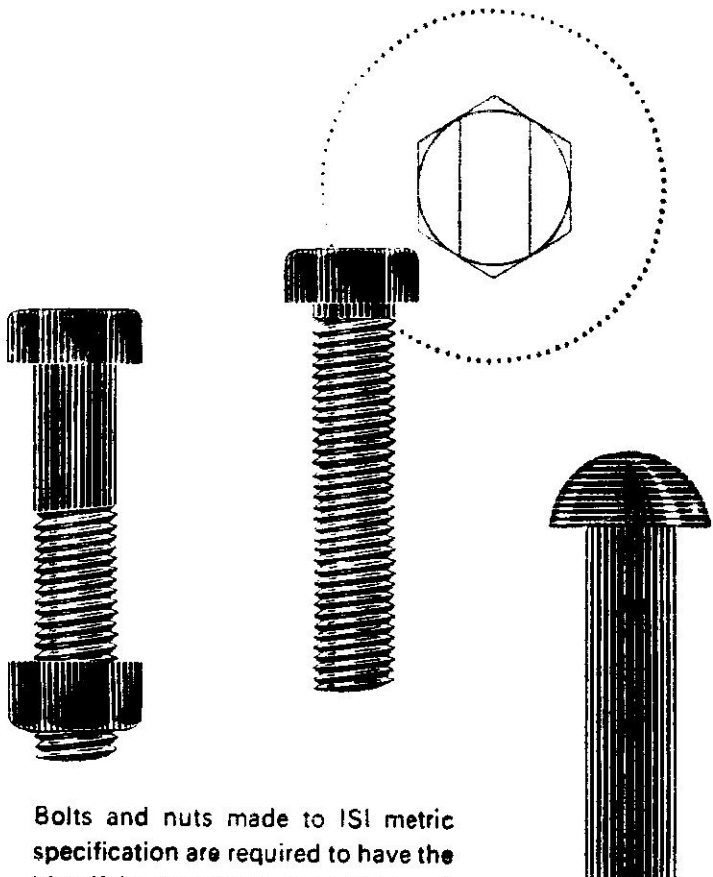
P.O. Kandla Free Trade Zone,
Gandhidham (Gujarat).

davp 67/244

Look for these parallel lines



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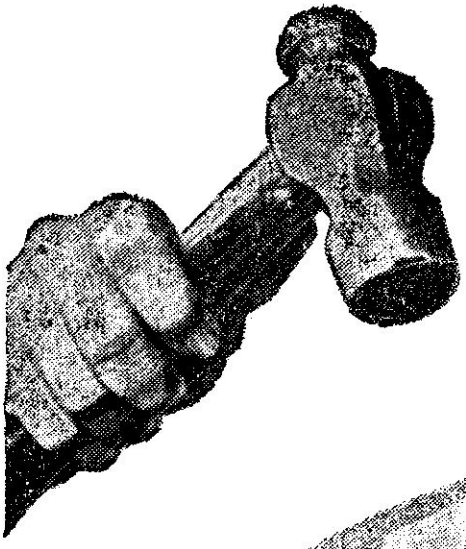

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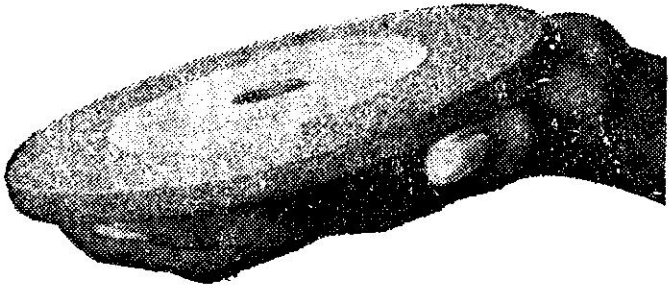

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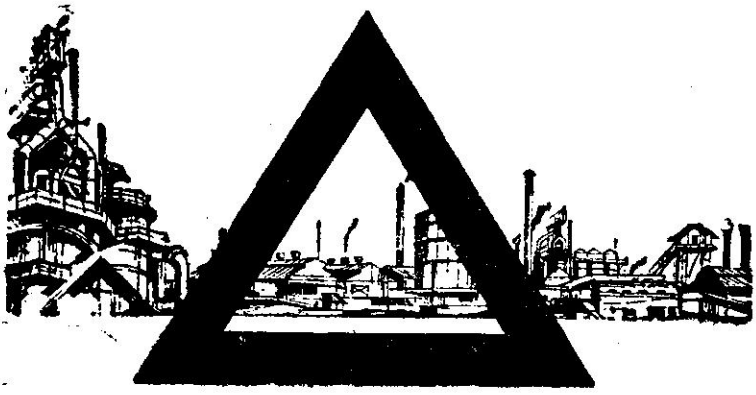


AT JAMSHEDPUR, SAFETY IS PART OF THE JOB

Seventy-five per cent of industrial accidents, it has been found from experience, are avoidable because they are *caused* by human negligence. That is why at Tata Steel much stress is laid on the systematic safety education for each worker.

One of the first things that an entrant to the Steel Works has to undergo is a safety induction course. The lesson thus begun is pursued through a continuing campaign. Regular inspection of shop-floors, good house-keeping, use of safety appliances, combined with the activities of the ever-vigilant safety committees, are helping to root out possible sources of hazards...to make working conditions safer. In addition, regular study courses, exhibitions and competitions are held to make safety a habit with every worker.

The success of these efforts is seen in the fact that between 1961 and 1966, the average monthly rate of accidents at the Tata Steel Works has dropped from 249 to 64. The safety highlight of 1966 was the achievement of 2.4 million accident-free man-hours between 1st June and 14th June—an all-time record in safety for heavy industry in India.

Safety is part of the job at Jamshedpur where industry is not merely a source of livelihood but a way of life.

TATA STEEL

The Tata Iron and Steel Company Limited

TN 3/17A

FIGURES AT A GLANCE	
1965 : Rs 17,300,000	
1966 : Rs 31,000,000	
EXPORT EARNINGS IN 1966	
U.K. and W.Europe	Rs 16,317,000
U.S.A.	3,585,000
Australia, New Zealand and Far East	3,123,000
Canada	2,225,000
Middle East	2,575,000
West Indies	2,400,000
West Africa	1,470,000
East Africa	305,000
Total :	Rs 31,000,000

Bata INDIA

Exports Hit New High in 1966

Rs 31 Million Earned in Foreign Exchange

Bata-India, the country's leading exporter of footwear, has hit a new high in 1966, by earning Rs 31 million in foreign exchange.

A net gain of U. S. $ 500,000 (half a million) over what it earned in 1965.

A remarkable performance indeed : achieved at a time of general decline in exports from India, and in the face of keen competition from such major exporters as Japan, Hong Kong and others.

What is more, many developing countries, becoming self-sufficient in footwear production, are not only restricting imports, but are making a bid to enter the export field themselves.

Bata-India, consequently, has to build new markets and to increase exports to such highly developed countries as the U. K., the U. S. A., Canada, and others, where quality products have to be offered at a price that must meet both international and local competitions.

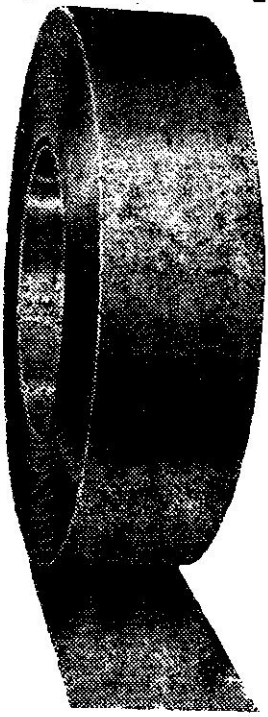
Bata-India has rendered service to the country by earning valuable foreign exchange. And it has earned entitlements to import its vital raw materials which are yet scarce in the country and which it is progressively and successfully substituting with indigenous ones.

The Company makes full use of its Market Research and Product Development methods, which enable it to keep pace with progress in the developed countries and cater to their demands

Tube Products of India offer

Cold Rolled Steel Strip

to your precise requirements



Tube Products of India offer you the most accurately finished, uniform strip—Cold Rolled Steel Strip. The strip is available in a variety of tempers, edges and finishes for a diversity of end uses—Bright Finish being most suitable for electro-plating and superfine enamelling.

Amazingly versatile

TPI Cold Rolled Steel Strip is produced by continuous rolling of descaled pickled, hot rolled strip between rolls to very close tolerances. The Steel Strip is generally supplied to BSS 1449 or to the special requirements of customers.

The rolling process imparts to the strip uniform strength and dimensional accuracy, high ductility and smooth, fine grained surface which allows for excellent fabricating efficiency and superb finish. The close tolerances to which the gauges can be maintained, results in uniform thickness (so vital for precision parts) that cannot be obtained from hot rolled steel strip.

Tailored to your requirements

TPI Cold Rold Steel Strip can be supplied in tempers from Dead Soft to Full Hard, either in coils or in cropped lengths (for heavy gauges only) of upto 304.80 cm (10 ft.) and widths from 3.81 cm to 30.48 cm (1½" to 12") and in gauges from 12 SWG. to 26 SWG.

Typical applications for TPI Cold Rolled Steel Strip: The end uses of TPI Cold Rolled Steel Strip range far and wide; the more important applications are found in automobile and cycle industries, office equipment, electrical appliances and hardware.

Specify TPI Cold Rolled Steel Strip for superb finish and better fabrication.

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SK WARRIAR

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The Pros and Cons of Automation

More than 2000 years ago, the great Greek philosopher, Aristotle, said: "When looms weave by themselves, man's slavery will end." Now that such a prospect is in sight through Automation, serious doubts are being raised as to the future of the human race, whether automation with its associated computerisation will not mean a new slavery for man. The author has examined the whole issue in an objective, historical perspective, citing chapter and verse, as to the almost astronomical increase in output, employment and efficiency that have been accomplished—in fact, could only have been accomplished—through automated equipment and information techniques, which have made advanced countries what they are at the moment; and which we must do—and earlier the better—if we are at all to achieve comparable standards of efficiency and affluence.

THE ADVENT OF AUTOMATION IS BEING characterised as the second Industrial Revolution. The first Industrial Revolution ushered in the machine age that has changed practically every aspect of our daily life. By taming the elements of nature and moving the wheels of industry, it substituted muscle power with machines. Without the fruits of this industrial revolution, the mass production of consumer articles at prices within the reach of the ordinary people would have been impossible. Yet in the initial stages of the First Industrial Revolution, it caused some real hardships to a number of working people and it raised quite a few imaginary apprehensions also particularly about unemployment. The immediate reaction of the working people to the advent of the industrial revolution was best reflected in the revolt of the stage-coach drivers who smashed the first locomotive and demonstrated before the British Parliament. Though temporary difficulties were created by way of job displacements and the need for re-acquisition of new skills, history has proved that most of their fears were ill-founded. The British Railways later employed many times the number of stage-coach drivers. When Arkwright invented the cotton spinning machinery in 1760, only 7900 hand spinners were producing cotton textiles in England. Just 27 years later 3,20,000 men were employed in the textile mills there—nearly 40 times.

In the U.S.A. an estimated 10,000 icemen carried the cold, wet loads in the 1920s; today 25,000 refrigerator servicemen alone work as their counterparts, not to mention those engaged in manufacturing refrigerators. In 1924, the General Electric Company employed 8000 men in the Lamps Division and sold 100 watt bulbs at $1.00; today the cost has come down to 25 cents in spite of

200% increase in labour cost since productivity has gone up by 360% and they employ 17,000 workers—115% more. All these point to the fact that the progress achieved during the 19th and 20th centuries would have been impossible without the first industrial revolution and that most of the fears entertained about it at that time were ill-founded.

In the wake of the Second Industrial Revolution, as automation is called, it is not at all strange if we have some doubts about its impact on our life. Learning the lessons of history, however, we should realise that a *quixotic fight against automation is not going to succeed* and that, on the other hand, technological changes like automation are conducive to human progress. A proper study of the problems involved will help us to avoid the hardships that may be caused by it and to re-equip ourselves with the new skills and orientations required by the new situation.

In fact, the speed with which we orient ourselves to the new situation is important. If the changeover to automated office equipment is going to keep the trend of other technological developments, *there will be little time to cushion the impact of automation on employment* particularly, and the society generally, considering the dramatic telescoping of the time span between the initial innovation and its practical application[1]

A substantial part of the electrical and electronic equipments that we are now using did not exist fifteen years ago. While the adoption of electric power in industry took more than sixty years, automatic accounting systems introduced 15 years ago have caught up so fast. So *the time available for us to make the readjustments in our attitudes and work methods will be shorter than what we normally think.*

[1] Please refer to W.O. BAKER: *Dynamism of Science and Technology.*

S. No.	Innovation	Year of Discovery	Year of Application	Time Span in Years.
1.	Electric Motor	1821	1886	65
2.	Automobile	—	—	40
3.	Radio broadcasting	1887	1922	35
4.	Vacuum tube	1882	1915	33
5.	X-ray tubes	1895	1913	18
6.	Aeroplane	—	—	14
7.	Television	—	—	10
8.	Nuclear Reactor	1932	1942	10
9.	Atomic Bomb	1938	1945	7
10.	Earth Satellites	-	—	5
11.	Stereoscopic rubbers & Plastics	1955	1958	3
12.	Transistor	1948	1951	3
13.	Solar battery	1953	1955	2

ADVANTAGES

The major advantages of automation, besides the obvious savings in manpower, are the following :

(1) **Automation makes New Products and Processes possible:** The telescoping of the time span of research developments into actual application mentioned earlier could not have been accomplished without the help of computers as a new means for fast processing of data and information. This is particularly true of earth satellites, moon rockets and other latest innovations. New products like fluorescent lamps could not be made physically at the right price without automated equipment.

(2) **Avoidance of Drudgery:** "A whole stratum of dull, repetitive, low-paid jobs, both in the factories and offices, will be eliminated." If the drudgery involved in

taking data and information from old records and reports, calculating new figures and indices and entering them in new records and reports can be avoided by the use of machines, *why waste human energy on it?* Is it not the logical extension of substitution of hard physical work with machines on the shop floor ? A survey conducted by the Bell Telephones indicated that *if all the hand sets now used in the USA were to be served by manual exchanges, more than 50% of the total female population in the country would have been engaged as telephone operators only !* What a colossal wastage of human resource would it have been ? Thanks to automatic exchanges, they can now do more useful and meaningful jobs.

(3) **Automation leads to Expansion of Business Activities:** Another aspect of the problem is that without automatic exchanges the facility of telephones would not have reached wide sections of the population as it has done now—just as with horse-drawn stage-coaches travel facilities would have remained severely restricted, and without locomotives, buses, cars and planes such large numbers of people would not have been travelling so fast. Method improvements made possible by the use of automatic equipments enable us not just to save money but to make money, that is, generate more wealth for the economy. Thus *automation has generated an enormous increase in the demand for goods and services which has resulted in expanding business and creating more employment opportunities.*

(4) **Overcomes Physical and Magnitudinal Limitations:** This brings us to the next point that *manual methods would restrict output by their sheer physical and magnitudinal limitations.* Modern Governments, industrial units and business establishments require large volume of data and information to plan, co-ordinate and control their operations; this has led to 'paper work explosion'. Manual methods are not able to cope up with the requirements of this large volume of data and information in proper time and attempts in this direction have only resulted in a plethora of paper work mostly after the event. Computers can play an effective role in processing this large volume of data and information fast enough and in preparing condensed, meaningful reports.

(5) **Makes available Information not so far available :** When part of an intelligently designed system, *computers offer new and exciting capacity to provide management with information never previously available in time even with an army of clerks.* For example, is accurate and timely information available to the marketing executive so that he can determine the sales activity of every product at every point of the distribution pipeline ? Does the production executive know whether his machines and equipments are optimally utilised, whether the various lines are properly balanced and co-ordinated and whether he is getting the maximum of the output possible ? Is the General Manager certain of control over the relationship between production, finished goods inventory and sales ? Do financial reports tell him what they are intended to, fast enough to permit effective action ? It is in application to systems which will provide solutions to problems such as these that electronic computers make their most important contribution. Let us explore a little deeply into these areas.

(a) *In the area of Marketing:* If we can rapidly, accurately and intelligently accumulate, analyse, summarise and report sales and inventory data to marketing management and provide it with a knowledge of what is happening in the field up to the last minute, we will be sharpening one of its dullest executive tools, viz., the present sales analyses; a major obstacle to reliable market forecasting will be eliminated as sound short-term forecasting is dependent on rapid, accurate, pinpointed sales and inventory statistics. This is particularly important for big

organisations with hundreds of distributors, thousands of dealers and millions of customers. The same applies to market research data, which is the basis for long-term forecasting and planning of strategies. The system should provide the marketing manager with a sensitive pulse of the sales activities so that shipments can be properly allocated, production appropriately adjusted and products suitably developed.

(b) *In the area of Production:* In factories where a variety of products are manufactured using a large number of equipments with different processing time for each operation, the control and co-ordination of production can be a stupendous task. Also, finding out the most profitable product mix taking into account the profit margins for each of the products is another fruitful pursuit which many companies do not attempt at present due to sheer lack of data and facilities to process the data. To the computor these are very easy tasks. Within a matter of few hours the computer can work out the optimum product mix and shop loading schedule and automatically print out the control paper work specifying (i) what operations will be done, on what machines and equipment, at what time, in what quantity, and (ii) what materials in what quantity should be provided, at what location, at what time. Balancing of assembly lines and co-ordination of product pipe-lines pose problems which according to present methods require the efforts of an experienced planner for several days; the computer will do it in a matter of minutes. Further, the computer programme, unlike the 'best guess' of the hit and miss method of the planner, will probe all possible alternatives and arrive at a solution which is better than any possible by the manual method. It can also keep ready various alternative solutions to suit changing conditions.

(c) *In the area of Inventory Control:* The function of the computer in this application will be to digest the mass of source documents, affecting the inventory status and to issue timely reports based upon daily analyses of conditions. The computer will explode any proposed production schedule and will automatically determine the material requirements for every item for any selected period of time. For the current production schedule, it will prepare the shortage and average reports by item, thus enabling management to anticipate critical situations in sufficient time to provide for effective action. Another great advantage is that the effect of material stocks on any perpesed production schedule can be checked quickly. It will maintain perpetual records of inventory and it will prepare purchase orders telling us what to buy, in what quantities, from what supplier and at what date.

(d) *In the area of Accounting:* The application of computers in pay-roll work, invoicing, general and cost accounting are well known. In the budget preparations many combinations of price, product mix and quantity discounts, each of which deserve careful analysis, exist. Without the computer, the problem of exploring all these possibilities would be insurmountable. Manually it will be the 'best guess' that we will be using. With the help of a computer the budgets will be more timely and realistic than they have ever been without it. Many alternative budgets can be prepared enabling pre-analysis of the profit effects of alternative courses of action, variations of management judgment and even the

actions of our competitors. Budgeting on the above lines will meet the following objectives :—

(i) Provide mangement with the means of knowing in advance the budgeted results of sales and production budgets;

(ii) Indicate the budgeted net income from sales from various sales and production mixes;

(iii) Determine the optimum and break even production and sales levels for various product mixes;

(iv) Determine selling prices required to achieve a pre-determined net income from sales for a fixed production level;

(v) Determine product mix and production level to achieve a predetermined net income from sales at predetermined prices;

(vi) Determine in advance the net income from sales resulting from proposed changes in sales or production levels;

(vii) Provide detailed operating budgets down to the Operation Supervisor's level.

Thus instead of the present historical (hysterical) accounting, computerised accounting can tell management the backward and forward flow of money. The accountants now chauffering the managements down the business highway using only a rear view mirror, can be provided with a good clear windshield and even with some ability to see around curves. "They will be able to plan tomorrow's action today using yesterday's data" (W.W. Smith of General Electric Company).

(e) *In other areas* like: Maintenance Planning, Equipment Replacement, Project Management, Research and Development, many Operations Research methods have been evolved to help management decision making, which base themselves on mathematical models of actual business situations. To solve these problems, computers are very helpful, and probably the best uses of computers, in terms of the returns and savings, are these applications which comparatively take less of computer time than applications like pay-roll which involve voluminous data processing time without contributing much to the profit picture of the company.

(f) *Integrated Management Control:* An integrated management control system can be evolved by the use of computers utilising the market research data and sales forecasts for long-term corporate planning and short-term production planning respectively to maximise profits, working out the effect of these plans and schedules on shop loading and inventories and preparing costs and budgets accordingly. Management can make a rapid pre-evaluation of various alternative decisions and their effect on operations; possible bottle-necks and hidden inefficiencies not detectable so far, fast enough, will be revealed earlier. To do all this manually with regard to a plant having 10 models, 500 raw material items and 1000 purchased parts, week by week for 20 weeks, may take three weeks while the computer will take only a few hours. A change over from one production schedule to another which previously would have taken six weeks or longer can be accomplished in a matter of hours.

In the implementation phase of production schedules, the computer will prepare the necessary revisions and print the daily, weekly or monthly status reports. *The mass of data that management receive, today may be compared to a newspaper without headlines, without capital letters and even without punctuations and spacings.* This will be changed into a situation of condensed action-

oriented information permitting 'management by exception'. Electronic computers are the most powerful 'management tool' yet developed but it should be emphasised that *it can do no original thinking, that it will do only what it is asked and programmed (and fed) to do* and that the decision making responsibility of the management, except very routine ones, cannot be delegated to it. The benefits to be derived from this valuable tool will entirely depend on the management.

PROBLEMS

So far we have seen the benefits of electronic computers and the advantages of automation. Now let us look into the problems posed by computers and the difficulties caused by automation.

Automation and Employment

The first problem which comes to our mind is that automation may cause more and more unemployment, temporary redundancies and job displacements. All technological changes and all pursuits for higher productivity have posed this problem and its impact may be more severe in developing countries like India where unemployment and underemployment are already high. Let us delve deeply into this problem of unemployment. Two factors have contributed predominantly towards the present situation:

(i) *Population Explosion:* Our population is increasing at a tremendous rate and the number of persons seeking employment is shooting up;

(ii) *Transformation* from a backward, agricultural economy into a modern, industrial economy which attracts more men from traditional occupations to new factories and offices. If we absorb them in the existing factories and offices, it will add to the cost of the products and services, reduce the margin of savings and thus make the surplus available for ploughing back into the economy less than what was available earlier. This will slow down the development of the economy through the improvement of agriculture (primary sector), expansion of business and industrial activities (secondary sector) and provision of more services (tertiary sector) and thus render the creation of additional employment opportunities more difficult. An example will illustrate this point. If General Electric Company had used in 1967 the same method as in 1907, 10 million people would be needed to do the job which at present is being done by 17,000 employees and a 100 watt bulb would cost 20 dollars instead of the present 25 cents. Costs would have been so high that only the richest could afford to have electric lamps and the demand would have withered and *the bulb manufacturing business would have offered fewer job opportunities than even candle production.* Thus we see that *any attempt to solve the unemployment problem by engaging more people in existing activities would be a self defeating move. Our coir, brick and tile industries are standing monuments to this truth.*

The solution to the problem of unemployment is to absorb the new entrants in new factories and offices to be created in a developing economy. The men working in existing industries and other sectors of the economy should improve their productivity (per capita output) and thus generate extra national income which should be reinvested in new industries, business establishments and other development activities to provide additional avenues of employment (it is also relevant here to state that full and immediate distribution of the additional income generated to those who have contributed to it will make reinvestment and additional employment impossible). This is the only lasting way to solve the problem of unemployment.

All technological changes and higher productivity techniques should aim at generating more income with the existing number of employees and contributing the surplus for reinvestment, which in turn should create more job opportunities for the unemployed. Automation also should be viewed with this perspective in mind. The experience of advanced countries, who are adopting automation faster than us, indicates that it has not resulted in shrinking employment; on the contrary, it has contributed to enlarge employment. In 1947, there were 58 million people employed in all sectors of the economy in U.S.A., now the figure exceeds 73 million—an increase of 15 million or 25% in spite of automation. Meanwhile the agricultural productivity has gone up by 16%, industrial productivity by 60% and the real hourly compensation to labour (wages) by 70%.

Dr. L.T. Rader, Vice-President of General Electric, has put it very well: "Statistics show that industries which invest the most capital per worker, that is, the most in plant and machinery—automation, if you please—are those that have the highest employment growth, the highest wage scale, the highest profits and the most favourable balance of trade". During a period of 13 years (since 1948), says Dr. Rader, the four industries that were the most efficient in the use of labour increased their employment by 2,36,000 people while the most inefficient industries from the labour standpoint decreased their employment by 6,09,000.

Computer : Creator of jobs

The computer itself is a creator of jobs. Though fewer workers will be needed on routine operations, more employees will be needed for planning, programming and coding of machine instructions. *Actually about 1 million people have jobs today, making, selling, servicing and programming computers—in a field where no one worked just 20 years ago.* Automation builds up jobs by enabling companies to do things that were impossible before, as we have seen in the case of fluorescent lamps, precision instruments, space programmes etc. Moreover the effective managerial controls that have been made possible by computers have resulted in more efficient industries, business and services which have created new demands and expanded employment opportunities. The instance of a company which, by mechanising the order processing system, has cut the time required to fulfill the orders from two weeks to 24 hours, is one among the many examples of how computers help create new business volume and increased employment.

Computers : Fact and Fiction

There are a lot of misconceptions about the computers: that they will become the masters of men and reduce the workers to subordinate position; that only a few high priced, highly-educated specialists and technicians will be necessary to operate; that the few workers who should be left, need do only simple repetitive tasks and so on. We have seen earlier that the computers will do only what they are programmed to do. They are more dependent on human beings than standard office machines, to tell them what to do, how to do, in what form etc., as they are more flexible. Specialised knowledge for computer jobs such as programming, coding, machine operation, etc. can be obtained in a few weeks of training such as is offered by the equipment manufacturers : these are not such highly skilled jobs. But in analysing the jobs and developing mathematical models, there is need for Industrial Engineers, Systems Specialists, Operations Research personnel etc. with technical know-how.

In order that the machine does a completely automatic job, methods, systems and procedures must first be broken down in the most complete detail. A pay-roll job, for example, may require 2000 or more steps and take a small group of people several

months to analyse. Only when the routines are detailed, they will be translated into the machine language. The minute and thorough analysis of methods that computer programming will necessitate is one important side benefit derived from it. Sizeable economies can be obtained if some of the advanced thinking necessary for computerisation is applied without actually using the computer, though this is seldom accomplished in practice, human nature being what it is. An interesting example of men competing with and defeating the computer occurred in a Japanese Smelter. *When automatic voltage control was introduced in a few lines which helped to increase the efficiency from 86 to 90%, the workers in the mechanically operated lines raised the efficiency from 86 to 91%.* This necessitates to some extent personnel with higher educational background: and it is here that the machines bring new jobs needing creative thinking, initiative and responsibility.

Upgrading of Skills

Jack Stieber, in his paper on 'Automation and White Collar Workers,' says, ".....the advent of electronic computers into the office will result in the upgrading of skills, the redistribution of skilled jobs and the virtual elimination of tedious, repetitive, clerical operations" both in factories and offices. In the words of John Diebold, "in an odd and entirely unexpected way, automation may bring us back to the human and psychological values of the self-respecting craftsmen whose alleged demise the professional mourners decry by wailing and bawling debasement." One company has estimated that with the use of computers 20% of their employees would be assigned jobs of a higher calibre with enlarged responsibilities.

In the four phases of data processing, viz., *planning*, *input*, *processing* and *output*, effective reduction of work occurs only in the data processing phase. We have examined above the work involved in planning. In the input and output phases of translating information into machine language and back, as well as in properly interpreting them, only additional work is created. And in spite of the tremendous flexibility and memory capacity of the computers, it will be impossible to programme them to handle all the many exceptions that take place in the day to day operations of the average office. Again, as mentioned earlier, in the field of marketing production control, inventory control, accounting, etc. computers will make it necessary to collect and process additional data. *The net effect of all this is to increase white collar jobs compared to blue collar ones.* And so, there is going to be lot of clerical jobs still with us.

"The Rochester Story" is an example. Of Rochesters' (N.Y.) 5,371 business establishments, 76 were automated (found to have some form of data processing equipment); only 3 of the 76 firms showed a decline in total employment over the past 15 years (mostly due to business decline in the industry itself, and in all three cases, the use of modern data processing techniques has lessened the effect of industry declines) contrasted to 25 firms which showed an employment increase of 100 per cent or more. Half a dozen actually increased their employment as much as ten-fold. The average automated company increased its white collar work by 57%. These 76 automated firms—1.3% of the total in Rochester—employ more than half of the total number of white collar workers in the city.

This effect of automation, that is, the increase in the ratio of white collar workers to blue collar workers noticed in the U.S.A. is conclusively proved in many surveys. M/s. S.E. Hill and F. Harbinson of Princeton University give the following data based on a sample survey among a representative cross section of U.S. industries.

White Collar jobs :	Percentage of Total Post World War II	Recent	% Increase
Executive	6.1	7.2	1.1
Administrative	1.6	2.1	0.5
Professional	1.9	2.8	0.9
Technical	2.0	2.8	0.8
Sales	1.2	1.8	0.6
Clerical	10.0	12.0	2.0
			5.9

The 6% increase indicated above agrees with the following data compiled from the white collar report of the Beareau of National affairs and other sources.

	Percentage of Total Post World War I	Recent	% Increase
White collar:	22	37	43
Professional and Technical	5	9	11
Administrative & Managerial	7	9	11
Clerical and Sales	10	19	21
Blue Collar	37	41	36
Skilled	12	14	13
Semi-skilled	14	21	18
Unskilled	11	6	5
Service	10	10	13
Farm	31	12	8
Total	100	100	100

At present there are 4.5 million "whites" more than "the blues" in the U.S. working population. Even among the 'blues' there is a significant realignment in the skill break up, as shown below (less of production workers and more of maintenance and technical workers) :—

	Percentages of Total Pre-automation	Post-automation
Production	77.9	51.8
Maintenance	21.4	36.2
Technical	0.7	12.0
	100.0	100.0

Re-training Needed : It is true that automation has necessitated some temporary redundancies, job displacements and occupational adjustments. In the blue collar field, the number of routine production jobs have come down and in their place maintenance and service jobs of a technical nature have gone up. In the white collar field, executive, administrative, professional, techcal and clerical jobs have gone up; only the jobs involving manual computations and routine paper work have been replaced by office machine operators, coders etc. This shifting pattern of requirements has resulted in structural unemployment, that is, unemployment in old categories of jobs, while at the same time having many new job opportunities in new fields. This has necessitated retraining of personnel and an increased educational content in many jobs. The most important step in meeting the difficulties caused by automation is this reorientation and retraining of workers. The employees thus affected will be two to three times that of the employees rendered surplus. In this context it has been the experience that young displaced workers take these changes without much difficulty but it is hard on old workers above 40 or 45 years of age, who find it difficult to acquire new skills. This is probably an area where industry, trade union, Governmental agencies and educational institutions should concentrate and evolve certain action programmes

to avoid hardships. Continuing education at all levels when training and education are threatened with obsolescence, matching the jobs that are arising and the people available to fill them, employment counselling etc. are the needs in this context. An assurance to employees that none would be laid off, retrenched or lowered in status would be very helpful to effect automation, as in implementing many other changes. The companies and other organisations should take advantage of the normal labour turnover (as it will take a minimum of 2 to 3 years to complete any change over to computerisation) and the growth of business and service requirements should be utilised to absorb any surplus personnel.

Correct Perspective

Viewed in the background of the fact that we have only reached a stage of automation in office which was prevalent in the U.S.A. 15 years back, we have this much time available to devise methods to bring about a smooth transition and to lessen any adverse effects of automation. History has shown how *attempts to resist the industrial revolution failed* and how *attempts to fight automation are failing in other countries.* Instead of fighting against progress and the trends of time, if we apply our minds to understand the problems that are likely to arise and to find suitable solutions to them ahead of time, we will be making our life less miserable. On the contrary we will be contributing our mite towards higher productivity and better standard of living in the country.

It may be mentioned here that automation is not an exclusive development in the capitalist countries but that it is equally well applied in the socialist countries. In this context, the following words of Mr. L. Brym Leader of the Czechoslovakian Team of Experts at the Central Machine Tool Institute at Bangalore are worth quoting. "Automation has stepped in as a sure means of raising industrial productivity. Apart from increasing industrial productivity, automation brings in certain desirable human benefits. It relieves and frees human operators from the mental and physical strain of keeping pace with the monotonous rhythm of machines and operations. The overall effects of automation will prove economically advantageous to society".

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NARENDRA K SETHI

Associate Professor of Management, St. John's University College of Business Administration Jamaica, N.Y.

The Computerised Society of Tomorrow*

The world of science and technology is experiencing a new thrill of computerisation in a growing number of social areas and business applications. This trend has manifested itself in an emphatic manner during the last decade, and the indications are that the society of tomorrow will be one of *quantified* information flow and systems design in all its aspects. Only those businesses and social processes will survive this challenge which plan their course of action according to the requirements and expectations of this phenomenon. An effort has been made in this paper to hypothesise some of the business-oriented changes which this process of computerisation would initiate.[1]

THE COMPUTERISED SOCIETY WILL BE BASED on a faster quantitative mechanism than we are accustomed to at the present time.[2] It will eliminate an increasing number of *human* management functions. It will witness a pronounced change in the present methods of decision-making. It will initiate an information theory which will revitalise communication methods. Most middle management jobs will be re-structured, as the functions performed at that level will be computerised. There will be a great emphasis on INSTANTISATION of almost every business aspect: instant information of all kinds, instant decision, instant communication and instant movement.

There can be no denial by any far-seeing businessman of the fact that the survival and growth of his business depend upon his ability to plan for this new computerised society, which would, in the next decade totally envelope all our behavioural attitudes and functions.

Essentially this new computerised society, in a business context, will be characterised by the following developments:

1. Information Revolution
2. Decision-Process Variation
3. Re-analysis of the Organisation Process
4. Major Breakthroughs in Functional Business
5. Communicational Developments.
6. Structural Changes in Administrative Management
7. Re-orientation of the Human Resources Area

Information Revolution[3]

The computerised society will be totally immersed in the realm of information and its application in a multitude of new and hitherto unknown aspects. Information will be the power behind any organisation and/or administrative management. This

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1. See references.

information-power would be one of quantifiable characteristics, with minimum qualitative structuring. It would have become possible by then to quantify everything, including psychological variables, attitudes, opinions, and judgmental concepts as well. Through newer techniques of heuristic programming,[4] it may also be possible to develop such computers which can yield effective results with no human involvement at any stage whatsoever. Self-programmed and self-accentuated computers will replace most of the computers that we see today, and these giant computer-complexes will develop a non-human information system, capable of not only gathering relevant information of all kinds, but also what is significantly more important, of utilising that information to arrive at meaningful and rational plans of future action on an instantaneous basis.[5]

Decision-Process Variation[6]

The process of decision-making will undergo a great transformation in future, entirely dependent upon information-flow, computerised systems, and non-human implementation. The future society will also require different *kinds* and degress of decisions than we are used to actualising these days.

Alternative selection, optimisation, fact and value correlation, etc., are some of the relatively newer techniques which are being used today in the semi-computerised society. These will no longer produce highly effective results in the decision-process of tomorrow. It will require a much *larger* number of variables than we can visualise today in the modern business situations, and with the *time-dimension emerging as a significant factor*, the older tools would not be able to process the increased variables in any integrated manner.

What those newer tools will be, we cannot fully anticipate. But one thing we do realise: decision process will not be a simple alternative-selection myth which we assume it to be. It will be enormously complex; it will no longer be delegated to *a* single process or *a* single system; on the contrary it will require a *total* involvement of the firm and its global environment.[7]

Organisational Process[8]

As a structural mechanism of activity, assignment and work-satisfaction, the organisational system will undergo great changes in the years to come. *The organisation process will draw more from mathematical systems and sciences and less from purely behavioral areas*, though one cannot totally eliminate the possibility that the quantifiable mechanism may extend its range to include the basic tenets of behavioral sciences too.

Organisational engineering will increasingly depend on the sub-optimisation of resources, rather than on mere proliferation of jobs and functional activities. The neat little functional flow of authority and responsibility, as we see today in current organisations, will be a thing of the past. Patterns of authority will not remain isolated on the basis of departmentalisation alone, but there will be a great degree of cross-departmentalisation through which the system-analyst will design the future organisational process. The concepts of line and staff, chain of command, unity of control, and such other traditional principles of organisation theory will only arouse curiosity in the intellectual historians, as these would hardly be of any executive effectiveness in the future computerised society.[9]

There will be a much greater fluidity in the new organisation patterns than we observe today, and as a result of this, the new system will be capable of absorbing a large measure of changes and process variations. Since the new organisation will increase its effectiveness by minimising human involvement in all its stages, any change-implementation will, by necessity and definition, be far simpler to execute than we are accustomed to expecting now.

Functional Business[10]

The neat functional classification, to which we are so deeply committed in modern business situations will undergo a rapid change in the society. The traditional functions of production and marketing will change their boundaries and their content as well, to cross-fertilize one another and also reinforce themselves simultaneously. Even the content of such pedestrian functions as finance, accounting, logistics, and statistics, will be thoroughly re-designed to be more realistically attuned to the changing need of bussiness enterprises. *Perhaps, one major directional sign would be a division of the company in just two basic components, like 'Input' and 'Output' divisions,* and the organisational mechanism may be restructured for this two-process division.

Even in the broader perspective, specialisation, as we understand it now, will also undergo major changes. Business enterprises in particular and industries in general will no longer be characterised by the "unitary objective functionalism" of today, but will reflect a mature perception of *total* business functions, and they will re-classify themselves accordingly. There will be more and more opportunities for the businesses to fulfil total needs, rather than segmented ones as we now know. Even industrial classification like manufacturing, distribution, banking, life insurance, and others will undergo a process and content revision in this society.

Communication Development[11]

This is the one single area in which we can now really see the elementary shape of the future things to come in the computerised society. This is the *key* area of the future growth, and what we have accomplished so far does give us a sound indication of the future. The complexity of the business systems, spread and extended as those would be on a global basis, would call for instantaneous communication of all kinds. New media of communication flow, new networks for instant transmission, simultaneous relay of processed data through newer symbolic tools are just a few of the developing things which would eventually characterise our society in the computerised age.

The global nature of business will not leave a single place unconnected with an integrated communication link. Through a centralised data-processing centre, the flow of communication will move in all ways with minimal human involvement. The computers of that age will be in a position to process all the communications and arrive at an effective decision *simultaneously*, with the result that the flow would always be uninterrupted.[12]

With the increased speed, the communication pattern of that age will be simple, easy to understand and implement, without the usual cultural lag and/or semantic difficulties which are generally attributed to communicational flow at present. The destructive impact of such occupational hazards as misunderstanding, rumour, misinterpretation would also have been quite controlled by then.

Changes in Administrative Management[13]

Initially, the management of corporations will rely less and less on one man top administration, and increasingly more on committee management or plural executives, fully supported by computers at all stages, There will be a further move towards multiple decision-making and shared responsibility so that administrative management can be extended over a wider range.

Secondly, in view of the fact that *most middle management functions and jobs will be replaced by computers,* the future administrative hierarchy may conceivably contain only two levels of top and lower management, with the identity of the middle management being immersed in the other

two levels as well as in the computerised functions.[14]

Thirdly, at a more pragmatic level, the future administrator will be required to display a mature appreciation and utilisation of the *total* mathematical processes which by then would have started to govern the corporations in all their forms and processes, rather than be superficially familiar with "common sense" human understanding only, which is mistakenly supposed today to be the prime managerial requirement for success in business. This would in turn call for a more rigid professionalisation of administrative management than we are used to having at this time, and would further emphasise the need for disciplined training and continued development for all administrative managers.

Finally, the whole area of industrial relations, between the management and the work-force, would also have undergone a reorientation, inasmuch as the *traditional functions and job processes of the work-force would by then have been taken over by the computers and highly automated precision equipments.* As a matter of opinion, at the height of the computerised progress, the present dichotomy between "traditional" management and "traditional" labour would already have become meaningless. The dividing lines between them would by no manner be rigid or easily definable; hence the traditional components of labour force will also undergo sharp revisions to accommodate new patterns. In this perspective, the collective bargaining mechanism and its antecedent functions, as we conceptualise them today, will also be replaced by some newly designed tools of mutuality and cross-fertilized relationships.[15]

Human Resource Area[16]

The nucleus of the computerised society is the preservation of human energy and effort as much as possible, to an extent that human involvement can be minimised, if not eliminated, from a majority of the functions within the business setting. In other words, it calls for the optimum use and effectiveness of the *available* manpower within the computerised frame of reference. Thus, what would eventually occur is that there would be a *substitution* of manpower from functional and/or traditional areas of activity involvement of today to a more conceptual level of activity of tomorrow, wherein human resourcefulness can be utilised in the best possible manner and also to the best of work-satisfaction of the parties and the processes concerned.

It seems that this area of human activity substitution in the computerised society has been mistakenly criticised and condemned by a great number of people who consider this whole idea as a manipulatory device to drown mankind in a myriad of gigantic mechanical complexes called "computers". They seem to assume that computerisation, at least in this particular aspect, is nothing short of being an inhuman catastrophe. In the opinion of the writer, this is an erroneous view, based primarily upon a misconception about the function of computerisation, and partially on a myopic attitude of the self-styled critics of human involvement of this process. It is indeed significant to note that the process of computerisation aims at the *preservation* of human resources rather than their elimination. The computerised society will definitely minimise human involvement in some of those functional areas of business where they are most commonly and erroneously utilised today,[17] and redirect the available human energy in more productive areas of satisfaction.

In this aforementioned sequence, as far as the optimum effectiveness of human resources is concerned, there are definite advantages to be achieved by the processs of *total* computerisation, and in general, these benefits would be available to a wide cross-section of the community who have the foresight to equip themselves in advance by dedicated planning, purposeful training, and quantitative development of their administrative abilities.

Summary and Conclusions

The dawn of computerised society is already on us, casting its rich glow on our industrial horizon. In its wake, the patterns of industrial management, business behaviour, and administrative process will undergo a transformation with regard to their content methodology. The new society will be marked by more and more sophisticated quantification of practically every conceivable (and in some cases, even currently unconceivable) factor. Information-area would be the first to be included in its *total* environment, which in turn will generate changes in the traditional processes of decision, organisation, and communication—the three major variables of the modern business enterprise. Furthermore, the traditional notions of administrative structure, human resources, and functional classification will also be correspondingly modified to accommodate the newer requirements and acceptances of the computerised society. Contrary to the popularly held myth, the human factor will not be disintegrated; it will only find a better activity-involvement in a setting which would be highly conducive for its optimum utilisation.

The elementary beginnings of this new civilization are already with us. Only a myopic businessman or a self-deceiving social analyst can fail to perceive the far-reaching and far-extending impact of this new development. However, the new society will neither be a utopian dream come to reality as many management scientists hope it to be, nor would it be a nightmare, as many public-opinion builders dread it to be. It will create *some* new difficulties as it will solve *most* of the older ones. But then is not this process in itself the very nucleus of new societies, new cultures, and new developments?

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The Real Meaning of Automation

Bernard J Muller-Thym*

Automation today is bringing us face to face with problems and potentialities beyond our previous experience, and its impact is forcing us to question some of the basic assumptions we have made about the design of machinery, our concepts of organisation, and even our basic concepts of work and wealth.

THE ASSUMPTION WE MADE ABOUT THE design of work done by machines has dominated industrial practice for half a century. Our assumption has been that work will be performed more efficiently if the entire piece of work or the total sequence of operations is broken down into relatively fine pieces, and if our work forms are simpler and more specialised. Although we have achieved a great amount of progress by working within this framework, it was actually a curious set of assumptions, since it goes counter to all the rest of our experience with nature. Man, for example, is far more complex than the dinosaur—yet man survives, and the dinosaurs perished. Hands are among the most complex and general-purpose things in nature; with very few elements of specialisation, they can perform a tremendous variety of tasks. Yet we made exactly the opposite assumption—that simplification and specialisation are more efficient than complexity—when we designed the machines that run our factories all over the world.

As a result, we have had to make our machine tools increasingly larger and more specialised in order to get greater production from them. And as machines get larger, they require proportionately greater investments of capital. So in order to get the incremental cost advantage out of a new machine, a company has to use it to produce ever-greater quantities; instead of a run of one hundred, it becomes necessary to have runs of a thousand, ten thousand, or a million of the same item. In consequence, our factories have become larger and more cumbersome, and it has become very difficult to optimise the productive facility. A businessman who bought a machine tool three years ago is at the mercy of a competitor who buys one this year, because the new machine is not only more efficient but incorporates additional technological advances. And even if the three-year-old machine is paid for, the businessman simply does not have the courage to

*The Author, Dr. Muller-Thym, is an American Management Consultant and Visiting Professor at the School of Industrial Management of the Massachusetts Institute of Technology. This article is based on a lecture he delivered to the International Chamber of Commerce in Paris.

start all over—to tear up his factory and redesign it from scratch.

The New Tools

The new generation of machine tools is not like this at all. It represents a completely different set of assumptions—a complete reversal of past practice. To take a simple example, consider the methods of making automobile tailpipes. The older types of machines with which we are familiar consist of jigs, dies, and fixtures, and once the settings are made, they make a hundred, a thousand, or ten thousand of the same kind of tailpipe. The new type of machine for making tailpipes is small—perhaps the size of a desk—and it has no dies, no fixtures, no settings of any kind. It consists of certain general-purpose things like grippers, benders, and advancers, and it is programmed by tape. On this machine, which costs less than its predecessors, it is possible to make eighty different kinds of tailpipes in succession, just as rapidly and as cheaply as eighty of the same type. This is simple and primitive, but it is an indication that the prototypes of the new generation of machines are already in existence. Their characteristics are general purpose, flexibility, and ability to be programmed with constant changes of programme, and hence to be part of a network or society of such machines that form a completely flexible productive array.

By reason of the development of such machines and the development of the concepts and technology of information management, it has become possible to manage the productive matrix directly. In previous years, we have done this in a rather clumsy way by the use of such devices as production control, materials control, and the like. What is now within our grasp is a kind of productive capability that is alive with intelligence, alive with information, so that at its maximum it is completely flexible; one could completely reorganise the plant from hour to hour if one wished to do so, and inventories would begin to approach the zero point. It may never be possible to achieve this maximum potential, but it will be possible to come close enough to change radically the allocation of capital as well as the allocations of the productive capabilities themselves.

Organisation and Authority

Automation will also have an impact on our forms of organisation, on work structure, and on the institutions of authority and control within the organisation itself. Here again, we have been operating for perhaps half a century on the basis of certain assumptions about the organisation of work done by human beings.

We have always assumed, for example, that there must be someone who is superior over workers, that everyone must have a boss, that no one should have more than one boss, that a limited number of people should report to the same boss, and so on. As a result of these assumptions, we have inevitably created a management work structure illustrated by the classical organisation chart—a structure that is pyramidal and many-layered. As a business organised this way grows larger and larger : not only does the base of the pyramid broaden, but the number of intermediate layers (consisting of supervisors and managers) is multiplied.

We are already, and we have been for some time, beyond the tolerable limits of inefficiency that result from running a business with this kind of organisational structure. There is no need to go into detail about the communications problems, and the decay of action that result—not as a consequence of individual incompetence, but as a consequence of the structure itself. Once an organisation has grown to any size at all, such a work structure diffuses and dissipates competence and creates organisation distances and separations between the parties responsible for action. It results in a delay in action and communication that is directly

proportional to the number of intermediaries through whom the action or the message must be transmitted.

Goodbye to Euclid

It was possible to run our businesses with this kind of work structure one, two, or three generations ago, because businesses were smaller, rates of change in the society and in the economy were slower, and the kinds of competence required to run a business were fewer. This is no longer true. Not only are our businesses larger and more complicated, but the kinds of competence required to run a business have multiplied, and the required competence levels are constantly rising. It has already become impossible to run a large business efficiently with the old kind of structure.

We already have working models of the new kind of organisational structure that increasing complexity will require. If you were to diagram them, they would look somewhat like diagrams of a nervous system, or the kind of diagrams nuclear scientists make. We might consider the present-day organisation chart as a two-dimensional Euclidean structure in which any increase in size automatically creates greater distances between the various points. The new type of organisation, in contrast, exists in a kind of curved space, where points of competence, mobilisation, points of decision-making, and points of information management are so arrayed that one can go directly, or almost directly, from any action-taking, decision-making, information-handling point to any other point.

Timely Arrival

We are fortunate that computer technology has arrived on the scene when its potentials —capability of handling information non-selectively, totally, and in configurations that can be changed at will—will enable us to be much more daring in designing organisation structures. Up to now, business information (e.g., accounting, controls) has been handled piecemeal and selectively. Instead of total information, our information systems have reported samples of business behaviour or managerial action, both qualitatively (selected costs, selected money allocations, selected items of sales performance) and in time. These systems were supplemented by having some middle-level manager try to find out what was wrong at a lower level in order to pass the information to his superior, or by managers in a chain trying to force information from the top down through many layers to the point where, hopefully, work would be done. This 'bucket brigade' approach is extremely inefficient: There is about a 50 per cent slop, a 50 per cent loss at each transmission.

Analyses of managerial action indicate that people in middle management spend 80 per cent of their time simply handling information—and handling it in a very primitive and inadequate manner. We are fortunate, therefore, that at the very moment when we need to optimise the managerial work structure, we have available to us a computer technology through which we can handle the total information in a system nonselectively, instantaneously, and with random access. This makes it possible for us to create a flexible managerial organisational structure that will enable us to manage the integer of work, the points of concentrations of competence, and the entire business network. And because profit and the creation of wealth is a function of the business network, and is not (as classical economists thought) simply a matter of adding value through production, we now have the capability of managing wealth itself.

End of an Age

This brings us to the third point: the social consequences of automation. We are living in a period in human history that might be considered the end of the Neolithic age. At the very beginning of the Neolithic

age (8000—10,000 B.C.) we abandoned our nomadic ways and settled down, and after we became static and attached to the land, we invented the wheel. We also invented property, as defined by an object, primarily land ; and we invented ownership as a moral act that focussed on and had as its terms such an object.

The Disappearance of Property

We are living at the end of the age of the wheel ; we are living at the end of the electromechanical age. We have abandoned Neolithic weaponry like spears, arrows, and bullets—selective, single-purpose weaponry that is used to kill the enemy seriatim, one after another—and have adopted nuclear weapons that are total, instantaneous, and with random access. And now we are abandoning property as well.

One of the characteristics of the world in which we live is that property and work are disappearing. This process is going on inexorably ; it is further advanced in some parts of the world than in others, but all parts of the world will be involved in it. Automation is accelerating the process, although automation did not bring it about. Property as a thing-type object is disappearing ; it is doubtful whether any group of people in the history of the world could measure themselves against their ancestors of comparable wealth and find that they owned so little in comparison.

A house, for example, used to be a thing to be born in, to live in throughout one's life, and to leave to one's son or heir. In recent years, the average length of time a person in the U.S. lives in a particular house has dropped from eight years to five years, and it is still going down. A house today is a kind of space valve in which a married couple and their children live for increasingly shorter periods of time before moving on to another house or to an apartment ; it is a place where a family spends the semiprivate part of their lives between trips to the more public centres of worship, work, education and play.

To take another example: Americans, at a startlingly increasing rate, are leasing personal automobiles rather than owning them. (One of the largest auto manufacturers believes that the majority of our people will have cars through lease within not too many years.) When the leasing company owns the car but does not use it, and the driver uses it but does not own it, the result is something quite different from classic ownership.

One could cite other instances to indicate that property and the thing-element of property are disappearing. (The description of the disappearance of both property and work has already been made eloquently by Gerard Piel in *Consumers of Abundance*, published in 1962 by the Fund for the Republic.) The fact is that we are relatively more wealthy than our Neolithic ancestors; there is an increasingly richer abundance of goods and services for us to enjoy; but there are also increasingly less property and less ownership.

Creating Wealth

We have brought business into being as the prime wealth-generating organ of our society. The only sources of new wealth up to now have been the household of the ancient world, increase from nature, and independent, sporadically occurring invention. Now we have added to the technology of generating wealth by designing a modern business, for a business is a system in which output is greater than input. That output—newly created wealth—is a function of organised innovation and of the total business as a system. But to an increasing extent, the wealth that is created is not so much resident in the hardware as in the competence—the software—of the objects that enter into economic exchanges; and the wealth itself is created at and exists only as a point of intersection in a matrix of economic exchanges.

Work and Pay

At the same time, work, in the sense of servile work, is disappearing. It is futile to talk of relieving 'chronic unemployment'; the rate is going up, and it is going up much more rapidly than in the past decade. A substantial amount of retraining is going to be necessary, for there is going to be a radical change in the skill mix of people found in a business. But no amount of retraining is going to provide the amount of work that human beings now perform as sources of power, servo-mechanisms, levers, and things of this sort. No amount of work for human beings is going to replace the work that is being destroyed by automation.

In a world in which the prime mechanism for distributing the wealth we have learned to create has been pay for work, the disappearance of work has serious implications. It means that we are able to generate wealth, to invent almost anything we decide to invent, and to achieve command over nature for the first time—yet no one will have money; no one will be able to buy anything.

It would be foolish to try to reverse the direction of this trend; it is basically not bad. It is, in fact, an extension of the noble work of freeing man from slavery, from the curse of Adam, from having to earn his bread by the sweat of his brow. It is a direction that is generally good, and should be regarded by any normal human being as good.

The task before us, therefore, is to invent a new kind of money, new institutions for the distribution of wealth. None of us is ready to describe what these new institutions will be—after all, we have only now identified the phenomenon. But one can describe something of what that society will be like and some of the design criteria for that money or monies that will replace or supplement pay.

Shape of the Future

It will be a world in which two of the largest industries will be education and the management of information. Add to these communications—both electronic communications and physical communications in an intricate and sensitive space-time network whose management will require both people and computers. Some factories will produce long rows of standard commodities, but most of them will produce a marvellous variety of different end-products to the requirements of individual customers as well as of markets. (Even buildings—houses, laboratories, and the like—can be produced this way now, and more cheaply than the inflexible structures we now build.) There will be many more wants and many more goods and services to satisfy them. But while there will be an opportunity for people to be very active and engaged, there will be increasingly less opportunity for them to do the kind of work that has represented the great bulk—perhaps 90 per cent—of the world's work up to now. The displacement we expect, therefore, will not be like the kind that occurred after the Industrial Revolution—the cycle of temporary employment, followed by greater productivity and then by a greater requirement for workers to satisfy the new orders of demand in a mechanised world. It will rather be a displacement or shift towards kinds of activity, nonservile and sometimes even wealth-producing, that have not been considered work and for which people generally have not been paid in the past.

New Kinds of Money

We know that wealth exists only at a moment of exchange in an economic network. We know that we are also in a society where peoples are getting married younger, expect to have some children, and look forward to a life of opportunity with a reasonable right to education, health, pleasure, and a life of useful activity in the economy, the society, the polity—and at whatever age may be appropriate. We

need, therefore, a kind of 'money' that will enable them to have enough such opportunities on a random and timely basis. This would be a money with no thing component: It would be only a language. But the thing part of money—gold, cattle, women—ahs practically disappeared anyway.

Planned Evolution

We have barely enough time in which in an evolutionary but planned way to invent such a network and the money-language to make it operational. As a practical strategy, we might use that time to sell our present competences abroad and bring the rest of the world as rapidly as possible to equality with us. A world so dominated by science and electronic communication has to be one world, and economic exchanges can take place in greater volume and with greater enrichment to both parties in such measure as the parties are equal and strong.

This strategy of working simultaneously to design the new networks and to bring the world to our higher level of well-being is the only one we see at the moment to buy our way out of the dislocations that will otherwise occur as we head into an age wherein automation can be either tyrant and malignant, or servant and benign.

Parrot Productivity

"The principle of *laissez-faire* may be safely trusted to in some things but in many more it is wholly inapplicable; and to appeal to it on all occasions savours more of the policy of a parrot than of a statesman or a philosopher.

"It may, for example, be laid down as a general rule that the more individuals are thrown on their own resources, and the less they are taught to rely on extrinsic and adventitious assistance, the more industrious and economical will they become, and the greater, consequently, will be the amount of public wealth. But, even in mechanics, the engineer must allow for the friction and resistance of matter; and it is still more necessary that the economist should make a corresponding allowance, seeing that he has to deal not only with natural powers, but with human beings enjoying political privileges, and imbued with the strongest feelings, passions and prejudices. Although, therefore, the general principle as to self-reliance be as stated above, the economist or the politician who should propose carrying it out to its full extent in all cases and at all hazards, would be fitter for bedlam than for the closet or the cabinet. When any great number of work-people are thrown out of employment, they must be provided for by extraneous assistance in one way or the other; so that the various questions with respect to a voluntary and compulsory provision for the destitute poor, are as necessary parts of this science as the theories of rent and of profit."

McCulloch's Preface to the *Principles of Political Economy*

Cybernation:

Its International Implications*

McLain & Singh

FOR AT LEAST FIFTY THOUSAND YEARS, MAN has had his present physique and capabilities. Most of that time he survived by hunting, fishing, and collecting food. Only within the last ten or twelve thousand years has the cultivation of plants and the domestication of animals developed. Agricultural practice created radical changes in man's way of living. For example, the permanency of agriculture made settled village life possible. This way of living undoubtedly created new kinds of problems to which man had to adjust, but the adjustment could be gradual because the transition took place slowly over a period of thousands of years.

At a much faster pace, industrialisation of the Western world has developed in less than two hundred years. Although much of the world is not yet industrialised and the Western people have not yet learnt how to adjust to the advanced technology that has developed so rapidly, a new age is developing as radically different from the industrial age as the industrial age was from the agricultural. This is the *age of cybernation*—the use of automatic, self-adjusting machines which receive their directions for operating from "thinking" computers. As a result of this new process of production, vast social and economic changes may be expected to develop at an unprecedented rate, affecting not only the technologically developed nations but the whole world. These changes may lead to chaos and destruction or to the freedom of mankind from want and fear.

The most immediate effect of cybernation is the displacement of human labour by machines. *The computer, for example, is a far more efficient worker than the human being* in book-keeping, auditing, account-keeping, inventory control, payroll handling and many other business operations. They can compute "best" combinations of crops and livestock for given farm conditions, *design and "fly" planes and rockets before they are built*, process the granting of bank loans, and analyse stock portfolios. Thees are just a few examples of what the computer

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* In this analysis of Cybernation, two Professors of Wisconsin State University have collaborated: Dr. John D. McLain, Professor of Education and Dr. Surender Singh, Associate Professor in the Department of Political Science.

can do. The possibilities are limitless. It is possible that *the computer can take over any structured task* where the decision-making rules can be set out in advance. Even beyond this, a computer has been built that can learn to recognize what it has seen before and to teach itself about what it recognizes. Computers have also been programmed to write music and plays and to translate from one language to another. The automatic, self-adjusting machines of production can direct, control and correct within limits mechanical and chemical processes automatically without human effort, *once the system is established.* The two, together, provide the possibility of making production almost limitless, with little or no human labour.

Commenting on the productive power of modern technology, the Secretary-General of the United Nations said: "The truth, the central stupendous truth, about developed countries today is that they can have—in anything but the shortest run—the kind and scale of resources they decide to have . . . *It is no longer resources that limit decisions. It is the decisions that make the resources.* This is the fundamental revolutionary change—perhaps the most revolutionary mankind has ever known."

The greatest impact so far has been and probably will continue to be, in the near future, in the United States where cybernation emerged in 1960. It is presently developed to only *about one per cent of its present potential* but is rapidly expanding. It is likely that the majority of the blue-collar and white-collar jobs now commonly being done by human labour will be done by machine twenty years from now. How the United States will adjust to this is not known. The basic problem will be one of distribution of goods and services. For example, in the economy of free enterprise the price of a commodity is determined by supply and demand. The more scarce an item is in relation to its demand the higher is its price. Conversely, the less scarce (or more abundant) an item is in relation to its demand the lower is its price. *If cybernation develops an abundance or virtually unlimited supply, which it can, how will the law of supply and demand operate?*

Goods and services are generally purchased by money earned from work expended to produce goods and services. *On what basis will they be distributed if human labour, or work, is not needed to produce those commodities?*

Already the United States is confronted with this problem for some people—the people who are without jobs and without income. A large percentage of these people with no way to make a living are Negro. Throughout the history of civilisation the power groups in society have devised means to maintain their power and to use the resources of the less fortunate for their own aggrandizement. In the United States slavery has been eliminated a hundred years but rigid barriers of prejudice have continued to relegate the Negro and other minority groups to the tedious, repetitive, and hard labour tasks. Such tasks are the simplest and easiest to be done by machine. Thus technological change has forced the Negro to rise up and to demand acceptance to other kinds of work opportunities. With their jobs being eliminated the only other alternative is starvation in a land of abundance.

Probably the basic reason why the industrial revolution advanced so rapidly compared to the development of agriculture was the development of communication systems that made the dissemination of new knowledge possible. The computer, data processsing equipment, television and other communication techniques are making the dissemination and use of information far more rapid and more comprehensive today than ever dreamt of in the past. One of the results of increased communication is the growing knowledge in the underdeveloped nations of the world that disease and poverty can be eliminated. This has led to rising hopes of the have-nots of the world that

they, too, may have the fruits of technological development. This is true not only of the American Negro but of the people of Asia, Africa, and Central and South America. A human rights revolution is developing as the under-privileged peoples of the world grow restless in their want for food, clothing, and human dignity.

A major question, though, is how can this be achieved? How can India, for example, develop machines that will produce enough goods to meet the needs of her people? It took the United States, with vast and undeveloped resources, a hundred and fifty years. During much of that time huge sums of money were accumulated by a relatively small number of people to invest in the development of capital goods—the development of machines. This was done by keeping the wage rates at levels just sufficient for the maintenance and reproduction of the labour force. This was true in England and Western Europe, too, just as Russia and China have used constraint of consumption and living standards, notwithstanding poverty and starvation, to create wealth for the production of capital goods.

The developed countries of the world have exported the idea that poverty can be eliminated by technology and created the human rights revolution. At the same time they have exported something else that has created an almost insurmountable obstacle to the development of that technology—population explosion. Throughout the history of mankind the population of the earth has changed in relation to the ability of the people to subsist. During the early period of history when man was primarily a food gatherer, the population of the earth is believed to be not more than ten million because it took about two square miles of fertile soil to suppport one human being. When the agricultural age developed, living was less hazardous and more people lived longer. The result was a very rapid increase in population, for agricultural practices produced greater amounts of food for the increased population. As the industrial revolution developed, medicines and better health practices were developed which reduced the death rate, and in the technologically developing nations there was a comparable increase in population together with increased productivity to support the population.

Medicines, pest controls, and health practices which developed in the technologically advanced areas of the world were and are still being exported to underdeveloped areas. The result is a rapid increase in population, but without the accompanying increase in ability to support that population. In India, for example, the population is about 500 million today. The present rate of increase is estimated at 2.4% per year. At this rate, the population of India will double before the year 2000—in less than thirty five years. Can this many people survive? How can India feed and clothe a billion people? According to B.R. Shenoy, Director of the School of Social Sciences at Gujarat University, the per capita consumption of food-grains averaged 15.8 ounces per day in 1958. Since then the average has fluctuated downward. This is at a subsistence level below that considered minimum for prisoners in the United States. Between 1955 and 1960 the annual per capita use of cloth fell from 14.7 metres to 13.9 metres.

Even without the problem of population explosion the margin above bare existence in India and other undeveloped nations is so small that the accumulation of wealth to build capital goods will be extremely slow compared to the need.

Is there another alternative? Capital goods do not have to develop from accumulated savings. Import of capital would achieve the same purpose.** Histori-

** The authors' suggestion that the country be developed largely with foreign capital would not be politically acceptable, assuming its availability in adequate measure and on reasonable terms—**Editor**

cally surplus capital in the Western economics has not been greatly attracted to the underdeveloped areas due to the insecurity of capital investment and the lack of skills of the labour force. Will cybernation, which does not demand large amounts of semi-skilled or skilled labour, be the answer? It can be. It can eliminate poverty if it is used for the benefit of mankind—if man has the will and the understanding to use it for his own benefit. To achieve this, understanding must be developed.

The average Americans are completely unaware of the development of the cybernation revolution. They do not clearly understand the human rights movement nor see the relationship between the Negro problem and technological change. They cannot comprehend the poverty of most of the world. The forces which are shaping the economy of America today, as a result of cybernation, are so great that they are beginning to permeate the will of the people. Without clearly understanding the complexities of this social change, the people are giving support to President Johnson's "Great Society." An awareness is beginning to develop among the political leaders. The Centre for the Study of Democratic Institutions, a non-political, non-profit institution, is focusing its efforts on these staggering problems and is attempting to stimulate discussion groups and study in every community in America to develop reason and understanding of the forces of change.

Whether the changes will lead to chaos and destruction or to the elimination of poverty and prejudice does not depend upon the machines, for they can be used to do either: it depends upon man himself. ●

THE BENTHAM CABINET

It is interesting to recall that the famous philosopher Bentham, who is reputed to have stood for the principle of No Government on Utilitarian Principles, actually wrote out in the final years of his life a Constitutional Course, in which besides the Prime Minister he proposed the following Ministers for the Cabinet :

Election Minister
Legislation Minister
Army Minister
Navy Minister
Preventive Service Minister (Police, Fire, etc,)
Interior Communication Minister
Indigence Relief Minister
Education Minister
Domain Minister
Health Minister
Foreign Relations Minister
Trade Minister
Finance Minister

He even provided for a Central Statistical Office ("statistic function"), a competitively selected Civil Service, etc. etc. He also proposed the establishment of a Board of Trade, for whose President he wrote out detailed instructions to bear in mind the "effect produced on the money prices of commodities—things movable and immovable—by variations in the relative aggregate quantity of money of various sorts, as compared with the aggregate quantity of commodities destined for sale."

(Bentham, *Manual of Political Economy,* **Vol. IX, P. 7)**

A Fragment on Incentives

GC BERI*

The country is passing through difficult times: there are many problems before it which must be tackled properly. One of the main problems is how to increase *productivity which is at a low ebb*. The author believes that if proper wage incentives are offered in industrial firms, they will not only increase productivity but also contribute towards the establishment of healthy industrial relations. The strikes, lay offs, *gheraos* and all such things which retard industrial production will not be so common as they have become now.

THERE ARE TWO WAYS IN WHICH THE Productivity of Labour can be raised : (a) by increasing Labour's capacity to work; and (b) by increasing Labour's willingness to work. The first method implies that Labour should be equipped with more efficient equipment; better and newer methods of production should be followed; purposeful and effective training should be provided to Labour; and better conditions of living should be offered. The second method which is aimed at increasing Labour's willingness to work implies that suitable financial and non-financial incentives should be offered to Labour. This will induce Labour to work harder and more sincerely, as by so doing the workers will earn higher incomes.

The main purpose of wage incentives is to achieve the maximum possible reduction in unit costs through motivating labour to work at their best. "... the primary and universal reason for the installation of wage payment plans (i.e. wage incentives) is today, as ever, to secure the lowering of unit costs on the one hand, and to improve the earnings of employees on the other".[1]

An important aspect of wage incentives is the setting up of an *explicit standard of performance.* The idea is that this level be surpassed and labour rewarded for the excess over standard performance. On the other hand, wage incentives may be viewed by labour as a punishment for low output. Further, the explicit standard of performance set by a firm may give rise to fears of rate cuts in the minds of workers.[2]

There are many pertinent issues involved in the relationship between incentives and productivity. Some of these problems are mentioned here :

*Dr. G.C. Beri, Senior Economist of the National Council of Applied Economic Research (New Delhi), is a top Productivity Expert, having done pioneering work in the Measurement of Productivity. He is the author of *Measurement of Production and Productivity in Indian Industry*, a thesis for which he was awarded the Ph..D. by the London School of Economics, and the coveted Bowley Prize.

[1]LYTLE, C.W. : *Wage Incentive Methods, Their Selection, Installation, and Operation* (1942).

[2]For fuller discussion, see, WITHIM B. WOLF *Wage Incentives as a Managerial Tool*, Columbia University Press, New York, 1957.

1. *A good deal of research on incentive payment schemes is needed in order to determine precisely their impact on productivity.* At present there are many opinions, and often contradictory to one another, on the wage incentive schemes. Substantial research needs to be undertaken to reduce the imbalance between opinions and facts in this sphere. Since the tendency for output to increase may exist independently of the change in the system of payment, it is necessary to determine how earnings of workers changed during some months both before and after the introduction of the wage incentive scheme, and how the latter affected the trend in productivity of labour.

2. *Incentive schemes should not be designed to do the work of wages.* In some cases one finds that such schemes have been designed to remove a gap in wage levels between one unit and its competitive units. In certain units the level of wages is kept very low and incentive rates are kept very high. In this context it is necessary to examine the precise relationship between wages and incentives which are two distinct things.

3. *Increased productivity is generally regarded as the main objective of an incentive payment scheme, on the assumption that labour will work harder if it is paid according to output rather than at a fixed rate.* However, in certain cases the workers have shown indifference or even hostility towards wage incentive schemes. In such cases productivity would remain more or less at the same level even after the introduction of wage incentive schemes. It is, therefore, necessary to show scientifically how wage incentives would motivate workers in increasing their output. Particularly when production has reached a certain level, there is a need to determine the scope for further improvement before introducing such schemes.

4. Wage incentive schemes involve constant consultations and joint participation of labour and management. *New ideas should be adopted for motivating Labour.* This calls for a careful and imaginative attitude on the part of the management. In this connection, it is advisable to undertake a technological audit so as to alter the performance norms if required as a result of changes in work content and technology. Particularly when the performance level set under an incentive system has become more or less a routine with workers, the incentive scheme should undergo change and new levels of performance should be set, with due regard to the interests and sentiments of workers.

5. In cases where dearness allowance or some other substantial component of the wage is linked to the cost of living index, there may not be sufficient enthusiasm on the part of Labour to put in its best under an incentive scheme. *How far linking of wages with the cost of living indices contributes towards a complacent outlook among industrial workers, thereby acting as a disincentive for higher productivity, needs to be determined.* This is an important issue, deserving immediate and systematic investigation.

6. If maximum benefits from wage incentive schemes are to be obtained, it is necessary to undertake comparisons of the level of productivity at the factory level on a continuing basis. For this purpose, *productivity indices at the plant level should be compiled.* In addition such indices should also be constructed for different industries on a regular basis. The existing levels of production and productivity need to be clearly settled on the eve of introducing a wage incentive scheme. The concept of productivity to be used under a wage incentive scheme should be well-defined so that chances of misunderstanding and confusion may be minimised.

7. *Productivity studies at the plant level should be undertaken especially in those factories where incentive schemes are already*

in operation, so as to quantify the gains in productivity attributable to incentive schemes. Such studies may be undertaken on (a) different groups of workers having similar jobs under the same management; (b) workers having similar jobs under different managements but within the same industry; and (c) workers under the same management but in different industries, etc., for determining the impact of incentives. These studies will necessarily involve detailed comparisons between the productivity of workers covered by wage incentive schemes and that of the workers not so covered. Care should be taken to have such comparisions made under as homogeneous conditions as possible in order to bring home the real advantages that may accrue from properly conceived and honestly implemented wage incentive schemes.●

EDITOR'S NOTE

A word may be added that in the context of the present recession, when the maximum cost reduction is a matter of imperative necessity for reasons of sheer survival, both at the micro (individual firm) level as also at the macro (national) level for maximising export earnings, intelligently tailored incentives, linking optimum machine and materials utilisation to the maintenance of worker earnings and the level of employment, may serve a number of important social objectives. The essence of a creative Productivity Policy in the present context is to think out and work out a new scheme and scale of incentives that would, simultaneously, boost output, reduce unemployment, bring down unit cost of production, enabling Industry and Government to adjust their economies and plans to the substantive changes in domestic and foreign affairs affecting the Indian Economy at its vital points.

THIS WAS CHINA

"China has long been one of the richest, that is, one of the most fertile, best cultivated, most industrious, and most populous countries in the world. The accounts of all travellers, inconsistent in many other respects, agree, however, in the low wages of labour, and in the difficulty which a labourer finds in bringing up a family in China. If by digging the ground a whole day he can get what will purchase a small quantity of rice in the evening, he is contented. The condition of artificers is, if possible, still worse. Instead of waiting indolently in their work-houses for the calls of their customers, as in Europe, they are continually running about the streets with the tools of their respective trades, offering their services, and as it were, begging employment. The poverty of the lower ranks of people in China far surpasses that of the most beggarly nations in Europe. In the neighbourhood of Canton, many hundred, it is commonly said, many thousand families have no habitation on the land, but live constantly in little fishing boats upon the rivers and canals. The subsistence which they find there is so scanty, that they are eager to fish up the nastiest garbage thrown overboard from any European ship. Any carrion, the carcase of a dead dog or cat, for example, though half putrid and stinking, is as welcome to them as the most wholesome food to the people of other countries. Marriage is encouraged in China, not by the profitableness of children, but by the liberty of destroying them. In all great towns several are every night exposed in the street, or drowned like puppies in the water. The performance of this horrid office is even said to be the avowed business by which some people earn their subsistence.

ADAM SMITH : *Wealth of Nations* (Cannan edition), Vol. I, p. 435

Incentive Wage Plan for Supervisory Staff

M CHIKKIAH*

A number of Incentive Wage Plans have been over the years devised for rewarding direct workers for increases in output or savings that they can make in one way or another. The basis for extra payment was determined on the basis of Time and Motion Studies in the earlier days, and later by more scientific and acceptable methods of work measurement. Thus standards of work are fixed and performances over and above an agreed normal are paid for according to an accepted formula. It has, however, not been possible to work out an appropriate method of Work Measurement for supervisory jobs. In the following article, the author has made an attempt, in this direction.

IT IS NOT EASY TO DEVISE, WITH ANY DEGREE of accuracy, a plan of measuring the work content of supervisory men, as they are not engaged on any direct job. It is virtually impossible to make meaningful statistical calculations regarding the time taken, the standard time and the time saved in respect of supervisory assignments; yet it is essential to reward them, for there is no doubt that the outturn of direct workers can be improved by the quality and efficiency of supervision. In other words some portion of the time savings of direct workers is evidently attributable to their supervisors. It is the business of the cost accountant to devise a plan of segmenting the 'time' savings of direct workers, that may be attributed to the supervisor. Indian Railway Workshops have worked out a formula on the basis of the following assumptions :

1. The savings of the supervisor are merged in the savings of time of direct workers whom he supervises.
2. As he can supervise and instruct only one direct worker at a time, the average savings of time of one direct worker shall be the basis of arriving at the savings attributable to him.
3. The question of supervision and the corresponding savings of time will evidently arise only when both the supervisor and the workers are present at workspot and engaged on jobs. Therefore the physical or effective attendance of direct workers and also of the supervisor should be taken into account and finally the average savings of one direct worker should be modified to arrive at the savings contributed by the concerned supervisor.

Based on the facts enumerated above, the average savings of one direct worker

*Accountant, Incentive Scheme, Southern Railway, Hubli.

during a wage period of, say, a month, in one standard hour multiplied by the hours of presence of the concerned supervisor for the same wage period will be the time savings of the supervisor. If the hours of savings thus arrived at are multiplied by the basic hourly rate, it gives us the bonus amount payable to him over and above his normal time wages. Here the correct meaning attached to standard hour as applied in this context has to be properly defined and comprehended. A standard month is the basis of standard hour. A standard month is considered to be a period consisting of 208 hours based on 26 working days of 8 hours duration each (that is, 30 days less 4 Sundays). But the working days and the physical attendance of direct workers are variable factors from month to month. These variable factors are to be linked and expressed in terms of 208 hours to arrive at the standard hours as follows :

$$\frac{\text{Effective hours based on their actual attendance during the month}}{\text{Scheduled hours based on the working days of the month.}} \times \frac{208}{1} = \text{Standard hours of direct workers for the concerned month}$$

A formula can be devised to present the facts effectively.

(1) Let the total number of direct workers supervised in a month $= a$

(2) Total effective hours put in by the direct workers $= b$

(3) Scheduled hours of the month fixed by the management for a particular month under consideration $= c$

(4) Total hours saved by the direct workers supervised in the month d

(5) Actual hours of attendance put in by the concerned supervisor in the month e

(6) Basic hourly rate applicable to the said supervisor $= f$

The incentive bonus payable to the supervisor may now be worked as follows :

(7) Standard hours of the month $= \frac{b}{c} \times 208 = \frac{208b}{c}$

Say $= g$

(8) Average hours saved by one direct worker $= \frac{d}{a}$

(9) Average hours saved by one direct worker in one standard hour $= \frac{d}{a} \div g = \frac{d}{ag}$

Say $= h$

(10) Hours saved by the supervisor in the month based on the savings of direct workers $= h \times e$

(11) Bonus amount payable to supervisor for the month $= h \times e \times f$

or

(Substituting the value of h and g). $= \frac{cdef}{208\,ab}$

Deducting 20 per cent for rest pauses, the supervisor becomes entitled to an incentive bonus, calculated at the rate of

$$\frac{0.8\ cdef}{208\ ab}$$

"Really I don't know about that," observed Traddles thoughtfully, "Many people can be very mean, when they give their minds to it."

DICKENS, in *David Copperfield, p. 820*

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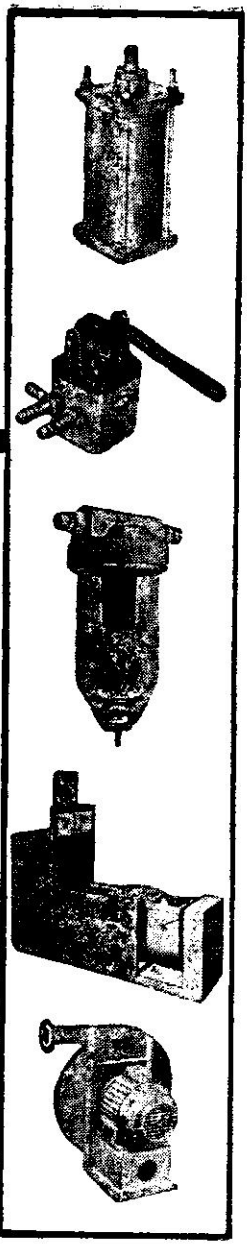

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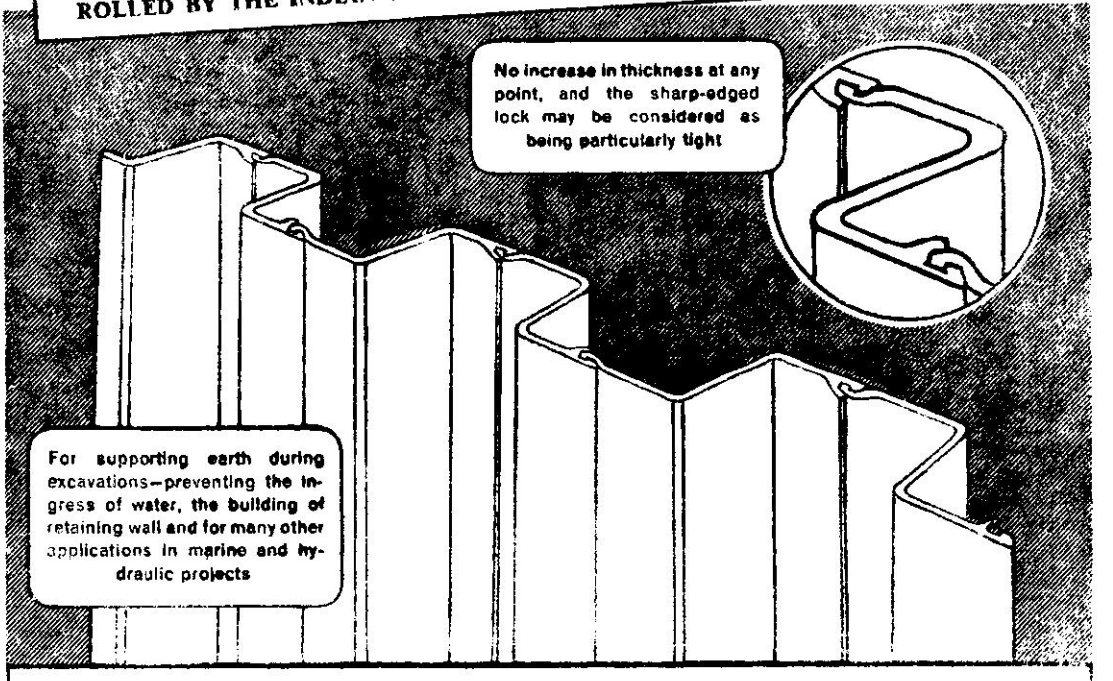

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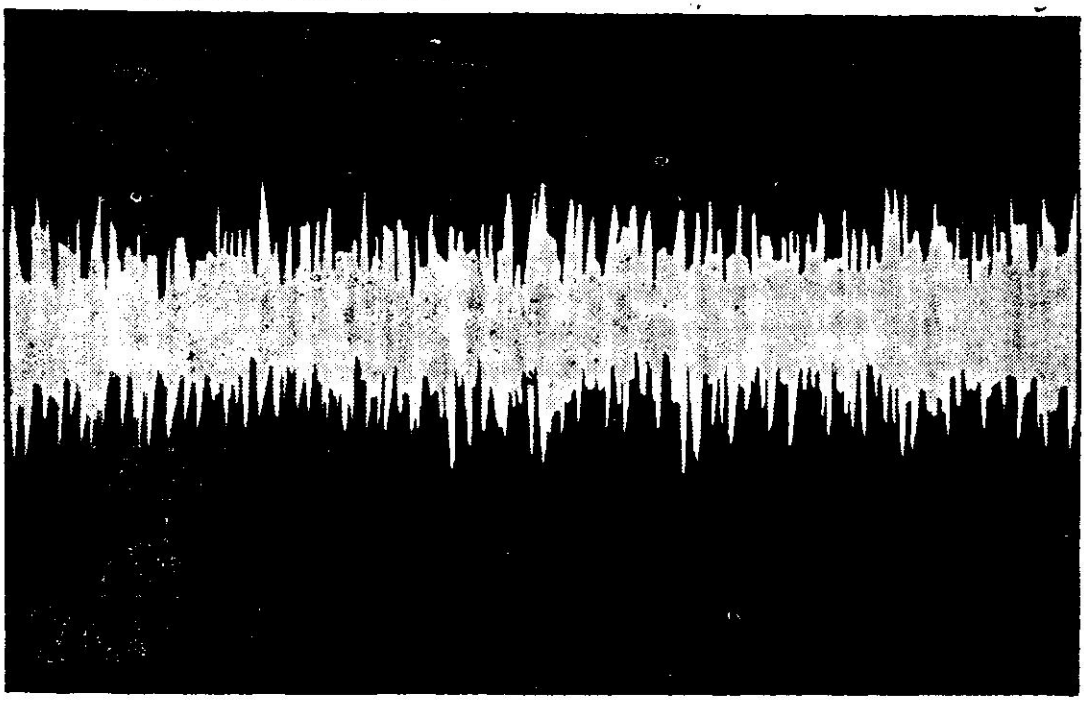

NOISE

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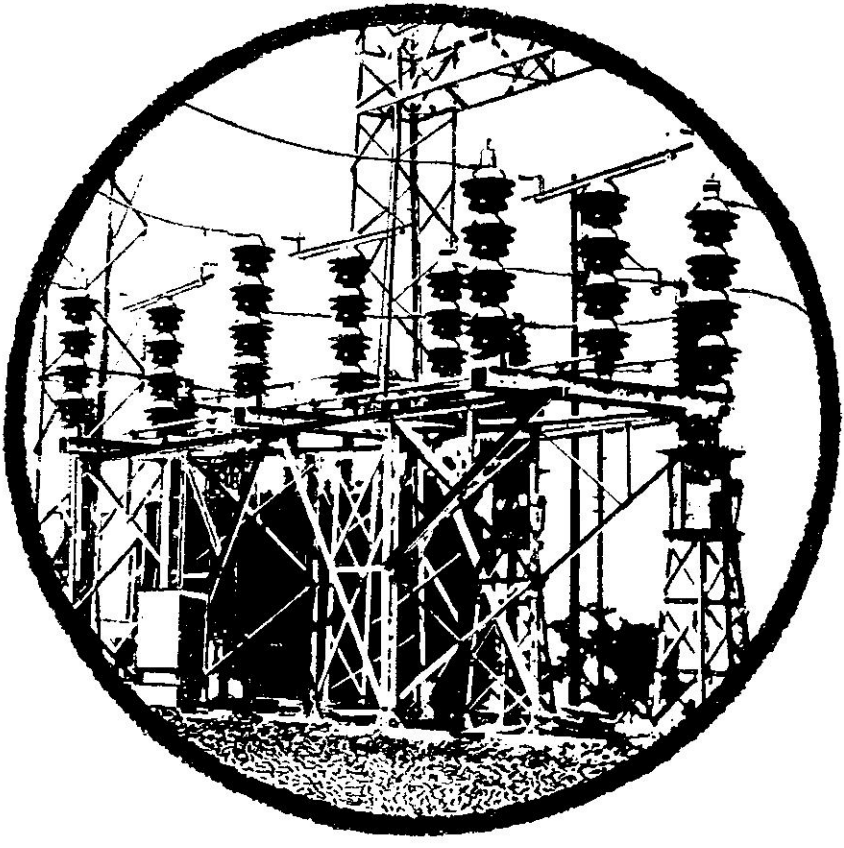

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Industrial Development of Andhra Pradesh

TWO PUBLICATIONS THAT ARE OF UNUSUAL significance, illustrating what civil service enterprise can do in the matter of economic development are :

i. Role of Andhra Pradesh Industrial Development Corporation and the Achievements under the Third Five-Year Plan, Including a List of Projected Industries for the Fourth Plan.

ii. Industrial Potentialities and Investment Opportunities in Andhra Pradesh.

What is more revealing is that in the matter of development, the widely advertised ideological conflict between private and public sectors is in actual fact a fib ! Here is a State Corporation, empowered to promote industries in its own right, raise finances and use it as it likes (of course in the public interest)—direct financial assistance, underwriting subscription to equity capital, etc. ; but it has found it most productive and profitable to arrange what may be called a triangular collaboration between foreign parties (be it of Czechoslovakia, Hungary, Norway or others) who can furnish the necessary technical assistance and equipment, local entrepreneurs or even outsider entrepreneurs, and the Corporation itself, the latter remaining mainly as a catalytic agent. During the Third Plan period, the Corporation's investments amounted only to Rs 25 million but the total cost of the projects set up with the Corporation's assistance amounted to Rs 520 million, that is 21 times the money provided by the Corporation ! Actually the Corporation sanctioned an amount aggregating Rs 840 million. It should be really no aspersion to say that only Rs 25 million was utilised. The sanctioned amount constitutes a sort of invitation and encouragement to entrepreneurs to come out and set up various types of industries in respect of which detailed indications are given and feasibility studies made. The Corporation itself is a major entrepreneur in a modern sense, but it is prepared to assist any enterprise to develop the resources of Andhra Pradesh.

Largely, of course, its investments have so far gone into Coromandel Fertilizers, plastics, textiles etc. A number of joint ventures in collaboration with private enterprise have been undertaken but, from what accounts are available, their prospective costs as well as returns have been rather adversely affected by Devaluation. The Government of India itself egged on the Corporation to take on certain projects on a mass scale, such as the manufacture of ball-bearings—indicating the pro-enterprise policy of the Government of India.

The Corporation itself appears to be highly productivity-minded ; for example, in the Glass project, when it found that the capital cost had been adversely affected by Devaluation, there was a proposal to switch over to cheaper forms of fuel and make other adjustments which would keep the cost within controllable limits.

Rightly, the Corporation is not inhibited in its collaboration arrangements, the main criterion being the capacity to deliver the goods. It has, or is going to have collaboration arrangements in a wide variety of fields with countries abroad, as also with private and public sector undertakings in India.

The wide net that the Corporation is setting up in respect of industrial enterprises over a large range of industries is an act of wisdom. Apart from ball-bearings and the glass projects, the Corporation has several other projects for the manufacture of high tension and low tension insulators, acetic acid, pig iron, power cables, electric motors, ammonium chloride, soda ash, printing machinery, reduction gears, switch gears, alloy steel, steel castings, electrodes, chassis frames, modern rice milling plants, small-sized cement plants, insecticides and pesticides, etc.

During the Fourth Five Year Plan, the Corporation has been able to get from Government a sum of Rs. 65 million for financial assistance to industries, besides Rs. 35 million for direct promotion of industries. A list of 74 projects for materialisation during the Fourth Plan period is available to anyone wishing to participate in the adventure of development of a backward State, endowed with a vast potential in terms of raw material resources. It has two other favourable factors, namely, popular enthusiasm and food surpluses. If these are intelligently deployed in the public interest, Andhra Pradesh might well become one of the major industrial States of the Indian Union in the coming decade.

In this respect industrial entrepreneurs both in the State as well as in other States of the Indian Union may well read with profit the second pamphlet brought out by the Andhra Pradesh Industrial Development Corporation, namely, *Industrial Potentialities and Investment Opportunities in Andhra Pradesh*. This is written in gazetteer style, giving facts and figures of present availabilities, facilities etc. The present state of industrial development, which will be the base upon which any entrepreneur will operate, has been exhaustively dealt with in Chapter II. There is again a whole chapter devoted to industries based on agriculture, livestock and forest resources in which the State is particularly rich; another chapter is on mineral-based and engineering industries; still another details chemicals and allied industries, electro-thermal industries, etc. The information is supplemented by a detailed Annexure giving particulars of potential industries with annual output and expected capital outlay, presumably based on detailed or preliminary feasibility studies.

Much of this material was made available to us earlier in manuscript form by the enterprising Managing Director of the Corporation, Dr. Ram Vepa. We really intended to publish this as an original article in this Journal but since the information is now public property, all that we can do is to commend it for reading of intellectuals, suffering from certain theoretical and ideological prejudices in respect of the public and private sectors, and more so to all entrepreneurs to whom an invitation is held out to develop the State of Andhra Pradesh for public good as also for private gain.

One thing which appears implicit in these documents but which is worthwhile emphasising is that the development of Andhra Pradesh, as of other States in the Indian Union, is for the maximisation of productive employment for the people of Andhra Pradesh; and this is sought to be accomplished by gaining capital and enterprise from any part of the world and from any part of India. If these policies were made explicit as for general application, there would be in their exposition an almost incalculable amount of social good.

SITRA Conference on 'Human Relations'*

THE SITRA CONFERENCE ON HUMAN RELATIONS has become almost a classic. The Management has been good enough to send us as usual a copy of its report on the 8th Conference on Human Relations in Industry. It contains three pieces of absolutely first rate stuff: HVR Iengar's talk on 'Human Relations', which we had taken the liberty of printing (as he was our Chairman) in our last issue for purposes of record; Sri K Srinivasan's paper on 'From Family to Professional Management' and Dr. Chandran Devanesan's paper on 'Industry and Society'. Besides, there are quite a number of other good papers, for example, Sri KN Subbaraman's piece on 'The Case of the Professional' and Dr. Veeraraghavan's research paper on 'Changes in Social Status'; in fact there is much readable stuff in these 128 pages.**

Probably few institutions in India would be comparable in their creative impact to the SITRA Conference on Human Relations. "One of the privileges of SITRA", K Srinivasan said in his concluding remarks, "is to act as a meeting ground between academic knowledge, education and research on the one hand, industrial problems, difficulties, solutions and practical wisdom on the other"; and it must be said that this privilege has been very well exercised and that for a considerable enhancement of the public good.

The SITRA technique is pretty simple: "... we try and spread our net as widely as possible and *bring people with original ideas and concepts* to come and speak to us, so that we will always be kept on our toes and a little fresh, and that our ideas will never get sufficiently solidified as to become too hard..." Someone described SITRA, the other day, as a bee which goes around gathering honey from all the flowers and then distributes it as its own and takes the credit for all the sweetness that is in the honey." Strangely enough this is exactly how Dean Swift demonstrated the superiority of the classicals—representing them as the honey bee, as against the moderns represented by the spider—in his famous satire called 'The Battle of the Books'.

From the way SITRA functions, it is really a productivity organisation and has become very much more so in the context of the recession in the textile industry to which frequent references were made in the course of the Conference. It has done a number of cost reduction studies and its investigations were brought to light in a Seminar on Recession in the Textile Industry.

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*Since the final report was received, SITRA have held another Human Relations conference, of which the preliminary report is being published in NPC *Productivity News* for October 1967.

**Obtainable from South Indian Textile Research Association, Coimbatore; price not mentioned.

The occasion of the Human Relations Conference was naturally utilised in making known a number of small and big things that SITRA does, for example, its investigations into the methods of packing as well as the size of yarn packages revealing a considerable scope for reducing the cost of packing without in any way affecting the quality; and what is happier to record, some of the recommendations have been implemented and others are on the way to implementation; and in all this the SITRA itself plays a good part. On the other hand, in a big matter where the Government of Madras drew upon SITRA resources—for the opening and economic operation of closed mills, the Government has accepted the recommendations of SITRA. SITRA has also done a good bit of work in the optimum utilisation of cotton resources through studies on control and reduction of waste. Encouraging results have actually been obtained in tihs area; and the benefits can be calculated from the fact that saving of one per cent in waste for the country as a whole would mean an extra 70 thousand bales of cotton, which need not be imported. In all their investigations, SITRA has also kept in view the need to improve working conditions for the workers on the one hand and the need to improve the quality of the products on the other.

The highly commendable work which needs to be recorded is the design and fabrication of instruments necessary for testing and quality control. SITRA is actually now in a position to supply some of these instruments which until recently had to be imported.

The fact that there has been an increasing demand for SITRA services in the areas of training and consultancy from various mills, also that the business world has drawn on the resources of its Human Relations Division, is a proof (if one were needed) that SITRA is doing an extremely useful type of work in the social interest.

The Chairman of SITRA Council of Administration, Sri GK Devarajulu, presided over the occasion; apart from complimenting SITRA—"they do all our long-term thinking as well as a lot of our short-term thinking also"—his address was mostly devoted to productivity so as to counter what he called 'a general depression in our economy': "... The managements have a responsibility to ensure that they reduce costs to the maximum extent and not add to the inflationary pressures operating in the country ... It is fairly well known that productivity in Indian industry in general and the textile industry in particular is very low... Unless there is willing and active co-operation between managements and workers, no significant improvement in productivity is possible. If such co-operation does not exist, the money that is invested in modern equipment and in the various techniques and methods employed will not bear fruitful results ... Such co-operation may be better achieved if workers are better trained and understand fully the role they have to play in such efforts. In this area also SITRA has done significant work in promoting the training of workers in enabling them to understand the problems of productivity and their implications."

Srimati Parvathi Krishnan, Vice-President, AITUC, Coimbatore, put forward the labour point of view. "The working class today asks for the answer to the question, 'you promised us a welfare state and where is that Welfare State?' With the rising prices, with the cutting of the food ration, the worker being asked to tighten his belt, at the same time when you ask him to increase productivity it becomes almost a physical impossibility."

She also referred to retrenchment of technicians. "Why is this happening? We say that we have to go forward, that we have to build up National Self-Reliance and then you find yourself, even where steel is concerned—an important commodity for a backward country—an industry that has got to be built up in our country if we are to become

nationally self-reliant, it is there that the retrenchment starts. There is something basically wrong."

She said something extremely interesting about the multiplicity of trade unions and how it stood in the way of trade unions acquiring the necessary expertise : ". . . all responsible trade unionists in this country are aware of the fact that this multiplicity of trade unions does lead to a great deal of trouble in industry—trouble in the sense that it makes a field day for the management. It is almost as though we might reach a stage when management will be calling for tenders from trade unions as to who will give the highest productivity at the lowest wage ! . . . here, the trade union leaders are so busy fighting to survive that they have no time to study balance sheets and become experts in any field. Either you survive or you go down. Therefore, you cannot be sitting there having technical education in this, that or the other, when another trade union—the leader of a rival trade union—might be cutting the ground from under your feet. So, we would also be unemployed."

During the course of the Conference, three major problems were discussed :

(a) Consultant-Client Relations
(b) From Family to Professional Management and
(c) Industry and Society

On the first subject, Dr. Parukh of the BEAM Services of Bombay put forward the consultant's point of view : the need for building up a code of ethics for disabusing people that management consultants are only efficiency experts and labour advisers, experts in reducing men, window dressers, fire fighters etc., etc. He pleaded for what he called the preventive approach and more importantly the developmental approach : "an approach primarily to develop people within the organisation". Dr. Parukh was of the view that the consultant was very much needed because the business manager worked under severe pressures : the pressure of time, the pressure of habit and the pressure of routine. Dr. Parukh mentioned Sherlock Holmes, which of course must have created an awkward and probably an eerie impression. He complained that management often took a patch work approach to consultants, instead of using them to create an impact on the organisation as a whole; or sometimes they used consultants as a whip over their own managers, sort of gestapo.

Dr. Parukh was being less than fair when he accused the NPC and LPCs of unfair practices in giving free service to private profit-making organisations : in the first instance, we do not give free service; the PSIS is paid for by the parties concerned; in fact, the grievance now is that the charges are rather on the high side. Secondly, what is more important—and this point was made at the Conference by Sri Ratnam : "As a matter of fact, after the work of the productivity councils, the demand for consultancy has gone up tremendously." However, it is in the public interest to record what Dr. Parukh said at this Conference . . . "It is our feeling that it is an unfair practice on the part of Productivity Councils and such related organisations to give free service to private profit-making organisations, unless they are small scale enterprises not capable of taking service from consultants. What is the major purpose of these Councils and Associations ? It is firstly, to create an awareness about productivity and they have done an excellent job of it. Everybody including consultants have benefitted from it. What is the second foremost goal ? They should do *fundamental, basic work. This is not being done.* It is not the function of Productivity Councils—in fact, we consider it as an unfair trade practice—to give affluent concerns free service of a routine kind, like plant lay-out, job analysis and so on. They are there to develop certain basic expertise, such as for instance, a breakthrough in operations research, development of certain trade tests, development of programmed instructions—basic research which consultants cannot do. Consultants are financially not equipped to do so. It would be worthwhile taking the help of consultants,

I am sure many consultants would give free advisory service to these Councils, and help them develop these basic tools and techniques which all, including consultants, can then use. This is not being done." (Italics ours).

Towards the end of this paper, Dr. Parukh made a very fundamental point; and there is much truth in what he said . . . "I feel that *our culture is essentially authoritarian.* People do not face each other and they are not frank. There is great deal of anxiety in a subordinate meeting his superior. There is a false sense of respect. Therefore, people do not use unequivocal language; they do not use forceful language; do not call 'a spade a spade.' A manager, however high he may be in the organisational heirarchy, is always soft pedalling his view point. Therefore, there is a need for an outsider who has no position to strive for in the company, who has no anxiety of his own and who has the capacity to use unequivocal language to put certain facts before top management in an emphatic manner. This, in our authoritarian culture, our managers do not do. This is a role which is essentially a consultant's role and a good consultant should play this to the best of his ability."

Sri K. Sundaram put forward what was called the client's points of view: he rightly remarked that ". . . . The imperative need to improve productivity has resulted in the use of consultants for re-organisation, workload and job evaluation studies, incentive schemes, etc..The field of consultancy is rapidly expanding and is presently so enlarged, that today there are many specialised consultants who can render services in entirely new spheres of industrial or commercial activity".

Sri Sundaram made a broad observation that the consultants were expected to be trained investigators operating on the best scientific principles of observation and deduction with objectivity. Their investigations showed that the consultancy services were mostly in the general practice. As such, each consultant usually dealt with several areas of management, rather than specialising in fewer ones with a possibility of increasing effectiveness; and there were certain areas that were not being frequently dealt with by consultants, such as industrial relations, selection of executives, inventory control, production planning and control, office layout and construction. Sri Sundaram presented a good deal of factual material with regard to the nature of problems referred to consultants, areas of service rendered by them, types of consultants, how consultants are chosen, the duration of consultations, fees etc., etc. While reporting the general consensus that consultancy service had been useful to industry, he also had some adverse comments to offer: " . . . *unfortunately, there are many quacks.* I am sorry to say that. All sorts of people indulge in consultancy services of which they have no knowledge and try to do consultancy work by *reading a few books here and there* with the result that they fail miserably and the industry loses confidence in consultancy". Sri Sundaram made a number of very useful suggestions whose adoption would lead to a fruitful utilisation of the services of consultants.

In the discussions that followed, Sri K Srinivasan offered some very interesting comments .."The consultant has to be extremely careful in accepting consultancy particularly in the realm of human relations. The moment he goes into the organisation you will find that every member of the organisation wants the consultant to make the kind of recommendations that will improve his status, salary, or position. The top management might want the very same people to be sacked!... In the days when SITRA used to give free service to its members, many of our reports went unread. Now that we have begun to charge more and more, our reports have acquired considerable amount of respect and they are kept sometimes in locked cupboards so that only the top management can read them!"

Sri CV Natarajan of SITRA read a paper on "Consultancy in Special Situations"

with particular reference to organisation... "The Management Consultant was viewed as one who effects structural changes by re-designating a few or suggesting an increase or decrease in the number of employees... By observation, study and discussions with the various people in the set-up, he establishes the existing relationship through an organisation chart...The impact of consultancy in effecting changes in organisation is felt in more than one area: first and foremost, *the responsibility and authority of the individuals get re-distributed to the point of greatest use*..There is a reduction in the number of problems routed to the higher levels. Realistic objectives are fixed for individuals and for departments".

Summing up, Sri Natarajan said that there was need for consultancy in organisational planning, as there was continuous change going on in the set up both in terms of size and nature of ownership. In the absence of consultancy, outdated organisational polices and practices which really were a brake on growth, would continue.

In the course of discussions, Sri Veeraraghavan elaborated the type of service that SITRA gives: "...we undertake *reorganisation work, in a training situation.* It is here we find it pays more dividends. There is less of resistance to change. We get the co-operation of the top management and we also get the co-operation of the middle management. We try to give them a little course on the 'scientific principles of management'. Then, we ask them, "Well, let us put this into our own organisation; could you point out what are all the flaws ? Could you find out whether there is anything like a lack of adequate span of control or a lack of adequate definition of duties and responsibilities ?". We elicit participation from among the supervisory and executive personnel. When they come out with their suggestions, there is feed back on to the top management. Now, we find that this symbiotic relationship, the close relationship between the executive on the one hand with our own Training Officer who goes in as a consultant on the other, makes both the training man or the consultant and the client understand the problems, with the result we are able to bring about realistic changes in the organisation. This is where the success of the SITRA approach rests."

Sri SK Roy of ATIRA* (Ahmedabad) read an excellent paper on 'Some Aspects of Training Consultancy'. Sri Roy complained that much of our training consultancy was done in an isolated manner. He argued that it was necessary for a consultant to try and relate training to a given organisation, to the totality of its processes and functions; and to see that the training was developed into a line function. Sri Roy said that in the first instance ATIRA tried to achieve a firsthand determination of the training situation through studies, based on a series of shopfloor observations, to find out how a supervisor actually spent his eight-hour day; this should be supplemented by interviews with a cross-section of supervisors who had previously attended ATIRA training programmes to find out, besides the strength and weaknesses of their previous training programmes, the factors that helped or hampered supervisors in the application of their learning to work situations. Then through questionnaires, ATIRA explored the attitudes towards supervisor responsibility that existed at various levels in the organisation. While the training programme was being conducted, an attempt was simultaneously made to initiate into mill practice a certain reorganisation of roles and attitudes considered conducive to development.

Sri Roy has very beautifully described the contradiction that has now developed in some segments of our industrial life..."While human relations techniques are being imparted within the four walls of the training room, out in the loomshed, for example, another

*Sri Roy submitted this paper for publication in the NPC Productivity Journal, but since all of it has been printed in the book under review, we have summarised Sri Roy's paper in the piece published here.

set of values might be prevailing. Back in the workplace, the requirement might be that a tight punishment schedule is to be followed, so many fines, so many warnings, so many show-cause notices a week to be produced, as a means of preventing weaving damages that may have gone up recently."

Sri Roy really makes a point when he says that "the employment of a consultant carries with it perhaps an unfavourable implication of failure...and to that extent poses a threat to the existing system of prestige, status and relationships...*It is difficult to come across even a first line supervisor, for example, who is not his own psychologist....*"

Sri Roy considers skill-oriented training as inadequate and calls for a practice-oriented vocational training, designed to stimulate supervisors to re-evaluate their perception of themselves and others, leading them on to the acquisition of certain skills, capable of application on the shopfloor: "For being assimilated into work behaviour, learning has to take place in the setting in which it is to be applied. In our experience also, *on-the job situations are very difficult to be abstracted* on to a classroom . . ." It is difficult to say what an "imaginatively organised on-the-job practice" really means in practice; but we are sure that ATIRA is doing it successfully and that it is worth learning and practising.

Summing up, Dr. Nayudamma, Director of the Central Leather Research Institute, Madras, recalled Sri Sundaram's remark comparing the industrial consultants to *a bee collecting honey from different flowers and selling it as its own sweet honey, making money in between !* Dr. Nayudamma pleaded for an understanding of the dynamics of industrial change that has been going on at a fast rate in our country : "...*in our society, our people have to face new situations*, new conditions, new functions, new aspirations every day...the multiplicity of people going into industry, both as labour and management, would naturally be considered as a simple exercise in 'mechanics' which requires an understanding of adjustments and more adjustments.

In the discussion on 'Family *versus* Professional Management', Sri Arunachalam, Managing Director of Tube Investments, Madras, presented a paper characterised by a high level of objectivity : how family management, which is so pervasive in the private sector, has a place for it because of the need of financial and managerial resources and the manner in which they can be utilised best, because of the training received by juniors from the seniors of the family, their strong sense of loyalty and responsibility, the absence of fear etc. etc : "one can ensure efficient working in a company without being unduly exercised over nepotism."

Sri Arunachalam did not fail to point out the many weaknesses in family management : the objectives and aspirations of the family may be and many times are at variance with the business interests of the enterprise ; there is often misguided financial secrecy, reluctance to broaden capital ownership, lack of appreciation of operational needs; many times there is lack of discipline; the cost control systems are poor and often corrective action is not taken when accounting procedures indicate that the pet projects of the family are out of line. Many difficulties naturally appear because of too much involvement with family interests and there is ineffective utilisation of non-related management talent. There is the problem of succession (as in a dictatorship) and it has often been found that the third generation of family managers lack both character as well as talent : "it is very essential that such a pitfall is avoided and that third generation family members equip and qualify themselves suitably to run their business efficiently..." and there is much evidence that this is in fact happening in India.

Sri Arunachalam then reverted to the strong points of family management : how an organisation acquired a unity of purpose,

an image due to family sacrifices, the family name becoming a bankable asset as in the case of the Rothschild legend; how disastrous executive turnover could be avoided through family management: how an organisation got the benefits of technical experience, unusual access to management secrets, an immunity from organisational pressures, etc. etc.

On the whole, Sri Arunachalam ended on a note favourable to Family Management: "... *popular opinion* has it that when family and business are inter-related, a less efficient business enterprise generally results; but a close examination of the subject suggests that this belief is unfounded..... *Ownership management remains as perhaps the most effective kind of human motivation*... A personal stake in the progress and prosperity of the employer is the best guarantee for management devotion ..They cannot expect to command success but they can do more—*They can deserve it.*"

Though somewhat idealistic, Sri K.N. Subbaraman, Chairman of the Neyveli Lignite Corporation, presented a good case for professional management, particularly in the public sector. Probably in the following passage there is an oblique reference to the real joys and the real qualities of public sector executives: "...The satisfaction that comes of pursuing an art, and the exhilaration of achieving a goal set by oneself in that pursuit are rare experiences felt or seen now. They alone have regenerating qualities, not the exhibition of fat salaries through conspicuous expenditure that burns away creative urges."

The case for professional management is obvious. "...It has its *advantages of detachment*, so necessary for some bold decisions. At the same time it might lead to some unjustified euphoria because *the owner is insulated from the subtle messages that pressing problems emit.* The position of an intermediary confers on the professional managers an ability to discern what is more important for the future than the immediate gains expressed as profits .....".

In passages of marked analytical ability, Sri Subbaraman laid bare the nature of the public sector, its field of operations, the difficulties of laying down a yardstick, etc. etc. The major role of the public sector, Sri Subbaraman said, is to establish self-generating growth. Of course, that is really too tall an order. The general public are "shareholders by compulsion" in undertakings chosen to be set up by Government. These enterprises are of a wide variety; some provide infra-structure facilities, others set up basic industries; some of them yield direct benefits in the ordinary sense of the word; others generate a chain reaction of development: how to measure their return is no easy task.

And then there are difficulties of organisation; the long chain of command, the rigidity of rules and procedures, the impersonal approach—a sort of "dehuman impartiality or objectivity"—and as if this were not sufficient, we have it: "...performances pass off as routine and failures alone are thrown up for attention. There is *no reward for excellence, possible chastisement for shortcomings.* He is best then who can avoid mistakes... There are too many to find fault and over-sensitiveness depresses output ... external constraints and compulsions are many that syphon off takings..."

Sri Subbaraman made a point when he said that as professional managers, particularly in the public sector, have little power to distribute profits to those who have helped to make them, they are normally inclined to attach greater importance to employee welfare.

Ending on an idealistic note, Sri Subbaraman said that "business is part of the wealth of the country"; and the professional manager must use his ability to his very best, because without that "the country cannot grow, nor he survive. And the most important actor in this drama is himself

and he will do well to *perform above the setting.*"

Making a broad survey of the transition from family to professional management, Sri K. Srinivasan remarked how the whole matter hinged on the level and nature of industrialisation; how in the case of smaller companies there are certain advantages in family management, particularly when entrepreneurs are themselves technically qualified: "Because of the financial stake involved and the personal interest in the business, the entrepreneur will devote his time for a low remuneration while a professional manager, if he is efficient, will be expensive for a small company. That is why we find that even in highly industrialised countries small companies are still largely family-owned and managed."

Sri Srinivasan then went on to deal with the level of sophistication in industry, how with the employment of modern techniques, management tended to become professional: "But during the last two decades, a number of factors have contributed to an increasing use of professional people at the middle and even higher management levels. Improving technology as well as an increase in the need to modernise and to get the best out of the machines have resulted in the employment of technically qualified staff. The complicated nature of industrial relations has demanded that most companies employ personnel officers. Introduction of modern management techniques, which have been necessitated as a result of increasing competition and the need to maintain quality and to reduce costs has resulted in the employment of professionals in various fields such as work study, quality control, cost control and so on."

Sri Srinivasan has also drawn attention to the fact how the source and manner of financing, particularly from public institutions like Finance Corporations, LIC etc. etc. have led to the development of professional management: "...these institutions have a right to appoint their nominee on the board and are in a position to *advise and occasionally dictate* with regard to policies as well as in the appointment of high level specialists to ensure that the companies run on an efficient and profitable basis... The attitude of Government and the company law administration towards the managing agency system has also been a contributing factor in accelerating the growth of professional management."

In passages of remarkable beauty and depth of analysis, Sri Srinivasan referred to social environment within which industry functions: how both managers and workers are also citizens, part of the society influencing it and influenced by it: how certain old values still persist: "Respect for age and seniority, *reverence for the high and contempt for the low, helping one's own relations are still considered virtues by many.* A large number of people still invest their money on the basis of their relationship and *not on the basis of an objective assessment of future prospects.*. On the other hand, modern industry demands decisions based on facts, selection of people as well as equipment on merit. It demands delegation, discussion and co-operation rather than unquestioned acceptance of decisions from above . . . Often an individual is a member of both these social systems—the industrial system during working hours and the traditional system during the rest of the time."

Sri Srinivasan argued powerfully for making efforts to see that "the entire industry in the country may reach a highly uniform level of efficiency. The executive of the future, irrespective of the source from which he originates, should be prepared to act according to his knowledge and judgment and take responsibility for such action . . . "

In the public sector it is obvious " . . .The nature and type of accountability that is demanded from a public sector executive is such that it seems to hamper his ability to take the initiative... In taking decisions, the public sector executive is concerned no[t]

only with the effects of those decisions on the industry he runs, but also with their effect on the audit department, and on the type of questions that may be asked in Parliament. Therefore, it is essential that *a new system of accountability* similar to what exists in good private sector organisations will have to be evolved if the public sector is to be more efficient."

Sorrowfully Sri Srinivasan has recorded that "*during the last few years, management, rightly or wrongly, has failed to create a good public image of itself within the country.*" He has, therefore, rightly argued that efforts should be made to evolve a code of ethics and its acceptance and implementation by management.

Dr. Pylee of the Kerala University School of Management Studies gave an academic, historical account of the growth of family management; it is his view that professional management has a long way to establish itself in India. But there is hope for the long-term future: "Whatever might be the relatively important role today of family management, a quarter century from hence, competence rather than heredity will be the decisive factor that will determine the profitable existence or otherwise of an enterprise."

In his concluding remarks, Principal Ramakrishnan of the Coimbatore Institute of Technology said that while the family business had a place in the industrialisation of any country, "*for any company to prosper, the management must be efficient whether family managed or professionally managed.*" So on balance there was a vote for productivity.

In dealing with the subject of Industry and Society, Principal Chandran Devanesan of the Madras Christian College presented a highly idealistic point of view. His whole paper was a powerful argument for the development of an adequate social philosophy. He examined at some length what made contemporary western society to 'tick': "... But when we turn to India, I am afraid there is an inhibition about sociology. I think, one of the significant things about SITRA is the tremendous way in which it plunges into sociological arguments and debate."

Dr. Devanesan said that we had one great advantage, namely, of being able to study the Industrial Revolutions in the West as sort of case studies; and he suggested in this context the inclusion in management syllabus of the writings of the critics of the Industrial Revolution, such as Ruskin, Thoreau, Tolstoy and Gandhi. He added: "I would also advise all industrial managers to see the films of Charlie Chaplin which are extremely good for the soul! Charlie Chaplin portrays the helplessness, the pathos, the poignancy and yet the dignity of the 'little man' caught up in the whirlpool of industrial civilisation."

Dr. Devanesan tried to draw a parallel between labour unrest and student unrest because in both fields—education as also in industry—we are involved in mass production: whether you like it or not, the student explosion is continuing to explode and we will have to find better mass production methods, more meaningful mass production methods to get the products we want out of our colleges just as we need good quality products from our factories. The two problems are not dissimilar at all. And, of course, mass production has given society a greater feeling of equality. After all, Cleopatra herself would be envious of the cosmetics which any young lady has within her reach today!"

Then followed a highly idealistic note which we reproduce here without comment: "I think that the whole concept of *Karma* has to be reinterpreted to suit the industrial world so that the worker and the manager have a sense of duty, of responsibility, of performing a useful function and of pride in his work. Or if you take the concept of *Nishkama Karma*,, we must apply to it the ability to make decision in a detached and objective manner. I think a man who under-

stands *Nishkama Karma* will make sound decisions even in a modern industrial society ... And finally and lastly let us consider the doctrine of *Ahimsa*. We need not interpret *Ahimsa* simply in terms of the non-violence, of turning the other cheek, but also in terms of Love of Nature, of reserving parks and playgrounds and open spaces amidst strong industrial development...I would like to end with the words of Jesus Christ who said, "What shall it profit a man if he gains the whole world and yet loses his own soul ?"

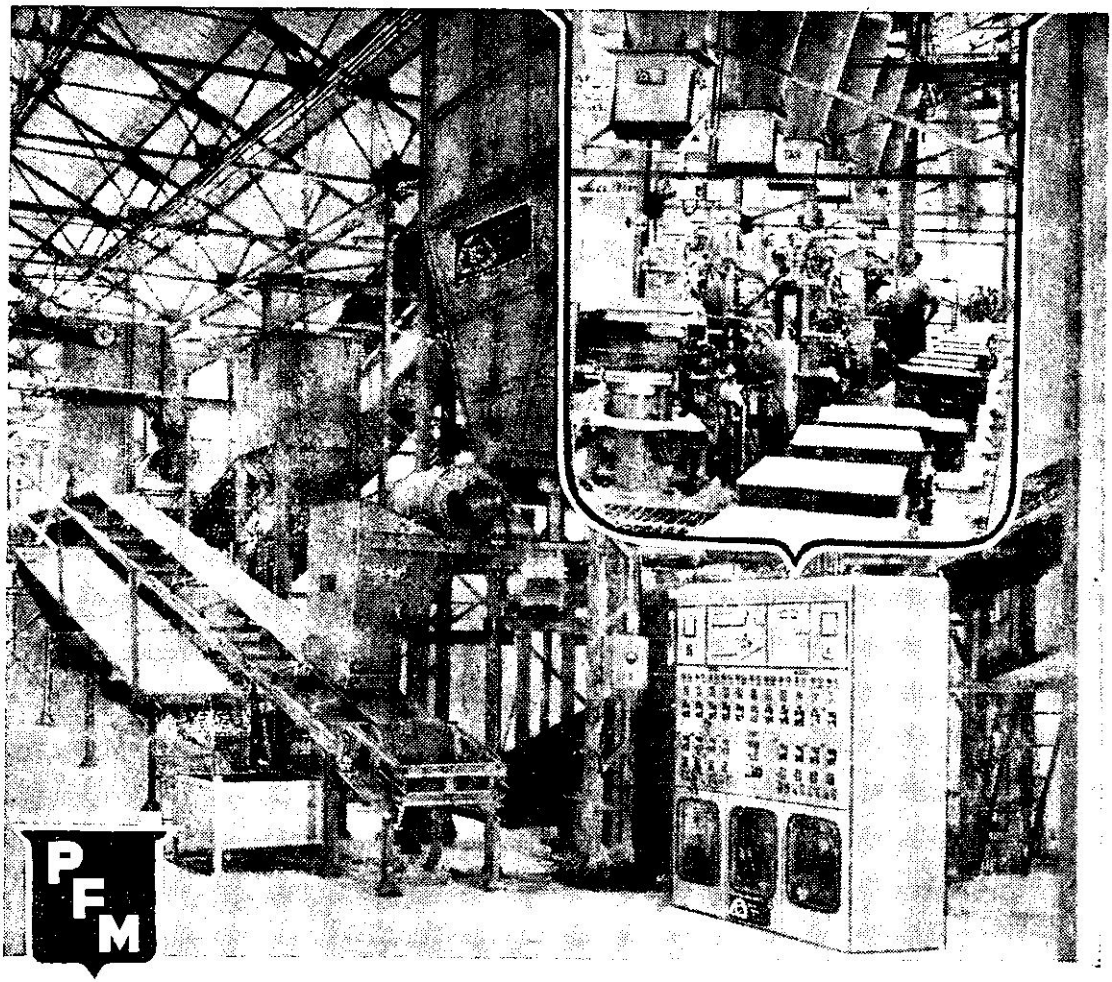
Towards the end, a number of research papers were presented, the one on 'Changes in Social Status' by Sri Veeraraghavan being the most important. In a significant table printed on page 98, the sociological significance of status comes out very interestingly. In the rural areas, for example, 41 per cent of the people identify themselves by their caste. This percentage comes down to 11 in the urban areas, where 31 per cent of the people identify themselves by the farms or factories in which they work. It is also interesting to know how people are judged in rural and urban areas. Income is, of course, the highest criterion both in urban and rural areas, but it is an important sign that education occupies position 2 as a status criterion both in the rural as also in the urban areas and character occupies position 3 in the rural areas and position 4 in the urban areas. Caste and food are a long way behind in both rankings. What factors are needed for rising in social status is listed as follows : (i) money (ii) intelligence (iii) education. Up to this, rural and urban rankings agree; then they diverge slightly. While honesty occupies position 4 in rural ranking, it is number 5 in urban ranking where the fourth place is occupied by "whom you know". Courage and perseverance soon follow : and caste and cunning are a long way behind, in fact the very last; in rural areas caste is number 8 and cunning is number 9 and the last, while it is reverse in the urban ranking.

Of the deeper sociological implications of industrialisation, Sri TAS Balakrishnan, Additional Secretary of the Government of Madras, gave certain very interesting examples : "Sri 'A' set up a factory in Tanjore district employing 250 persons. A large number of people from the neighbouring village approached him for setting up a factory in their place. He probed deeper and found that as a result of putting up this industry in this area, in that particular village and the surrounding areas, there was no pilferage and petty thefts at night ! The two hundred and fifty people who were doing pilferage and petty theft were having regular empolyment and they did not bother to go in for petty pilferage. Now, this had apparently struck the community."

The second example appears more modern—in an area where five big companies operated with a labour force of a lakh of persons, what happened when the bonus was distributed: "As soon as the bonus is given—it is given in cash—this money is burning a hole in the pocket of every labourer. For the next two or three weeks, they roam the surrounding bazaar and practically everything that is movable is bought—whatever the price, irrespective of whether they need it or not ! Approximately a crore of rupees goes down the drain every time bonus season starts."

Towards the end, Sri K Srinivasan came on the stage again and in a good-humoured speech said : "As you know, in the *Mahabaratha* Duryodhana had one of his uncles, Saguni as his consultant ; The *pandavas* had Lord Krishna, and the victory or defeat depended on choosing the right type of consultant."

The best comment on the SITRA Conference on Human Relations was offered by Sri TAS Balakrishnan in true Browning style : "I did not know how wonderful it was until I came here."●



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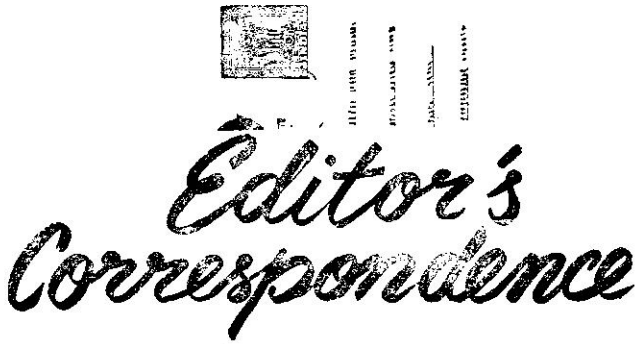

Education and Productivity

This has reference to the highly thought-provoking and, at places, apparently controversial paper on **"Management Development, Industrialisation and Productivity"** by Dr. M. V. Pylee (PRODUCTIVITY, Vol. VIII No. 1 pp. 27-31), as well as your comments by way of footnotes therein. Obviously, the stress that the author of the paper has laid on "entrepreneurial ability and managerial competence" as the principal engine of economic development *vis a-vis* the underdeveloped economies, is in wild contrast not only to the "classical" concept to which you have rightly adverted (col. 2, p. 31), but to the general view held in academic circles hardly a decade and a half ago (cf. RAGNAR NURKSE: Problems of Capital Formation in Underdeveloped Countries, Oxford, 1952). For example, Nurkse said that capital alone could break the vicious circle of poverty that the underdeveloped countries are enmeshed in. Nowadays, however, the entrepreneurial aspect of economic development, and not capital, is generally recognised as playing the crucial role in the development process, though the importance of capital in the scheme is not sidestepped.

Sir, you seem to disagree with the author in regard to the role that different types of education should play in the development process of a typically underdeveloped economy. Actually, if I have understood the author correctly, I should say he does not in any way suggest that Kerala, or India as a whole for that matter, should give no place for mass education and that the entire educational endeavour should be directed in the line of simply providing technical education. Far from that. It seems to me that the main burden of his argument, on the other hand, is that the mushroom-like proliferation of schools and colleges that provide general education, to the comparative neglect of those providing for technical education cannot cater to the actual need of economic development. And, understood in that light, his point is not likely to raise any serious controversy.

In fact, I should go a step further and say that it is not only the predominant

provision of facilities for technical education but a deliberate and carefully planned attempt at providing those types of technical education which command high premium in the development process, that will deliver the goods in the context of economic development in an underdeveloped or even developing economy. One does not have to strain one's power of reasoning very much to understand that haphazard and misdirected efforts to spread education among the masses cannot be conducive to economic development and raising the productivity, whatever else they may bring in. Recent history teaches us that education, if it should be fruitful in terms of economic development, should produce a sort of "backwash effect" whereby those areas which have the strongest pull are attracted first and then their influence gradually gets escalated to the remaining areas by way of a "spread effect". Such a system alone can be automatic and hence stable. Sir, if you find no difficulty in agreeing with the view that an undue emphasis on general education can lead to frustration on the part of the people, then you cannot disagree with the point that it does make the people poorer too, because frustration, *ipso facto*, acts as a drag on prosperity and steady economic development.

Education is investment in human resources. And, as in any other line of investment, in education also the scarce resources should be spent with a view to their producing the maximum returns. And in the modern technological age, unless India puts in the greatest effort to keep pace with the relentless march of science and technology, she is sure to be left far behind in the race for rapid industrialisation. If we still continue clinging on to the system which Macaulay's ingenious brain invented one hundred and thirty four years ago for an altogether different purpose, we cannot blame anybody except ourselves when the Joneses have advanced far ahead keeping us miserably behind. And the emphasis on technical education in India cannot brook any more delay for the pride of place among all schemes of education, especially when her very survival is threatened by adverse developments in hostile neighbourhood. Since we are operating under a planned system, it is only natural that we lay down priorities. What will contribute more and better for the rapid development of the economy should be our first concern and, therefore, that should get our first attention.

"Rectify one angle of a square", said Gandhiji, "and the others will automatically be right". Well, let us rectify the angle of technical education by giving it top priority in our educational schemes; general education will take care of itself in the process.

Placing undue emphasis on general education is, again, like putting the cart before the horse. Sound economics does not always conform to sound politics. Mass education, which should not be confused with mass literacy, may be a coherent and highly practical political proposition; it is, however, bad economics of an extremely dangerous proclivity, at any rate, in the case of a poor country like India aspiring to stand on its own feet within the shortest possible time. Sentimentalism has its own value in the general scheme of things; but to allow it to have free reins in the field of economics is little short of cutting one's own throat.

As for Kerala, no sensible person will disagree with your observation that she should be "treated as an integral part of the Indian economy". You have rightly pointed out that Kerala should concentrate on those export items which fetch valuable foreign exchange for the country and in turn has a right to expect her shortage of foodgrains production to be made good by efforts in other parts of the country. However, when you extend the same argument to the field of general education by saying that Kerala should continue her present educational system and can hope

that her educated young men and women will be absorbed in the other parts of the country in the context of unemployment, your argument altogether gets off from the realm of practical affairs in the country today. Division of labour on the strictly economic front is based on certain grounds of peculiar advantages, whereas those advantages disappear when you attempt to stretch the principle to an area where factor endowments are practically the same. Obviously, any other part of India can concentrate on general education with equal advantage as Kerala ; at the same time, it stands to reason that Kerala should *a fortiori* now direct her main attention away from general education because of the tight position that it is already confronting.

It will indeed be worthwhile to bear in mind in this context that Kerala leads all other States in the country in the matter of literacy. While Kerala's literacy is 46.8%, that of Jammu and Kashmir is a mere 11.8% and Rajasthan's nothing more than 16.2%. The annual expenditure on education in Kerala is Rs 15.19 per head which, to say the least, is the highest for any State in India. With an area of only some 15,000 sq. miles, Kerala has no less than 1151 High Schools, 2447 Upper Primary Schools and 6454 Lower Primary Schools, all providing general education. Of 2,622,460 applicants on the Live Register of Employment Exchanges in India as on December 31, 1966, Kerala alone accounted for 157,182 persons, the majority of whom have general education. Another revealing fact is that among 9,702* persons in India as a whole coming under the category of "agricultural, dairy and related workers", Kerala had 1,667*—the largest number for any State in India. Does not this position eloquently plead that top priority in education in the State should now go to technical lines ? Does it not also suggest that even in such lines the action areas should be carefully chosen ? The fact remains that if Kerala is not to become a still-born child in the highly sensitive field of education, it is high time that the traditional pattern undergoes a complete change and that the main emphasis goes to technical education which will eventually make men provide employment for themselves...—**N. C. JOHN, Asst. Lecturer, School of Management (Kerala University), P. O. Kalamassery, Kerala.**

*There is apparently some serious error in these figures : they must be in several million —**Editor**

Mr. John's letter discusses at length the issues raised both by my article and your comments. I would only add the following :—

I am very happy indeed to note that some of my observations in my article and the comments thereon by you, Mr. Editor, have excited a good deal of interest among the readers of *Productivity*. It shows, more than anything else, the importance of the subject of education in the context of our developmental needs and perhaps a widespread feeling that we have not so far been able to evolve a policy which will suit such needs of the country.

I, for one, feel that education of a developing country needs most careful handling. If properly handled, it can produce good results from a developmental point of view. If poorly handled it would create all types of imbalances, frustrations and instead of development, retardation. To a great extent, this is what has happened in our country.

We all know that our resources are limited. In that context a planner has to lay down priorities. What will produce fast development is of primary concern to him if he is a good planner. Maybe that it will appear to be unintelligible to the ordinary, uninformed and often unthinking person whose understanding of the nation's problems is extremely limited.

I would like you, Mr. Editor, to come

down to Kerala (where our plans have utterly collapsed) from the distant and lofty heights of our capital city of Delhi where our planners and top government officials operate in an atmosphere of utter unreality. They create paper plans largely based on imaginary facts and figures. When implemented, instead of solving our problems and the nation moving forward, we create many more unwanted ones which take us backward.

One last word. There is a vital difference between education and literacy. What goes under the term education in our country today is at best only making people literate. But literacy, although it is a blessing in itself, need not and often does not help economic development. It only helps increase widespread and all-round frustration ...— **Dr. M. V. PYLEE, Dean, Faculty of Commerce, The School of Management Studies (University of Kerala), Kalamassery (Kerala).**

Automation in India

I read the letter of Mr. Rathor in reply to mine on "Automation", published in these columns. However, Mr. Rathor, while giving the example of Japan, has not said a word about the way in which the Japanese successfully introduced automation without tears. It would be educative and useful if one could know something more about it. If they experienced any trouble in the initial stages, we may wisely avert it if possible. One can learn a lot from the experience (and mistakes:) of others. Mr. Rathor has also not commented on the concrete suggestions contained in my letter in respect of—

(a) offering suitable employment avenues to people displaced as a result of automation, and

(b) providing training facilities to those who have the potential and aptitude to take up new jobs offered by automation, in the Indian context.

These two actions must start before embarking on automation to save our industry and society from the so-called initial mal-effects of automation on employment. Going in for automation without making these provisions in advance would be like putting the cart before the horse.

If we are really serious about automation, let us then take a close look at the educational curricula of our schools, colleges and universities. Let us develop the necessary skills for automation even at the college and university levels. Let us eliminate or review and reorganise those subjects where a good number of student and tutor hours are dissipated-

(a) Either because such subjects do not have scope of practical application/use or

(b) There is duplication of effort and time spent in learning some subjects/laboratory practicals during successive years at the college (the latter could be vouchsafed for from my own college experience in the branch of mechanical engineering).

If we have to go in for automation we must possess develop our own men and skills and make better effective use of resources at our disposal. We cannot depend on foreigners for ever. So far we have been relying heavily on foreign aid alone, which has crippled our economy.

Secondly, we Indians need to develop the sense of responsibility and patriotism in our rank and file. These qualities are very much pronounced even among the Toms, Dicks and Harries of Japan. After independence, we Indians have managed to shelve these important and essential qualities which we boast of having possessed during the pre-independence era. Why does this happen ? Because we very much lack the right type of leadership in our country. We lack the national outlook. Those who have risen to power are not the true representatives of the masses; otherwise, decisions on very important matters like introduction of regional languages as media of higher education, which do not have the support

of the educated masses, would not have found strength. Even the trade union leadership in this country, which to labour is the fountainhead of education and inspiration, does not play its role effectively for the well-being of the nation and even of labour. Politics and selfish motives have crept into this, otherwise noble, trade union movement. In trying to protect the rights of labour the trade union leaders, and through them therefore the labour itself, are oblivious of their obligations towards the nation, towards industry and towards the community. It is painful to see labour fighting for their rights alone without caring for their responsibilities. Therefore objective education, both for the trade unionists and workers, is a prerequisite to introduction of any changes, particularly major ones like automation.

Thirdly, let me make it clear that I am not opposed to automation, as Mr. Rathor has misunderstood. I would welcome automation in India, but not right now as we are not yet prepared for it, as I mentioned earlier. I believe that automation does help improve productivity, but my only contention is that it should be implemented only at an opportune time. Here also, the application of automation in India should be selective rather than extensive. For example, let us look at the application of computers. I personally feel that the application of computers in India should be restricted to fields like scientific or technological research, solving of complex industrial problems, etc., where human power would either be unable to tackle them or would take a very very long time to solve them. But to introduce computers extensively at this moment in our national economic life, merely to replace manpower, would, to say the least, spell catastrophe.

The example of Japan, cited by Mr. Rathor in respect of automation heavily aided by America, has its political background that can't be so easily forgotten. Having destroyed Japan to ashes, the Americans had to save their face in the eyes of other nations, and hence on humanitarian grounds and simultaneously to keep Japan under their political umbrella, they offered aid in all forms—capital, machinery and technical know-how to the developing post-war Japan.

Of course, one must, without hesitation, admire the outstanding ability and success of the Japanese in having made the best of these facilities and in having been able to stand on their own legs firmly, squarely and proudly. But is India willing to align politically with America? Now this is a question which our political leaders have to decide. An objective (and not dogmatic) approach is necessary in this regard, if we wish to solve our economic problem and achieve industrial progress.

Thus, introduction of automation is not so simple a problem as one would tend to think. One should not be mis-impressed (if I may coin the word) by the spectacular results certain countries have achieved as a result of automation. It is a very complex problem involving and affecting not only economic and technological aspects but also the more important social and political considerations. I, therefore, reiterate that let's go in for automation if we must, but let us make adequate arrangements sufficiently in advance to nip in the bud those problems which we are able to envisage and those that we should try to anticipate and avoid in the light of experience gained from other countries. In the process of attempting to solve a problem we should not create many more. The therapy, I believe, should always be preventive rather than curative.

I shall thank you if you send the enclosed copy of this letter to Mr. Rathor so as to convey my comments on his reply to my earlier letter. Automation being the burning topic of vital importance in the present economic context in our country, I thought of voicing my views on the subject and of thinking aloud on certain aspects closely related to it.

May I hope that, space and your other formalities permitting, you would kindly publish this letter in your next issue of *'Productivity'*. . . .—**R. P. NADKARNI, Voltas Ltd., Dr. Ambedkar Road, Bombay-33.**

Seminars by Mail

It has been an established practice with Productivity Councils, Management Associations and such other Bodies to organise Seminars or Conferences, from time to time, on topics catering to Indian Productivity. Such Seminars are usually held at metropolitan cities or at large industrial units and so, for obvious reasons, only a limited number of persons can attend such Seminars and avail of the enlightening discussions held therein. A large number of persons, though keenly interested to avail of the benefits of such Seminars, cannot do so.

In order to create productivity consciousness in all the nooks and corners of India, it is necessary to see that the greatest number of persons are provided with facilities to participate in the discussions of the Seminar. This need can substantially be met, in my opinion, if the desired Seminars are organised by post by concerned organisations. Readers of the 'Productivity' Journal may be invited to communicate their views through articles or letters addressed to the Editor on subjects chosen for the Seminar, by an announcement in the Journal. Procedural rules regarding the organisation of such Seminars should be published while making an announcement as above. Such postal Seminars should be organised once a year and the articles and views received from readers selected for publication in the Journal, to be styled as 'Seminar Special Number. Renowned authorities or experts on the topic of the Seminar should be requested to preside over the postal deliberations of the Seminar and to offer their concluding observations thereon.

May I hope that the above modest suggestion will meet with the approval of the worthy Editorial Board and the Readers of the Journal ....—**R.D. KULKARNI, Kopargaon Sahakari Sakhar Karkhana Ltd. P.O. Kolpewadi (Dist. Ahmednagar).**

The Public Relations Aspect

Please accept my humble congratulations on the latest issue of your Journal and your leading article on Two Faces of Productivity. You have very rightly hit the nail, at this large spectre of unproductive sector of our economy which is sucking its life and blood like a malignant disease. Your article, read together with Sri Iengar's piece, not only highlights the problem but suggests solution also. 'Be productive or else perish' was never so true as it is now.

Of late I have been thinking of writing to you to suggest that some literature on public relations and advertising may also be included in the Journal. Public relations is a very important part of management as production and sales are. I think with the growth of management thinking, a stage would come when the management would be guided not only by the motive of profit but by public relations also. It is more true in the case of public sector enterprises where the fair image of enterprise is often tarnished by bad public relations in spite of its productive results . . . .—**S.K. KHANNA, Public Relations Officer, Hindustan Insecticides Limited, New Delhi.**

Promotion from Within—Or New Blood?

In their article on "Promotion from Within—or New Blood ?" published in the Summer number of your *Productivity* (Vol. VIII, No. 1), Mr. Johri and Mr. Satyamurthi, seem to emphasise and favour bringing in 'New Blood' into an organisation instead of filling up vacancies by promotion from within. As this aspect is delicate and complex since it directly affects human aspirations and reactions, it needs to be dealt with very carefully. I believe each case needs a thorough examination on its own merits before deciding upon the final course of action. One cannot afford to cling fast to the dictum of 'new blood' as strongly argued but rather one should follow the path suggested by Yoder —"What is required to infuse new thoughts by making possible the interaction of new employees at different levels, whenever occasion permits". I take the liberty to suggest a change to the last part of Yoder's sentence by saying, "whenever occasion justifies". And this is important as will be readily seen. When a vacancy arises, it definitely 'permits' filling up by an outsider if the organisation wants it to be so, but whether bringing in an outsider is 'justified' and a promotion from within is 'not 'justified' in the case must be examined carefully. New blood should be admitted only when the calibre for promotion from within does not fulfil expectations or requirements of the vacancy. If there is suitable calibre within, it is most desirable and only fair that the vacancy be filled by promotion from within. If, however, the aspirant from within lacks the required calibre/qualifications, he should be taken into confidence and informed of it in advance instead of letting him receive the decision like a bolt from the blue only as a result of appointing an outsider. The probable heart burning, discontent and loss of morale as a result of unexpected and surprising decisions could be avoided through proper and well timed communication between the decision makers and employees and maybe through proper counselling. Unfortunately we often come across painful situations caused by bringing in the uncalled for new blood even in the so-called progressive organisations.

I may make it clear that these are purely my personal views and not of or related to the organisation I belong to. . .—**RP NADKARNI, Voltas Ltd, Bombay.**

Training Technicians

I came across your Journal and found it very interesting and informative. I share your views that our nation can progress rapidly, if our technicians are well informed, well trained in their jobs. I am a youth of 33 years of age, full of zeal and keen to help my motherland. I am working as a Foreman/Mechanical in a leading coal-tar dyestuff factory, employing nearly 1,000 persons. I am very much interested to get myself trained in my job : not only trained but scientifically and systematically trained, so that I can be worthy of my employers and an asset to my country...—**MN KHUNTE, AMER DYE-CHEM Ltd., Kalyan, Bombay.**

Computer and Employment

I am a regular reader of the *Productivity* Journal. Various articles in the Journal on executive development, work study, job evaluation, etc., give me enough knowledge for discharging my duties as a junior executive in this organisation. I am very grateful to you for the same.

I have before me two articles relating to Electronic Computers, written by Sri S.M. Patel and Sri G.K. Prakash, published in

the *Productivity* Journal. In Kerala, this computer is a hated machine. People regard it as a ghost since it denies them employment opportunities. How far is this view correct? In States like Kerala where educated unemployment is a serious problem facing the authorities, are these machines a hindrance to economic progress? I am looking forward to hear from you details on the following:

i) Descriptive information as to what is a computer
ii) Detailed articles on employment opportunities in computer-installed enterprises abroad
iii) Address of Computer Suppliers in India

Please enlighten me by furnishing materials on the above...—**M.N. VASUDEVAN NAIR, Asst. Superintendent, Aluminium Industries Ltd. Kundara (Kerala)**

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The Correspondent is requested to look up a number of articles on Computerisation, appearing in this issue of the Journal

—Editor

Productivity Literature

...I happened to go through your literature, including some reports. You will be pleased to note that it is interesting and informative to professional students like me. Moreover, your periodicals provide up-to-date and authentic clues to certain problems. It keeps one in touch with recent developments...—**Yogesh, C-800, Township, Virbhadra, Rishikesh, (U.P.)**

Management of Plans

I am extremely impressed with your piece on Management of Plans...Your article is not only a piece of literature but presents a critical analysis of Indian Planning and the views expressed in this context by eminent authorities like HVR Iengar, Vikram Sarabhai, Prof. Dantwala and Prof. Lewis. Please accept my congratulations on the vivid picture of Planning in the country... **—RR SINGH, Head of the Department of Economics, Agra College, Agra.**

PRODUCTIVITY IN INDIAN MUSIC

Indian music is enjoying a vogue in Europe and the United States. The names of its exponents are sometimes better known there these days than they are in this country. And, needless to say, their incomes are increasing in direct proportion to their fame, a fact which suggests there will soon be considerably more than love of music behind the so far modest efforts to spread the taste. The latest move seems to be to link Indian music with jazz. If that sounds somewhat of an indigestible mixture, it must be remembered that the two forms of expression have much in common. Both are unwritten, and allow for considerable improvisation on the part of the individual musicians. Neither requires any large number of players, nor any really expensive equipment. The difference is mainly in the cultural background, but basic to both are the same human emotions. One group which is hard at work taking advantage of the new taste to break down old barriers boasts the title "Indo-Jazz Fusions" and it employs musicians from different countries—Indians, Europeans, Jamaicans and Canadians. They recently performed at London's new Queen Elizabeth Hall, and taking part as a soloist was none other than the famous Larry Adler. I have not yet had any report on the concert which I could regard as authoritative, but I believe the audience enjoyed it. Personally I remain enough of a purist in musical matters to stay unimpressed by any aspect of this particular phenomenon other than its financial one. Music is these days a major international industry, and so far this country has not featured among its main exporters. If American and European audiences can be persuaded to develop a taste for what I personally am inclined to regard as artistic sacrilege, then I cannot see why it should not be exploited to the utmost: do we, or do we not, need the foreign exchange? But before we attach too much importance to what could prove to be strictly temporary gimmicks, would there not be something to gain from attempting to cultivate a taste in the western ear for good, genuine and unmongrelised Indian music?

—CAPITAL, dated 27th April 1967

PRODUCTIVITY

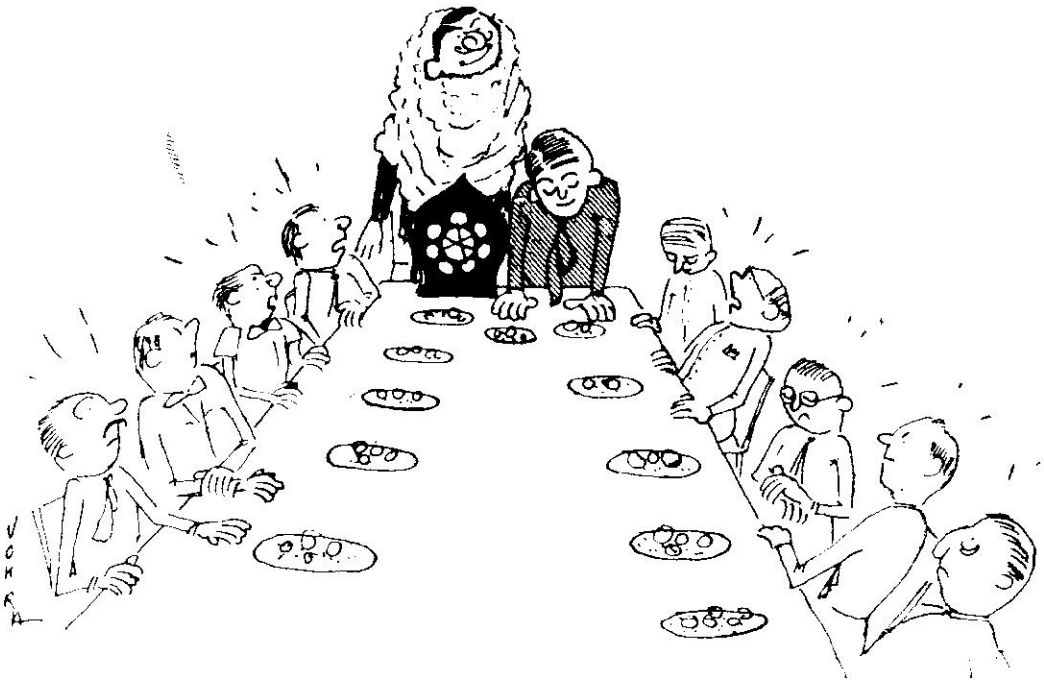
IN PICTURES — P. R. Vohra

Productivity in Pictures

PR Vohra

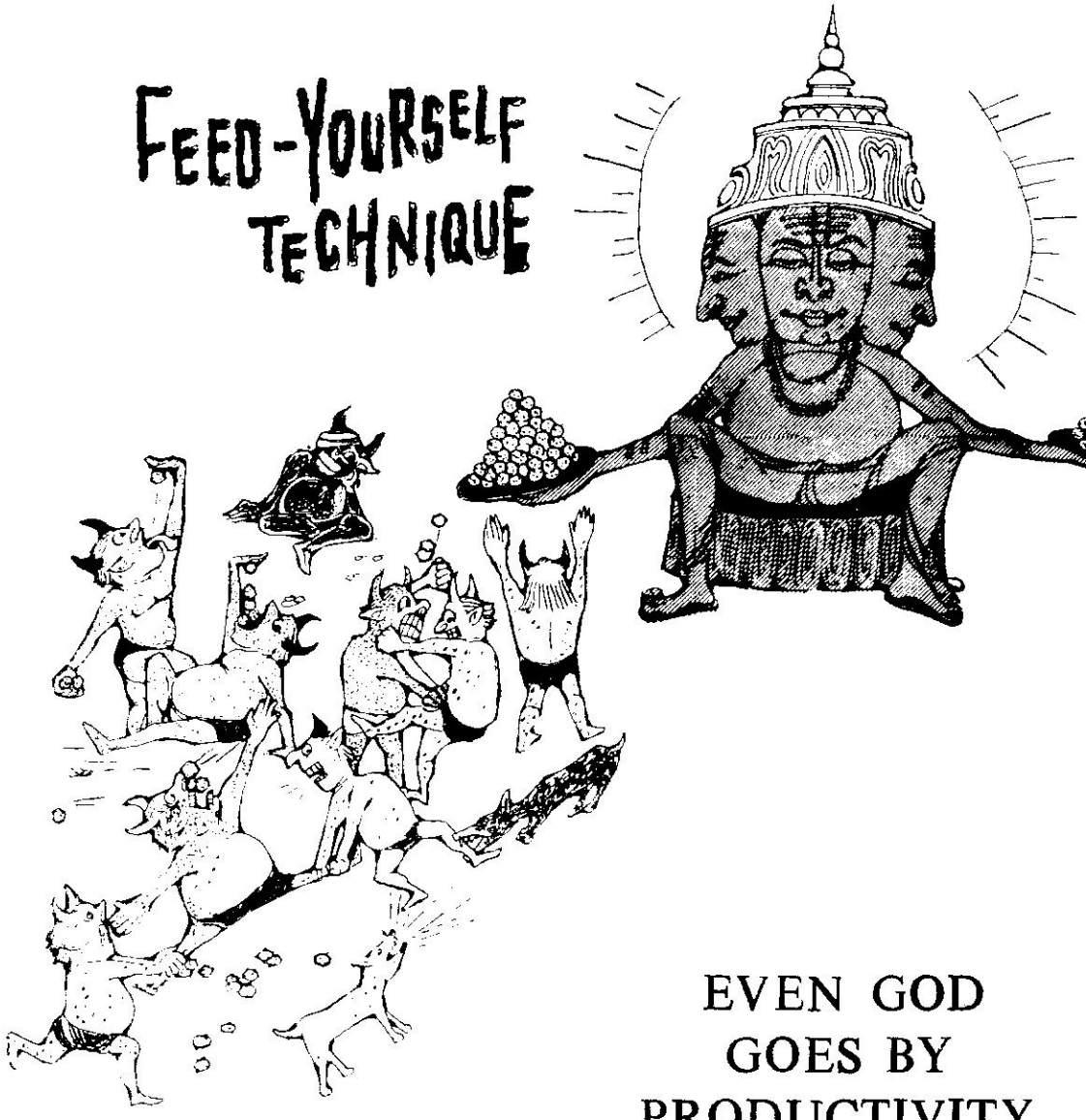
Page No.

Model of Productivity



"Sir . . . you are a model of productivity; and it's with a heavy heart that we part with you; for all that you have done, we present you this shield as a token of remembrance; and we have decided to contribute each one of us a month's salary to eat and drink in your honour in the cause of productivity."

FEED-YOURSELF TECHNIQUE



EVEN GOD
GOES BY
PRODUCTIVITY