Raw Materials

The inventory turns ratio of crude materials during the eleven years has shown progressive improvement from 1.24 to 2.61 and then jumping to 4.25 in the last year. The lowest was at 1.15 during 1967-68 and highest recorded was 4.25 in 1976-77. In terms of months of consumption the material holdings fell from 10.5 in 1967-68 to 2.8 in 1976-77. Fig. 3 leaves no optical illusion about the concave formation of the curve over the period.

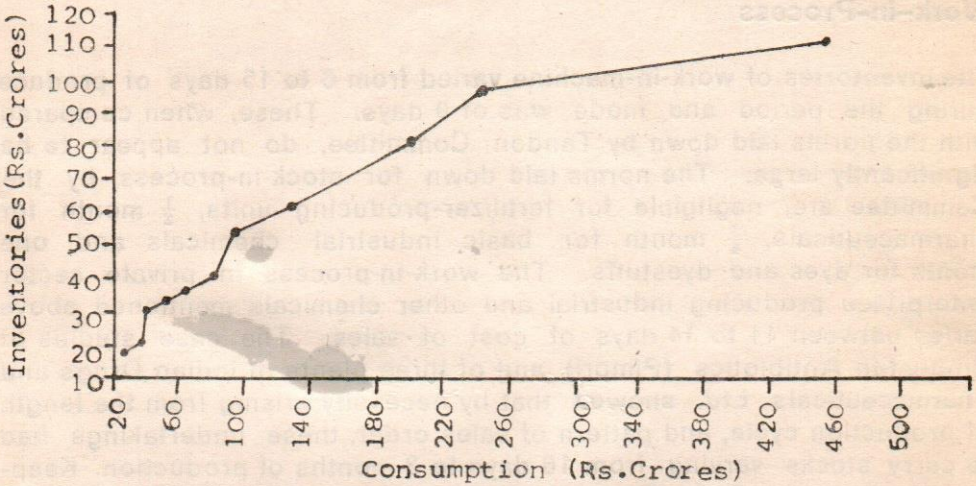


Fig. 3 : Inventories of Raw Materials & Spares and their Consumption Relationship—Chemicals & Pharmaceuticals

Despite progressive improvement, the inventories of materials seem to be better managed in private sector during 1971–76. The inventory turnover ratio in this category for basic industrial chemical companies of private sector varied between 2.6 and 3.68 and, in the same management style for all the chemical companies, it ranged between 3.45 and 4.05 during 1971-72 to 1975-76, whereas in public sector the corresponding ratio moved between 1.75 to 2.61. It means that a lower level of holdings in private sector covered larger volume of sales. The inventory holding of raw materials and spares in terms of months of usage was the least during the decade at 4.6 in 1975-76 and in eleventh

year it was 2.8 In July 1975 the Reserve Bank of India constituted a Study Group under the Chairmanship of Mr. P.L. Tandon to indicate, among others, the inventory norms for different industries both in public and private sectors. Tandon Committee (as was popularly known) had laid down the norm of $2\frac{3}{4}$ months for firms producing basic industrial chemicals and pharmaceuticals, $2\frac{1}{2}$ months for units producing dyes and dyestuffs and $\frac{3}{4}$ to 3 months for those engaged in fertilizers. The public enterprises held stocks of raw materials higher than the norms suggested by Tandon Committee.

Work-in-Process

The inventories of work-in-machine varied from 6 to 15 days of produce during the period and mode was of 9 days. These, when compared with the norms laid down by Tandon Committee, do not appear to be significantly large. The norms laid down for stock-in-process by the Committee are, negligible for fertilizer-producing units, $\frac{1}{2}$ month for pharmaceuticals, $\frac{1}{4}$ month for basic industrial chemicals and one month for dyes and dyestuffs. The work-in-process in private sector enterprises producing industrial and other chemicals mentioned above varied between 11 to 14 days of cost of sales. The case studies of Hindustan Antibiotics (Pimpri) and of three plants of Indian Drugs and Pharmaceuticals Ltd. showed that by necessity arising from the length of production cycle, and pattern of sales order, these undertakings had to carry stocks varying from 16 days to 3 months of production. Keeping in view all these facts, overall level of inventories of work-in-process of 9 to 15 days of produce, does not appear to be excessive. The changing pattern of WIP in relation to cost of sales is shown in Fig. 4.

Finished Goods

The turns rate of finished goods has shown irregular fluctuations. In the first four years it deteriorated from 10.34 to 6.78, and in the next four years it improved from 6.78 in 1969-70 to 11.77 in 1973-74. In the last three years it fell sharply to 9.91 in 1974-75, 6.29 in 1975-76 and to 6.01 in 1976-77. During 1971-72 to 1975-76 the turns rate was 9.78, 11.0, 11.77, 9.91 and 6.29. The corresponding ratio for finished goods

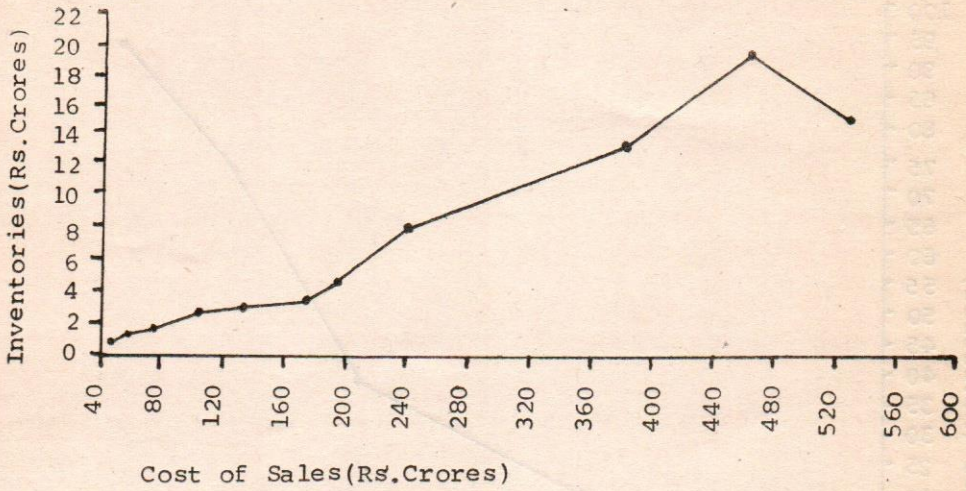


Fig. 4 : Inventories of Work-in Process and Cost of Sales Relationship—Chemicals & Pharmaceuticals

in the large-sized basic industrial chemical companies of private sector was less than 10 in one year, nearly 10 in another two years and more than 11 in the remaining two years. The highest ratio was 11.95 in 1974-75. In all the chemical companies of private sector the inventory turnover ratio was less than 10 in one year, around 10 in two years and in the remaining two years it was more than 11. The highest was 12.14 in 1974-75. The comparative figures show that management of finished goods inventories in private sector is better than the public sector. In terms of months of cost of sales the public sector undertakings had the least stocks equal to 1.02 months of produce value in 1973-74. In five years of the period it was more than $1\frac{1}{2}$ months and the highest was of 2 months in 1976-77. The Tandon Committee had suggested norms of finished goods inventories in terms of months of sales equal to 1 for basic industrial chemicals, 3/4 for dyes and dyestuffs, 2 for pharmaceuticals and 1 to $1\frac{1}{2}$ for fertilizer manufacture. Fig. 5 adopts a convex formation in later part of the year thus giving some evidence of diseconomies of scale which is required to be investigated.

Tests of Optimality

Experience has given some idea of approximate limits, within which, inventories *vis-a-vis* the derived demand/usage would move. This

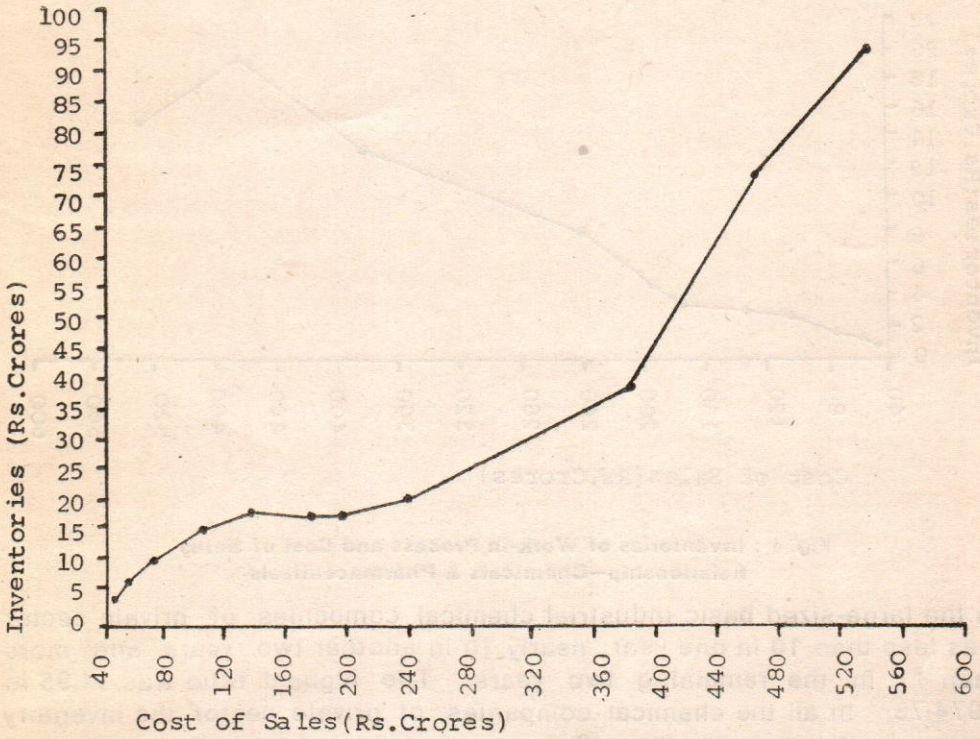


Fig. 5: Inventories of Finished Goods & Cost of Sales Relationship—Chemicals & Pharmaceuticals

approximate limit suggests three possibilities. First, inventories may move in constant ratio with their usage. Second, according to established belief, with increasing consumption or sales relatively lesser volume of inventories are needed and under ideal conditions of effective management, inventories should move in square root relationship with their usage. The third alternative is that inventories increase in between the two extremes. These trends can be captured through application of the following three models to time series data :

(i) $I = a+bS$

(ii) $I = a+bS^{1/2}$

(iii) $I = \propto S^{\beta}$ where $\frac{1}{2} < \beta < 1.0$

Here I stands for inventories, a—safety stocks, b/$\propto$—policy variable and S for sales/usage. The value of the exponent β will indicate the degree of economies of scale in the holding of inventories. A general form equation $I=a+bS^{\beta}$ could give better idea about the extent of economies of scale, but unfortunately there are statistical difficulties in establishing by linear regressions an equation of the general form and as such this model cannot be applied. The application of three models will give insight in the inventory behaviour, and assess the extent to which there had been economies of scale in inventory holding. In Model (i) inventories form a constant ratio with usage. In (ii) stocks are in squareroot relationship to derived demand. The model (iii) holds the assumption that economies of scale exist, but are not as great as those indicated by the squareroot relationship.

Application of Model I : The material and finished goods inventories of enterprises in chemical and pharmaceuticals group were correlated with usage of material and cost of sales respectively according to the linear model $I=a+bS$ through regression analysis in five groups of years 1 to 7, 1 to 8, 1 to 9, 1 to 10 and 1 to 11. The important results of these regressions are summarised in Table 4.

Table 4 : Simple Regression : Inventories to Usage : I=a+bS

	1966-67 to 1976-77		*1966-67 to 1974-75*		*1966-67 to 1973-74*	
Parameters for Analysis	*Materials & Spares*	*Finished Goods*	*Materials & & Spares*	*Finished Goods*	*Materials & Spares*	*Finished Goods*
No. of observations	11	11	9	9	7	7
a—coefficient	25.91	— 6.14	16.34	2.72	12.51	3.07
standard error	4.55	4.38	2.34	1.71	3.08	2.38
t—value	5.70	—1.40	6.98	1.59	4.06	1.29
b—coefficient	.2122	.1580	.3287	.0891	.3964	.0883
standard error	.0252	.0160	.0239	.0092	.0498	.0191
t—value	8.42	9.87	13.75	9.70	8.00	4.64
R^2	.887	.915	.964	.931	.927	.811
F—variance ratio	70.82	97.51	188.95	94.19	63.93	21.49

The regression of raw materials and spares to their consumption reveal positive intercept 'a' and it is significantly different from zero at 95 per cent confidence level in all the five different groups of periods. This shows marginal inventory-usage ratio is less than the average inventory-turnover ratio. The multiple coefficient of correlation R^2 is nearly .9 and is highest at .979 for the decade as a whole. This shows that the linear model I is on the whole a good fit. The 'b' value which shows reaction of inventory holding to change in consumption had been significantly different from zero at 95% confidence. All these factors give strong evidence of the existence of economies of scale in the holding of material inventories.

The regression of finished goods inventories to cost of sales shows—ve intercept term 'a' for all the 11 and 10 years and is+ve in the remaining three groups of years. In none of the cases it is significantly different from zero as judged from their 't' values. The multiple coefficient of correlation R^2 is less than .9 in three cases and are .915 and .931 when analysis was made for 11 and first 9 years respectively. These facts give no evidence for economies of scale and suggest that the inventories of finished goods have moved in costant ratio with sales as intercept 'a' is approaching zero. But in three out of five groups of years, R^2 is found relatively low, so it will be better if some further examination is made before forming a definite conclusion in this respect.

Analysis of different parameters of this Model in respect of all the inventories taken together showed that in all the five groups of years the intercept 'a' was+ve and significantly different from zero at 95% confidence. R^2 was more than .93. These facts give conclusive evidence of economies of scale in holding of inventories for meeting the sales over the period of study. It seems the economies of scale made in crude materials have pulled their weight to offset the impact of laxity in management of finished goods inventories.

Application of Model II : The alternative theory to that of the linear model is that inventories are a squareroot function of sales/usage (i.e. $I = a \times bS^{1/2}$). Regressions were run again for each of the two kinds of inventories in the same correlation as in the Model I and results are set out in Table 5.

Table 5 : Regression of Inventories to Usage : $I = \alpha + bS^{.5}$

Parameters for Analysis	*1966-67 to 1976-77*		*1966-67 to 1975-76*		*1966-67 to 1973-74*	
	Materials & Spares	*Finished Goods*	*Materials & Spares*	*Finished Goods*	*Materials & Spares*	*Finished Goods*
No. of observations	11	11	9	9	7	7
a – coefficient	–5.75	– 34.79	10.78	10.60	—7.23	– 6.77
standard error	3.99	10.01	3.22	3.39	5.39	3.46
t—value	– 1.44	— 3.48	—3.35	–3.12	—1.34	—1.96
b—coefficient	5.7268	4.5852	6.2982	2.2896	2.7676	1.9207
standard error	.3489	.6749	.3573	.0271	.7156	.3254
t—value	16.41	6.79	17.63	8.45	8.06	5.90
R^2	.968	.837	.978	.911	.929	.874
F—variance ratio	269.34	46.15	310.66	71.39	64.96	34.83

The regression results for the crude material inventories upto first seven years and all the eleven years show that intercept 'a' approaching zero and R^2 respectively are .929 and .968. These show signs of data responding to the model. But in other groups of years 'a' is—ve and is significantly different from zero at 95 per cent confidence. Further technical examination showed that S—lowest usage value of the period of study—is greater than the model value of $4a^2/b^2$. It means that the model II when applied to the data of chemicals and pharmaceuticals group of enterprises, did not capture the reality of inventory behaviour. All these facts show that as far as inventories of raw materials are concerned, the exponent of S is likely to have value higher than .5. In finished goods inventories for all groups of years R^2 value is relatively low (indicating a poor fit) except in case of the analysis up to first nine years. In that case also a is—ve and lowest value of S in the period is greater than $4a^2/b^2$. This shows that the model has failed to capture reality and exponent of S is more than .5.

Application of Model III : The model $I = \propto S^{\beta}$ with β lying anywhere between .5 and 1, indicated economies of scale, but these economies were not as great as those indicated by the squareroot formula. Linear regression on this model was calculated in the logarithmic form

$\log I = \log \alpha + \beta \log S$. The results of regression for each of the two kinds of inventories in the same correlation as in the previous two models are indicated in Table 6.

Table 6 : Regression of Inventories to Usage : $\log I = \log + \beta \alpha \log S$

Parameters for Analysis	*1966-67 to 1976-77*		*1966-67 to 1974-75*		*1966-67 to 1973-74*	
	Materials & Spares	*Finished Goods*	*Materials & Spares*	*Finished Goods*	*Materials & Spares*	*Finished Goods*
No. of observations	11	11	9	9	7	7
β	.5924	1.0550	.6296	.8741	.6197	.9348
standard error	.0323	.0937	.0405	.1002	.0710	.1570
t—value	18.33	11.26	15.53	8.72	8.73	5.95
log α	1.19	— 2.41	1.04	—1.59	1.08	—1.85
standard error	2.06	3 07	1.03	1.06	1.29	1.31
t—value	.58	—0.79	1 04	—1.49	0.84	—1.40
R^2	.974	.934	.972	.916	.938	.876
F—variance ratio	366 15	126.76	241.20	76.06	76.27	35.44

As far as inventory holding of crude materials is concerned, there is strong evidence of economies of scale. The value of 'β' is .59 in all the eleven years and slightly more than .6 in other groups of years; and when judged from 't' value it is significantly different from zero at 95 per cent confidence. The .592 value of β for all the years indicates the slope of the log-log line and it means that as each unit moves, the usage value moves to the right of the inventory line and rises by .592 unit. In this category of inventory R^2 for the fit is very good being more than .93 in the first seven years and more than .95 in the remaining four other groups of years. For the period as a whole R^2 is .974. In case of finished stocks for the period as a whole β value is 1.055 but is not significantly different from 1 and in the first 10 and 7 years it is more than .93 but less than one and is significantly different from zero at 95 per cent confidence. In the other two groups of years the value is more than .85 but less than .9 and is significantly different from zero at 95 per cent confidence as judged from the 't' value. R^2 in 1 to 11, 1 to 10 and 1 to 9 years is more than .91 and in other two groups of years

is .87. This shows that the model on the whole is a good fit. The unity value of β for the period as a whole shows that there had been no economies of scale in holding the inventories of finished goods. In this regard the position was slightly better in other groups of years due to lesser values of β. On the whole, economies of scale were very mild and very much less than those observed in case of inventories of crude materials and spares.

For all the inventories together and the period as a whole the value is .8158 and R^2 is .976 showing an overall mild economies of scale in the holding of stocks.

Excess Holdings

The applications of models gave evidence of some rationalisation in the management of inventories of raw material, but nearly no economies of scale were seen in the finished stocks. The models did not assist in assessing the excess inventories on any data. An approximate idea of the excess holdings can be formed through analysis of growth rates on the assumption that safety stocks and policy variables have not changed over the last eleven years. (The mechanics of working out excess holdings were explained in paras on pages 324 and 325 of the similar article on petroleum enterprises of Central Government published in *PRODUCTIVITY* October-December 1978).

It may be noted that this methodology will give an underestimate of excess inventories if stocks in the beginning of the period under study are found to be excessive to requirement, which, in fact, is the position as revealed by the case studies of Committees on Inventory Control set up by the Bureau of Public Enterprises.

Analysis of Growth Rates

During the period under study the consumption of crude materials and their inventories grew at 31.91 and 18.16 per cent respectively. If inventories had moved in the squareroot relationship of their consumption the growth rate would have been (1.3191—1) x 100, i.e., 14.85 per cent as against the actual rate of 18.16 per cent. The excess stocks of crude materials in the eleventh year as compared to those required

under ideal conditions of squareroot relationship (on the basis of methodology referred to in the preceeding para) are worked out at 20.6 per cent, i.e., Rs. 22 crores out of total holding of about Rs 108 crores in 1976-77.

The stocks of finished goods in the period under study increased at 29.92 per cent whereas the cost of sales grew at 28.34. This gives some evidence of diseconomies of scale because normally stocks should grow at a rate less than the value of produce, but through application of models the conclusion of diseconomies of scale was not proved. During the decade, the two had grown at 27.91 and 28.67 per cent respectively. In case the two had increased in squareroot relationship the inventories over the entire period and the decade would have increased at 13.29 and 13.43 per cent respectively. In that case inventories could be less by Rs. 73 crores in the eleventh and Rs. 57 crores in the tenth year, out of the stocks of about Rs. 91 and Rs. 73 crores respectively.

The total average inventories over the period of study increased at 22.61 per cent whereas the cost of sales grew at 28.34%. In case the square-root relationship would have been adhered to, in the terminal year these undertakings could have less inventories by 55.5%, i.e., Rs. 118 crores out of total stocks of about Rs. 214 crores.

Case Studies

The Committees on Inventory Control made in-depth studies of inventories of (i) Fertilizers and Chemicals Travancore Ltd. (FACT), (ii) Fertillzer Corporation of India Ltd. (FCI), Sindri and Trombay units, (iii) Hindustan Antibiotics Ltd. (HAL), Pimpri, and (iv) Indian Drugs & Pharmaceuticals Ltd. (IDPL)—Antibiotics Plant Rishikesh, Synthetic Drugs Plant, Hyderabad, Surgical Instruments Plant, Madras. The Committee on Public Undertakings of the Lok Sabha have also examined the working and Control of inventories of these enterprises in their reports Nos. 67 (1974-75), 50 (1973-74), 80 (1975-76) and 56 (1973-74) respectively. In addition, the Committee also studied the stock position of Cement Corporation of India Ltd. in its report No. 69 (1975-76). Apart from these two agencies, Bureau of Public Enterprises, reviews the position of inventories every year, in its annual reports.

The case studies of different units of these undertakings revealed partial applications of ABC analysis, determination of safety stocks on the basis of thumb rules, ordering policy not guided by EOQ principle, receipts of materials being more than issues, incomplete codification and standardisation, high percentage of stockouts and surplus stocks, and considerable scope of improvement in reporting system, inspection methods, and in watching performance of suppliers over time. The case studies revealed heavy disposal of surplus stocks and huge stock holdings without any movement for over five years. According to a case study, the disposal of surplus stocks caused loss of about 75 to 80 per cent of the book value. In cases where data were available, physical verification was done of 21 to 32 per cent items per annum and the percentage of out of stocks was 23-41. The Committees on Inventory Control recommended norms for various categories of inventories of the units studied and on the basis of these norms excess percentages of 41.9 (FACT), 37.3 (FCI Sindri), 42.2 (FCI, Trombay), 24.3 (HAL, Pimpri), 39.2 (IDPL, Rishikesh), 31.5 (IDPL, Hyderabad) and 55 (IDPL, Madras) were worked out. This mixed group of all the seven case studies gives an overall excess percentage of 38.

The analysis of growth rates indicated an excess holding of 20.6% in case of raw materials and spares, of about 80 per cent in finished goods and an overall excess of about 55 per cent. Thus out of about Rs. 214 crores of stocks in 1976-77 nearly Rs. 100 crores worth of inventories could be withdrawn for effective use elsewhere in case the squareroot relationship had been adhered to by these 11 undertakings. The 7 case studies had revealed overall excess holding of about 38 per cent and in individual cases excess percentage varied between 24.3 to 55 per cent. The experience of other countries show that a reduction of stocks between 20 to 25 per cent is within easy reach of management through modern inventory techniques. This will release nearly Rs. 50 crores of capital for active use, apart from saving 10 to 15 per cent of carrying cost of stocks every year.

Conclusions

To study the behaviour of inventories of 11 Central Government chemical and pharmaceutical enterprises over 1966-67 to 1976-77, six tests were applied. These related to (i) inventory turnover ratio, (ii) trends

in investment of inventories—absolute and in terms of period of usage/ sales; (iii) comparison of level of holding with similar undertakings under different management styles; (iv) regression analysis according to three preconceived models; (v) analysis of growth rates; and (vi) corroborative evidence from in-depth study at micro level. The results obtained are consistent in respect of following conclusions:

(i) The evidence here does not refute, but rather supports the hypothesis that level of inventories is higher than what is required for production at consistently efficient level.

(ii) The 11 undertakings of this group have taken advantage of economies of scale in holding of inventories, but these are not so significant as those indicated by the classical squareroot formula. As a result we hold about 55 per cent of excess stocks in the last year of the study as compared to the inventories required under ideal conditions.

(iii) Comparison of sales to inventory ratios of the eleven undertakings with the American Corporations and with the large-sized private sector joint stock companies shows that the results of management of inventories in Central Government Public Sector Enterprises in chemical group can be significantly improved.

(iv) The behaviour of three categories of inventories are different. The work-in-process stocks in these undertakings do not appear to be excessive. The inventories of crude materials have shown economies of scale, but these are not so significant as those indicated by square-root relationship. The stocks of finished goods have moved nearly in constant relation with value of produce.

(v) Two case studies of the Committee on Inventory Control indicated 23 and 41 per cent of the items being out of stock as against their recommended percentage of 2 to 3.

(vi) According to one case study mentioned by Committee on Inventory Control, disposal of surplus stocks throw the company to heavy loss of about 75 to 80 per cent of their book values. In

another case reported by Committee on Public Undertakings there was a loss of 89 per cent in disposal of redundant stores.

(vii) The seven in-depth case studies reveal redundant holdings in large number of stock items and their aggregate value gives an excess varying from 24.3 to 55 per cent of the existing stocks.

(viii) Experience has shown that a reduction of 25 per cent of stocks is within easy reach of management through modern inventory techniques. This will release nearly Rs. 50 crores of capital for active use apart from saving 10 to 15 per cent of carrying cost of stocks.

(ix) During the period under study when inventory models were given wide currency, some rationalisation took place in inventory management particularly in raw materials category and economies of scale were taken advantage of, but not to the extent of square-root relationship. □

Restricting Overheads : Case Study of a Government Press

Sugan Chand Jain* & Pasupati Agarwal**

The Government Central Press, Jaipur, processes various printing jobs of the Government departments of Rajasthan. It employs over 500 persons and works in two shifts. It has a capital investment of over Rs. 10 million. This press has a special status in the sense that besides Government Gazette it undertakes printing of all the Rajasthan Legiststative Assembly publications, Government Books, State Fortnightly Confidential Reports, State Budget, etc.

One of the most important elements of the cost structure of any manufactured or produced article with special reference to a printing press is the overhead. If costing principles are followed, these overheads can be classified into (i) Manufacturing overheads, (ii) Administrative overheads, and (iii) Selling and Distribution overheads. These overheads are collective in nature, because they are incurred for the concern as a whole.

Manufacturing overhead costs—also referred to as indirect manufacturing costs, factory burden, or manufacturing expenses—are defined as those costs or expenses which cannot be treated to any specific porduct costing unit, but without these expenses no factory can operate or produce the desired output. Administrative overheads are the costs of formulating the policy, directing the organisation and controlling the operations of an undertaking, which is not related directly to production, selling, distribution, R & D activity or function, whereas the selling costs are the cost of seeking to create and stimulate demand and securing orders. The distribution cost may be defined as the cost of sequence or operations which begins with marketing the packed product available for despatch and ends with making the reconditioned returned empty package, if any, available for issue.

On making personal enquiries it was found that in this Press overheads are not classified on any functional basis. Overheads are neither grouped under fixed and variable overheads nor are these

* Faculty Member, Department of Accountancy and Business Statistics, University of Rajasthan, Jaipur,

** Staff Member, Government Central Printing Press, Jaipur (Rajasthan).

classified like manufacturing, administration, selling and distribution overheads because the press has to follow the principles of classification of indirect expenses as laid down in the Budget Manual of the Government of Rajasthan.

In the Budget Manual, the items of expenses are classified into major and minor heads of expenditure. Keeping in view the principles of classification of expenses in the Budget Manual, the expenses which can be treated as indirect expenses have been classified for the Stationery and Printing Department as under :

Group I - Direction and Administration;
Group II—Purchases and Supply of Stationery Stores;
Group III - Government Presses;
Group IV—Cost of Printing of other sources;
Group V—Government Publications;
Group VI— New Items of Expenditure.

The expenses of these groups are totalled separately and the total of each group of expenses is termed as minor head total. A demand is made for various items of expenses under each group of head in which detailed accounts are given for at least three consecutive years.

In the Budget Manual, under Stationery and Printing head, the last two columns (cols. 8 and 9) indicate the budget estimate for the current year. The second column shows the amount expended during the year just preceding the previous year. And in columns 4-5 and 6-7, the budget estimates and the revised estimates are shown. This statement of detailed account of the various items of expenses is helpful in making a comparative analysis of the increase or decrease in the expenses to be incurred during the currenf year by various sections of the Stationery and Printing department. From the detailed accounts as discussed above, an abstract is also prepared in the same manner in which the total expenditure under different groups are shown (Table 1).

A close scrutiny of Table 1 reveals that under various groups the items of expenditure are as under :

I. Overheads relating to Stationery :

A. Stationery Offices and Stores :

1. Pay of Officers

Table 1 : Stationery and Printing

Abstract (In Thousands of Rupees)

Summary	Accounts 1974-75		Budget estimates 1975-76		Revised estimates 1975-76		Budget estimates 1976-77		Total
	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	Non-Plan	Plan	
1	2	3	4	5	6	7	8	9	10
Direction and Administration									
Purchase and Supply of Stationery Stores (Voted									
(Charged									
Government Press (Voted									
(Charged									
Cost of Printing by other Sources									
Government Publications									
Major Head Total (Voted									
(Charged									
Grand Total									

Table 1A : Detailed Account

1	2	3	4	5	6	7	8	9	10
Direction and Administration									
1. Salaries									
2. Travel expenses									
3. Medical charges									
4. Office expenses									
Minor Head Total :									
Purchase and Supply of Stationery Stores.									
1. Stationery Office & Stores									
1. Salaries									
2. Travel expenses									
3. Medical Charges									
4. Office expenses									
5. Decretal charges	(Charged								
	(Voted								
Total :									

1	2	3	4	5	6	7	8	9	10
Purchase of stationery stores									
1. Paper									
2. Other Stores									
Total :									
Minor Head Total (Voted									
(Charged									
Government Presses									
1. Salaries									
2. Wages									
3. Travel expenses									
4. Medical charges									
5. Office expenses									
6. Machinery & equipment/ Tools and Plants									
7. Material & Supplies									
8. Scholarships & Stipends									

1	2	3	4	5	6	7	8	9	10

9. Decretal Charges

Voted

Minor Head Total :

Charged

Cost of Printing by other Sources

Government Publications

1. Salaries
2. Medical Charges
3. Office Expenses

Minor Head Total :

New Items of Expenditure

Voted

Major Head Total :

Charged

Grand Total :

2. Pay of Establishment
3. Allowance and Honoraria
   i. Dearness Allowance
   ii. Travelling Allowance
   iii. House rent Allowance
   iv. Medical Charges
   v. Ad hoc Relief
   vi. Additional Ad hoc Relief and
   vii. Other allowances
4. Other charges :
   i. Postage, telegrams and telephones
   ii Railway freight
   iii. Packing stores
   iv. Decretal charges and
   v. Other items

B. Purchase of stationery stores other than paper.

II. Overheads Relating to Printing :

A. Government Presses

(a) Direction

1. Pay of Officers
2. Pay of Establishment
3. Allowances and Honoraria
   (T.A., D.A., H.R.A., and other Allowances)
4. Other Charges :
   i. Postage, telegrams and telephones

ii. Libraries
iii. Books and periodicals and
iv. Other items

(b) Presses

1. Pay of Officers
2. Pay of establishment
3. Allowances and Honoraria
4. Other charges
   i. Postage, telegrams and telephones;
   ii. Liveries;
   iii. Railway freight and carriage charges
   iv. Electricity and water charges
   v. Rewards
   vi. Compensation
   vii. Other items
   viii. Decretal charges
   ix. Book Binding and Printing material
   x. Labour Welfare Fund, and
   xi. Insurance of Godowns
5. Stores and Equipment
   i. Spare parts and other supplies
   ii. Other stores
6. Plant and Machinery
   i. Additions to Plant and Machinery
   ii. Apprenticeship.

(c) Publications Branch

1. Pay of establishment
2. Allowances and Honoraria
3. Other charges
4. Pensionary charges
5. Cost of publications

B. Printing and Private Presses

C Cost of Printing Work done by other Governments

On further analysis, on the basis of costing principles, it is observed that overheads have not been classified on functional basis It is not clear what expenses can be exclusively charged as direct or indirect expenses in relation to printing, binding, etc. If various processes and functions are seggregated, the expenses on composing, on maintenance and running of printing machines, on ink and rollers and the other stores materials which can be treated as indirect materials, along with wages paid to indirect labour working in such printing departments, should be treated as manufacturing or production overheads, but such a classification does not exist It is only in the work docket which is supplied to the institution from which work order is received, that details regarding different types of expenses are provided The proforma of such a Docket is given in Table 2 A study of this docket reveals that it contains various instructions regarding binding, ruling, numbering etc Through this docket one may find the details of costing as under :

1. Composing charges; 2. Binding charges; 3. Ruling charges,

4. Perforating charges; 5. Numbering charges; 6 Stitching charges;

7 Eyeletting charges; 8. Die-embossing Relief/coloured charges:

9 Collecting charges; 10 Pasting charges; and 11. Waste Material used.

To the total of all these expenses, the cost of material used is added and to this total overhead which is not specified is also added to arrive at the Total Cost.

Table 2 : Printing and Stationery Department, Rajasthan Government Central Press, Jaipur

WORK DOCKET

Money received in advance C.R. No. _____ dated _____ for Rs. _____
Charged in Bill No. _____ dated _____ 197 Amount _____
W.O. No. _____ Dated _____ 197
Particulars of work
Name of Dept Size _____
Ref. No. No. of copies received

Whether the proof required	Date of proof sent	(I)	(II)	(III)
	Date of proof return	(I)	(II)	(III)
When the work is required to be completed.	Date of reminder	(I)	(II)	(III)

INSTRUCTION REG. COMPOSING, ETC.

(1) Type size. _____
(2) Hand composed/Mono/Lino/Sterio
(3) Whether the matter will be kept standing.

INSTRUCTION REGD. PRINTING ETC.

(1) Quantity reqd. _____

(2) No. of impressions_____

(3) Central Bdg/Crd. Bdg.

(4) One side/Both sides.

(5) Head to Head/Head to tail

Title and Block_____

(6) Ink Text_____

(7) Title/Without Title

(8) Price to be printed or not_____

(9) Description of paper

(1) Title

(2) Text

(3) Block

(10) Details of pages :

(1) Title_____

(2) Inner Title_____

(3) Print Line_____

(4) Preface_____

(5) Introduction _____

(6) Contents_____

(7) Text _____

(8) Index _____

(9)

Total Pages_____

Registered by

Clerk, A.S.E. Office

Checked by

A.S.E.

COSTING

	Rs.	P.
Composing...		
Printing... ...		
Binding Limp / Stiff.		
Ruling ordinary/Stop		
Perforatng.....		
Numbering... ...		
Stitching		
Eyelecting...		
Die Embossing Relief / Coloured		
Collating ...		
Pasting		
Waste material used ...		
Cost of material used.....		
Overhead.....		
Total :		
Grand Total :		

Signature of Costing Clerk.

Checked by

Supdt. or Asstt. Supdt.

Price _____ per copy.

Entered in the detailed Costing Book at Serial No. _____

Signature of Charging Clerk,

Supdt. or Asstt. Supdt.

From other records that are maintained by the Government Press the various direct or indirect expenses, without any clear classification in the cost structure, are calculated for composing, printing, binding, ruling, perforation, punching, eyeletting, folding, numbering, die-embossing, cloth binding, cutting of printed forms and trimming of books, labour of preparing file-pads, labour of preparing stiff files, folding and cloth lining maps, etc.

Various rates for different types of work and also for different sizes of the printed materials have been fixed by the Government. Thus the Government Press, in fact, does not have any opinion of designing its own cost structure and making any classification of different types of overheads on the basis of production and service functions. All the overheads are consolidated in such a way that they can neither be said to be exclusively production expenses nor administrative and selling or distribution expenses.

It follows that GCP has made a classification of all the expenses incurred under different heads in relation to their own activities. But because of the absence of any scientific sub-division of indirect expenses, either on functional basis or on the basis of their nature, the adoption of Marginal Costing has not been possible. That is why the concept of cost-benefit analysis does not operate there. It may be due to the fact that it is a Government departmental undertaking and the element of profit on the forms, books and other material printed for various departments of the Goverment is not taken into consideration. Although no information has been supplied in this regard, still it can be presumed that the actual cost incurred on the printed material supplied to the various departments is realised from them. In case of sale of such printed material to the outside public, possibly, only incidental charges are included in the selling price so that the public may be benefitted by getting the Government publications at reasonable price.

Aspects like the point at which the break-even is achieved, the profit being earned at various levels of activity, the level of activity required to earn a desired amount of profit, the possibility of reducing higher production, etc., are some of the basic issues which remain unanswered in the absence of a comprehensive system of marginal costing.

In order to have a check and control over the variances between the estimated and the actual expenses, inspection team appointed by the Accountant General would be suggesting measures so as to enable the management of the Press to take necessary steps to minimise the expenses.

From various records that have been made available, nothing could be gathered about the accounting of normal and abnormal wastage, spoilage, depreciation, scrap, etc., unless a proper record is maintained of these items and unless these items are included in the cost structure, the costing system for overheads cannot be said to be perfect in all respects. Following are some suggestions which emerge from the study :

1. Overhead costs of any service or maintenance department should be accumulated according to their nature.

2. Overhead costs should be classified as fixed or variable. This classification leads many times to the recognition that most service departmental costs are fixed over fairly wide range of service volume.

3. A charge ratio should be determined by dividing total departmental cost by the number of hours the service is expected to be needed. The hours can be based on eitner past experience in a representative period or on future activity or volume as expected in the budget, As some departments require more service than others, the initial cost preparation should be made on that basis. The remaining cost should be then divided by the budgeted hours of the receipient departments.

4. Actual service department costs incurred in the department should be compared with the predetermined or budgetted costs. This comparision is again two-fold;

   a) Comparision should be made with the service department to which the expenses are originally charged—actual costs should be compared with charges-out or sold-out accounts;

   b) Comparison should take place in the producing department in which the charges for service departments' service are lniked

with the predetermined budget allowances. This step is the control phase of the service departments' charging out procedure. The production foreman should be responsible for the number of hours or the cost incurred.

5. Comparision can lead to the calculation of the variances; a) Spending, and b) Idle capacity. The designation of favourable or unfavourable variance is generally not quite appropriate in these cases, for only the final results achieved by the excess or deficiency of costs incurred should really determine such a qualification It sould, therefore, suffice to compare actual with predetermined costs within a service or producing department.

In order to utilise overhead costs in the optimum way, it is necessary to incorporate the above suggestions in the system of overhead cost control. The existing structure of overheads should be redesigned and based on sound principles of costing. A continuous revision of the cost classification and control system is also necessary to modify it if circumstances change. The possibilities of reducing costs in general and overeeads in particular in Government departments and undertakings are immense which should properly be explored by its management urgently. □

Ganga Bridge, Kanpur

Overseas Communication Services, Bombay, 76.25 m

Book Reviews

The Payment of Bonus Act, 1965 : Provisions, Amendments, Comments, Explanations, Case Laws and Rules

D.S. Chopra

N.M. Tripathi Private Limited, Bombay, 1977. Price Rs. 50.00

Reviewed by P. Chattopadhyay*

Payment of bonus and the enactments in this behalf along with the growing body of literature of case laws have remained an enigma to many having to deal with this question as a part of daily responsibilities. The element of grace in payment of bonus has gone with the coming of the compulsion under law for declaration of minimum bonus at a certain rate and making bonus payment almost an extra element of wages, albeit the Supreme Court judgement on the subject that bonus is not a charge against profit, it is an appropriation. A lot of water has since passed down the rivers of the country and we now have a comprehensive Industrial Relations Bill before Parliament which also deals with bonus payment. Though this book has come earlier than the Bhoothalingam Committee Report and the Industrial Relations Bill, it nonetheless raises issues which should be considered seriously.

The author has dealt with the subject by sections of the Bonus Act, 1965 as amended in 1976. The treatment of different intricate issues connected with payment of bonus and the cross references to different sections as also case laws on different issues of principles and parties have contributed to the value of the study not only to lawyers and workers but also to management for going by the provisions of the Act in regard to bonus payment. The changes brought about in connected enactments, like what the amendment of 1976 did to the Income-tax Act, have been underlined by the author. Explanations and illustrations given in the book have added to its relevance, both to employers and employees. The treatment of gross profits and the elements that comprise such profits have been concise and clear. These are indeed basic issues in many a bonus dispute wherein the methodology of computation of gross profits is called to question by workers for different reasons. The explanations of tricky issues like calculation of direct tax payable by the employer, eligibility for bonus, amount of bonus, etc., have been authentically treated. □

* Director (Research), Institute of Cost and Works Accountants of India, Calcutta.

exporters in the country.

Indian exporters with varying export performances often complain of procedural delays in getting their duty drawback benefit; this fact is ascribed, *inter-alia*, to the lack or insufficiency of proper information about filling in the requisite forms and complying with the formalities prescribed for the purpose. It would have been better if the author had brought out succinctly the areas with a high degree of infallibility of Indian exporters in complying with the prescribed procedures and formalities. The value of this publication would have considerably enhanced if the author had given the proper 'Do's and 'Don't's, based on his practical experience and observations; these could help the exporters in having all necessry information and guidance in the first instance and also the Government authorities in expeditious disposal of exporters' application for duty drawback.

Notwithstanding all this, the publication should prove a useful addition to the export literature often needed by the Indian exporters for day to day reference. □

Customs & Central Excise Duty Drawback Procedures With Drawback Rate Schedule

Edited by H.M. Singh

ITIS Publication, 1978, Price Rs. 20.00

Reviewed by O P. Jain*

India's exports are estmated to be around Rs. 5.5 billion in 1977-78, showing a consistent increase over the recent years in particular. Non-traditional manufactured exports, incorporating a varying element of imported inputs, have figured quite prominently in India's export performance. Apart from the broadening and diversification of production base in the country, the growing export culture among the Indian manufacturers has considerably contributed to such a performance. Equally important in this connection are the export incentives given by the Government, which are intended to compensate the exporters against the incidence of import and excise duties on inputs used by them in export products and to meet certain incidental imposts levied by the Central/State Governments on such inputs. Such a compensatory measure has helped these products

Industrial Relations : Some Aspects

Compiled and Edited by B.P. Gupta

Published by Punjab, Haryana & Delhi Chamber of Commerce and Industry, New Delhi, Second Edition, pp. 161, 1978, Rs. 20.00.

Reviewed by B.R. Seth*

Basically industrial relations which are an important determinant of economic growth and prosperity in a country, are human relations between man and man placed in different positions of employer and employee. The management of these relations is the most difficult area in industry as there cannot be a carbon copy for the simple reason that human nature does not permit duplication. As man is a very complicated piece of machinery, industrial relations which concern man and his working environments, are not so simple, and it is no wonder that they need careful handling. As primarily these relations are matters of attitude, that is, how an employer feels about his workers and what the latter think about him, some conflict in their relations is inescapable. There are good or bad ways of resolving the same, but there are no shortcuts or quick cures in these relations. The problem of industrial relations is not so much of avoiding industrial conflict as that of creating atmosphere of mutual goodwill, confidence and trust between the parties. The book under review highlights some of the problems of employers' and employees' relations which if handled fairly and with proper understanding, could enable managements to win over willngness and cooperation of their employees, necessary for maximising their working results.

The Punjab, Haryana & Delhi Chamber of Commerce and industry has done a commendable work in getting compiled resume' of discussion of some aspects of industrial relations in the meetings of labour officers/personnel officers during the last four years(1975-78). The discussions at these meetings cover as many as thirty problems affecting employer-employee relations, such as absenteeism, leave and holidays, transfer, promotion, misconduct, discharge simpliciter, domestic enquiry, lay-off, retrenchment, strike and lock-out, settlement of disputes, conciliation proceedings, reference of disputes for adjudication, fixation of minimum, fair and living wages, training of apprentices, social security measures like gratuity, provident fund, ESI.

* Consultant in Labour Laws and Industrial Relations, New Delhi.

family pension schemes, and workers' participation in industry. All these—employment and service problems—have to be faced by the employers and employees in their day to day relations and working. The timely and fair solutions to these problems go a long way in ensuring industrial harmony. Some aspects of important labour legislations like Industrial Disputes Act, Payment of Wages Act, Payment of Bonus Act, Payment of Gratuity Act, Contract Labour Act, Apprentices Act, latest amendments of Factories Act, etc., are also discussed, which if understood properly by the managements and the workers, would reduce considerably the area of conflict and litigation. The value of these discussions has been further enhanced by citing extensively relevant Supreme Court decisions and other case law either in support of the views expressed, or for interpreting the provisions of the legislations discussed.

Although all the views contained in the publication may not be acceptable, the book, on the whole, is informative as well as educative. It should, therefore, be useful as a guide or a reference book not only to the members of the Chamber, but also to other employers and their organisations, trade unions, labour and management consultants, management institutes and all others interested in industrial relations problems. □

Trade Policies of India : A Quantitative Analysis

V. R. Panchamukhi

Concept Publishing House, New Delhi, 1977, pp. 317, Rs. 70.00

Reviewed by N. K. Nair*

The author of the book under review is well known. The area of his efforts in this book is predictably well rewarding also. Therefore, there is a fair chance of the results obtained by this volume receiving wider public attention and, hopefully, becoming the basis for policy formulation also.

The main purpose of the study, according to the author, is to induct quantita-

* Deputy Director (Research), National Productivity Council, New Delhi.

tive approach to the area of trade policy making in the Indian economy. After surveying the existing theoretical and empirical literature on India's problems of trade policies, a number of areas providing scope for quantitative research are identified. The modest claim of the author is that the study has raised and listed a number of new issues and hypothesis in the field.

The study has attempted to discuss certain selected aspects of the trade policy system : Firstly, the problem of identifying and measuring the different components of the trade policy are discussed; secondly, the effects of the trade policy system on the various aspects of the domestic economic activities are analysed. The conflicts between the trade policies and the objectives of planning are identified and quantified. The third aspect considered by the study refers to the determinants of trade behaviour. The question of relative importance of the different determinants of trade flows such as factor endowments, factor proportions, technology factor, trade policies etc., is aiso discussed.

The term trade policy is used by the study in a very broad sense to refer to all the policies which have an important bearing, either directly or indirectly on the export performance or import behaviour of the economy. Defined in this way, trade policies refer to tariff policies, import licensing system, exchange control and exchange rate policies, etc.

After observing that the existing trade theories fail to take a comprehensive view of the reality in developing nations, the author agrees that there is an urgent need to develop a unified trade theory relevant to the institutional framework of the developing countries. There appears a bird's-eye-view assessment of the trade performance of the Indian economy during the period 1950-70. The author examines as to how trade strategy affects domestic relative prices. The concept of import-price multiplier is developed and estimated with the help of the input-output method. While discussing the relationship between import allocation coefficients and total flow coefficients, the assumption made by the Fifth Five-Year Plan that the import flow coefficients follow the same pattern as the total flows is examined and found inappropriate, both conceptually and empirically. After a critical examination of the traditional factor proportions theory, a concept of trade policy content of exports and imports is developed. Also the concept of technological distance between exporting and non-exporting firms is developed and measured to study its relationship with export performance. A generalised trade behaviour function is also formulated in which various determinants

enter as explanatory variables, and estimated on the basis of the cross-section and time series data for selected developing countries, including India, of the ESCAP region. The importance of the trade policy factor in explaining the trade flows is highlighted by the empirical results. The approaches of Effective Rates of Protection and Domestic Resource Cost are used, while dealing with the question of the effects of trade policies on resource allocation. A detailed micro-case study of Effective Rates of Protection Pattern for one major import substituting industry, viz., aluminium is also presented The relationship between Generalised Scheme of Preference concessions and the domestic trade policies is also studied to examine whether the domestic export promotion policies are consistent or conflicting with the GSP concessions.

The above, in nutshell, is what the study has attempted. Undoubtedly, this is an ambitious target. Yet, the author has achieved a fair amount of success in exposing the weaknesses of the traditional theories in the context of developing nations. The study threw up a number of hypotheses in the context of evolving trade policies in developing nations, a significant number of them being tested by the author himself. One may reserve his opinion regarding the validity of a few of the empirical excercises carried out by the author, particularly those based on comparatively less known sources of data. Yet, the study is commendable in its coverage and conceptual sophistication. □

Indian Labour Laws A Supervisor Should Know

B. R. Seth

All India Management Association, New Delhi, 1978, pp. ix + 197, Rs. 30.00

Reviewed by M.J. Naik*

The above publication is a revised and combined third edition of the earlier two publications, Indian Labour Laws Parts I and II. Dr. Seth updated and integrated his earlier publications in response to the demand as reflected in the success of the earlier two editions of the first part and also the

demand for the second part.

The supervisor's position, as rightly pointed out by Prem Pandhi, President, AIMA, in his Foreword "is a sensitive one" and it is, therefore, for the managerial and supervisory personnel to acquire a proper understanding of the salient features of important labour laws which deal with the working conditions, social security measures, wages, bonus, industrial relations, etc. Dr. Seth has presented in simple language the salient but important features of the Labour Laws of which the supervisory personnel ought to have a clear understanding for creating a right kind of industrial relations climate.

In the Introduction, Dr. Seth has given the general background of the development of Labour Legislations, rightly stressing the employers' obligation "to provide their employees safe, healthy and comfortable living, employment and working conditions" The influence naturally was of "economic and social conditions created by two wars, the Russian Revolution, growth of trade union movement, progressive labour standards set up by the conventions and recommendations of ILO," etc. He rightly goes on to describe that "These Laws are not only restrictive, but also protective and beneficial".

Nineteen labour enactments have broadly been explained, giving the genesis, their scope and coverage, main provisions, important relevant definitions with respective sections, the obligations and the rights of both the employers and the employees, followed by a brief discussion under "General Remarks" for every enactment discussed in the book. Each chapter thus gives the exact implication of the relevant enactment and proper guidance, in understanding and appreciating the relevant provisions, to the supervisory and managerial personnel.

Dr. Seth has added a chapter on "Future Outlook", giving indications of the "possible changes" as envisaged in the Industrial Relations Bill now before the Parliament as well as some changes that have already been given effect to in certain Acts. On the whole, this publication is a must for every supervisor and manager. □

Towards Economic Integration in Asia

Indra Nath Mukherji

Published by Vidya Vahini, New Delhi, 1978, pp. xv+232, Rs. 60.00

Reviewed by O. P. Jain*

The vital importance and imperativeness of economic cooperation for overall development of Asia is evident from the unanimous adoption of a blue print on intra-regional trade and cooperation by the Trade Ministers of the Asian and the Pacific region in the conference held under the auspices of ESCAP in New Delhi in August 1978. Taking note of an excessive dependence of the region on the developed countries to the tune of more than two-thirds of its total trade as well as the economic changes occurring in these countries, the blue print recommended an all-embracing action programme with developmental, promotional and regulatory content for implementation by the participating countries. The Conference further suggested the setting up of a Trade Conference Group (TCG) as a forum to consider how to implement the agreed programme of economic and trade development. The value of this book is to be appreciated against so recent a background of this Conference.

With its scope restricted to two major themes, viz., Asian Clearing Union (ACU) and the Bangok Agreement for factual analysis and suggestive narration of developments and events, the book lays down certain guidelines which, it is hoped, would be of use to participating governments in the course of future rounds of negotiations. Some of these 'guidelines' appear to be echoed in the discussions at and the conclusions reached at the Conference. Herein is the utility of the present study, which attempts to analyse the main elements and the pros and cons of these two schemes in a historical and comparative context. Though mostly narrative in treatment, the author uses certain algebraic expressions to calculate permissible and anticipated surplus and deficit positions of Central Banks participating in ACU and to estimate the exchange of concessions given by the participating countries in the Bangkok Agreement. He seems to have creditably made a laborious and serious effort in establishing a correspondence between the specific products as given under SITC and BTN for calculating trade flows in between and among the participant countries and also the extent of con-

*Director (Export Promotion), Small Scale Industries Development Organisation, New Delhi.

cessions offered by the participating member countries. This exercise must help the economic planners and the researchers in appreciating the limited scope for the concession—oriented expansion of intra-region trade under the present production and trade framework of different countries in the region.

It is thought-provoking to read in the book that the 'value of intra-participating countrie's imports could be doubled merely by substituting about 6.1 per cent of imports of the non-participating countries by those of participating ones'. The author could profitably attempt a further analysis of this anticipated observation with a view to formulating a few pertinent and useful suggestions for extending the participation by countries in the Agreement. Search for industrial complementation agreements among countries, as suggested in the book, could be factualised and concretised in the light of resource endowments and economic aspirations of the concerned countries, on the one hand, and the experiences of comparable groups in this respect in other parts of the world. Not being unconscious of difficulties in operating 'agreement' industries based on trade-cum-investment approach, this alone seems feasible and appropriate for the countries in this region for maximisation of their production and employment and the welfare of their masses.

The book, as it deals with a part of the subject with inter-connected and mutually related ramifications, leaves the reader searching for something more in the areas already covered and in a mood of quest for something in the areas to be covered. Absence of correspondence between member countries forming the ACU and the Bangkok Agreement could be accounted for. Variations in inter-region economic environments could be made to bear on differences in payment arrangements existing in different regions of the world. Permissible and anticipated trade surpluses and deficits could as well be analysed in the dynamic setting of trade potentialities of different countries in the region. The existing and plausible relationship between the sub-regional groups and the Bangkok Agreement could be speculated in detail against the background of relevant experiences elsewhere, e.g., LAFTA. Criteria known to have been employed for selecting products by different countries for tariff concessions to others could be analysed and their improvement or modification could be suggested for broadening the range of products for the purpose. Last, but no less important, is the omission of a scientific analysis of a closely related aspect of the Asian Payments Union and the Asian Reserve Fund, which are very much relevant to 'cushioning the imbalances arising from supplementary trade creation as a result of measures towards regional trade liberalisation'.

With the specific framework chosen for analysis, the author has done a creditable job in marshalling and analysing a mass of trade data as presented in Appendices to the book. This book must prove of considerable interest and value to the economic planners and administrators in the region and to the research scholars of regional economics in the developing countries. □

The Master Key to Promote Yourself

K. S. Bhatnagar

P&T Carreer Institute, Post Box No. 4802, New Delhi

Reviewed by M.F. Abbasi*

The book deals with the psychological factors which influence people as well as the units to become effective and productive. It presents an integrated picture of Supervisory Management as a vital function in any enterprise—one which concerns all Management.

Although the outer look of the book is unimpressive and unattractive, it contains a lot of food for thought. It keeps you absorbed and creates a sense of achievement which is a must for any individual or a growing organisation.

It looks in depth at every aspect of the 'Management of Men' with a special reference to 'Effective Supervision' and is likely to be a definite text on the subject.

This handbook promotes a new form of leadership matched to the needs of the industry and the problems of today's Boss. It is written with a deep concern to help the Bosses to plan and to secure their own present and future.

The author has taken pains to write this book in a lucid manner on the basis of his rich experience. The most striking feature of this book is that though it is theoretical, it has a practical bias which will be valuable to working Supervisors/Managers and bosses and also to the students of management.

*Director, National Productivity Council, Sub-Regional Office, Bhopal.

This handbook of pocket size is not only useful but also interesting to read before going to bed or during travel. The Author shows how 'creative thinking' and 'imagineering' with the help of analytical techniques can be applied to maximise efficiency and service. □

Management Decision Support Systems

Andrew M. McCosh and Michael S. Scott Morton

Macmillan Press Limited, London, 1978, Price £10.00

Reviewed by P. Chattopadhyay*

This book purports to present some philosophy and examples of computer-supported decision-making in an orderly manner. The primary focus in the book is on financial and accounting decision-making though the authors claim that the concepts are applicable in many other management fields. They underline the relevance of their study in the context of large scale availability of mini computers seeking to solve different types of problems of management considered impossible before the advent of these computers. Though the book is addressed to management, it has a larger appeal to managers, professional accountants and cost and management accountants and engineers having to deal with information for decision-making purposes. A major importance of the study is that it shows the way of transformation of data into information, through, different types of analyses relevant for management. In ten chapters, the authors set about their task. The first chapter relates to the fundamental character of decision support systems underlining that if a manager is unwilling to consider the possibility of improving his decision-making procedures, there is no doubt that the decision support systems are impractical for him; not only that, he seems to reject himself even without trial. Chapter two deals with models for managers underlining the uses to which models are actually put and the possibilities for expansion of areas where models may be found relevant. The authors anticipate these models to be a part of a hierarchy of models allowing for access to an appropriate model for the decision to be taken by a manager in the area in which he is concerned. Aptly, the authors draw a

*Director (Research), Institute of Cost and Works Accountants of India, Calcutta

distinction between use of financial data for purposes of financial accountants and management accountants and the use of such data for supporting line managers' decisions, regardless of whether they are in finance, marketing or production. This distinction is appropriate, particularly from the point of view of the fact that the same data can be used for different purposes in the organization and may undergo different processes of analyses or fitted into different types of models.

Chapter three highlights the aspects of technology bearing on the management decision processes. Constituting an important element in the environment of businessman, technological change has acted as a major component of decision support systems. The authors go into different details concerning the technological aspects, stressing that it is important to recognize that technology itself is not the major problem in considering decision support systems; what is important is its appropriate application from the managerial point of view. The managerial problems attending on technology are, in fact, much more difficult than the technical problems. The design process is not a linear sequence of steps, but rather a cyclical, highly iterative process. Secondly, the design process for decision support systems is hierarchical. Though the process is basically the same at all levels, the decision and the people that are involved will differ as one goes down the organization. In view of the limitation of funds, the question of focussing on the right problem is extremely important at each level. Thirdly, the decision support design process has application in different areas concerned. Demonstrating the hierarchical nature of the design process, the authors underline that different firms will find it desirable to emphasise different elements of the process. The most appropriate design process may have to evolve from within the organization both in response to and in anticipation of the needs of the organization. They suggest that the involvement of the line managers whose decisions are to be supported is a vital requirement and their participation cannot be just assumed away.

Chapter five is concerned with a profit planning support system in which the authors emphasise that since managers are regularly called upon to decide whether to accept significant or unusual orders, it is incumbent on them to consider whether the benefits from accepting the order exceed the cost of filling it. Different situations are taken into view as to how to obtain reliable and current numerical data in answering a problem quickly. From this point of view, it is necessary to evolve a programme that will enable the manager to perform the analysis in which he is interested. Storage and reuse of data

at regular intervals spell problems if the design process is inadequate. Chapter six, on budgeting, suggests that decision support systems can be extremely useful for the budgeting process, providing the necessary interaction, flexibility and access to manipulative power that are required for both the budget setting and budget analysis phases of the process. Budgeting is a major tool, forming the heart of a control system and posing the task of setting up the budget each year and the subsequent task of analysing performance against budget and deciding on suitable corrective action. In both these cases, the decision support systems, with data and the analysis, can not only help streamlining the principles and practices of targetry but also exercising control. In chapter seven, the authors discuss the financial analysis of merger opportunities underlining the information needs and the analytical framework of decisions on merger. The financial algebra provided as an appendix strengthen the textual matter. The pricing decision forms the subject matter of chapter eight in which the authors discuss different elements of pricing decisions on the basis of case studies. The organizational implications of decision support systems are taken into view. The authors underline the importance of the willingness of managers to demonstrate their interest in having the decision support system succeed, both by their personal actions and by promoting the active participation of their staff. Otherwise, the system is likely to fail. More than that, the system is to evolve from within the organization, not as a challenge to the existing set of things but as an essential part of the innovative process in which managers of different rungs should show interest and active participation.

The case studies provided in the book and the appendices demonstrating different tricky aspects of decision support system as well as a checklist for its application have enhanced the value of the book to organizations in which computers have already proved their mettle as also those in which computers have large possibilities in improving the qualities of decisions taken by managers of different levels. □

Coal Industry in India

A. B. Ghosh

Sultan Chand & Sons, pp. 312, Price Rs. 60.00

Reviewed by V.S. Mahajan*

Since the steep hike in oil prices, coal has begun to occupy an important place in the energy development. India has large reserves of coal and the Government has lately been quite active in setting up thermal plants (using coal) in different parts of the country to relieve the acute power shortage. The book under review which makes a historical analysis of development of coal industry in India, is a timely publication. The survey, in this volume, covering the period before 1947, was financed through a grant by the ICSSR. It covers several aspects of development of coal industry – known coal reserves, development of the industry over time, production and consumption of coal; labour problems, prices, wages, profits, and investments, distribution trade, etc. Thus, it provides a comprehensive account of the industry before 1947.

While exploitation of coal on modern lines began from the middle of the last century, it accelerated after the opening of Jharia mining area in 1893, followed by a sudden spurt in coal mining lasting for the first quarter of this century. For example, the number of joint stock coal companies rose from 18 in 1891-5 to 109 in 1905-10 and to 260 in 1921-5. The paid up capital also rose substantially during this period and so did the profits which enabled the declaration of dividends averaging between 42 to 60 percent between 1906-25. The boom period started thining down after 1925 and such a trend continued till late 1930s. While the boom conditions reappeared during th S econd World War because of rapid industrialisation and movement of railways, there was no matching growth of industry as compared to the earlier boom period. For instance, the coal output during this period fluctuated between 26 to 29 million tons and paid up capital of joint stock companies rose from Rs. 100 to Rs. 117 crores. It may be asked, when demand and prices of coal were continuously rising, why did it fail to attract matching investment? Was it due to the fact that investment elsewhere yielded better return? Or, was it due to the fact that it was getting progressively expensive to work on the known mines? Or, was it that Jharia coal mines did not hold that much prospects for further investment as they did in the

*Reader, Deptt. of Economics, Punjab University, Chandigarh.

earlier part of the century? That there was scarcity of labour and there was slow availability of railway wagons, as pointed out by the learned author, would only provide partial answer to the question. Another question that arises is that while high dividends were being declared in the earlier part of the century, did these leave enough funds for reinvestment and modernisation or had the industry failed to build up adequate reserves? These are pertinent questions and need further probe.

The book is a useful contribution on the development of coal industry. It is well documented and contains extensive bibliography. However, the price is high. □

Wage Incentive : Theory and Practice

Edited by GK Suri

Shri Ram Centre For Industrial Relations And Human Resources, New Delhi, pp. 237, 1978, Price Rs. 40.00

Reviewed by B.R. Seth

The word Productivity which had been leading a quiet life in the economic text books, has come into sudden prominence during the recent years, and has assumed great importance in the context of industrial development of the country. The steep increase in inflation and consequent rise in prices has made this term a fighting word in the country. There is a common feeling among citizens, employees, employers and consumers that their well-being depends on increasing productivity. Politicians also feel that the democratic set up in the country may be upset if productvity is not increased to control rising prices.

Along with productivity, the idea of wage incentives has assumed great importance, since it is regarded as a useful aid and tool for increasing productivity, through better utilisation of manpower and reduction of cost. Not a few industrial establishments in India and other countries have introduced this scheme not only to maximise production, but also to reduce cost by maximising utilisation of their producing capacity. It is also regarded as an important method of payment of wages, as in some industrial establishments wages earned through incentives form 20 to 25% of the total income of the employers. Suri has rendered a valuable service in the field of wage and salary administration by editing this book on "Wage Incentives" wherein

Consultant in Labour Laws and Industrial Relations, New Delhi.

this method of wage payment has been discussed in all its theoretical and practical aspects.

This publication is a reprint with some revision and modifications of the orginal book under the same title which was published to utilise extensive research work done in the area of wage incentives at the Sri Ram Centre for Industrial Relations. It, no doubt, contains two new papers, one on productivity bonus scheme in the Steel Industry and the other on the ITCO experience on productivity-llnked bonus scheme. Both these papers are informative as well as suggestive as to how the difficulites regarding the linking of bonus with productivity could be overcome. The paper by Papola on Wage Theory and Wage Incentives is also very interesting. He explains how the traditional theory of wage determination is antithetical to the inducement to work which is the foundation of any wage incentive plan. He also rightly points out the greater possibility of the success of such plans in poor and developing countries like India where incentives are still effective in motivating large section of employees for better working. In such countries it is not the higher wages but the higher wage through incentives which results in higher efficiency.

The relation between incentives and motivation is discussed by R.K. Misra. An organisation has to be productive if it has to remain in business, and for this, there should be an effective incentive-motive system of tne employees in the organisation. Incentive which is a promise of satisfaction, is generally used to tap a certain motive, which in turn, elicits a feeling of satisfaction, and that reflects itself in increased production.

Other important problems dealt with in the papers comprising this book are how the wage incentives are viewed by the management and trade unions, possbility of introducing wage incentives in building industry, management prerogatives and incentive schemes, social implication of wage incentive schemes, incentive motivation and organisational effectiveness, incentive pay for supervisory staff, and how to make wage incentives effective and ensure their continuing effectiveness.

Since wage incentives cannot be applied in all situations and cover all categories of employees, Suri in the last paper discusses the alternative payment methods which may serve the same purpose as that of effective utilisation of the workforce and consequent increased productivity. Some such important methods explained are the Scanlon Plan which provides a participative framework and gain-sharing mechanism based on the concept

of industrial democracy. Productive Bargaining which is fundamentally based on improvement in productivity as it links gains and concessions with the same, Measured Day Work under which attainable standards are explicitly made known and reward is set in advance, Merit-Rating Incentive Schemes such as Merit Increment and Merit Awards, Profit-Sharing and Co-partnership, and the Lincoln Incentive System. Situational characteristics considered favourable for their choice and effective working are summarised in a Table at the end of the book.

Although one may not agree with all the views expressed in regard to different dimensions of this problem, this does not detract from the value of the book which is problem and policy-oriented, and attempts a multi-disciplinary and multi-group approach, and also blends theory with practice. The value of the book is further enhanced by the comprehensive bibliography compiled for further reading on this subject. It should prove useful to Personnel Managers, Management Consultants and practitioners, scholars and all others interested in problems of productivity and methods of wage payments. □

How to Prevent Industrial Sickness : Symptoms and Rehabilitation

Sudarshan Lal

Publishers, Navrang, New Delhi, Price Rs. 35.00

Reviewed by P. Chattopadhyay*

Drawing the analogy of the human society in which sickness or mortality is not only an inexorable maxim but also a part of daily living, the author emphasises that in a developing country its impact becomes disastrous. Sickness in old age or mortality by way of normal death of an aged person is a part of life in developed societies. In our country, chronic ailments and premature deaths are what have caused widespread anxiety. For reasons, perhaps one has to go back into history of industrial development in this country and the typicalities of the institutional set up under which industries functioned in different lines. A characteristc feature of Indian industrial development was the evolution and largely successful functioning of the

*Director (Research), Institute of Cost and Works Accountants of India, Calcutta.

managing agency system. With the abolition of the managing agency system, the functions that managing agents were performing were left unattended, to a large extent. The result is what it is. This book by Sudarshan Lal puts into perspective the features of industrial sickness in the country and underlines the way it should be dealt with. He is right in emphasising that scarce capital resources become a waste because of sickness. Production becomes a casualty. In interlinked production systems, this impeded production has an impact much larger than it looks on the surface, for one unit's finished product is the raw material of another unit and stoppage of production in another unit causes widespread disorder in linked enterprises which use such products as their primary input. Sickness also affects investment in industry as it pollutes the industrial climate and poses several disincentives to the intending entrepreneurs. While a good lot of literature has already emerged, this book is perhaps the first formal attempt in this country to deal with sickness in a comprehensive manner.

There are nine chapters in the book, dealing with warning signals, causes, prevention and cure of sickness, rehabilitation of sick units, avoidance of sickness in new projects, change of management, merger or amalgamation or reconstruction or sale, assistance to sick units, measures for prevention of sickness from the point of view of lending agencies and others and studies on sick units. Dealing with causes of sicknees, the author lays his focus on the qualities of management and widespread absence of managerial expertise, weak organizational set up, technological and technical weakness in the context of production and management of inputs, weak marketing and lack of financial planning and control, inadequate personnel management including strained industrial relations, absenteeism or labour turnover and overstaffing. Going into details of each of these areas, the author has been able to pinpoint issues which should be taken into serious consideration by government and also by financial institutions seeking to put such units back on track. He distinguishes between small, medium and large scale units and the nature of ailments attacking them. The approaches to prevention and cure of such ailments have to be naturally different in these cases.

Unfortunately, it has not been realised on a wide scale that for real prevention of sickness one has to closely watch the running units which are not overtly sick but are no better than languishing on the verge of sickness. Cure, on the other hand, has to be concerned with the units already sick. Instead of going into the problems inhibiting better performance of units belonging to different scales of operations, we have remained engaged in

generalitites. There are many units in this country that should die a natural death. It is no use to flog them at high cost. There are also units that can be put back on an even keel only with certain doses of funds and other technical assistance. Most of the time, they have been given much less than their requirements of either. In the circumstances, the problems of beginning at the beginning remains.

The author does not critically assess the economic policies of the government to determine their impact on the health of industrial and commercial units. What he does instead is to generally touch on the phenomenon of sickness as reported in different places and to trace such sickness to the reasons which have been enlisted in different studies and reports. Though on reading the book one is left with a feeling of inadequacy, his analysis should nonetheless provoke serious thinking both in industry and government as to what causes sickness and how to prevent its recurrence. However, a caution is required here : Standard medicines for nonstandard, unique type diseases would be ineffective, to say the least. But this is what we have been trying to administer on a national scale. The ills are known. So are the remedies. What is needed is action. □

The Republic of India c/o BHEL

Bharat Heavy Electricals Limited is a true symbol of national integration. In any one of the BHEL townships you will find people from all over the country, representing various communities, cultures and backgrounds, working and living together in perfect harmony.

Whether they are called Ali or Arumugam, Gadkari or Ganguly, Kapur or Karthikeyan, Thomas or Tambe—BHEL people are one close-knit family.

This family is nearly 54,000 strong and includes among its members engineers, scientists, accountants, skilled artisans and even doctors. People who are fully involved with BHEL as professionals doing their jobs. As part of BHEL's modern participative management. As contributors to the growth of their own region, the state and the whole country—by virtue of their involvement with the vital power sector.

BHEL: taking care of its family — at home.

To BHEL, the families of the employees are as important as the employees themselves. One of the most significant aspects of BHEL's staff welfare measures is the provision of greater amenities to children. BHEL runs 70 schools for 42,800 children; 5 hospitals and 20 dispensaries. 1,74,000 men, women and children live in the BHEL townships and benefit from the Community and Welfare Centres, clubs, cinemas, subsidised transport, canteens, organised cultural and sports activities.

BHEL has also introduced Group Life Insurance for all its employees—a social security measure of great importance.

BHEL takes care of its family—at work.

For every BHEL staff member, there is a well planned career laid out.

For example, training centres turn unskilled workers into skilled workers. Training facilities are available to employees at all levels. Staff have also been given paid study leave opportunities and have been sponsored for higher studies.

Equally important, BHEL's setting up of new units and entry into new areas have enabled employees to acquire special skills and a greater opportunity to develop. A significant fact, in this context, is that nearly 60% of the employees are locally recruited.

BHEL's present generation of several exclusive facilities, strengthened by the wholehearted response of its employees, is building up the right infrastructure for the future generations to takeover.

Bharat Heavy Electricals Limited
18-20 Kasturba Gandhi Marg
New Delhi 110 001.

BHEL Power to the people

SAA/BHEL-2634

Index to Current Literature on Productivity and Management

Compiled by S. N. Vig* & C. V. Rao**

With this issue of PRODUCTIVITY we are introducing a new feature "Index to Current Literature on Productivity and Management", which incorporates information on the latest literature published in various reputed Indian and foreign journals. We hope the readers will find it useful. Any suggestions for effecting further improvements will be most welcome.

—Editor

Agriculture

Chatterjee, NN	Grain-saving Campaign in M.P. *Yojana*, 22 (23), Dec. 16, 1978, 18-20 p.
Chatterjee, NN	Success of SFDA, *Yojana*, 22 (22), Dec. 1, 1978, 18-21 p.
Hooja, B	Agricultural Extension: A New Programme for Continuous Training at All Levels, *Kurukshetra*, 27 (7), Jan. 1, 1979, 16-19 p.
Khan, RR	Integrated Pest Management, *Yojana*, 22 (23), Dec. 16, 1978, 15-17 p.
Jaiswal, NK Kolte, NV & Arya, HPS	Management of Agricultural Extension : A Study of T&V Approach in Rajasthan and Madhya Pradesh. *Behavioural Sciences and Rural Development*, 1(2), July 1978, 75-104 p.
Mann, Gurtej Singh & Karam Singh	Higher Input Prices : Their Impact on Farm Technoiogy, *Eastern Economist*, 72 (7), Feb. 16, 1979, 277-82 p.
Mukerji, SP	Maximum Production for Maximum Number. *Kurukshetra*, 27 (9), Feb. 1, 1979, 31-33 p.

* Documentation & Information Officer, National Productivity Council, New Delhi.
** Associate Editor, PRODUCTIVITY.

Mukhopadhyay, K Arun — A Lead Bank's Group Loan Scheme for Small Farmers: A Study in West Bengal. *Behavioural Sciences and Rural Development*, 1 (2), July 1978, 105-37 p.

Parpia, HAB — More Than Food Would be Saved. *Yojana*, 22 (23), Dec. 16, 1978, 21-25 p.

Prasad Kamta & Sampath, RA — Agricultural Development in Backward Districts. *Yojana*, 22 (22), Dec. 1, 1978, 27-33 p.

Rao, BV Rama — Cooperative Farming with a Difference. *Kurukshetra*, 27 (12), March 16, 1979, 4-5 & 21 p.

Ray, SK — IFFCO Helps Farmers. *Yojana*, 22 (24), Jan. 1, 1979, 31-34 p.

Singh, AJ Inder Sain & Joshi, AS — Inter-Relationship Between Farm Size and Productivity in Punjab. *Eastern Economist*, 72(11), March 16, 1979, 577-79 p.

Sinha, AK — Intensive Extension Technology. *Yojana*, 22 (22), Dec. 1, 1978, 23-26 p.

— Aquaculture. *Kurukshetra*, 27 (10), Feb. 16, 1979, 16 p.

— Credit for Small Farmers. *Kurukshetra*, 27 (11), March 1, 1979, 5-6 p.

— Cross-Breeding of Cattle. *Kurukshetra*, 27 (11), March 1, 1979, 26-27 p.

— Development of Fisheries. *Kurukshetra*, 27 (11), March 1, 1979, 23-24 p.

— Improved Post-harvest Technology. *Kurukshetra*, 27 (10), Feb. 16 1979, 13-14 p.

— Minimising Risk and Uncertainty in Food Production. *Kurukshetra*, 27 (10), Feb. 16, 1979, 10-13 p.

— Perspective on Agriculture. *Kurukshetra*, 27 (11), March 1, 1979, 31-33 p.

Thomas, Willard — Video : The Promise Is Real, The Payoff Depends on You : *Training and Development*, 32 (12), Dec. 1978, 3-5 p.

— — Mass Communication, *Kurukshetra*, 27 (11), March, 1979, 27-28 p.

Cooperatives

Agarwal, SM — Cooperatives to Break Multinationals' Monopoly. *Kurukshetra*, 27 (12), March 16, 1979, 19-21 p.

Sivarama Prasad, A — Cooperative Agricultural Credit in India. *Yojana*, 23 (5), March 16, 1979, 31-33 p.

— — Major Role for Cooperatives. *Kurukshetra*, 27 (11), March 1, 1979, 10-13 p.

Corporate Planning

Chaudhury, Sekhar — Corporate Strategy : Concepts and its Relevance in the Indian Context. *Vikalpa*, 4 (1), Jan. 1979, 27-38 p.

Jones, Mary Gardiner — The Consumer Affairs Office : Essential Element in Corporate Policy and Planning. *California Management Review*, 20 (4), Summer 1978, 63-73 p.

Mital, KM — Social Responsibility of Business Organisations. *Vikalpa*, 4 (1), Jan. 1979, 39-50p.

Preston, Lee E *et.al.* — Comparing Corporate Social Performance : Germany, France, Canada, and the U.S., *California Management Review*, 20 (4), Summer 1978, 40-49 p.

Decision Making

Puterman, Martin L & Shin, Moon Chirl — Modified Policy Iteration Algorithms for Discounted Markov Decision Problems. *Management Science*, 24 (11), July 1978. 1127-37 p.

Dev, S Kumar — Problems of Public Distribution System. *Commerce*, 138 (3534), March 10, 1979, 360-67 p.

Joshi, Navin Chandra — How to Make the Public Distribution System a Success. *Capital*, 182 (4552), March 29, 1979, 306-7 p.

— Public Distribution : The Task Ahead. *Commerce*, 138 (3534), March 10, 1979, 355-56 p.

— Public Distribution : Will the New Scheme Click ? *Capital*, 182 (4544), Feb, 1, 1979, 61 p.

Economics

Arya, KC — Growth Trend in Social and Development Expenditure *Eastern Economist*, 72(8), Feb. 23, 1979, 317-21 p.

Rao, VKRV — Rural Poverty Inceases Despite Economic Growth. *Capital*, 12th April 1979, 35-43 p.

Satya Sundaram, I — Low-cost Economy : How it Can be Turned into a Reality. *Capital*, 182 (4551), March 22, 1979, 282-83 p.

Upadhyaya, KK — Beyond the Take Off. *Yojana*, 22(21), Nov. 16, 1978, 25-26 p.

Vakil, CN — Economy in Public Expenditure : Prerequisite for Solid Growth. *Eastern Economist*, 72 (7), Feb. 16, 1979, 273-77 p.

— Credit Squeeze On The Horizon. *Commerce*, 138 (3536), March 24, 1979, 440 p.

— Limitation of Fiscal Instruments. *Commerce*, 138 (3536), March 24, 1979, 432-40 p.

Economic Policy

Ganguli, Sidhartha — Themes and Variations in Management : The Realities of Indian Economy. *The Management Accountant*. 14 (1), Jan. 1979, 24-26 p.

Mehta, Ashoka — Economy — Strengths and Weaknesses. *Kurukshetra*, 27 (10), Feb. 16, 1979, 22-24 p.

Sen, NN — A New Concept in Planning : *Yojana*. 23 (5), March 16, 1979, 29-30 p.

— Economic Survey 1978-79 : Basic Issues Remain Unsolved, *Commerce*, 138 (3535), March 17, 1979, 65-69 p.

Curran, James & Stanworth, John — Job Choice and the Manual Worker-Where the Theories Break Down. *Personnel Management*, 10(9), Sep. 1978, 41-45p.

Productivity, April-June 1979

Prasad, CS — Role of C. D. Programme in Rural Recoustruction. *Yojana* 22 (22), Dec. 1, 1978, 7-9p.

Rao, S Koteswara — Role of DIC in the R&D of Small Firms. *Yojana*, 23 (5), March 16, 1979, 32-33p.

Rao, NK Muralidhara — Galvanising a District into Action. *Kurukshetra*, 27(12), March 16, 1979, 16-18p.

Rao, VKRV — Has Rural Poverty Increased in India? *Eastern Economist*, 72(12), March 23, 1979, 627-33p.

Ramesh, KS & Ramana, DV — A Management Approach to Formulation and Implementation of Block Level Plans. *Behavioural Sciences and Rural Development*, 1(2), July 1978, 138-54p.

Ratnam, Nittala V — Decentralised Management of Rural Development. *Kurukshetra*, 27(12), March 16, 1979, 13-15 & 18p.

Roy, Asoke Mohan — Integrated Rural Development : Need for a Realistic Approach. *Capital*, 182 (4543), Jan. 18, 1979, 39-40p.

Satya Sundaram, I — Rural Reconstruction: Facing the Hard Reality. *Capital*, 182 (4545), Feb. 1979, 100-1p.

Vagganavar, M — Development Loans for Weaker Sections. *Kurukshetra*, 27(12), March 16, 1979, 22-26p.

— DICs : Hurdles to Cross. *Commerce*, 138(3529), Feb. 3, 1979, 111-12p.

— Housing the Rural Poor, *Kurukshetra*, 27(11), March 1, 1979, 9-10p.

— Integrated Rural Development. *Kurukshetra*, 27 (11), March 1, 1979, 28-30p.

— Rural Electrification. *Kurukshetra*, 27(11), March 1, 1979, 21-23p.

— Rural Industries. *Kurukshetra*, 27 (11). March 1, 1979, 7-8p.

— *Rural Water Supply Programme*. *Kurukshetra*, 27(11), March 1, 1979, 15-17p.

— Public Distribution : The Task Ahead. *Commerce*, 138 (3534), March 10, 1979, 355-56 p.

— Public Distribution : Will the New Scheme Click ? *Capital*, 182 (4544), Feb. 1, 1979, 61 p.

Economics

Arya, KC — Growth Trend in Social and Development Expenditure *Eastern Economist*, 72(8), Feb. 23, 1979, 317-21 p.

Rao, VKRV — Rural Poverty Inceases Despite Economic Growth. *Capital*, 12th April 1979, 35-43 p.

Satya Sundaram, I — Low-cost Economy : How it Can be Turned into a Reality. *Capital*, 182 (4551), March 22, 1979, 282-83 p.

Upadhyaya, KK — Beyond the Take Off. *Yojana*, 22(21), Nov. 16, 1978, 25-26 p.

Vakil, CN — Economy in Public Expenditure : Prerequisite for Solid Growth. *Eastern Economist*, 72 (7), Feb. 16, 1979, 273-77 p.

— Credit Squeeze On The Horizon. *Commerce*, 138 (3536), March 24, 1979, 440 p.

— Limitation of Fiscal Instruments. *Commerce*, 138 (3536), March 24, 1979, 432-40 p.

Economic Policy

Ganguli, Sidhartha — Themes and Variations in Management : The Realities of Indian Economy. *The Management Accountant*. 14 (1), Jan. 1979, 24-26 p.

Mehta, Ashoka — Economy — Strengths and Weaknesses. *Kurukshetra*, 27 (10), Feb. 16, 1979, 22-24 p.

Sen, NN — A New Concept in Planning : *Yojana*. 23 (5), March 16, 1979, 29-30 p.

— Economic Survey 1978-79 : Basic Issues Remain Unsolved, *Commerce*, 138 (3535), March 17, 1979, 65-69 p.

Job Enrichment

Connelly, Sharon L — Career Development: Are We Asking the Right Questions? *Training and Development*, 33(3), March 1979, 8-11p.

Harris, Philip R — Cultural Awareness Training for Human Resource Development. *Training and Development*, 33(3), March 1979, 64-74p.

Job Evaluation

Bergman, Bernard — Employer Evaluations in Cooperative Education Programs. *Human Resource Management*, 17(3), Fall, 1978, 31-32p.

Job Satisfaction

Gupta, Manju, — A Study of Job Satisfaction Among Women Workers. *Indian Journal of Industrial Relations*, 14(3), Jan. 1979, 449-59p.

Curran, James & Stanworth, John — Job Choice and the Manual Worker-Where the Theories Break Down. *Personnel Management*, 10(9), Sep. 1978, 41-45p.

Industrial Sickness

Agarwala, Virendra — Rehabilitation of Sick Units—A View Point. *Prajnan*, 7(2), April-June 1978, 163-66p.

Madan, BK — Industrial Sickness : Causes and Cures. *Capital*, 12th April, 1979, 93-95p.

Mahantu, PC — Spreading Sickness in Industry. *Commerce*, 138(3528), Jan. 27, 1979, 64-68p.

— RBI Report : Special Institutions for Sick Units? *Commerce*, 138(3528), Jan. 27, 1979, 70-71p.

— Tending Small Sick Units. *Commerce*. 138(3528), Jan. 27, 1979, 69p.

Prasad, CS — Role of C. D. Programme in Rural Recoustruction. *Yojana* 22 (22), Dec. 1, 1978, 7-9p.

Rao, S Koteswara — Role of DIC in the R&D of Small Firms. *Yojana*, 23 (5), March 16, 1979, 32-33p.

Rao, NK Muralidhara — Galvanising a District into Action. *Kurukshetra*, 27(12), March 16, 1979, 16-18p.

Rao, VKRV — Has Rural Poverty Increased in India? *Eastern Economist*, 72(12), March 23, 1979, 627-33p.

Ramesh, KS & Ramana, DV — A Management Approach to Formulation and Implementation of Block Level Plans. *Behavioural Sciences and Rural Development*, 1(2), July 1978, 138-54p.

Ratnam, Nittala V — Decentralised Management of Rural Development. *Kurukshetra*, 27(12), March 16, 1979, 13-15 & 18p.

Roy, Asoke Mohan — Integrated Rural Development : Need for a Realistic Approach. *Capital*, 182 (4543), Jan. 18, 1979, 39-40p.

Satya Sundaram, I — Rural Reconstruction: Facing the Hard Reality. *Capital*, 182 (4545), Feb. 1979, 100-1p.

Vagganavar, M — Development Loans for Weaker Sections. *Kurukshetra*, 27(12), March 16, 1979, 22-26p.

— DICs : Hurdles to Cross. *Commerce*, 138(3529), Feb. 3, 1979, 111-12p.

— Housing the Rural Poor. *Kurukshetra*, 27(11), March 1, 1979, 9-10p.

— Integrated Rural Development. *Kurukshetra*, 27 (11), March 1, 1979, 28-30p.

— Rural Electrification. *Kurukshetra*, 27(11), March 1, 1979, 21-23p.

— Rural Industries. *Kurukshetra*, 27 (11). March 1, 1979, 7-8p.

— Rural Water Supply Programme. *Kurukshetra*, 27(11), March 1, 1979, 15-17p.

Byham, C William — How to Improve the Validity of An Assessment Center. *Training and Development*, 32(11), Nov. 1978, 4-6p.

Campbell, Clifton P — Individualising Vocational Training. *Training and Development*, 33 (3), March 1979, 30-34p.

Clement, Ronald W — Changing Demands on the Training Professional. *Training and Development* 33 (3), March 1979, 3-7p.

Clement, Ronald W — Unethical and Improper Behaviour by Training and Development Professionals. *Training and Development*, 32 (12), Dec. 1978, 10-12p.

Dayal, V — Training Function in Public Enterprises : The Neglected Aspects. *Indian Journal of Training and Development*, 8 (5) Sept-Oct. 1978, 3-8p.

Finkel, Coleman — Speaker *vs.* Trainer Platform Skills. *Training and Development*, 32 (11), Nov. 1978, 26-27p.

Cammuto, John J — Designing and Staffing a Technical Training Center - A Case Study. *Training and Development*, 32 (12), Dec. 1978, 20-22, 24, 53, 54p.

Guyot, James F — Management Training and Post-Industrial Apologetics. *California Management Review*, 20(4), Summer 1978, 84-93p.

Hariharan, G — Training and Development of Managers in Europe. *Indian Journal of Training and Development*, 8(5), Sept-Oct. 1978, 23-25p.

Jackson, Donald W — The Continuing Education Needs of Sales Managers. *Training and Development*, 32 (11), Nov. 1978, 8-10p.

Murthy, PVR and Venkataraman, N — Training of Interviewers—Can it Eliminate Subjectivity in the Selection Process? *Indian Journal of Training & Development*, 9(6), Nov-Dec. 1978, 13-18p.

Newstrom, John W — Catch 22—The Problems of Incomplete Evaluation of Training. *Training and Development*, 32(11), Nov. 1978, 22-24p. □

Index to Advertisers

A Practical Guide to Effective Management

P. C. Luthar*

Introduction

The subject of Management has spawned a plethora of literature. No two authors think alike and therefore, it is impossible to synthesise the contradictory theories and recipies. In the final analysis, a manager has to lean heavily on personal experience and judgement. This article aims at sharing certain practical guidelines which have been crystallised from the author's own experience of managing human organisations. They may be of help in hewing a path through the jungle of management jargon.

Reacting to Infractions

It is necessary to take note of every infraction, no matter how minor it may appear to be. To ignore them is to encourage them. The result is a compulsive progression from minor infractions to major ones similar to a man graduating from minor lies to major lies and minor crimes to major crimes, if not checked. What is applicable to individuals is applicable to groups and organisations.

What is meant by taking note of is "reacting to". It should be emphasised that it is the *certainty* of reaction and not the severity that is important to deter irresponsible behaviour. The options for reaction are just two: counselling, and punishment. The skill of a manager lies in determining the optional blend of these two options for dealing with a given person or a given situation. Since the two independent variables, viz., the person and the situation are subject to infinite variations, the dependent variable of the optimal blend of options is also subject to infinite variations ranging from zero of counselling and hundred of punishment to hundred of counselling and zero of punishment. Punishment must not be treated as an end in itself. It is merely a means to an end, the end being the achievement of rectitude. Whenever in

*Mr. Luthar is Chairman & Managing Director of Mining and Allied Machinery Corpn., Ltd., Durgapur.

doubt about the proposition of counselling and punishment, incline more towards counselling. The logic is this :

> If a man has committed an offence and he is awarded matching punishment one is quits with him. On the contrary, if rectitude is achieved through counselling and without the formal act of punishment, one builds up a bank balance of good-will.

In real life situations the commitment of an offence and the award of punishment do not, in fact, result in a clean slate. No offender is, as a rule, inclined to acknowledge his offence. Therefore, the formal act of punishment leaves a trail of bitterness or ill-will in the mind of the man. This is not to say that punishment as an instrument of rectitude should not be used. It is imperative in certain situations. What is meant by this is that, whenever feasible, counselling should be preferred to the formal act of punishment for achieving rectitude.

Counselling *must not* be misconstrued as appeasement. Appeasement of wrong doer tantamounts to complicity with the wrong doer. Therefore, it is evil and unethical. What is more, the appeaser comes to be perceived as a weak and pliable manager who can be easily pressurised into yielding to illegitimate demands. Such an image is the best fuel of irresponsible militancy on the part of workers.

Comparative Role of a Manager and a Judge

In some respects the role of a manager is comparable to that of a judge. A judge has to punish a person who violates the laws of the society in order to fulfil his obligation as the protector of social interest. In a like manner, a manager has to take corrrective/punitive action against a person who violates the rules of the organisation. A judge who condones criminality is not a good judge. Likewise, a manager who condones violations of organisation's interest is not a good manager. The laws may not be perfect nor the rules. In fact, perfection in human institutions is not possible because, among other things, we do not even have a universal definition of perfection. The concept of perfection varies from person to person. Therefore, while we may certainly try to change laws and rules through constitutional processes, we cannot

afford any licence to violate the codes as they exist. This is necessary for the sheer survival of an organised society.

Reacting to Complaints

How to react to complaints and grievances? One way is to treat them as unpleasant irritants. The other and healthier way is to treat them as vindication of the man's faith in one's bonafides. A man with an ailment never goes to a physician in whom he does not have faith. Orientation of reaction to complaints as suggested, will make for a sympathetic and constructive response to the felt needs and grievances of people. An attitude of sensitive *and sincere* response, by itself, takes the edge off the grievances.

It is not important to bear in mind the fact that grievances and desires are a part of life. A state of *Nirvana* is only a dream for individuals and organisations. Therefore, there is no need for despondency to the fact that people have grievances. What is needed is sympathetic attitude and a sincere attempt to (a) remove the causes of legitimate grievances and (b) redress the legitimate grievances when they do arise. The first part—identifying and removing the causes of grievances—is of prime importance. It is always better to act than to react.

In dealing with grievances it is necessary to remember that "Justice delayed is justice denied". Time is of essence because the grievance is like a festering sore, which becomes deeper and deeper with the passage of time. A deep sore will always leave a deep scar even after it heals.

Art of Negotiation

There can never be identity of views amongst individuals and far less among groups. Thus, the view points of trade unions will necessarily be different from those of management because of inevitable differences in priorities. There is nothing wrong with this. In fact, this is how it should be. However, differences need not degenerate into dissensions and dissensions into confrontations. The basic requirements for avoiding such degeneration are (a) the recognition of the "norm" of differences,

and (b) willingness to see the others' view point. In other, words, dissent, *per se* must not be construed as offence.

With the willingness to see each others' view point, it becomes possible to harmonise differences into broad areas of agreement aimed at preserving and promoting the overall interests of the organisation. Trade unions do realise that they are, after all, part of the organisation. And no part can thrive at the cost of the whole. If the the tree decays so do the roots, the trunk, the branches and the leaves. Conversely, if the tree thrives, so do all its parts. Befitting recognition of and emphasis on this basic concept is the essence of fruitful negotiation.

Credibility

The credibility of the manager in the eyes of the subordinates depends on the former's image as perceived by the latter. The manager's own concept of self-image is of no consequence. The basic ingredients of the image of credibility are the qualities of fairness and impartiality, integrity, competence and resolute will, *as seen by subordinates*. Special emphasis on resolute will is important since a vascillating and weak manager can never command respect. He is like a paralytic physician.

Credibility of management is an essential condition of harmony and morale of the organisation. It engenders a climate of mutual confidence and mutual goodwill which raise the threshold of mutual tolerance. This prevents the degeneration of grievances and unfulfilled needs into irritants and mutual bickering.

Respect Begets Respect

The respect that a person gets is a reflection of the respect that he gives to others. Respect should not be equated with fear. An authority which command respects gets voluntary obedience. For instance, we submit ourselves voluntarily to the authority of a surgeon whom we respect by virtue of his competence and goodwill. By contrast, authority exercised through fear can, at best, command only vengeful obedience. And vengeful obedience can easily turn into vengeful defiance. History is

replete with examples of "the most obedient servants" of today immolating their tyrannical masters with great relish the next day.

Style of Management of the Leader

It is a characteristic of human nature that people tend to mirror the attitudes of those above. Therefore, style of management of the leader tends to permeate the entire organisation through layer by layer progression. Hence the imperative need for top manager to practice enlightened management. The wrong style of functioning of the top executive can not only erode but extinguish the organisation.

Vital ingredients of the right style are :

* Fervent commitment to institutional interest.
* Resolute will to inculcate discipline and accountability at *all* levels.
* Delegation of authority consistent with assigned and merited responsibility.
* Fairness, justice and impartiality.
* Senstive response to legitimate grievances.

Imbuing the style with these qualities is the essence of effective management. □

Training for Productivity in the Industry

G. K. Suri*

An effective use of materials, money, machines and human resources is essential for achieving a higher level of productivity in industry. Whereas other resources have limitations, the human resources has unlimited potential. Moreover, this is the only activating resource; others are passive. Its quality can also be improved by intervention of training.

So, to raise productivity, an improvement in the quality of the human resource through training inputs is of vital importance.

Training of the human resources can be considered at the levels of (a) workers, (b) trade union functionaries, (c) supervisors, (d) middle level managers, and (e) top managerial personnel.

Worker-training : From the point of view of raising productivity in industry, the training of workers essentially implies (a) improving job knowledge, and (b) attitudinal change. While job knowledge can be imparted through on-the-job training, attitudinal and behavioural changes can be induced through training inputs intended to sharpen his understanding of his work, his environment, his relationships with his colleagues, and trade unions and the management. The latter kind of training is almost non-existent in industry. The workers' education programmes conducted by the Central Board of Workers, Education or the training given under the apprenticeship training scheme do not meet these requirements.

Training of Trade Union Functionaries : Effective use of human resources in industry will not be possible without a positive approach on the part of trade union functionaries. While there could occasionally be a general conflict of interests as well as a role-conflict of union functionaries in improving productivity and safeguarding and protecting workers' interests, there is no denying the fact that there is a need essentially to give them the training in job evaluation, work study, and other productivity techniques. Speaking from experience, we have found that their appri-

*Dr. Suri is Co-ordinator, Industrial Relations, and Director, Diploma Programme, at the Shri Ram Centre for Industrial Relations and Human Resources, New Delhi.

ciation of these techniques generates a favourable predisposition towards the use of these techniques. The training of trade union functionaries in these areas is highly inadequate, if not totally absent.

Supervisory and Middle-level Management : Usually, we find that the supervisory jobs are filled by promoting efficient workers. An efficient worker need not be a good supervisor. The types of skills required for being an efficient worker and supervisor are quite different. A good supervisor needs to possess human relations and administrative skills. Training in these areas seems to be totally absent. The prime need, therefore, is to sharpen these skills through systematic training inputs. An efficient use of the training instruments should be made to develop these skills among the promotee supervisor.

Top Management : The top management has to be trained essentially and primarily for bridging the gap between technology and management. Scientific and technological knowledge has been growing, particularly during the last decade, at an astonishing rate. It becomes vital for the top manager to have a keen appreciation of the widening scope of technology. Only in this way will he be able to discharge his functions as an effective manager. Another area where he needs to be trained and exposed is computers and electronic processors. The growing complexities of a company's internal operations, diversification and growth, and in some cases competition, have generated unprecedented pressures. The process of managerial decision-making can be considerably improved by harnessing these electronic aids. The top manager also needs to be exposed to the growing complexities of the environment. He needs to examine the relationship of his job to such factors as the growing influence of the government in business, the changing role of organised labour, the altered expectations of the public from business, and growing international competition as well as the possibilities for international cooperation.

Trainer and his Credibility

The next question that arises is as to who is to provide the training? As of to-date, a trainer is of usually two types. One, he is academically sound but has limited exposure to industry; two, he has rich industrial experience but his academic equipment is limited. To be effective as a

trainer, he needs to possess both academic excellence and rich industrial experience. This can be achieved only by training a trainer which will involve, among other things, a) formal academic training, b) field experience, consultancy and action research work, c) specific task assignments in industry, and d) a consultation assignment for implementing a productivity improvement plan. This will also build credibility of the trainer with the clientele. Credibility is essentially built with competence which can be acquired only through training, consultation and action research. Also initially senior and junior trainers could be combined in a programme for the purpose of developing the junior trainers. Again, in-plant tailor-made programmes could be designed so that the company's trained personnel can apply the techniques of productivity. It is only through the demonstrated ability and results that the credibility of a trainer for the purpose of raising productivity in industry can be built.

Trainer as an Agent of Change

Our knowledge of the impact of training on productivity and its facilitators and constraints is highly inadequate. Probably, a coordinated research project on this theme has been initiated by the National Productivity Council. More of this effort is required to find a clear direction on the role training can play in improving productivity.

Research effort is also required to ascertain workers' attitude to productivity and its various parameters. Based on this research, training needs of workers can be ascertained. Also, intervention of training for raising productivity by a trainer or a consultant will be meaningful and effective only if the trainer and the consultant are accepted by the workers and the management. Professional ethics has a lot to do with the acceptance of the trainer and the consultant by the parties involved.

Organisational Arrangements

It is not clear as to what organisational arrangements are needed to make training effective for improving productivity in organisations as well as sectors of industrial activity. At the moment, it is being imparted by individual trainer-consultants, small consultancy firms, and institutions

of various kinds. Apparently, there is a need for a concerted and well-coordinated training intervention by bringing together resource institutions and persons and coordinating their activities. The *modus operandi* can be provided by a well-conceived and designed action project. The executing agency could be the National Productivity Council or some other institution. Pious resolutions unaccompained by action would be futile and frustrating.

It is also necessary to promote multilateral and bilateral collaborative arrangements among institutions concerned with productivity movements. Through such collaborations, training inputs for transfer of knowledge can be provided. As a matter of fact, it appears essential to work out a network of institutional collaborative mechanisms. It will also be desirable to sponsor missions abroad for international interaction, which will hopefully broaden the vision of trainers. A linkage between our trainers and consultants with their counterparts abroad should certainly improve their expertise and capabilities. Importing experts from abroad for short while and exchange programmes could certainly provide opportunity for Indian trainers to have an interface with experts from outside India.

Internally, the organisational mechanism would perhaps be to constitute a resource group or a steering committee which could undertake an action-consultation-cum-training project on productivity leading to multiplier training programmes with the objectives of raising productivity in industry. □

Why and How of Workers' Participation in Management

R. D. Pathak*

An organisation is an integrated whole—a total man-machine system—in which relationship between the component parts is as important as the parts themselves. The same can be said with regard to "the human organisations". In the latter we can direct our attention to the smallest social units – work groups.[1] Each of these is to be regarded, then, as a fundamental building block for a productive organisation. Workers' participation in management is not a new concept; it is as old as the institution of owners and workers. Only its importance has increased and has been brought into sharp focus with the advent of industrial revolution and of large enterprise. At the end of World War I, the idea of workers' participation in the control of industry was conceptualised and given a practical shape, with the establishment of the Joint Committees or Work Councils in various countries. Though much has been talked and written about participative management, confusion still prevails due to differing interpretation by different people. This paper discusses different objectives of workers' participation in management and develops models based on these objectives. It also suggests a viable scheme of workers' participation in management in terms of these models and gives a systems theory perspective for the successful implementation of the programme.

Concept of Workers' Participation

Participation takes place when management and employees are jointly involved in making decisions on matters of mutual interest where the aim is to find solutions to problems which benefit all concerned. Participation should be distinguished from negotiation, which involves joint decision making by a process of distributive or conjunctive bargaining

* Mr. Pathak is an Assistant Professor with the Department of Commerce & Business Administration, Himachal Pradesh University, Simla.

The author is thankful to Dr. Sagar Sharma, Professor and Head, Deptt. of Psychology, H. P. University, for his valuable suggestions in preparing this article.

1. Pigors, Paul and Myers, Charles A., *Personnel Administration : A Point of View and a Method*, Tokyo : McGraw Hill, KOGAKUSHA, 1973, pp. 115-121.

where the sole aim is to resolve pure conflicts of interests. Participation is also more than joint consultation, which is the process by which management seeks the views, feelings and ideas of employees through their representatives, prior to negotiating or making a decision. Although joint consultation may involve the discussion of mutual problems and is a necessary aspect of participation, it leaves with management the ultimate responsibility for making decisions. Participation is also more than communication, which is the process of keeping people informed about intentions, opinions, results or decisions on matters that interest them, although effective two-way communication is necessary to successful participation and joint consultation.[2] Further, it is necessary to point out whether participation and industrial democracy are one and the same. To some, industrial democracy is an alternative way of describing more or less traditional forms of joint consultation. To others, it comprises the joint regulation or control by unions and management of decisions and actions which affect the present and future conduct of the business. This implies trade union participation in decision making at all levels in the enterprise, including the highest level, the board. There has been a fair measure of agreement on both sides of industry with the following definition of the two basic purposes of industrial democracy prepared by the Industrial Participation Association (Great Britain) for its evidence to the Committee of Inquiry on Industrial Democracy :

> (a) That it is both reasonable and just that the employees of a company should have the means to influence the major decisions that may determine the conditions of their own working lives, and thereby the lives of their families—decisions that are commonly taken at a level where at present it is not usual for employees to be directly involved or represented.
>
> (b) That an essential purpose of industrial democracy must be to improve the efficiency and productivity of the enterprise, by enabling employees at all levels to make more effective contribution—increased productivity being the context in which employees' interests, as well as the interests of other parties, can best be advanced."[3]

2. Armstrong, Michael, *A Handbook of Personnel Management Practice*, London : Kogan Page, 1977, p. 304.
3. *Industrial Democracy—The Way Forward.* Industrial Participtation Association, London, 1976.

Objectives of Workers' Participation

The concept of participation has been experimented with or advocated for achieving a wide range of objectives. The concept has remained basically ambiguous and a misunderstanding presists even today because of the interchanged application of these connotations. Any scheme of participation to be meaningful, therefore, requires that the objective be definite without any conglomeration of vague expectations. The objectives vary with the model which are (a) the political model, (b) the psychological model, (c) the behavioural science model, (d) the conflict model, and (e) the economic model. The classification of participative management into five models brings out the different connotations of the concept in different contexts and suggests a framework for the study of any experiment of participation. However, it must be noted that no model is complete in itself as every model represents only one facet of the total reality and, therefore, any meaningful scheme of workers' participation in management must make use of all of these models.

Hereunder, each model is explained in brief :

(a) Political Model of Participation : This model is inspired by socialist ideology of the working class movement as put forth by Marx and Engels. Socialist thought emphasise the need to change the mode of production and production relations. The socialist theory holds the view that only a basic change in the social structure will bring about workers' freedom.

"If the proletriat, during its contest with the bourgeois is compelled by the force of circumstances, to organise itself as a class, if, by means of a revolulion, it makes itself the ruling class, and, as such, sweeps away by force the old conditions of production, then it will, alongwith these conditions, have swept away the condition for the existence ot class antagonisms and of classes generally, and will thereby have abolished its own supermacy as a class. In place of the old buorgeois society, with its classes and class antogonisms, we shall have an association, in which the free development of each is the condition for the free development of all."[4] Workers' participation, it is obvious from the above, is one of the structural changes aimed at changing the production relations and hence, is a political process.

4. Marx, K. and Engels, F., *Manifesto of the Communist Party*, Moscow : Progress Publishers, 1975, pp. 74-75.

The major objection in India, for the introduction of a real participative structure comes from a few employers and to top political leaders of trade unions. The employers oppose because of the fear of ultimate total workers' control of the enterprise which is the objective envisaged by the political model described above. However, workers' participation in India in the present day context is only meant to ensure that management of an enterprise proceeds in a proper and just manner without any exploitation by vested interests, thereby, resulting in greater efficiency of the enterprise as has been proved by experiments conducted in West Germany, Yugoslavia and other European countries like Poland and Sweden.

So far as the trade union movement is concerned, there is a lot of politicalisation of trade unions.[5] Politicalisation leads to the external leadership of trade unions, resulting in multiplicity of the unions which in turn, affect industrial relations. Most of the trade unions are also financially weak and their top leaders being rather busy in their political pursuits have little or no direct contact with the workers. Politicalisation of the labour unions has prevented Joint Management Councils from drawing the crucial distinction between their role as instruments of collective bargaining with the management and as participants in managerial decisions. It may not be wrong if it is suggested that a person holding trade union office is debarred, through legislation, to have any political affiliation.

A few political leaders of trade unions fear thal the real participation of workers can bring about the emergence of a new leadership, which is more acquainted with the day-to-day problems of the workers, thereby weakening their own hold. This opposition from a few trade union leaders is more out of a sense of personal insecurity rather than from a genuine desire to develop a constructive trade union movement in the country. Unless there exist sound trade union ethics, it is better to have direct participation of workers through their comrades in the plant, rather than through the politics-ridden trade unions which resort to axe grinding in participative bodies to the ultimate detriment of industrial democracy. Saiyadain [1977] reported that "In some cases, studies have found very little evidence of active communication and feedback

5. Virmani, Bowey and Chandra, National Wage Policy in India, *Economic Times*, 19, 20 and 21 August, 1976. Also Virmani, *Environment and Industrial Relations in India* Course of Studies Paper, Administrative Staff College of India, Hyderabad, 1973.

between the electors and their representation. Part of the blame can be put on the representatives themselves who have found themselves ill-equipped to judge as to how and what should be communicated. Partly multiplicity of union has caused such a problem. In Indian context, this has done considerable damage to JMC."[6] On this aspect, Deepti Bhatnagar[7] [1977] found the same results but in case of new and growing organisations. It is therefore, obvious that actual workers' participation in management should develop from the workers within the enterprises. A minority representation, of course, can be given to external trade unions so that the macro-level interests of the working class are also taken care of in the formulation of policies at the top level of the enterprise. At the same time, trade unions in India will have to amplify and reformulate their objectives as has been done by trade unions in Germany. Instead of working for improvement of the economic and welfare aspects of workers at the enterprise level, they will have to enlarge the scope of their activities and concentrate more on macro-level problems like workers' education, welfare facilities, drawing up and working for the acceptance of new feasible scheme of workers' participation in enterprise (in order to function effectively on joint forums and getting involved intelligently in participative management at the level of enterprise) and providing positive advice and assistance to the enterprise workers so that they participate meaningfully with greater efficiency.

(b) Psychological Model : This model provides an insight into some of the psychological processes within each of us, which, participative management can put to an effective use. The foremost of them is the power of the psychological gap.[8] Anyone who has been taught conference techniques or has attended meetings, quickly learns that people cannot resist trying to find solutions to problems. In participative management, the proper use of this gap method of stimulating the action can be made in negotiations between management and workers. For instance, during joint consultations or negotiations between management and workers, goals must be made clear at the outset and then progress be made in achieving the objectives. Delays and deviations should be spotted more

6. Salyadain Mirza S., Workers' Participation in Decision Making : Research and Hypotheses *Productivity*, Jan-March, 1977, XVII, (4) pp. 547-61.
7. Bhatnagar, Deepti, Workers Desire for Participation : An Empirical Study, *Productivity*, Jan-March 1977, XVII. (4) pp. 580-90.
8. Dyer, Frederick C. and Dyer, John M, *The Enjoyment of Management* Homewood, Illinois : Dow Jones Irwin Inc. 1971, pp. 135-46.

quickly and steps taken to feedback corrections or new plans into the system. Management and workers, together, can then decide as to what should be accomplished by a stipulated date. Once both sides commit themselves, this enables both, the employee and his manager to do those things which they ought to do. They may also undertake an extra-assignment. The main idea is that this approach enables an individual to think and work hard for achieving the goals set by him because of the inner urge to fill the gap. Similarly, in suggestion schemes due recognition should be accorded to the employee who has put forward a suggestion, and, if need be, should be actively involved in its implementation. There should also be a standard procedure for recording the decisions of the suggestion evaluating committee and informing those who made the suggestion of the outcome with reasons for rejection, if appropriate.

Another psychological aspect of workers' participation in management is to be found in Chris Argyris's Maturity-Immaturity theory[9] [1957] and the Transactional Analysis developed by Erick Berne[10] [1964]. In examining the widespread worker-apathy and lack of effort in industry, Argyris contends that in many cases, when people join the force, they are deliberately kept away from maturing by the management practices utilised in their organisations. In these organisations, they are given minimal control over their environment and are encouraged to be passive, dependent and subordinate; therefore, they behave immaturely. However, as is known, worker participation in management is meant to give the workers' more control over their environment and is an attempt to make them capable of behaving in a more matured fashion, i. e., by putting them in equal position with management in negotiations and by giving them due representation at board levels as well as through Work Committees and Joint Councils. But, if real participation is to take place to achieve this basic objective, then these Work Committees and Joint Councils should not only be consultative in nature but also mandatory and their scope be widened to cover all matters of interest to workers.

One major criticism against Joint Management Councils, since their establishment in 1958, is that such participative bodies are not likely to succeed due to ignorance and illiteracy of the Indian workers as they do not behave in a responsible manner. A Study Group constituted

9. Argyris, Chris, *Personality and Organisation*, New York : Harper and Row, Publishers, 1957
10. Berne, Eric *Games People Play*, New York : Grove Press Inc., 1964.

by the Union Ministry of Labour in 1962 on the working of Joint Management Councils in India recommended that more stress be laid on the workers' education. This is nothing but attaining a level of maturity a worker can gain through education or experience or a combination of both. This concept of maturity mainly involves two factors : (a) job maturity, i.e., to develop the ability and technical knowledge to do the task, and (b) psychological maturity, i.e., to gain self-confidence and self-respect about oneself as an individual.

Now worker participation in management has a higher probability of success as one moves from low to moderate levels of maturity workers and then begins to plateau in potential effectiveness as workers attain the peak in task relevant maturity. However, during the last twenty years, very little has been done for preparing the workers for their role in participative institutions. In a country of low educational level like India, workers' participation in management cannot succeed, unless considerable emphasis is placed on workers' education. The education and the basic understanding of workers have to be raised so that they can understand various social, political, financial and economic aspects of enterprise management. In Germany and Yugoslavia, there are special Universities and training institutions which run short term as well as long term courses for the workers to prepare them for workers' participation in management and to enable them to know how to safeguard their interests on the management bodies. The trade unions themselves have undertaken major responsibility in workers' education. However, in in India, for various reasons, the top trade union leadership has not considered workers' education as one of their major responsibilities. Therefore, various academic institutions and the government must initially assume a major role in workers' education and also strengthen the trade unions financially and otherwise to take up such responsibilities. As in Germany and Yugoslavia, the training programmes in India should preferably relate to both technical as well as participative aspects. A small Advisory Committee consisting of four to five experts can be constituted at the national level to study the educational needs of the workers and the trade unions for the purpose of workers' participation in management and to suggest a comprehensive scheme of workers' education at national, regional and local levels. This, it must be recognised, is one of the prerequisites for success of workers' participation in Industry. The Study Group [1962] also recommended that more emphasis should be laid on sharing of information. In India, the general trend is

that the employers accept workers' participation, if and only if the workers' representatives toe the management line and think of only increasing production and profitability. The moment workers' representatives ask for complete sharing of information, the employers' psychology repels participation. In Britain also, the participative structures have failed because of the unwillingness of employers to perceive workers as their partners. One of the essential prerequisites for the success of workers' participation in management is that of providing equal treatment to all members. If workers' participation has to be realistic, it is necessary that one should give up thinking in terms of any prerogatives and be prepared to collaborate and share all the information.

The philosophy behind this discussion of workers' participation can better be appreciated in terms of Transactional Analysis. While in paternalistic system, the transaction between employers and workers were that of parent to child, in real participatory system the transaction between employers and workers are that of adult to adult based on sharing of complete information. Organisations, which do not believe in participative management and are dominated by theory X assumptions about human nature, tend to be managed by critical parent managers with 'I am O.K., you are not O.K.' life positions, and who think that people are only motivated by physiological safety needs and satisfied hygiene factors. The subordinates in these organisations tend to be passive, dependent and child like with 'I am not O.K.. you are not O.K. or 'I am not O.K., You are O.K.' feelings. On the other hand, organisations who believe genuinely in participative management and are dominated by theory Y assumptions about human nature, tend to be managed by people with a good balance of parent-adult-child (P. A. C.), 'I am O.K., you are O.K.' feelings, and a sense that people are also motivated by affiliation, esteem, and self-actualisation needs as job-related 'motivators'. With this participative style of these managers, similar feelings are generated among subordinates and evoke adult problem-solving behaviour."[11]

(c) *Behavioural Science Model of Participation* : The theory of participative management developed on behavioural science model ignores the issue of ownership in contrast to the political model. It is primarily directed at individual and leadership styles. The emphasis in this model is on

11. Jongewood, Dorothy *Every Body Wins : Transactional Analysis Applied to Organisations.* Reading, Mass : Addition-Wesley Publishing Company, 1971.

maximising efficiency and productivity by increased motivation to individuals within the organisations. The essence of business management, by conventional standards, implies one man deciding of what another has to do. However, by Maslow's measure this is a challenge to the attainment of satisfaction for the fourth level of human needs. A man's ego is affronted when he has to follow orders blindly in a situation over which he has no control. The only way to respect the self-esteem of the individual is to give him a sense of participation. Research aimed at defining the general pattern of the wants of the workers has been attempted and the sort of pattern that usually evolves is (a) Recognition for good work and as a human being; (b) Security of job and income against the ordinary vicissitudes of life; and (c) Advancement to work of higher skills upon demonstration of ability.[12]

This, in fact, when viewed from workers' perspective calls for some share in the management of the enterprise of which they are a part, i. e., something to make them feel that they are more important than the piece of machinery they attend to. It is not that worker wants to influence things, but that he wants to feel that if needed he has a chance to influence them. While studying the workers' participation in management in MMB Ltd., Solan, and BHEL, Haridwar,[13] it was observed that the workers want to be involved in those management decisions which are intimately affecting their working life and what goes on at work place. It is with regard to matters relating to shop floor that the worker is interested and with his practical knowledge can make valuable contribution. It is in this area that the worker wants that his views be taken into account and is less interested in other matters. According to Lord Ruben (in Human Engineering), "Perhaps it would be better to recognise the basic difference of approach between management and workers and their representatives, and try to secure closer cooperation by attending to the real points of mutual interest."

One of the ways through which managers can ensure that workers will have a chance to influence the things is through their linking pins role.

12. Willsmore, A. W., *Managing Modern Man :* London, Sir Isaac Pitman and Sons Ltd., 1973, p. 78

13. Basant Ram, *Workers' Participation in Management*, 1977, (Dissertation under the guidance of the author, Department of Commerce and Business Administration, H. P. University, Simla).

According to Likert (1961), "The capacity to exert influence upward is essential if a supervisor (or manager) is to perform his supervisory functions successfully. To be effective in leading his own work group, a superior must be able to influence his own boss, that is, he needs to be skilled both as a supervisor and as a subordinate."[14] With an authoritarian pattern of management there is no attempt to give the worker any feeling of security by keeping him reliably informed with regard to company plans and future prospects. No opportunity is provided to the worker for participation in company operations and its plans. He is also not given any chance for expressing his grievances, unless, they are out of proportion. The emphasis in such a management style is on one-way communication in which the supervisor only acts as a transmission belt of information and influence from upper to lower levels. However, in participative management the role of the supervisor is expanded and a two-way communication takes place in which the supervisor acts as a linking pin joining the two levels—one he is responsible for and the other he is responsible to. Orders instructions from above are conveyed to the subordinates working under him, whereas suggestions, reports, ideas from lower levels are brought to the notice of top management. (In many companies, the mechanism for the upward communication is through suggestion boxes).

A framework that can be useful in helping to explain specifically the importance of the two-way communication and the linking pin role of every supervisor in workers' participation is Johari Window.[15] The feeling generated among the workers that they have a control or that they can influence the things, through the linking pin role of the supervisor, will ensure the real success of participative management if there is a proper feedback and disclosure within the organisational setting.

It follows that in implementing a participative style of management, managers or leaders have to develop an appropriate communication pattern. In that sense, the unstructured democratic wheel pattern seems very compatible with the participative change cycle, while the structured,

14. Likert, Rensis, *New Patterns of Management*, New York, McGraw Hill Book Company, 1961. p. 14.

15. Luft, Joseph, *Group Processes: An Introduction to Group Dynamics*, 2nd ed., Palo Alto, California : National Press Book, 1970.

autocratic star pattern seems appropriate for the directive change cycle.[16] In fact, the result of Bavelas'[17] [1953] experiments, with the circle and star patterns of communication suggest that the mere structure of communication can influence how people feel and act in terms of independence, security and responsibility. This same structure can also influence the total operational efficiency of a group in terms of speed accuracy, and adaptability. The structure, therefore, seems to influence the way people feel in one direction and their speed and accuracy in another. Thus, one of the basic essentials of participative management is to develop the structure of communication pattern in a democratic, free-wheeling manner as in the case of a circle, instead of structured and autocratic manner as is envisaged in the star pattern. Members of circle group will have more opportunity to participate, and take responsibility. They will be less dependent on one person since they will be in a position to check with another member. Thus, they will be more satisfied and happy. The group may be slow in terms of performance but it will develop involvement and commitment. The star pattern, on the other hand, may be fast but will tend to have a negative effect on morale. With each ensuing trial, they will feel less important and more dissatisfied and will develop resentment and hostility.

Rensis Likert, *et. al.*, of the Institute for Social Research, University of Michigan, emphasised the need to consider both human resources and capital resources as assets requiring proper management.[18] As a result of behavioural research studies of numerous organisations, Likert implemented organisational change programmes in various industrial settings. These programmes were initiated to help organisations move from theory X to theory Y assumptions, from fostering immature behaviour to encouraging and developing mature behaviour, from emphasising only hygiene factors to recognising and helping workers to satisfy the motivators.

One clear cut objective lesson drawn from this is that participative management objectives must be related to tangible and significant aspects

16. Paul Hersey, and Blanchard, KH *Management of Organisational Behaviour; Utilising Human Resources*, New Jersey, Prentice Hall Inc., 1977 pp. 285-89.

17. Alex-Bavelas, "Communication Patterns in Task-oriented Groups" In Dowin Cartwright and Alvin Zander, eds., *Group Dynamics : Research and Theory* (Evanston Ill. : Row Peterson and Company. 1953).

18. Likert, Rensis, *The Human Organisation*, New York, McGraw Hill Book Company, 1967.

of the job, the process of management and the formulation of the policies that affect the interest of the employees. They must not relate only to peripheral matters such as welfare or social amenities as is the case in most of the participative management practices, i.e., in Herzeberg's language they should not be concerned with the hygiene factors alone. For the success of participative institutions, a suitable culture has to be created in the organisation. The personal policies of an enterprise including appraisal and promotional systems, must support the participative institutions. The supervisory and the managerial style of leadership at the work place has to be made participative. In one of the studies conducted by Dhingra, out of 265 managers in public sector undertakings in India, nearly 50 percent did not believe in participative style of management at the work place. The personnel policies of the organisation also indirectly supported those who do not have mental acclimitisation to participation by promoting only such managers.[19] Management, therefore, must believe in participation. Actions speak better than words and management must demonstrate that it will put into effect the joint decisions made during discussions.

According to Pigors and Myers[20] [1937] taking the total organisational situation as the environment, the executive should examine the components of organisation structure, the communication system and corporate policies. Further, the managerial style which will promote participation, is one which is not only successful but effective too. "Success has to do with how the individual or the group behaves. On the other hand, effectiveness describes the internal state or predisposition of an individual or a group and thus is attitudinal in nature. If individuals are interested only in success they tend to emphasise their position power and use close supervision. However, if they are effective they will depend also on personal power and be characterised by more general supervision. Position power tends to be delegated down through the organisation, while personal power is generated upward from below through follower acceptance."[21] If managers are both successful and effective, their influence tends to lead to long-run productivity and organisational

19. Dhingra, OP, Participative Predisposition of Public Sector Managers, *Lok Udyog.* 1972, 2(12), pp.1201-11.

20. Pigors, Paul and Myers, Charles A. *Op. cit.*, p. 118.

21. Hersey, Paul and Blanchard, KH, *Op. cit.*, pp. 114-117.

development. Rensis Likert identifies theree variables—casual, intervening, and end results —which are useful in discussing effectiveness overtime.[22] It may be borne in mind that the effectiveness is a function of output variable (productivity, performance), intervening variables (the conditions of human resources), short range goals and long range goals. Any participative management scheme cannot be successful if the output variable, i. e., productivity performance are stressed (as is witnessed in most of the organisations) without building up properly the intervening variable, i.e., human resources. The management has to be concerned not only with short term goal (of increasing productivity) but also with the long term goal of building and developing the organisation. Force Field Analysis —a technique developed by Kurt Lewin for diagnosing situations—may be useful in looking at the variables involved in discussing effectiveness.[23] If the objective of participative management remains only that of increasing the productivity, then it can also be achieved by being autocratic and keeping continual pressure on subordinates which will lead to increase in output in the short run. By doing this, however, new restraining forces are developed, such as increased hostility and antagonism, absenteeism, etc., which results in the deterioration of the intervening variable (the internal state of the organisation) resulting into significant lower level of productivity after some time. Therefore, it is clear that for the workers' participation to be meaningful, employers in India must not restrict their vision to only short term gains, but should be capable to build a solid edifice to achieve long term objectives.

(*d*) *Conflict Model of Participation* : This model acknowledges the fact that when people are allowed to participate in the decision-making process that vitally affect them, it is inevitable that there will be differences of opinion. However, the situation need not be seen as one of destructive conflict between the two sides—the people who manage and the other who are managed. "Conflict serves the puropse of bringing irritations and frictions to the surface indicating the need for stabilising the relationship. From the point of the function of conflict, it may serve to remove dissociating elements is a relationship and to re-establish unity."[24]

22. Likert, Rensis *Op.-cit.*, pp. 26-29.
23. Lewin Kurt, "Frontiers in Group Dynamics : Concept, Method and Reality in Social Science, Social Equilibria and Social Change," *Human Relations*, I, No.1. June 1947, pp. 5-41.
24. Dublin, R as quoted in Ralf Behrendorf, *Class and Class Conflict in Industrial Society*, London : 1959, Routledge and Kegan Paul, p. 207.

Mary Parker Follet recognised that a new principle of association was needed because men had not yet learned how to live together in harmony. This new principle, she called, as the group concept and prophesied that it would become the basis for our future industrial system, the new approach to politics, and the foundation of international order. In many respects, her's was an early approach to the system concept of management. She was, in effect, a prophet in the management wilderness, crying, as she put it, for 'togetherness' and group thinking.[25] The function of getting together, however, cannot be to eliminate conflict, for this would only lead to 'a state of dormancy pointing to eventual disaster'. According to her, conflict should be seen not as the expression of differences between individuals, but as the failure of individuals to make their differences contribute to the common cause. These differences are valuable as they represent the specific, individual contribution that each member of a group is able to make to group opinion. But the difference between individuals must be built together to form a new group opinion. Only when the differences are integrated to form a new whole in which everyone is fully satisfied in the achievement of his own desires that there is a real group opinion and synergy.[26] Drawing on her background in social work and philosophy, she showed that authority as an act of subordination was offensive to man's emotions and, therefore, could not serve as a good foundation for co-operative organisation. Instead, she proposed an authority of function, whereby an individual has authority over his own job area. Order and authority, according to her, must be depersonalised so that they can be seen to operate not against people but towards the achievement of results and not out of the personal desires of the individual but out of the logic of the facts of situation.

In India, though all the parties emphasise on trust, understanding, co-parternership etc., they recommend collective bargaining which is based on mistrust and misunderstanding as a solution. The trade unions are not in a position to ensure through collective bargaining alone the entrepreneurial policy of providing equality to the interests of the workers, since, agreements are mostly on industry-cum-region basis and regulate only terms and conditions in the narrower sense. There is always a

25. George, Claude S, *The History of Management Thought*, Englewood Cliffs, N. J., U.S.A. Prentice Hall, 1972.

26. Willsmore, AW, *op. cit.*, pp. 86-87.

threat of strikes or lock outs in the power equation of collective bargaining, which a developing country like India cannot afford. Collective bargaining is no substitute to workers' participation in management. Participation brings both the parties together and develops appropriate mutual understanding bringing about mature and responsible relationship. Collective bargaining on the contrary, is based on the crude concept of power and its exercise for sectional bargaining may end up in mistrust, withholding of information and use of pressure tactics. If collective bargaining is considered as a form of participation, it will be a negative form of it, which could be injurious to the long term interest of the national economy.

Thus what is needed is a mutually acceptable independent body to settle differences, in case mutual agreement or consensus is not forthcoming. It may be desirable to have provisions for mutually acceptable mediation to settle differences without any delay so that the interest of the enterprise does not suffer for want of decision or agreement.[27] The above discussion can be better understood in terms of Blake, Shepard and Mouton[28] [1964] model, according to which there are three attitudinal sets or basic assumptions that people can have towards inter-group conflict : (a) Conflict is inevitable, agreement is impossible (b) Conflict is not inevitable, yet agreement is impossible; and (c) Although there is conflict, agreement is possible.

These attitudinal sets will lead to predictable behaviour depending upon the way the people involved see the "stakes". When people are actively engaged in a win-lose power struggle, as happens in collective bargaining, it can be predicted that the stakes in the conflict are high and they think that agreement is impossible. One possible intervention can be to lower the stakes so that the conflicting parties agree to have provision for mutually acceptable mediation to settle differences. When such an intervention is made, then efforts can be directed towards changing the assumptions of the people involved to "although there is conflict, agreement is possible." Once that is done, an attempt to increase commitment again will tend to move them into an active problem solving mode which is the basic objective of participative management.

27. Virmani BR, *Workers Participation in Management*, New Delhi : The Macmillan Company of India Ltd., 1978, p. 72.
28. Blake, Robert R. Shepard, Herbert and Mouton, Jane S. *Managing Intergroup Conflict in Industry*, Houston, Gulf Publishing Co., 1964.

(e) The Economic Model : In India, the expectation of workers is to achieve security of employment, better wages, bonus, etc. If the participative machinery is not able to achieve this objective, the workers will lose interest in it. As for the employers, their main interest is maximisation of profits. In case there is no increase in production for realising larger profit margins, the management indulges in authoritarian ways of attaining the objectives of increase in production. On the other hand, the Government of India considers participative management as a means of resolving industrial disputes and of increasing productivity simultaneously.[29]

There has been much criticism about having the increased production as the objective of workers' participation in management. Reference is made to a few studies undertaken in Germany, Yogoslavia, and USA, where it is suggested that there is necessarily no correlationship between productivity and participation.[30] It is also pointed out that if the objective is increasing productivity, one can get it also by authoritarianism. In fact, if workers who are used to authoritarian style of management, if given the choice of participative style, their efficiency deteriorates.[31] However, when the workers' participation in management is viewed in the context of the above mentioned models and with a systems theory perspective, it becomes evident that there can be no dispute over the fact that the size of the 'cake' has to be increased in the interest of national economy as well as in the mutual interest of management and workers. It is only in participative management that the urge to increase productivity is found because of commitment and involvement in jointly agreed goals.

It is pertinent to refer here to a scheme given by Michael Armstrong[32] to plan the introduction and development of workers' participation in management in the following stages :

1. Analyse and evaluate the existing systems of consultation, communication and other formal and informal means of participation.

29. Virmani, BR *opt. cit.* p. 5.
30. Erdmann, Ernest-Gerhard, *The Myth of Co-determination*, Emmid Survey Clarifies the Facts, Der Arbiert-gehar of 20 July, 1966.
31. Meyer, HW, Key, Emmanuel and French, RP Jr.. Split Roles in Performance Appraisal, *Harvard Business Review*, 1965, 42(1) pp. 123-9.
32. Armstrong, Michael, *op. cit.*

2. Identify the influences within and without the company which affect the climate of industrial relations and suggest the most appropriate form in which participation should take place.
3. Develop a plan for improving or extending participation in whatever form is appropriate to the company.
4. Discuss the plan in depth with all concerned, i. e., management, supervisors, work people and unions. The introduction of improved participation should itself be a participative process.
5. Brief and train those concerned with participation in their duties and how they should be carried out.
6. Introduce new schemes on pilot-scheme basis. Do not expect immediate results and be prepared to modify them in the light of experience.
7. Keep the whole system under continuous review as it develops to ensure that it is operating effectively. □

Algebra of Project Networks

M. Krishnamoorthy* & J. P. Saksena**

INTRODUCTION

During the last two decades or so, 'Network Algebra' has gained paramount importance and has been extensively used in various branches of management science like project planning, job scheduling, PERT scheduling and the like. This paper traces the contours of growth of the subject since it was conceptualised, and provides a brief resume of the work done so far in 'Network Algebra' incorporating various aspects of the topic including the mathematical development. It also deals with linear programming and network flow approaches followed by a discussion on and the application of divisibility and decomposition as techniques. The development and use of conjunctive and disjunctive activities are also presented in this paper alongwith the use of Tableau Method.

CPM AND PERT METHODS : A REVIEW

The origin of network approach to project management can be traced back to mid-fifties in USA when two projects—one for private sector and the other for US Government—were initiated. This method was an improvement over the bar chart method. The network was deterministic and activity-oriented. Kelley and Walker[(26), 1959] were the originators of this method called as 'Critical Path Method' or CPM. Simultaneously, another group tackling a very large project relating to Polaris Missile using Program Evaluation Review Technique (PERT), had based their system on event orientation. The project was very complex and being first of its kind, it was not possible to determine the exact duration of individual activities. However, the first possible description of PERT approach was given by Malcolm, Roseboom, Clark and Frazer [(35),1959]. The assumptions suggested by them have been further examined by several others.

The four stages of CPM/PERT development can be summarised as follows :

*Dr. Krishnamoorthy is the Executive Director and **Dr. Saksena is Director (Operations Research), with the National Productivity Council, New Delhi.

Stage 1 —Initial developments

Stage 2—Time and cost trade off

Stage 3—Divisibility of activities, network decomposition and use of alternative paths

Stage 4—Directions of research in Critical Path Analysis (CPA).

DIFFERENT STAGES OF DEVELOPMENT

An Overall Survey

The pioneering work of introducing the concept of decision nodes and boxes is due to Eisner [(10), 1962]. He, in his paper gives a distinct variation from the basic pattern of CPM and PERT methods. Elmaghraby [(14),1964], introduced the concept of probabilistic branching and feedback. Pritsker and Happ [(39),1966], further developed the idea of Elmaghraby relating to probabilistic branching and duration times. Chillcott and Thresfield [(7),1965], applied it in project evaluation. Extensions of the above model were made by Pritsker and Whitehouse [(39), 1966]. Later on, Elmaghraby developed a new area in Signal flow graph applications. Crowston and Thompson [(8b), 1967] introduced the concept of decision CPM. This was extended by Viarisio [(45),1972], in his paper on Deterministic Critical Path Method (DCPM). Sherrand [(42), 1972] wrote on 'PERT : A Dynamic Approach.' The probabilistic concept was further developed by Howard [(23),1960], in Markov processes with rewards using transitional probabilities and rewards. The latest contribution in this direction is due to Hastings [(22),1977] who has combined the deterministic and probabilistic decision boxes/nodes in his book on Decision Networks.

The linear programming and network flow approach forms a distinct class of problems in this area starting from the work of Charnes and Cooper [(5),1962], (discussed in the next section). Jewell [(24),1965], Jewell and Parikh [(38),1965], introduced the concept of divisible activities and decomposition. They applied it in decomposition of project networks. The last major contribution was disjunctive constraints due to Roy and Sussman, Balas and others.

Numerous applications of above methods are seen. One such important area is 'Project Planning and Evaluation.' A number of authors have worked on this problem. Some of them are given in references.

The next application refers to job-shop scheduling problems which is due to Thrillings [(44),1966]. Other scheduling and allocation problems were studied by Klein [(29),1967], Krishnamoorthy [(32),1968] and Martino [(36),1965]. Line balancing applications were due to Digman [(9),1967] in his paper on PERT and LOB. Another application in the 'Tableau method' is by Riggs and Inove [(40),1966]. Information theory applications were studied by Vocttl and Burnbough.

Linear Programming and Network Flow Approach

Charnes and Cooper [(5),1962] convert a project graph to a network flow problem in which a hypothetical unit of flow (+1) leaves the start event and enters the end event. A flow of (—1) is ascribed to the end event. All intermediate events play the role of transhipment points having conservation of flow. Accordingly, the activity duration (d_{ij}) is interpreted as the time (or cost) of transporting a unit of flow from event (i) to event (j). The related linear programming problem can be formulated with the help of non-negative flow variables (x_{ij}) correspnding to activities (i, j) which maximises the function $\Sigma\Sigma d_{ij}\, x_{ij}$ subject to terminal event conditions $\sum_J x_{ij} = -\sum_i x_{iN} = 1$ and the flow conservation in transhipment points $\sum_i x_{ij} = \sum_K x_{jK}$ for each $j = (2,3,\ldots\ldots N-1)$. This generalised form assumes that $x_{ij} = 0$, if there is no activity connecting events i and j. In this manner, the primal problem and its dual can always be written and the solution so obtained, gives the total project duration. This can be further viewed as a spanning tree which forms a connect graph with no loops.

Fulkerson [(17),1961] discussed a network flow computation for project cost curves. A network flow method is outlined for solving linear programming problem of computing the least cost curve for a project comprising many individual jobs, when it is assumed that certain jobs must be finished before others can be started. Each job has an associated crash completion time and normal completion time and cost of doing the job varies linearly between these extreme times. Given that the project must be completed in a prespecified time interval, it is desired to find job times that minimises total project cost. The above work of

Charnes and Cooper was further extended by Levy, Thompson and Wiest [(33), 1962] from the mathematical point of view. Kelley's contribution to this class of problems is significant. He wrote three papers. The first one was on 'Parametric Programming and the Primal Dual Algorithm' [(27),1961]. The next important paper related to 'Critical Path Planning and Scheduling.' This was a new tool for planning, scheduling and coordinating complex engineering-type model that incorporates sequence information, duration and costs for each component of the project. It is a special parametric linear programme that, *via* the primal-dual algorithm, may be solved efficiently by network flow methods. Analysis of the solution of the model enables operating personnel to answer questions concerning labour needs, budget requirements, procurement and design limitations, the effects of delays and communication difficulties.

The third paper by Kelley deals with experiences relating to combining CPM and Short Interval Scheduling (SIS) [(28b),1972]. This paper points to a way of successfully translating network plans and schedules into completed action. CPM was used to plan and update the work sequence, labour requirements and schedules using specific computer program. SIS complemented this activity by controlling the network execution, including the establishment of short period goals for line supervision, the follow up of work accomplishment and the correction for deviations. The results showed that savings in labour hours of 20% or more are possible by the union of techniques.

Glover *et.al.* [(20),1972] deal with basic dual feasible solutions for a class of generalised network. They characterise the properties of a special class of generalised network problem that permit a dual feasible basic solution to be determined in one 'pass' through the network. In particular, this class includes the class of pure network problems for which no such procedure existed previously.

The last paper is due to Moder and Philips [(37),1964] which deals with project management with CPM and PERT using linear programming network flow structure.

Divisibility and Decomposition

Jewell [(24), 1965], considers a project where an activity having total time (U) may be divided and allocated with non-negative values t_{ij} to two or

more locations (i, j) denoted by the subset D, $\{(i, j) \Sigma D\}$, of the project network and for each i, (i=1, 2,...N), V_i represents its time of occurence. The original primal and its dual are modified by bringing the primal constraint for (U) into the objective function with the help of an unknown Lagrange multiplier (Q). The modified form, facilitates the use of a standard network flow approach. A parametric procedure is initiated with a large value of Q. As this value is decreased gradually, there is a resultant increase in the allocation of time (t_{ij}) to the D activities. The procedure terminates when this allocation reaches the desired level (U), i. e., $\Sigma\Sigma_D t_{ij} = U$. In the case of several divisibile activities (K), the modified primal objective function becomes :

$$MIN=[(V_N-V_1+\sum_{k=1}^{K}\left(\frac{1}{Q_K}\right)(U_K-\Sigma\Sigma_D t_{ij})]$$

The dual of this may be recognised as a multi-commodity network flow problem. Jewell suggests further extensions of the model to include time-cost trade off principles.

Primal	*Dual*
Min $T=v_N-v_1$ S. T. C. $v_j-v_i \geqq T_{ij}$ $[(i,j)\varepsilon\bar{D}]$ $v_j-v_i-t_{ij} \geqslant 0$ $\Sigma\Sigma_D\ t_{ij} \geqslant U$ $[(i,j\varepsilon D)]$ $t_{ij} \geqslant 0$	Max $L=(\Sigma\Sigma_{\bar{D}})\ T_{ij}Z_{ij}+U_y$ S. T. C. $\Sigma_j (Z_{ji}-Z_{ij}) = \begin{cases} -1, & i=1 \\ 0, & i=(2\ldots N-1) \\ +1, & i=N \end{cases}$ $Z_{ij} \geqslant O$, $[i,j\varepsilon\bar{D}]$ $-y+Z_{ij} \geqslant O$ $[(i,j)\ \varepsilon D]$ $y \geqslant O$

Modified Primal	*Modified Dual*
Min $T=Q\ (v_N-v_1)+(U-\Sigma\Sigma_D\ t_{ij})$ S. T. C. $v_j-v_i \geqslant T_{ij}$ $[i,j\varepsilon\bar{D}]$ $v_j-v_i-t_{ij} \geqslant O$ $t_{ij} \geqslant O$ $[(i,j)\varepsilon D)]$	Max $£=\Sigma\Sigma_D T_{ij}x_{ij}+U$ S. T. C. $\Sigma_j (x_{ji}-x_{ij}) = \begin{cases} -Q, & i=1 \\ O, & i=2,\ldots\ldots N-1 \\ +Q, & i=N \end{cases}$ $x_{ij} \geqslant O$ $[i,j]\ \varepsilon\bar{D}]$ $x_{ij} \geqslant 1$ $[(i,j)\ \varepsilon D]$

Aonuma [(1),1964] has written on a 'Partition Algorithm for Critical Path Method. Parikh and Jewell [(38),1965] further consider decomposition aspect of a project network. This presents a method to 'tear' or 'decompose' a project network into several sub-networks, schedule the sub-networks and then to put the sub-networks back together. A computational algorithm is given for time-only networks; then two computational formulations are given for cost-time network of project sub-networks. The latter essentially generalises the algorithm due to Fulkerson in order to handle piece-wise linear, convex cost-time curves for some or all the activities.

Brucker and Blannings [(3),1972] introduce the concept of maximal cyclic index to the technique of decomposition. Gravess [(21),1965] further develops on Decomposition of Integer Programmes. His approach is in cutting plane methods for solving this problem when the system has 'structure'. He does not discuss the situation when the problem can be decomposed in the original coordinate system. His thesis is that many problems which are computationally difficult can be solved more easily, provided Integer Programming sub-problems can be identified in the coordinate system which arise in the process of adding, Gomory cuts and pivoting. Luttgen [(34),1966] further discusses and extends the problem of Reduction and Decomposition.

Jewell [(24),1965] considers *divisible activities in Critical Path Analysis.* In this paper, a critical path scheduling problem is investigated in which a single activity can have its completion time divided up and allocated to different 'locations' in the project precedence network. An algorithm for determining the allocation that minimises total project duration is given. This algorithm is very similar to those used in network flow problems and uses only integer valued variables, the final results for the divisible-activity network are, in general, rational numbers. He further develops this model to *Divisible and Movable Activities in Critical Path Analysis.*

This paper extends the model to *multiple jobs* of divisible type. The general approach is *via* the decomposition method of linear programming, however, the resulting algorithm is again fairly simple. Optimal cost-time solutions, possibly infinite, are generated by known algorithms. The resulting schedules or cuts are then combined into a simple, special structure linear program. The second part of the paper gives a branch

and bound procedure for the problem of movable activities, together with efficient heuristics for arbitrating and bounding these locations, using only the ordinary critical path algorithm. Examples are given for both the models. Kobayashi [(30),1967] comments on the above work and extends the results in his paper on 'The Critical Path Analysis for a Project with a Divisible Activity.'

Conjunctive and Disjunctive Activities

Another development in the original network is in the use of disjunctive constraints due to Roy and Sussman [(41),1964] developed further by Balas. Sussman deals with disjunctive constraints in Critical Path Analysis. He defines disjunctive constraints as those which allow a mathematical representation of the fact that two time intervals related to two jobs must be separate. This condition arises because a particular means (machine or person) must be available during both time intervals. First, he shows how such a requirement may be mathematically formulated and then attempts a survey of published works, together with some recent research. Four types of treatments are discussed which allow a rigorous or heuristic solution of these problems. They are :

(a) progressive construction methods based on local decision rules;

(b) systematic exploration methods (random or directed);

(c) mathematical programming (aiming at selecting an optimum solution); and

(d) rigorous and specific methods for particular problems.

He gives an algorithm for one class of sequencing problems with disjunctive constraints.

Sussman [(43),1972] extends the problem to 'Scheduling Problems with *Interval Disjunctions*. Interval disjunctions arise in scheduling problems when the durations of some jobs are constrained not to overlap. A general class of deterministic scheduling problems with interval disjunctions is discussed in this paper. Raimond deals with 'Disjunctive PERT Networks : Minimisation of the Length of a Critical Path'. This paper defines a disjunctive PERT Network and presents a mixed integer formulation of the network. The different steps involved in a branch and bound algorithm leading to an optimal solution are also discussed.

Balas [(2),1967] discusses 'Discrete Programming by the Filter Method'. A two-phase procedure—the Filter method—is proposed for solving linear programmes with zero-one variable. In the next stage, an auxillary problem is constructed which is used to 'filter' the solutions to which the tests of the additive alogrithm are to be applied. The method is then extended by partitioning procedure to the mixed integer zero-one case, as well as to general integer and mixed integer programmes. Finally, a speciallised version of this method is used to tackle a general machine sequencing model, formulated as the problem of finding a mini-maximal path in a disjunctive graph.

Balas further deals with 'Machine sequencing *via* disjunctive graphs : An Implicit Enumeration Algorithm'. One formulation of machine sequencing problem is finding a mini-maximal path in a disjunctive graph. The paper describes an implicit enumeration procedure that solves the problem by generating a sequence of circuit free graphs and solving a slightly amended cricital path problem for each graph in the sequence. Each new term of the sequence is generated from an earlier one by complementing one disjunctive arc. The search tree is drastically cut down by the fact that the only disjunctive arcs that have to be considered for being complemented are those on a critical path.

These disjunctive constraints are used in machine sequencing problem illustrated in a network form, but the technique has much wider application '*Resource Allocation Problems*. Carotl uses this method in job shop scheduling problems.

Tableau Method

A recent paper on critical path scheduling—'A Tableau Method'—by Riggs and Inoue [(40), 1966] provides an interesting diversion from the main theme of Network Analysis. This is a practical technique associated with a Table-Matrix format, which may contain all information necessary to compute time schedule and to construct various graphical representations for Critical Path Analysis such as arrow network, bar chart, time chart, and manpower diagram (a useful tool for resource allocation). The Tableau algorithm is totally activity-oriented and requires no numbering of nodes or preliminary plotting of sequencial relationship in a graphical form. For example, it is no longer necessary to draw a graphical network to determine critical paths or any other path that may

be of interest. Though the Tableau Method could generate *"Free Float"*, a more useful *"Independent Float"* is found for each activity in addition to its "Total Float."

C.P.S. Tableau has been found to provide more efficient algorithm for computer program over traditional programs by eliminating the need for node numbering. As a manual method, it can also serve as a compact historical record, as well as a conventional planning tool. The application of the method can further be extended to assist in allocating equipment, levelling manpower assignment and to find time cost curves of a Dual Network. Simple Dynamic Programming problems, such as the Travelling Salesman Problem, may also be solved by this method. □

Appendix

Definitions and Notations

(i) *Graph/Network* : Consists of a set of nodes and a set of links. Figure 1 is an example of a graph/network. In 'network' a flow of some type is recorded in its branches.

(ii) *Critical Path Analysis (CPA)* : The project network analysis technique used for determining the minimum project duration.

(iii) *Network Flow* : A node in a network is referred to as a 'source' if every one of its branches has an orientation that the flow moves away from that node. Similarly, it is called a 'sink', if each of its branches is oriented towards that node. A *movement* from source to sink is called a *network flow*.

(iv) *Network Flow Problem* : Is a class of problems concerned with finding maximum steady flow from one point to another point in a net work that has capacity and requirement constraints on its arcs/branches.

(v) *Network Analysis* : A group of techniques for presenting information to assist the planning and controlling of projects. The information, usually represented by a network, includes the sequence and logical inter-relationships of all project activities. This group includes techniques for dealing with time, with resource and with cost.

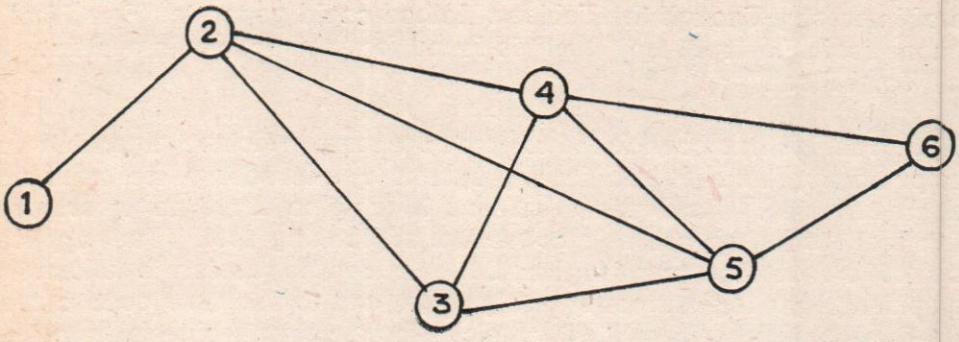


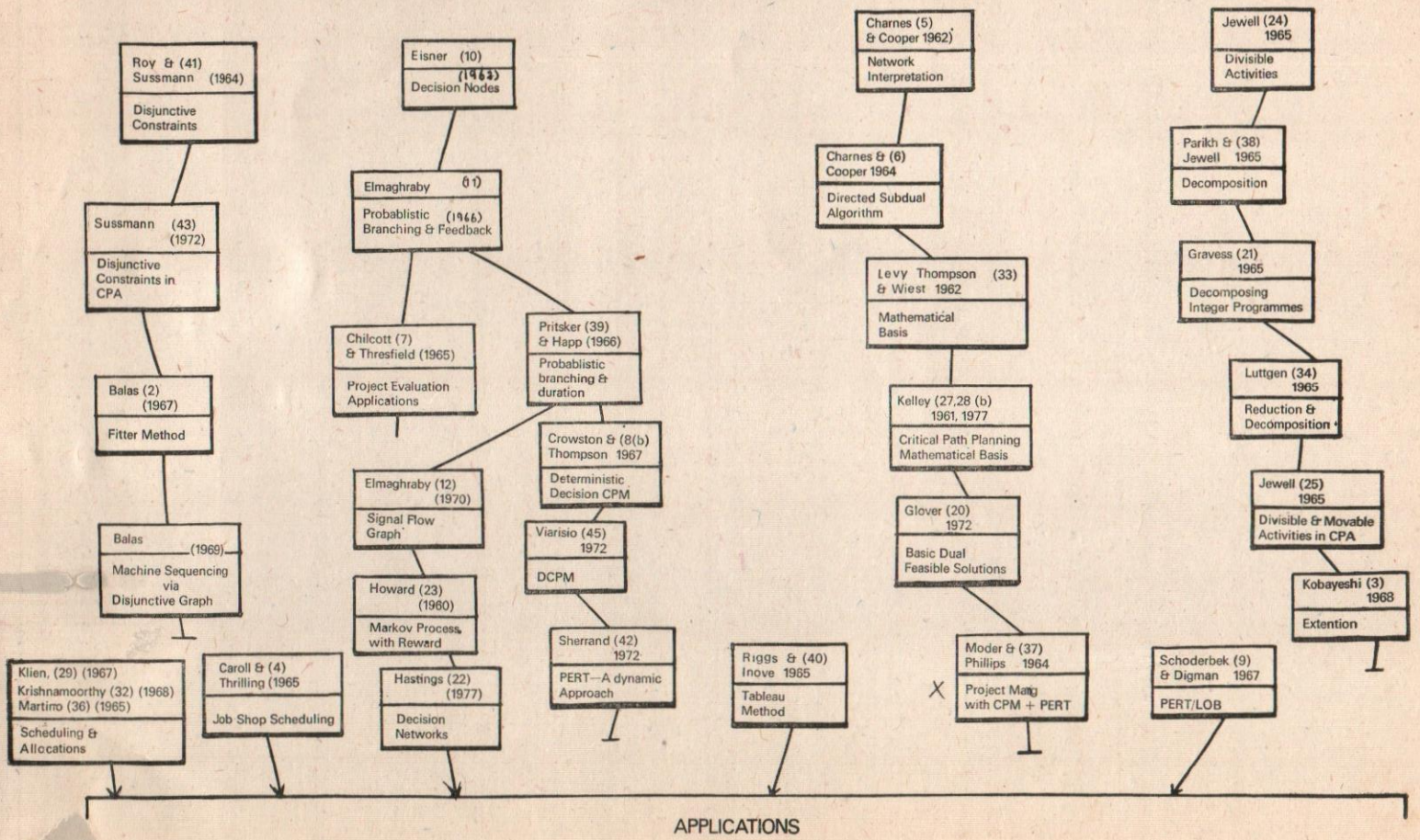
Fig. 1 : Example of a Graph/Network

(vi) Disjunctive graph and disjunctive constraints : In a directed acyclic network, a *disjunctive constraint* is difined in such a manner so as to ensure that a given resource is not consumed simultaneously by two or more activities (when this condition is not satified the arcs are called *conjunctive*). Let the nodes (i) and (j) represent two such activities with durations d_{ij} and d_{ji} respectively and let their starting terms be (t) and (t_j) then, the *disjunctive constraint* can be expressed as :

$$(t_i - t_j \geqslant d_j) \quad V \quad (t_j - t_i \geqslant d_i)$$

Although the condition that atleast one of the two activities should hold, the fact that $d_{ij} \geqslant 0$ and $d_{ji} \geqslant 0$ implies that only one of the inequalities can hold.

(vii) Divisibility and Decomposition : A single activity can have its completion time *divided* up and allocated to different 'locations' in the project network. Divisibility algorithm is used for determining the allocations that minimises the total project duration. The term decomposition means to 'tear' or decompose a project network into several sub-networks; schedule the sub-networks and then put the sub-networks back together. This process is called *decomposition*.



ALGEBRA OF PROJECT NETWORKS

Bibliography

1. Aonuma, T "On a Partition Algorithm for Critical Path Method" *Journal of the Operations Reasearch Society of Japan*, Vol. 7, No. 2 Dec. (1964) pp. 49-67.

2. Balas, E, "Discrete Programming by the Filter Method", *Operations Research*, Vol. 15, pp. 915-957, (1967).

3. Brucker, Peter, (D-84 Regensburg 2, Postfack 397, Germany) "Dekomposition Zyklisch Struckturierter Netzeerke, *Physica-Verlag* (D-87 Wurzburg 2, Postfach 1136, Germany) 1972, p. 11.

4. Caroll, DC, "Heuristic Sequencing of Single and Multiple Component Jobs", unpublished Ph. D. Thesis, Sloan School of Management, MIT., (June 1965).

5. Charnes, A and Cooper, WW, 'A Network Interpretation and a Directed Sub-dual Algorithm for Critical Path Scheduling, *J. of Indust. Eng.*, Vol. 13. pp. 213-219 (1962).

6. Charnes, A, Cooper, WW, and Thompson, GL, "Critical Path Analysis Via Chance Constrained and Stochastic Programming, "*Operations Research*, Vol. 12, pp. 460-470, (1964).

7. Chillcott, JF and Thursfield, P. "Network Planning Under Uncertainty ; Applications in Research Management, "Operational Research Society, Annual National Conference, Shrivenham, U.K., (1965).

8. Crowston, W "Network Planning Models," unpublished Ph. D. Thesis, Carnegie Institute of Technology, (1967).

8b. Crowston, W. and Thompson, GL. "Decision CPM : A Method for Simultaneous Planning, Scheduling and Control of Projects", *Operations Research*, Vol. 15, pp. 40-427, (1967).

9. Digman, LA, "PERT/LOB : Life Cycle Technique", *Journal of Industrial Engineering*, Vol. XVIII, No. 2, Feb. (1967).

10. Elsner, H, "A Generalized Network Approach to the Planning and Scheduling of a Research Project," *Operations Research*, Vol. 10 pp. 115-125, (1962).

11. Elmaghraby. SE, "On Generalized Activity Networks", *J of Indust. Eng.*, Vol. 17, pp. 621-631, (1966).

12. Elmaghraby Salah E, "The Theory of Networks and Management Science, Part I", *Management Science*, Vo. 17, No. 1 Sept. (1970) pp.1-34.

13. Elmaghraby, Salah E, "The Theory of Networks and Management Science, Part II," *Management Science*, Vol. 17, No. 2, Oct. (1970) B, pp. 54-71.

14. Elmaghraby : Salah. E., "An Algebra for the Analysis of Generalised Activity Networks", *Management Science*, Vol. 10, pp. 494-514, (1964).

15. Ford, LR and Fulkerson, DR, 'A Simple Algorithm for Finding Maximal Network Flows and an Application to the Hitchcock Problem", *Canadian Journal of Mathematics*, Vol. 9, pp. 210-218, (1957).

16. Ford, LR, Jr. and Fulkerson, DR, *"Flows in Networks"*, Princeton University Press, Princeton, New Jersey, pp. 151-169, (1962).

17. Fulkerson, DR "A Network Flow Computation for Project Cost Curves, "*Management Science*, Vol. 7, pp. 167-178, (Jan.1961).

18. Fulkerson, DR, "Expected Critical Path Lengths in PERT Networks, "*Operations Research*, Vol. 10, pp. 808-817, (1962).

19. Fulkerson, DR, "Scheduling In Project Networks", RAND Memo R. M. 4137 PR, (June 1964).

20. Glover, Fred, Klingman, D, and Napier, A., "Basic Dual Feasible Solutions for a Class of Generalized Networks", *Operations Research*, Vol 20, No. 1, Jan-Feb. (1972), pp, 126-136.

21. Gravess, RL "Decomposing Integer Programmes", Tech. Report 6501, Centre for Mathematical Studies in Business and Economics, University of Chicago, Nov. (1965).

22. Hastings, NAJ, "*Decision Networks*", John Wiley, (1977).

23. Howard RA, *"Dynamic Programming and Markov Processes"*, Technology Press, M.I.T. Cambridge, Mass. & John Wiley, (1960).

24. Jewell, WS, "Divisible Activities in Critical Path Analysis, *"Operations Research*, Vol. 13, pp. 747-760, (1965).

25. Jewell, W.S., "Risk-Taking in Critical, Path Analysis", *Management Science*, Vol. 11, pp. 438-443, (1965).

26. Kelley, JE and Walker, MR, "Critical Path Planning and Scheduling," Proceedings of the Eastern Joint Computer Conference, (1959).

27. Kelley, JE, "Critical Path Planning and Scheduling": Mathematical Basis", *Operations Research*, Vol. 9, pp. 296-320, (1961).

28a. Kelley, JE, "Resource Planning and Scheduling," *Industrial Scheduling*, Edited by Muth and Thompson, Prentice Hall, Ch. 21, (1963).

28 b. Kelley, JE "Converting Network Flows into Actions", *Practical Applications of Project Planning by Network Techniques*, Vol. 1, pp. 14-24, (1972).

29. Klein, MM "Scheduling Project Networks," *Communications of the ACM*, Vol. 10. pp. 225-231, (1967).

30. Kobayashi, T, "Note on the Critical Path Analysis for a Project with a Divisible Activity, *Journal of Operations Research Society of Japan*, July (1967).

31. Kobayashi, T, "Flow diagram niokeru CPM" (Critical Path Metod In Flow Diagrams) (Japanese), *Keiei-Kagaku*, (Japan) 11 (1968) 3. & 4 (June), pp. 170-179.

32. Krishnamoorthy, M., *'Critical Path Methods : A Review'* Technical Report No. 1968-4, Dept. of Industrial Engineering, University of Michigan, Ann Arbor, Michigan. (1968).

33. Levy, FK, Thompson, GL, and Wiest, JD, "Multiship Multishop Workload—Smoothing Program, *"Nav. Res. Logistics Quart.*, Vol. 8, pp. 37-44, (1962).

34. Luttgen, H., "Reduktion-und Dekomposition von Netzeerken", (Reduction and Decomposition of Project Networks), *Ablauf-and PlanungsForseung*, (West Germany), Vol. 7 pp. 92-104, (1966).

35. Malcolm, DG, Roseboom, JM, Clark, CE and Frazer, W., "Application of a Technique for Research and Development Programmes Evaluation", *Operations Research*, Vol. 7, pp. 646-669, (1959).

36. Martino, RL, *"Project Management and Control : Allocating and Scheduling Resources*, Vol. III (Book), American Management Association., New York, (1965).

37. Moder, JJ and Phillips, CR, *"Project Management with CPM and PERT"*, Reinhold Corp., N. Y., (1964).

38. Parikh, SC and Jewell, WS, Decomposition of Project Networks", *Management Science*, Vol. II, pp. 444-459, (1965) and "Note" by Blanning, RW and Rao, AG, Vol. 12, pp. 145-148, (1965).

39. Pritsker, AAB and Happ. WW, "GERT : Graphical Evaluation and Review Technique. Part I. Fundamentals, *"J. of Indust. Engg.*, Vol. 17, pp. 267-274, (1966).

40. Riggs, JL and Inoue, MS, "Critical Path Scheduling: Tableau Method", *Proceedings of the American Institute of Industrial Engineers*, pp. 273-282, (1966).

41. Roy, B. and Sussmann, B., *"Les Problemes D' ordonnancement avec constraintes disjunctives*, Rapport de Recherche No. 9 Direction Scientifique SEMA, (Oct. (1964).

42. Sherrand, William R, and Mehilick, Fred, "PERT : A Dynamic Approach", *Decision Sciences*, (U. S.) 3 (1972) 2 April, pp. 14-26.

43. Sussmann, Bernard G., "Scheduling Problems with Interval Disjunctions"., *Zeitschrift fur Operations Research*, (Germany) 16 (1972) 5 (Dec.), pp. 165-178.

44. Thrilling, DR, "Job Shop Simulation of Orders That Are Networks", *J. of Indust. Eng.*, Vol. 17, pp. 59-71, (1966).

45. Viarisio, Guido, "Management Decision System Based on Decision CPM", *Practical Applications of Project Planning by Network Techniques* J. Wiley (1972), Vol. 3, pp. 371-385.

Integer Programming Approach to Logical Decision Problems

Vivek Patkar* & P. C. Saxena**

Introduction

The art of decision making has undergone many changes with the introduction of Operations Research techniques to a number of areas. Linear programming has been extensively used for solving most of the management problems. Generally, in practical problems, the desired value of the decision variables has to be discrete, i.e., whole number and not the fractional one. To overcome this difficulty, integer linear programming techniques were developed[1, 3].

In decision making a special class of integer programming namely 0-1 (zero-one) programming is dealt with. That is, the decision variables can only take the value either zero or one. In many situations, the decision maker comes across the logical conditions which can be expressed by 0-1 programming problem because these 0-1 variables can be used to represent two valued decisions, e.g., 'yes or no', 'either..... or.....' etc. Now, these could also be conveniently represented by Boolean algerba but in order to avoid its techniques involving *truth tables* etc., a representation in terms of the linear equations and linear inequalities of integer programming is made (described in the next section). Williams [6] describes some problems of this kind.

In this paper, a few decision problems are analysed and a few possible situations are discussed where the approach presented would prove useful.

Boolean Statements in Terms of Integer Programming Constraints

The simple statements are combined into the compound statements in Boolean algebra by means of *Connectives*. Generally used connectives

* Dr. Patkar is with National Institute of Bank Management, Bombay, and **Dr. Saxena is with School of Computer and System Sciences, Jawahar Lal Nehru University, New Delhi.

Productivity, July-September 1979

defined hereunder :

i) *Components or Elements*—these are the parts of the system.

ii) *Attributes of Components*—these are measurable properties or characteristics of components, e. g., colour, weight, height, age, width, length.

iii) *Relationship Among Components*—these components of a system are always related to each other through their attributes, for example, the output of an assembly line may be related to the quality of work done by the employees.

iv) *Process or Action*—this is the behaviour of the system.

v) *Functions*—the system accomplishes its goal by its functions. What it does to the environment can be taken as the function of the system.

vi) *Sub-system*—in complex systems, a larger system may consist of smaller systems as components. These smaller systems are called sub-systems.

vii) *Inputs, Outputs and Throughputs*—each system can be viewed as having an *input* in terms of information, material or energy from outside the system. *Throughput* is the transformation or process performed by the system, while *output* is the end product going out of the system, which may be transmitted to the environment.

viii) *Black-box*—systems terminology uses the term 'black box' to refer to a component which performs action or processes an input in a stable and predictable manner, without our knowing what goes on within. The human mind is a good example of a black-box.

ix) *Boundary*—a particular system is further defined by its boundary. While conceiving of a system, its limits and boundaries have to be clearly identified. For example, a system may be classified as a machine system, which would mean that the machine system is bounded by the limits and boundaries in which the machinery operates components outside the immediate system.

x) *Closed and Open System*—from the view point of the nature of the boundaries, there can be two types of systems, i.e., *closed systems* and *open systems*. *Closed systems* operate automatically without

any exchange from the outside. *Open systems* are open to influence from their environment and also influence the environment in turn. For example, an organisation is an open system.

Simplified Inpnt-Output System

A simplified input-output system can be modelled as (Fig. 1).

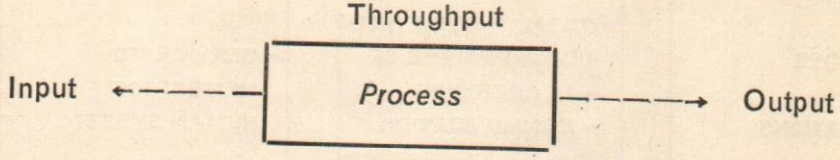


Fig. 1

Organisation as a System

Any organisation can be considered as complex open system, having many sub-systems, as illustrated (Fig. 2).

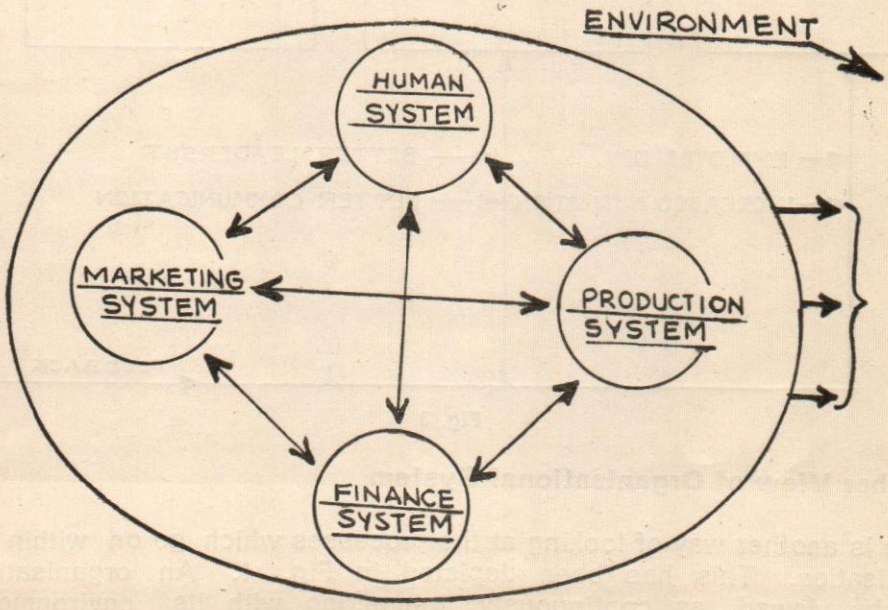


Fig. 2

Considering the organisation as an input-output system, it can be thought of as having seven essential resource inputs, as indicated in Fig. 3.

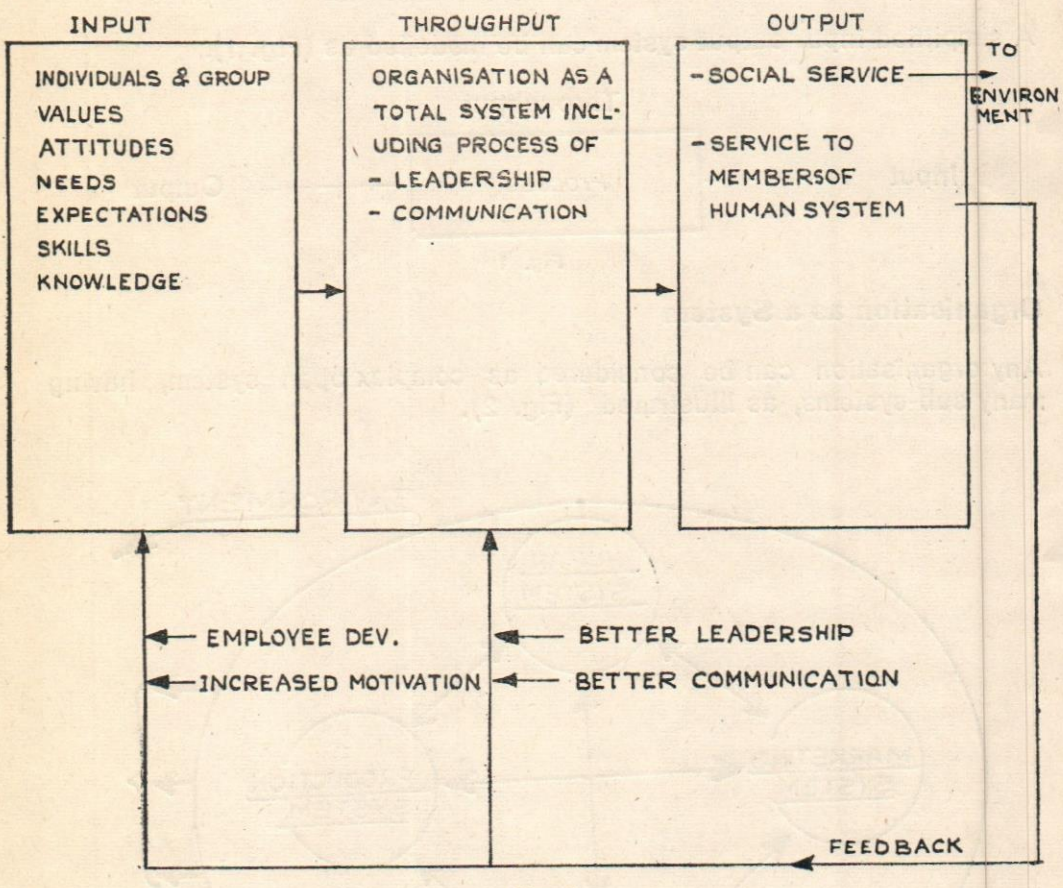


Fig. 3

Another View of Organisational System

There is another way of looking at the processes which go on within an organisation. This has been depicted in Fig. 4. An organisation can be viewed as continuously interacting with its environment. This process results in resistive forces being generated between

the environment and the organisation at the interacting points. The organisation has ultimately to succeeed in winning over the resistive forces which it meets. These resistive forces may relate to demands for products, shortage of resources, demand on quality, cost and time, etc.

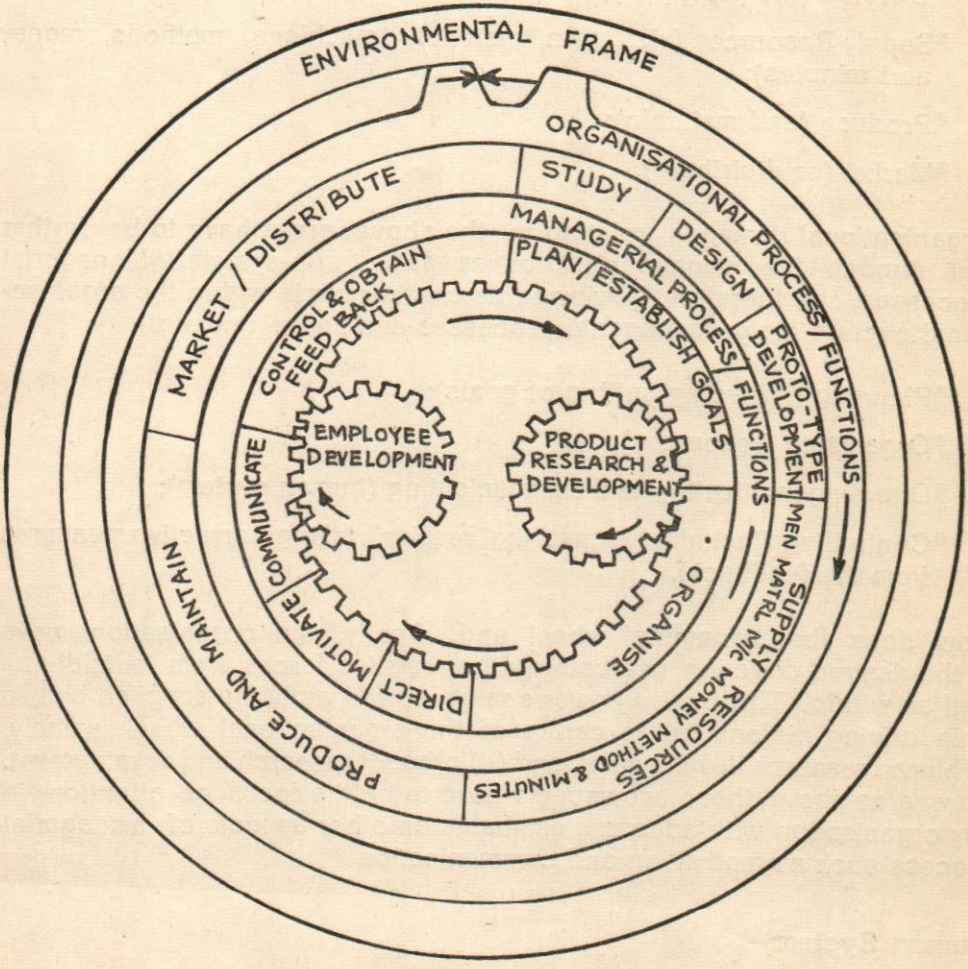


Fig. 4 : Processes within an Organisation

The organisational process or function which goes on inside come under the following six categories :

*Study (the environment, product, etc);

*Design (or redesign the product);

*Develop (the prototype);

*Supply Resources (viz., men, material, machines, methods, money and minutes);

*Produce (and maintain);

*Market (or distribute).

Organisational demands relating to the above areas have to be further met through the managerial process as a sub-system. Managerial processes, can therefore, be viewed as another circle within the organisational circle. Major managerial processes can be as under :

*Planning (including setting of goals);

*Organising (resources);

*Directing, motivating and communicating (human system);

*Controlling (including measuring results, taking corrective measures from the feedback).

How does the managerial wheel and, finally, the organisation move in the desired direction, overcoming the resistive forces from outside as well as within? This motive power can be viewed as being supplied by two main driving pinions in the centre of the organisational wheel, namely, (i) human resource development, and (ii) product research and development. Viewed as above, these two aspects have to be the focus of attention in any organisation with adequate emphasis on other aspects of managerial process such as motivation and communication

Human System

It would be seen from the above, that an organisation can be viewed as a complex system consisting of many sub-systems, such as human,

technology, accounting and financial sub-systems. The human system can be termed as one of the most important sub-systems of the total organisational system. By itself the human system can be conceived of in a simplified manner as in Fig. 5.

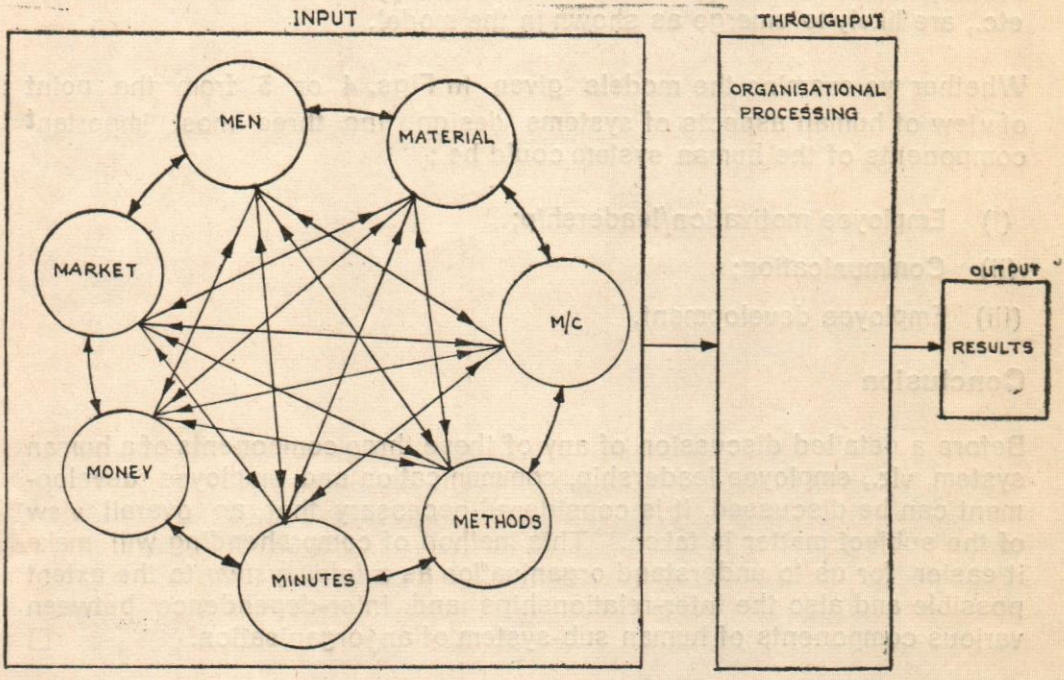


Fig. 5

Components of a Human System

The above models of the human system do not comprehend the reality fully. The human system of an organisation is bound to be a complex one. However, within certain boundaries, it is possible to conceive it in any of the manners shown earlier. A close scrutiny of the model (Fig. 5) would reveal that individuals and groups of individuals organised in a formal manner provide an input with their values, attitudes, needs, expectations, skills and knowledge into the organisation which has a component aspect such as the leadership styles of managers and communication sub-system. Finally, an output emerges out in terms of

attainment of goals. These goals on the one hand become an input to the external systems, but on the other hand also provide a feedback into inputs and throughputs conceived earlier. Through the feedback process, the human system can acquire increased motivation and employee development. Similarly, better leadership styles and communications etc., are likely to emerge as shown in the model.

Whether we examine the models given in Figs. 4 or 5 from the point of view of human aspects of systems design, the three most important components of the human system could be :

(i) Employee motivation/leadership;

(ii) Communication;

(iii) Employee development.

Conclusion

Before a detailed discussion of any of these three components of a human system, viz., employee leadership, communication and employee development can be discussed, it is considered necessary that an overall view of the subject matter is taken. This method of comprehending will make it easier for us to understand organisation as a *total system* to the extent possible and also the inter-relationships and inter-dependence between various components of human sub-system of an organisation. □

MBO in a Pharmaceutical Concern

L M Da Silva* & Berard F Pereira**

The Company

The company under study—where MBO is being practised for the last 30 months—is a multinational pharmaceutical concern. It began its activities in India in 1950 with a manufacturing plant in Maharashtra. In the course of years, it has developed to such an extent that, today, it has two manufacturing plants, one in Maharashtra and the other in Haryana.

The company's manpower today is around 2,500. Considering the growth of manpower in the last 25 years, it is seen that the employment figures have risen from around 50 in 1950, to 900 in 1960 and 2,000 in 1970 and 2,500 in 1977. Out of these, as many as 1,600 persons have been in the company for over 10 years, 900 have completed 15 years and 400 have put over 20 years of service.

The company lays special emphasis on manpower development to improve job knowledge and develop managerial skills. It extends this policy from managerial levels to the lowest supervisory level and has helped the employees to maintain and develop high standards of efficiency. The company also sends its staff abroad for training in world-wide manufacturing and research facilities.

Organisation Structure

At the helm of the company is the Managing Director, who is assisted by seven directors, viz., Resident Director, Administrative Director, Company Director, Personnel Director, Marketing Director, Production Director and Technical Director (Exhibit A). Each of these functional heads is assisted by various managers.

*Dr. (Miss) Da Silva is Medical Advisor, to Hoechst Pharmaceuticals Ltd., Bombay, and
**Mr. Pereira is Personnel Officer with Tata Electric Companies, Bombay.

"PRODUCITIVITY", July-September 1979, Vol. XX, No. 2

* Will it be possible to quantify objectives in case of service/staff jobs ?

* Will the MBO promoters become agents of the top management ?

Considering the expertise of those who were to implement MBO and, that the supervisory and managerial levels were already exposed to the MBO philosophy, the management decided to enter in this area with a forward thrust. Accordingly, the Managing Director along with the functional heads, met at a two-day session to define the role, purpose and the key result areas (KRA) of the company (Exhibit B). These KRAs were then translated into a Result Involvement Matrix (R-I Matrix) (Exhibit C). By March 1978, this corporate R-I Matrix was developed by the functional heads into a functional R-I Matrix, and finally by May 1978, each Officer/Manager of the company had developed his own KRA Document. As it is beyond the scope of this study to enter into the details of functional R-I Matrix, these have not been presented; however, as an illustrative example, R-I Matrix for the Personnel Function, along with the KRA Document of one of the Officers of this function, is detailed in Exhibits D and E.

Development of MBO

As expected, MBO has forged ahead in this company. A two-day review conference was held in October 1978, to assess the progress made and to plan action for its continuation and further improvement. The 123 participants were divided into 11 heterogeneous groups representing different functions, levels and locations. Each group selected one of its members as chairman who finally presented its recommenda-

MBO in the Company

The company introduced a number of service departments in the mid-sixties with a view to meet its growing needs. These included Quality Control, Production Planning and Control, Industrial Engineering, Waste Investigation, Process Control, Standard Costing and Budgetary Control, Organisation and Methods, Internal Audit, Data Processing, etc. In addition, steps were also taken to improve the situation by recruiting graduates in management, engineering and technology; imparting training to the technical and administrative staff in India and abroad, and by a more frequent supply of information at various management levels. It was, however, felt that a lot of managerial talent was still hamstrung and needed to be liberated. The company, therefore, needed something by which it could harness the otherwise furstrated energies of their young personnel. The Managing Director had read a little about MBO and, with a view to exploring it further, decided to send two senior managers for a five-day Seminar on MBO conducted by ASCI in November, 1976.

With the help of these managers, the concept and the practice of MBO was introduced in the company in January 1977. After a two-day workshop on MBO, it was decided that the functional heads were to

tions. These were then consolidated and the following decisions arrived at.

Participation : At lower unit/departmental levels, tentative objectives are to be set prior to the final formation by the divisional heads. This, it is hoped, will promote participation and bring in more ideas from the junior staff.

Delegation : It was felt that the Powers of Expenditure did not meet with the sanctioning responsibility of some of the company's personnel. It was, therefore, decided to examine these with the necessary alteration in delegation for smooth functioning.

Control Information : According to the common consensus of opinion, the control information was not satisfactory. The company is at present working on the development of a Management Information System with the help of consultants in keeping with its present needs.

Communication : It was generally agreed that MBO has led to some improvement in vertical communication. It was strongly emphasised that the success of a manager's job is dependent upon the cooperation he receives from other managers and vice versa. A number of inter-divisional panels have been formed and as a result managers concerned are able to appreciate each other's problems much better. This has led to some improvement in lateral communication but more needs to be done.

Conclusion

To successfully implement MBO, many factors become decisive. The honest commitment by senior management, the careful selection of advisers, the awareness of managerial needs and regular monitoring with frequent follow-up reviews, emerge as the crucial points to make MBO a success. Moreover, it permits high level company policies and managerial decisions to filter to lower cadres. And, above all, is the vital appreciation of its utility as an aid and not a panacea to solve all problems. It is designed to lead the company through a "Cultural Revolution".

Exhibit A

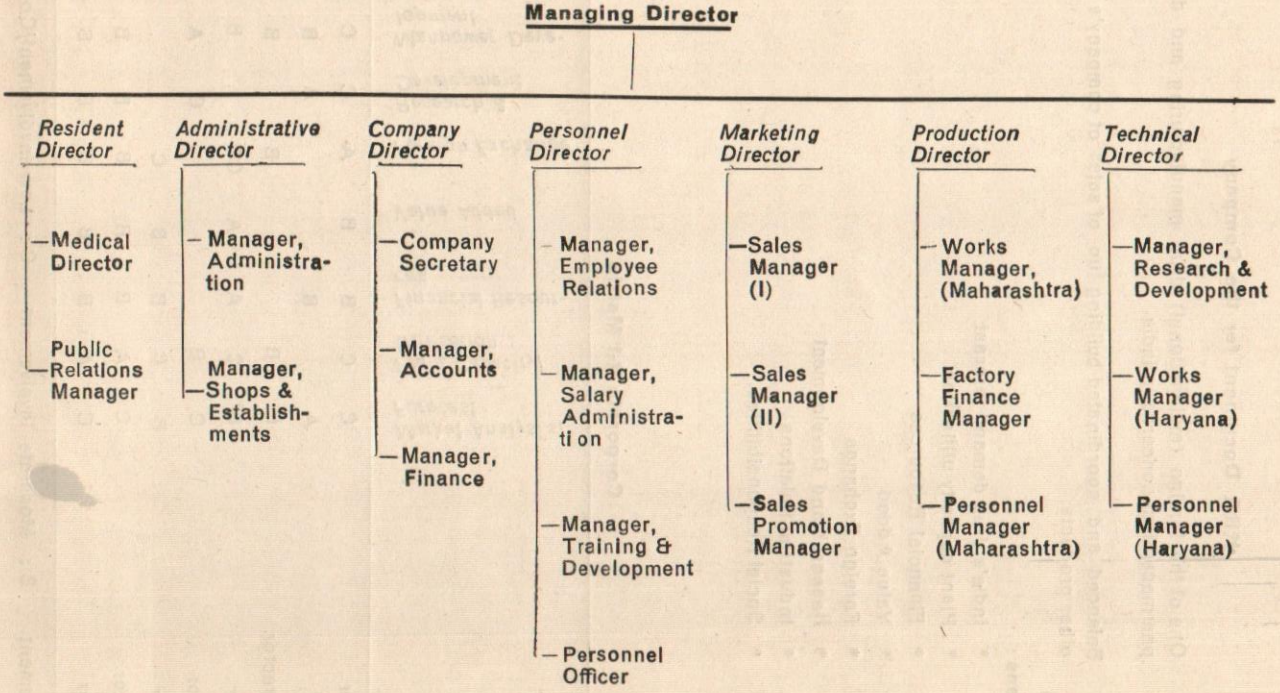

Managing Director
Resident Director
Medical Director
Public Relations Manager
Administrative Director
Manager, Administration
Manager, Shops & Establishments
Company Director
Company Secretary
Manager, Accounts
Manager, Finance
Personnel Director
Manager, Employee Relations
Manager, Salary Administration
Manager, Training & Development
Personnel Officer
Marketing Director
Sales Manager (I)
Sales Manager (II)
Sales Promotion Manager
Production Director
Works Manager, (Maharashtra)
Factory Finance Manager
Personnel Manager (Maharashtra)
Technical Director
Manager, Research & Development
Works Manager (Haryana)
Personnel Manager (Haryana)

Exhibit B

KRA Document for the Company

Role: One of the foreign (multinational) drug manufacturing and distributing, pharmaceutical concerns in India.

Purpose : Balanced and coordinated building up of sales of company's drugs and other products.

Key Results Areas :

* India's drug demand forecast
* Plant capacity utilisation
* Financial Resources
* Value Added
* Foreign Exchange
* Research and Development
* Industrial Relations
* Social Responsibilities.

Exhibit C

Corporate R-I Matrix

	Market Analysis/ Forecast	*Plant Capacity/ Utilisation*	*Financial Resources*	*Value Added*	*Foreign Exchange*	*Research & Development*	*Manpower Development*	*Industrial Relations*	*Social Responsibilities*
Managing Director	C	C	B	B	A	C	C	B	C
Resident Director	A		B			A	B		B
Administrative Director	C	B			B		B	B	A
Company Director	B	C	A	A	CC		B		
Personnel Director	C	B				C	A	A	B
Marketing Director	B	C	B	B	C				
Production Director	C	A	B	B	B	B	B	B	C
Technical Director	C	A	B	B	B	B	B	B	C

A : High Involvement B : Moderate Involvement C : Low involvement/Cooperation.

Exhibit D

R-I Matrix for Personnel Function

	Man Power										*Industrial Relations*					*Social Responsibilities*	
	Recruitment/Quality	*Retention Rate*	*Career Plan & Promotion*	*Discipline*	*Behaviour Change*	*Performance Improvement*	*Advice/Counselling*	*Wage Equity*	*Salary Equity*	*Reward System*	*Accidents/Health*	*Grievance Administration*	*Contract Terms*	*Negotiation*	*Union Relations*	*Family Services*	*Community Development*
Personnel Director	B	A	A			C	C		B						B		A
Manager, Employee Relations				A				B				A	A	A	A		
Manager, Salary Administration	A		B		B	B	C	A	A	A				B	B		
Manager, Training & Development		C	B	B	A	A	A		B	B		B					
Plant (Maharashtra) Personnel Manager	A	B	B	A	B	B	C		B			A	A	A	A		
Assistant Plant (Maharashtra) Personnel Manager	B	B		B	C		B	B		B	A		C	C		A	B
Plant (Haryana) Personnel Manager	A	B	B	A	B	B	B	C		C	A	A	A	A	A	A	
Personnel Officer (Corporate)	B	C		B			B	C			A	A	C	B	C	B	

Exhibit E

KRA Document for Manager, Training & Development

KRA			
Behavioural Change (R—I=A)	(1)	To organise a minimum of programmes on communication skills for middle managers	Comparative study by December '78/ January '79 to the Performance Appraisals of the Trainees with reference to their previous year's appraisal.
	(2)	To work out trainining plans for 1978-1979 in coordination with M/s. x, y and z for different kind of personnel by 20 6.1978 and coordinate its implementation	
	(3)	To organise 3 programmes to cover managers and union officials and to, therein sell to them the concept of workers' participation in management, so that they agree to its implementation in 1979.	
	(4)	Organise TA programme to a select group of senior executives, and to obtain their approval for its use in improving communication in the organisation.	
Performance Improvement (R–I=A)	(1)	To organise a Training Programme on Problem Solving Analysis to a select group of supervisory cadre personnel from the Maharashtra plant.	Cost-Benefit Analysis of the Programmes
Advice and Counselling (R—I=A)	(1)	To investigate into the transfer requests of different cadre of employees and advise them and those who are responsible for transfers.	
	(2)	To undergo a Counselling Course (Carkhauff Model) by the end ot the year.	
Discipline (R—I=B)	(1)	To develop human and close relationship with field personnel so that they do not find it necessary to use organised institution as a forum of self expression. The three major tools to be used will be as follows : a) Training Programmes b) Direct Dialogue	
Grievance Administration (R—I=B)		c) Determination of the most effective grievance model and its enforcement	Action Research on this and related areas.

Reward System (R—I=B)	(1)	To examine the rewards granted to the sales force by various pharmaceutical companies in particular, and compare the data thus collected to our reward system; and communicate its findings to Commercial Director	
Salary Equity (R—I=B)	(1)	To re-examine the compensation pattern of the sales force from the point of view of internal and external parity/change in CLI	Recommendations and findings to be submitted to Manager, Salary Administration by 30.9.1978
Retention Rate (R—I=C)	(1)	To undertake exit interviews and in the course evolve, in cooperation with the Personnel Director, a structured Exit-Interview Schedule	
	(2)	To interview those who have separated from the company for the last five years, and are serving today in other companies.	
Career Planning (R—I=C)	(1)	To ensure organisational continuity in the field by developing an accepted panel of potential sales representatives promotees by 15.9.1978.	
	(2)	To implement a select number of Individual development plans in consultation with Personnel Director.	

National Productivity Council

Regional Directorate 'DEEPAK', 13-Nehru Place
NEW DELHI - 110019

in Association with

BUREAU OF PUBLIC ENTERPRISES
AND
RAJASTHAN STATE PRODUCTIVITY COUNCIL

ANNOUNCES

Fifth Residential Seminar on

MODERN MANAGEMENT CONCEPTS

AT HOTEL MANSINGH, JAIPUR
27-29 SEPTEMBER 1979

TOPICS INCLUDE : Organisational Development, Corporate Planning; Management Development; Management by Objectives, Inflation Accounting; Management Audit.

The Resource Personnel will include : *Prof. Lloyd D. Brown*, Case Western Reserve University, Cleveland (U.S.A.); *Mr. Vinay Bharat Ram* (Executive Director, DCM); *Mr. Olaf Kleine* (Management Consultant, West Germany); *Mr. N. R. Jacobs* (Manager, ITC); *Mr. V. S. Tripathi* (Director, BPE); *Mr. S. M. Patankar* (Adviser, BPE); *Dr. Ram S. Tarneja* (General Manager, Times of India); *Dr. A. N. Saxena* (Director, National Productivity Council).

Fee : Rs. 1250/- inclusive of a board & lodging and Seminar material, etc.

ELEVENTH PROGRAMME FOR ADVANCEMENT OF MANAGEMENT AND PRODUCTIVITY (PAMP)

Objectives : Fostering better understanding of : *Corporate outlook so as to define corporate objectives, strategies and plans *The principles and procedures of policy making, planning, direction and control of an enterprise in the context of present-day socio-economic perspectives *The influence of socio-economic and technological factors on management and productivity *The inter-functional relationships and application of systems approach in improving managerial skills *The development and utilisation of human resources *The ways and means of promoting healthy industrial relations and productivity

Distinctive Features : *Exclusive concentration on post-experience management development effort *An intensive study of modern concepts and techniques of management with emphasis on developing an integrated approach leading to a realistic grasp of the interaction between different functions so essential for success at top level management *Rigorous disciplinary insights into management and its environment *An opportunity of living and working together with top and senior executives from public and private enterprises, banks and other service organisations, government establishments, public utilities and trade unions from India and other Asian countries

Venue : Hotel Oberoi Palace, Srinagar
Hotel Highland Park, Gulmarg

Duration : September 10 to 22, 1979

Fee : Rs. 6,500/-per participant. This includes Participation Fee, Board and Lodging and Course Material

Last date for application : July 20, 1979

For further information, please write to :

J. S. SARAON
Regional Director

National Productivity Council
1037, Sector 27-B, Chandigarh-160019
Telephones : 20361, 22871

On Line Management Information System : A Case

D.K. Jain*

Introduction

This article presents a case study of the application of an on line computerised Management Information System. A systems study of the movement of goods train wagons at Baroda Main Yard was conducted. It was found that the existing manual system uses data to generate 59 different reports during a month for management action and/or information. The study revealed that the modified system would be able to improve the accuracy of the reports and provide instantaneous answers to queries on the CRT display terminal.

The proposed system incorporates a microprocessor together with Floppy Disc Drives and Disketts, CRT display terminals, and a Serial Printer. The system provides for printed form of information presentation also. It will make possible availability of accurate and instantaneous answers to important questions such as

* Particulars of wagons in the yard,
* Oldest wagon in the yard or the number/list of wagons held for more than 24 hours,
* Inquiries from other yards regarding movement of a particular wagon,
* Train to which heavy detention wagon has been attached.

The existing normal system involves tedius record searching to answer the above queries and often the answers lack accuracy making management decision taking difficult.

Baroda Railway Division and the Baroda Main Yard

Baroda Division of the Western Railway controls the movement of passenger as well as goods trains. At the Main Marshalling Yard, about 35 goods trains are terminated and formed everyday besides about

* Mr. Jain is Chief Industrial Engineer, at Hindustan Zinc Ltd., Rajasthan.

15 goods trains which bypass through the bypass lines. Termination and formation of about 35 trains involves marshalling of about 1500 wagons. At any time there is a balance of about 2000 different categories of goods wagon.

It is proposed to study the application of the on line system for the goods train marshalling only at the Main Marshalling Yard.

Marshalling Yard is divided into two sections. One is for the trains to be marshalled (hump yard) and the other is for the bypass trains. For the bypass trains only inspection for the purpose of detecting any sick wagon is done. Hump yard is divided into UP reception, UP despatch, DN reception and DN despatch. UP side is Bombay, whereas DN side is Ahmedabad and the Godhra side. Trains coming from Ahmedabad and Godhra are received in the UP reception and similarly trains coming from Bombay side are received in the DN reception. On the despatch sides the various lines are earmarked for various destinations, say on the UP despatch, there will be one line for Jalgaon side for the wagons to go towards South India. An incoming train is received in the reception lines and may contain wagons for the various destinations. Shunting Zamadar's Book is maintained in the yard which contains the availability of wagons on the various lines in the yard and is updated as and when a transaction on the line takes place. A cut list is prepared for the received trains which shows which wagon will go on which line on the despatch side. This is prepared after taking into consideration the destination and total number of wagons on a particular despatch line and consulting the Shunting Zamadar's Book. After the cut list is ready, the line number to which a particular wagon is to go in despatch line is marked in big numeral by chalk on the wagon. At the time of humping the train, the wagon is made to go to the appropriate despatch line as indicated on it by chalk numeral. The operation is carried out manually by an operator who reads the chalk number and shifts the rail accordingly and the wagon goes to the appropriate line by the gravity force as it crosses the hump. The train is pushed at the back by an engine.

As soon as enough wagons accumulate on a particular line for a destination (as observed from Shunting Zamadar's Book) a train is formed.

Existing System

For an incoming/outgoing train Inward/Outward data is brought by the TNC's/STNC's in the number taker books. This contains the following information :

1. Line No., Train No. and Arrival Time
2. Station From
3. Station To
4. Owning Railway of each wagon
5. Corresponding Wagon No.
6. Tare Tonnes
7. Load Tonnes
8. Gross Tonnes

Running Diary/Vehicle Guidance Book contains information such as number of wagons for each destination, number of each type of wagon, driver's and guard's name, etc. It is prepared at Baroda Yard for all the outward trains and is transmitted to the control office for further transmission to the stations and other control offices. In case of trains arriving in the Baroda Yard, the running diary (Vehicle Guidance Book) is transmitted to Baroda Control Office. For the bypass trains, Inward/Outward number taker books are not prepared and the information is only recorded through the running diary/Vehicle Guidance Book. Most of the statistics are compiled from Inward/Outward number taker books for the Marshalled Trains and the Vehicle Guidance Book for the bypass trains.

In a flow diagram form (Fig.1) the information is collected and the various reports prepared. Discussed below are some of the important reports shown in Fig.1 and their information content :

1. ABC Register

ABC Register is used to note down the following particulars of each in/out train on a particular day :

1. Line No.
2. Train No.
3. Time
4. BVC No. and no. of other types of wagons (also location-wise)

2. Index Register

For each day a separate Index Register is maintained for all the trains coming from Bulsar, Ahmedabad and Godhra side. All the wagons from each side are listed in sequence of their last digit in the wagon number. This register is to facilitate location of the wagon as to when it has come. This will not be required in the computerised system as wagon tracing will be automatically carried out by the computer by the search process.

3. Wagon Exchange Book

Wagon exchange book is maintained to know the arrival, departure, detention time, etc., for a particular wagon. In the manual system it is the most important for wagon tracing, knowing the detention time, etc. In all, about 24 Wagon Exchange Books are maintained, one for each category of wagons as follows :

1. UP Through
2. UP Box Wagon
3. UP Oil Tank Wagons etc.
4. Down through Wagons (Ahmedabad)

The information contained in a Wagon Exchange Book is regarding

1. Owning Rly. of Wagon
2. Wagon No.
3. From
4. Train No.
5. Time
6. Date
7. Time
8. To Station
9. Detention

Pagewise summary of total number of wagons and total detention hours is worked out. For Sick Exchange Book data is also received from memos from TXR and inward/outward from sick lines.

It is proposed that in the Computerised System, train number by which the wagon leaves will also be recorded in the W.E.B. (to be maintained on computer) to facilitate tracing of wagons.

4. Balance Book

Two Balance Books are maintained. One UP Balance (trains to be despatched to Bombay side) and one DN Balance (trains to be despatched to Ahmedabad side). The Balance Book maintains the Stock Balance for each destination. After a train is despatched, an entry is made in the register in red ink and corresponding number of wagons are deducted to arrive at the remaining balance. The Register is updated as soon as a transaction takes place (wagons received or despatched). Data for the Balance Book is obtained from Inward/Outward Registers. The Balance is taken every 6 hours.

Objectives to be Met

It is proposed to meet the following specific objectives by the on line system :

1. Allow answers to queries at any moment of time such as following on immediate basis :

(a) Particulars of wagons in the yard,

(b) Oldest wagon in the yard on the number/list of wagons held for more than 24 hours,

(c) Average detention wagons,

(c) Inquiries from other yards regarding movement of a particular wagon,

(e) Train to which heavy detention wagon has been attached.

2. Make available printed reports as shown in Fig.2 on daily/10 day/monthly basis as the case may be. It is proposed to retain all reports regarding the wagon statistics, however, the information on the punctuality of the trains is not proposed to be computerised. Provision for expansion also exists in the hardware configuration proposed, if deemed necessary at a later stage. Certain other reports, such as the Railway Board Report, which contains multiplicity of information has to be compiled manually by taking the data from the computerised reports as well as other reports. Fig.3 shows the system configuration and the input data, output reports and answering of the queries through the system. Fig.4. shows the files to be maintained and the proposed processing procedures.

Proposed System

It is proposed that the TNC's would continue to bring the Inward/ Outward numbers data of the train and they would enter it into the GRT terminals through the keyboard. Data of Vehicle Guidance Book and other data as shown in Figs. 3 and 4 would also be fed through the CRT terminals. Arrival pattern of goods trains in a 24 hours duration is studied. This conforms to the Poisson distribution. Taking the mean arrival time of the 4 TNC's (one TNC in each line round the clock) and the mean time for entering the data in the CRT terminal and using the 'queueing theory' approach it was found that one terminal was not sufficient; two terminals would have to be installed. This would leave enough free time to answer the queries and would also increase the system reliability. It has been reported by the Baroda Yard Management that with an average of 5 queries a day, a maximum of about 200 queries a month on various aspects of the wagon status (tracing, detention, etc.) are received. It is proposed that the last 3 days' (including one current day, total 4 days) data of all wagons Inward and Outward will be maintained on two floppy disks both of which will be always on line on two Disk Drives. Data for more than three previous days will be converted through the third Disk Drive on the floppy disk to be stored off line. In view of the fact that the queries received are for wagons inwarded as long back as three months (only in extreme cases more than three months), it is proposed that upto three months data would be kept off line on floppy diskettes. A suitable indexing system of these disks can be used so that any query for wagon inwarded within three months can be answered by mounting the appropriate disk on the third disk drive. The answer to the query can be read on the CRT terminal as well as printed on the printer. It is anticipated that such a query can be answered within about 5 minutes time.

For the wagons outwarded in the past 24 hours a report on daily basis will be printed. Data on whichever are the wagons in the yard and not outwarded will always be maintained on the online disks. Also it is proposed that on a monthly basis an additional report shall be prepared which will contain data on wagons which have suffered more than seven days detention during the month. The above print out may be useful in answering queries for wagons inwarded more than three months back which may arise in very rare cases.

Ten day and monthly reports can be obtained by making access to the summary file and requesting the relevant reports. For all reports and daily data two copies can be obtained from the printer by using carbon paper stationery.

It is proposed that one operator each would be employed during each of the three shifts for reports taking, answering of queries, transferring of files etc. Operators can be trained from the existing staff at the yard. However, the TNC's would themselves enter the Inward/Outward data, Vehicle Guidance Book data, etc., into the CRT terminals.

Capacity of the System

It is reported that daily 2000 wagons are dealt with, including 500 of bypass trains. Also, it is reported that Baroda Yard cannot deal with more than 2500 wagons without major expansion of the facilities. Hence the present system has been designed for dealing with 2500 wagons a day. However, considering the spare time available on the CRT terminals, CPU and the printer, the system can cater to higher load than this.

Reliability of the System

Two CRT terminals are provided for TNC's to enter the data, in order to reduce the waiting time. This also provides extra reliability to the system, so that even if one CRT terminal is down, the other terminal may be used to enter the data. Similarly, since 3 disk drives have been provided, even if one disk drive is down, two disk drives for on line data can be kept running. Printer requirement for daily/10 days basis/ monthly reports is so nominal (peak requirement not expected to be more than 1 hour a day in a month), that even if the printer is down for a small duration, it will not affect the system reliability. CPU is of solid state circuitery with extremely high reliability.

As stated by the Baroda Division Management, it is extremely necessary to have in time the daily reports on UP/DN Balance, proforma F, E and COPS. Proforma F, E and COPS are essentially derived from UP/DN balance register and one TNC in each shift maintains this data. It is proposed to retain this post. TNC's will bring Inward/Outward information for trains from various lines and the above reports would be

prepared by the online system as discussed earlier. However, in extremely rare cases when the entire system is down (say power failure) for more than a few hours and at a time when those reports are desired (for transmitting to Western Railway, Bombay) they can be compiled manually by taking the previous day's balance (obtained through on line system) and the current Inward/Outward information brought by the TNCs.

Such a parallel arrangement would ensure 100 percent reliability of the entire Information Flow System. An appropriate cross checking system will be devised at the time of software development to avoid possible data entry errors by the TNCs. As an example, if a wagon number is wrongly entered in the terminal by a TNC for an outward train, inconsistency would be displayed on the CRT by cross checking with the wagon numbers of the wagon in the yard. Since this data is always maintained on line, the inconsistency would be displayed immediately after all the entries have been made for a train and can be corrected immediately.

Space and Environmental Requirement

A room 15ftx15ft size is suitable for installing the entire system. Since the system will be working round the clock in an area prone to dust, it is recommended that the room be airconditioned (to avoid dust and overheating) by a usual 1 tonne room airconditioner.

Costs/Benefits

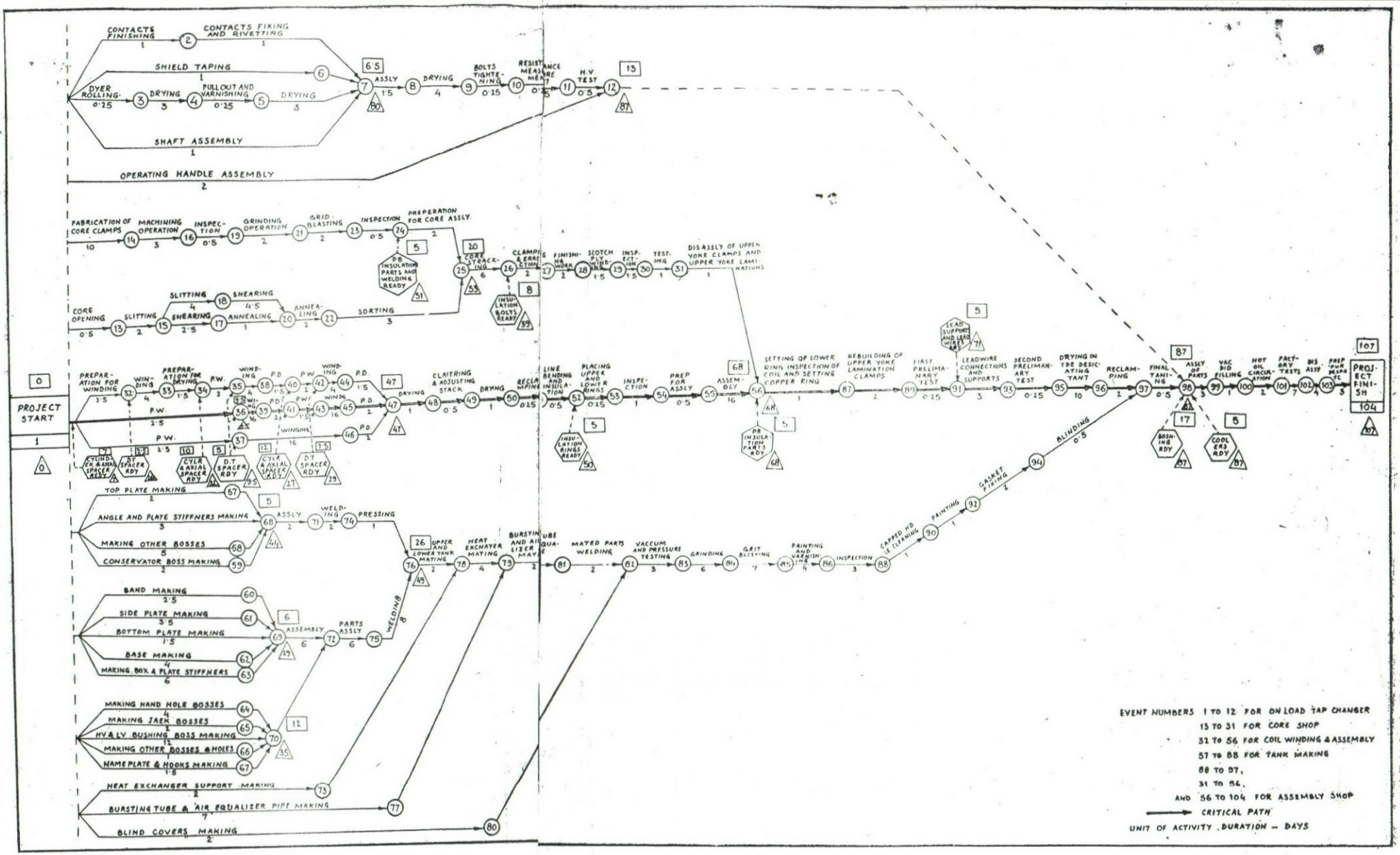
At a one time cost of around 6 lakhs and a recurring cost of Rs. 10,000 per year, the new system will provide the following benefits over the existing system :

Taking the salary savings of the clerical staff who can be transferred to do other important work and the recurring cost of maintaining the WTPS, the following rates of return are obtained :

Simple rate of return = 14 % Internal rate of return = 12 %

Reduced Detention Time of Wagons : Timely and accurate information will enable reduction of the detention time of the wagons considerably. This will enable yard to handle larger number of wagons as the load picks up. Future increases in load can be handled efficiently also by the staff and the Management.

Chart I : Network for 33 MVA Transformers



SAN/PWS/5
5-12-1977

RESOURCE ANALYSIS SCHEDULE (PWS)

DECEMBER 1977

CUSTOMER & M.O.NO.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
APEB 425 MVA 120120-2						PARTS GB	P.G 46x2	3X45	INSP 41X46																		
GEB 50 MVA 120127-1							UT GRIT BLAST	3X45		PG&V 46x2	INSP 41X46			PARTS GB 3X45	PG 46x2	INSP 41X46											
BEAS 60 MVA 130031-2																											
APEB 42·5 MVA 120120-3																											
GEB 50 MVA 120124-3																											
APE 42·5 MVA 120140-1																											
BEAS 83·3 MVA 130034-3																											
MHSEB 50 MVA 120129-1																											
PSEB 20 MVA 120079																											
MPEB 250 MVA 140011																											
AP 42·5 MVA 120140-2																											
CT AND PT		24 NOS T&S ϕ CT PLATES		43			CT PARTS PG 2X46							8 NOS 220 KV CT PLATES 43							PT PARTS - 8 SETS 43						24
OLTC			AP 425 41+42+43			LRN PARTS				GEB 50 41+42+43		132 KV INO		GEC PARTS 41+42+43						CROMPTON SALES 41+42+43							
GRIT BLASTING SCHEDULE						PARTS 1201	20-2	UT GEB 50 TANKS 123	27-1		BEAS 60 130031-2		TANK 131-2	UT PARTS 123-1 120	AR 42·5 120-3	UT 1800-3	PARTS 120-3			L T 1201	24-3	UT PARTS 120	124-3	SCC GB 1400A			TA 120
RESOURCES	41					7	6	9	9	10	14		12	11	10	14	9	10		14	12	12	12	14	12		10
	42					7	7	9	11	10	10		11	10	6	9	10	8		8	7	6	11	8	7		6
	43					14	11	7	6	6	6		8	10	10	11	12	9		7	14	12	11	7	4		4
	44					3	3	2	3	3	3		2	2	2	3	1	3		3	2	3	1	3	3		3
	45					3	3	3	3	3	3		3	3	3	3	3	3		3	3	3	3	3	3		3
	46					3	5	7	3	3	3		1	5	7	4	4	4		3	1	2	5	3	2		2

DECEMBER 1977 (27–31) / JANUARY 1978

CUSTOMER & M.O.NO.		27	28	29	30	31	1	2	3	4	5	6	7	8	9	10
CT AND PT		5 T&S ϕ CT PLATES 43							8 NOS 220 KV OT PLATES							
OLTC		C PARTS 1+42+43					GEB 50 220 KV PARTS	41+42+43								
GRIT BLASTING SCHEDULE		TANK 120	140-2	LT 120 140-1	LT 120 144-2			PARTS 140-2	PARTS 140-1	PCC 14001	LT TANK 130	34-3	UT 034-3		12	129-1
RESOURCES	41	10	11	12	9			10	7	5	3	3	2		2	1
	42	7	8	6	2			3	7	6	6	3	1		1	1
	43	7	6	6	8			11	10	9	8	3	6		6	6
	44	3	3	3	1			3	1	1	1	3	2		2	
	45	3	3	3	3			3	3	3	3	3	3		3	3
	46	3	3	3	3			3	2	4	3	1	2		4	1

TOTAL RESOURCES

RESOURCE	CODE	AV NO
SKILLED FITTER	41	16
SEMI-SKILLED FITTER	42	12
SKILLED WELDER	43	15

Ease in Tracing of Wagons : By making possible immediate availability of vital information of the stock, it will be possible to trace dislocated wagons thereby reducing the chances of penalties and misuse. It will also be possible to keep a close track of wagons carrying perishable goods.

Improved Customer Services : Quicker movement of stock and answering of queries on immediate basis will improve customer service. This may lead to generation of more traffic which can be conveniently handled due to increased wagon utilisation thereby resulting in increased profit to the Railways.

Improvement of Special Services : Certain services have been introduced by the Railways such as Container/QTS etc. It shall be possible to effect further improvement in these services and perhaps introduce similar other services. □

decision-making, cost determination and flow and cost accumlation on the basis of job order costing and process costing. The second section, dealing with planning, underlines cost-volume-profit analysis and the use of budgets in planning. Standard costs, flexible budgeting and overhead variance analysis, and human relations and responsibility accounting form the subject matter of section three which is developed to discussion on aspects of control. Techniques for special management decisions are discussed in section four in which variable costing, return on capital used, decisions involving alternative choices, pricing policies and capital expenditure decisions figure. Worked out examples and illustrations bearing on different topics dealt with in the study have enhanced the value of the book not only to students and teachers but also to professional accoutants towards improving their day to day practice Despite the fact that the background of the discussion is American, it has relevance in India.

Originally brought out in a much costlier edition, this cheaper Indian edition should find wide readership in both academic and professional circles, both among students and practioners □

*Dr. Chattopadhyay Is Director (Research) with Institute of Cost and Works Accountants of India, Calcutta.

Rural Leadership in the Context of Indian Modernisation

Paramatma Saran

Vikas Publishing House, New Delhi, pp. 132, Price Rs. 36.00

Reviewed by Ram K Vepa*

This book is a study conducted for the award of a doctoral degree by the City University of New York. It is based on field data collected by Dr. Verma in 1964-65 from 96 villages in Patna district which has a total number of 2354 villages. The present study, however, confines itself only to 16 villages out of the larger sample selected by Dr. Verma.

The object of the study was "to explore the extent to which changes in the economic, political and local conditions in a modernising society resulting in corresponding change in the attitudes and value of rural leadership." In other words, what does modernisation mean to leaders of public opinion in India's villages ? Can any definite trend be noticed in their attitudes and opinions as a result of the impact of new forces in the political, economic and social sectors ?

Modernisation is a process of transformation from a purely agrarian rural society to one becoming..... becoming what, is the puzzling question which sociologists are asking themselves. Quite obviously, the technological trends, the greater exposure to press, films and radio, the greater mobility of pepole, etc., all these are bound to have a perceptible impact on the attitudes of the village leadership.

Saran has attempted to quantify the attitudinal change through a process of interviewing 607 influential village leaders of whom 27 were women. The largest number of them (219) were between 30 and 39 and the smallest (106) over 50 years of age. In terms of caste affiliations, 167 belonged to the upper castes, 266 to the intermediate castes and 168 to lower. The overwhelming majority were Hindus (570) and 78.5% had some type of formal education. The majority (377) were cultivators by profession. A substantial proportion of them were exposed to Newspapers, Radio and the movies but 490 said 'no' to any formal political affiliation.

*Dr. Vepa is Development Commissioner, Small Scale Industries, Ministry of Industry, New Delhi.

Bihar, one of the most backward states in the country, is a particularly fruitful area for the study since its socio-economic pattern is an extremely complex one that cuts across political loyalties. In assessing the degree of Modernisation, Saran has attempted to use five criteria : attitude towards land legislation, exposure to mass media, value preference for leadership performance and involvement in the working of the Panchayat System. Information was also sought whether the leaders of the Panchayat were good or not, how they had voted in the last Panchayat elections, and whether, on the whole, the Panchayats could be regarded as successful.

The answers given to the questions have been analysed by Saran to obtain clues to the attitudinal changes in the thinking of village leaders. Some of the responses were as expected : those who are illiterate (and therefore from the lowest strata) favoured land legislation while, again, those who had gone to college favour it. Surprisingly, women scored higher on this account belying the popularly held mis-impression that women, as a whole, tend to be conservative; in fact, this came out consistently throughout the study and may well be most heartening result of it.

It is, of course, difficult at times to say with any accurancy whether the responses were genuine or what the respondent thought should be said. Thus, in Family Planning 536 (or nearly 90%) were said to have favoured it but the clean sweep of Janata Party in the '77 elections (where Family Planning became a crucial issue) makes one wonder how far this represented the true feelings of the respondents. Similarly, 510 stated they would vote for the Congress Party but it may well be that subsequent events made them change their mind.

It is interesting that the majority of them regarded the Panchayats as being basically good but were not impressed by the work of the officials. 42% felt that the corporation between the local leaders and the government bureaucracy was not adequate. In terms of democratic process, 491 favoured a majority system while only 93 favoured unanimity in settling matters.

Perhaps, the main value of a study such as that described in the book is not so much in the actual quantitative figures as in the broad conclusions it throws up. For instance, Saran has rightly pointed out that Modernisation may not always proceed in a one-dimensional direction; one is modern in some ways but traditional in others. In fact, any attempt to construct a single unique index of Modernisation seems destined to fail particularly in a society so complex as Rural India where the old and new live side by side and interact with each other.

Studies such as those made by Saran would help to provide the administrator and the academician profiles of the changes taking place in traditional societies under the impact of a Modernisation process. It, certainly, is a more complex process than is commonly believed and may be the reason for the constant dichotomy between ambitious Plans and the poor progress achieved.

A well-compiled Bibliography and index add to the utility of the book. □

Advertising

Kenneth A. Longman, Harcourt Brace Jovanovich Inc. New York, 1971, pp. 425

Reviewed by M M Anand*

There is no dearth of books dealing with various facets of advertising-ethics, philosophy, procedures, creativity, production, strategy or management. But most of them have approached the problem either from the practitioner's or theoretician's stand-point. Longman must be complemented for his attempt to bring out the present volume, which is aimed at bridging the gap between theory and practice. According to prof. William F Massy of Stanford University, the book provides true insights into the realities of advertising profession and where the author penetratingly illuminates and analyses his descriptive material at every stage. Above all, he adds, it is a book which is grounded in creativity—the touch-stone of advertising itself. Introducing the book, William J Colihan, Jr. of the American Association of Advertising Agencies has gone a step further and described it as the most complete book on advertising that has ever been written, possible the most complete book that has ever been contemplated and he goes on to add that let readers be warned "Longman may be the keynes of advertising and should not be thought of as a traditionalist."

The book has been logically divided into three parts. Part I deals at length with the context of advertising, covers historical background, studies its structure and economics, and its role in modern American industry. In part II, the author explains the planning process involved in defining advertsing

*Dr. Anand is with National Institute for Training in Industrial Engineering, Bombay.

goals, formulating copy and media strategy and determining advertising budget. White, the last part is concerned with production of advertising-writing and illustrating ads, implementing media strategy and coordinating with other marketing activities.

At the outset, it must be admitted that the author is an excellent practitioner. The book has been well promoted, both in terms of the credibility of the sources and advertising claims made. But what about the product ? What is the unique selling proposition, if any ?

First and foremost, a reader, who is looking for some insight into the realities of advertising from the point of view of a decision maker, is sadly disappointed. The book is highly descriptive and one is not sure if one would have the patience to go through the first 116 pages, which form part I. There are hardly any case studies. The hypothetical example of Able Food Company, which has been described as typical is far from it. It presupposes maximum sales level for a company, marketing efficiency, clear-cut data about cost—fixed, variable, etc, but the basic problem is not determination of break-even point but determination of various parameters such as maximum sales level for a Company. The reviewer is of the view that the author could have cited a number of live examples and case studies from his rich experience to reinforce the theory. The only campaign which has bean included to illustrate appears at the end of the book, viz., "The Coordinated Element of a Love Campaign."

Though the material is organised, at times, one does miss the connections and comes across avoidable repetitions. For instance, chapters 9 and 10 are definitely repetitive. No one would deny media considerations in copy platform but one would find difficult to agree with the treatment of media. Similarly, the last chapter "Advertising and other Marketing Activities" is a misfit. Since advertising is a part of marketing mix, it should logically find place either in the Context of Advertising or in "The Planning of Advertising" Similarly, one is not sure of the rationale of discussing the principle of communication and "How an Advertisement Works" after discussing the entire process of planning of advertising.

The book which has been described as the 'completest' is far from it—for instance, there is no mention of selection of an advertising agency, about agency relationship or its organisation. Testing of advertising is limited to copy research and testing. And here also, the treatment is rather sketchy.

The same is true of media strategy. Though the author does mention about "The High Assay Principle", i.e., the message should be sent where they will do the most good, yet, one is at a loss to know how to go about it. The model does not mention (not to speak of discussing) anything about various mathematical techniques such as linear programming, simulation or experimentation. Once again, the author has chosen to illustrate the application of the above principle with a hypothetical example, rather than illustrate the same with a case. Indeed, there are no illustrations or examples or their use.

The various models developed by the author for determining the appropriate function and the basic approaches suggested for the copy platform are useful tools for analysis. But one is not sure how to use the watertight approaches in highly overlapping situations. For instance, to quote the author "in advertising life insurance, it might be reasonable to make emotional appeals to the desire for security or to feelings of love and responsibility, but it would be inappropriate to appeal to desire to live dangerously". In this context, it may mentioned that two ads with headlines "What Would Become of Her" and "Retirement benefits at the age of 65" were pretested by John Caples - one of the World's renowned copywriters—and he found that the second ad generated five times more enquiries than the first one.

Lastly, the author's attempt to simplify some of the definitions have added unnecessary confusion. For instance, one finds hard to agree with the definition of Salesmanship which is as follows:—"where a persuasive communication is directed towords *a single individual*, it is an act of Salesmanship". Though the book is designed both for undergraduate and graduate students offering a course in advertising, yet, one feels that the undergraduate level exposure to managerial economics would be desirable. The book is highly readable, and the reviewer agrees with Prof. Massy that, as a writer, Longman is both fluent and interesting. □

Mathematics for Modern Management

B. V. Dean, Sasieni & Shiv K. Gupta

Wiley Eastern Pvt. Ltd., New Delhi., 1978, pp. 442, Rs. 25.00

Reviewed by Kanti Swarup*

This text book contains examples and exercises familiar to the students of modern management. Unfortunately, most of the available mathematics text has been written for students of the physical or engineering sciences and thus draw their examples and applicafions from classical machanics. This text book is an outgrowth of a graduate course, "Mathematics for Management Systems". The material has been presented in a form which is suitable for managers, technical staff and teachers to increase their ability to apply quantitative methods to the optimisation of systems.

The book contains five parts. The first part, Fundamental Concepts, includes elementary mathematics in terms of sets and relations, functional representation, limit and continuity and basic knowledge of coordinate geometry. The second part, Deterministic Systems, includes fundamentals of optimisation and its applications. In Part III Stochastic Systems', the authors have made a good attempt to present probability behaviour in management problems.

This is followed by part IV, 'Linear Systems', which provides the basic techniques for managers of production and marketing. The last section deals with The Mathematics of Finance. This part is well written for the students of Financial Management. It covers the basic concepts of finance and also discusses the insurance problems.

Each subject is introduced by means of examples, and numerous exercises are included at the end of each section as well as at the end of each chapter. There are two types of exercises : the first develops the reader's ability to apply mathematical concepts to the solution of management problems and the second develops the reader's ability to solve mathematical problems.

For executives who wish to keep abreast of recent advances, this book provides a convenient reference. Such advances require a competence in the newer quantitative methods and techniques. Books and articles written by management scientists have presupposed a knowledge of these concepts on

*Prof. Kanti Swarup is with the Indian Institute of Public Administration, New Delhi.

the part of the reader. However, often the manager finds it difficult to understand and apply these works because of a lack of knowledge of the underlying mathematics. The index to this book is sufficiently comprehensive to permit it to serve as a "dictionary of the mathematical terms used in management science." □

Market Study for a New Industrial Project

K. S. V. Menon

Vora & Co. Publishers Pvt. Ltd., Bombay, 1977, pp. 204, Rs. 20.00

Reviewed by G. Kantharaj*

Prospective entrepreneurs have to fulfil a number of obligations as stipulated by the plethora of agencies before new projects become a reality. The treatise makes an attempt to broach upon the intricacies of the important topic of market study for a new industrial project. The author tries to emphasise the crucial need for assessing the market potential of a product right at the conceptual phase of a project.

The credit policy of the financial institutions has a bearing on the technical feasibility and economic viability of a new proposal. Keeping in perspective the aspect of recession, commercial viability also assumes considerable significance.

The application of elasticity coefficients to the current demand for consumer goods and the additional factors which must be taken into account in the analysis of demand for intermediate and capital goods are well explained. Consumer behaviour is not really predictable and patterns cannot be evolved by the mere correlation of prices, incomes and quantities purchased. Apart from the economic consideration, the psychological and sociological influences have to be kept in view in analysing the demand for a product. Research studies are going on to make penetrative analysis of the factors that contribute towards consumer behaviour.

The techniques for demand forecasting are explained in detail. Accurate forecasting is a myth. There are no definite standards for assessing future demand and prices and the methods of projection used in practice have, therefore, practical limitations.

The methods of forecasting, viz., trend method, regression analysis, Delphi method, end use method etc., are well pronounced. The relationship between

Mr. Kantharaj is Director (TIPIE), in National Productivity Council, Madras.

(i) demand and price, (ii) demand and income (iii) demand, price and income are sufficiently dealt with.

The determinants of market share are elaborated. The theory of the competitive value of different marketing instruments at different stages in the product life-cycle are enunciated by the Finnish Economist, Gosta Mackwltz. His analysis of the changing elasticity of five competitive instruments, viz., product quality, price, advertising, service and packaging, constitutes interesting reading.

The author highlights the objectives and the precautions necessary for the preparation and interpretation of the market research report. Financial institutions evaluate market research reports to make investment decisions. A good market research report becomes an essential prerequisite to get the approval from the creditors.

The promoters should keep a constant vigil on the market and see how the demand projections and the actuals move after the project goes on stream. This may be also essential for the purpose of corporate planning.

Four case studies are judiciously chosen and presented in the book. These case studies stimulate the reader to think further about the important issues.

Overall, the book tries to convey the concepts and the techniques related to the market study for a new industrial project in a concise manner. This book could be recommended for prospective entrepreneurs and financial institutions. □

Export Marketing and International Business

S. Krishna

Centre for International Business ; pp. 108, Rs. 30.00 (£ 2.75 / $ 6.00)

Reviewed by G.C. Awasthy*

Though shorn of technicalities, yet, it would be a simplism to consider this book a primer for the layman or one uninitiated into the problems and complexities of export marketing. In fact, the maximum utility from this

*Mr. Awasthy is the Editor of Indian Journal of Communication Arts, New Delhi.

"PRODUCTIVITY", July-September, 1979, Vol. XX, No. 2

Productivity, July-September 1979

Appraising the definitional issues related to human capital formation and what they imply for economic analysis, the author discusses the role of human capital in economic growth and the methods of its measurement. He raises some interesting issues regarding the relationship between productivity and human capital intensity. Changes in human capital intensity at various stages of development and the use of the share of high level manpower in the total labour force as an indicator are thought-provoking and should form the basis of a nation-wide debate, maybe on grounds of its relevance and usefulness for purposes of planning and the costs impled in such compositional changes as against productivity and efficiency. He stresses the use of this indicator as one among several others while considering their relative merits and demerits.

Analysing the role of human capital in the application of new technology, he underscores the relationship between foreign participation in production and skill distribution and the need for linking human resource development polices with potential inflow of external resources, particularly physical, capital and technical know-how. The aspects of educational planning and approaches to human resource development in this country are subjected to a thorough scrutiny with reference to the objectives set in this regard and the results achieved. Empirical evidence culled from different sources has enriched his analysis and the propositions made.

Dhesi rightly suggests that there exists a definite relationship between technologies used by a society and the pattern of development of its human resources. He empasises that the role of higher education in producing knowledge should be given due recognition in setting up the input-output ratios in the educational system. Viewing on-the-job training as an important complementary of the educational system, he pleads for strengthening both from the standpoint of human capital formation. The degree of liberation from the shackles of tradition is, according to him, determined by the level of development achieved and the latter's rate of change creates the need for an adaptable institutional structure. Technological changes form the nucleus of many other changes, including those in skill requirements which demand larger investments in man.

The institutional and technical conditions influence the rate of technical and economic progress but for ensuring equitable distribution of the social gains arising from development an economy requires a highly sensitive institutional set up. The author stresses that public education should provide educa-

tional opportunities for persons of all age-groups, with freedom for mature students to enter, to leave when alternative experiences appear more meaningful, and then to re-enter. Such an open-loop system would require the best of coordination among the individuals aud institutions dispensing and receiving education. While the context of adult education has received a good deal of attention from the present Government, the open-loop system may be simply beyond our means, both financially and attitudinally That this is appropriate for a country like India can hardly be gainsaid, especially in view of the highly compartmentalised system of education that is followed, further confused by the age-old hierachy that exists in the system.

Both production of new technology and absorption of imported technology require highly developed skills. It is on grounds of inadequately developed human resources that innovative approaches to techno-economic progress remain at a low ebb, ill-digested and ill-directed. It is also on these grounds that planning for human resource development should be the core of economic plans. The task is gargantuan in a country like ours, but, as the author has shown, tt is not beyond our means and the tools and techniques therefor are not unknown. Right start is what is needed most. □

Trucking Operations in Asia : Problems and Solutions

(A Study Organised by Asian Productivity Organisation)

Asian Productivity Organisation, Tokyo, 1978 pp. 97

Reviewed by J.D. Verma*

The importance of road transport in the modern economy has gathered new dimensions as, on the side, there is a considerable acceleration in the mobility of men and material – an indicator of the process of economic growth, and, on the other, the cost of supplementing the resources already available in the form of railways, waterways, airways etc has increased tremendously. Besides, in a given situation, it is not always possible to provide all means of transport excepting the automobiles. As such, particularly in all developing countries the trucking operations are on the increase. Obviously, this has to be so, if the wheel of production has to remain in motion. Adam Smith's

*Dr. Verma is Director, Small Industries Development Organisation, Ministry of Industry, New Delhi.

proverbial statement, that the act of production of a commodity is not complete until it reaches the hands of consumer, holds as much true today as it was when it was made. However, like any other programme of development, the trucking operarions are also not free from problems. These relate to the availability of the automobiles, body building suiting to the specific nature of requirements in the form of goods to be transported, the relative imbalance between the demand and supply position of the automobiles as also of the manpower which has to run the vehicle both at the wheels as well as the loading and unloading level. Added to this is the road construction programme which again has to be specific according to the area, the vagaries of rainy season and availability of the repair facilities in the remote corners of the area of operation. This does not end here. One can add a lot to this list. Nevertheless, the fact remains that 40% of the total load is handled by trucks within the national boundaries because of their speediness, door to door delivery service and complementary relationship with other modes of transport. In spite of all this, the trucking industry has not been able to streamline its working as also provide efficient service to the consumer due to inherent shortcomings of the prevailing structure of the operations. These vary from country to country and even within the same country, these vary from state to state. While there are numerous factors responsible for this situation. the basic fact remains that, by and large, trucking operations are in the hands of small and, to some extent, not very efficient units. It is with this background that the Asian Productivity Organisation organised a fact-finding survey in 1976 in 9 APO-Member countries, viz., Iran, Pakistan, India, Srilanka, Thailand, Indonesia, Phillipines, Republic of China and Japan. It must be stated that the APO, by organising this survey, has done a useful service to the industry, the consumer, the Government and others concerned as the conclusions arrived at by the Survey Team pose some of the practical problems to all of them as also to the policy makers. This study is not merely a compilation of a statistical data and its analysis but it is more than that, as the study covers aspects like causes of the accidents the trucks meet with, the frequency of accidents in various countries, the freight system and, above, all the affect of the hike in energy prices which has hit the industry hard in almost all non-oil producing countries.

The book is divided into the Survey Reports of the participating countries, measures for improving productivity in the trucking industry in Japan and the proceedings of a Symposium on Recommendations of Trucking Operations. The situation in Japan, is indeed, worth emulating by some of the Asian countries, notwithstanding some of the most prominent characteristics of

Japanese economy including high rate of economic growth and high density of population of some of its cities.

The Symposium referred to above and as reported in the book was organised to highlight the problems which the Study Team diagnosed and discussed, made recommendations which were meant to be considered by the governmental agencies, including Regional Transport Authorities, the individuals and the firms which normally utilise the services of the trucking operations, the assemblers of heavy automobiles and the workshops and the Associations of Truck Operators. Some of the recommendations are indeed most practicable and, if implemented, should, undoubtedly, increase the productivity of the industry.

One has to appreciate the Study as much as it deserves. However, it would have added to it if the Study Team had also considered ways and means which could reduce, if not totally eliminate, some of the problems which emanate from the trucking operations. These include pollution in the cities, indirect connivance between the truck operators and the anti-social elements like smugglers, tax-evaders and the like. In spite of this, as stated earlier, the Study is extremely useful for all sections of society which are concerned with trucking operations not only in Asian countries but also elsewhere.

□

Excellence in Management

M. K. Rustomji

India Book House Private Limited, Bombay, pp. 180. Rs. 15.00

Reviewed by Kewal Soeny*

Rustomji has done yeoman's service to simplify management concepts and to keep them within the realm of practicality. That is why there is a universal appeal for his numerous publications on the subject.

It would be no exaggeration, if one comments that Excellence in Management has largely depended en the previous books. Rustomji's first book, "Getting Along Better with People" was a good example of beautifully expounding the

*Mr. Soeny is Education Officer with All India Management Association, New Delhi.

human relations concepts. In the present book, about eight chapters out of a total of 18 are devoted to this subject under different headings like Human Relations, How to Build a Team, Elements of Leadership, How to Size Up People, Developing People, Man Management, etc. To that extent, it is old wine in a new bottle. The other topics covered are How to Organise, How to Build a Team; Judgment and Creativity; Procedures; What Management by Objectives means; How to Control Costs, etc.

I would like to quote here from 'What Management by Objectives Means : "The emphasis in management, in the past, was that it is the boss who directs and controls. Over the last few years there has been a change in emphasis. The thinking now is that the unit or section manager should be directed not so much by the boss as by the tasks that have to be done.

□The managers of the various units or sub-units, or sections of an organisation should know not noly the objectives of their unit but should also actively participate in setting these objectives and take responsibility for them.

□The advantage of this approach is twofold : it frees senior executives from a great deal of day-to-day supervisory work, and work becomes more interesting and worthwhile for the sectional manager because he is given authority and left on his own.

□In every organisation there are factors which make for disintergration. One factor would be the manager in charge of specialised function : he is so anxious and keen about his own specialised function that he concentrates on this alone, to the detriment of the organisation as a whole. Then you get the ambitious manager who is only interested in the performance of his own section without any regard for the rest of the organisation. There are many other such disintegrating factors : dissatisfaction, company politics, empire building. The most effective manner in which these disintegrating factors can be countered is through setting up an organisation which is run on the principles of management by objectives.

From above, one get a feel of Rustomji's style. Obviously, it has made a big, positive contribution toward the acceptance of management as a science or an art of day-to-day interest to us. His books have brought management closer to our daily living.

Having studied practically all books written by Rustomji so far, the reviewer cannot help commenting that the theme has become somewhat stale, though for those not familiar with his earlier works, it would be exciting. So the real job is of taking this important knowledge to people who are still unaware of it.

The book is full of Roma Chakravarty's beautiful illustrations. They would be a source of pleasure and amusement. The 180 pages and the price of Rs. 15 are light burdens.

In the last analysis, one tends to go with what the introduction says : "It (the book) exudes more down-to-earth commonsense than a whole library of learned and weighty books on management". □

The New Manager

Martin M. Broadwell (Adapted by B. M. Kapur)

Shri Ram Centre for Industrial Relations and Human Resources, New Delhi, Rs. 30.00

Reviewed by Rahul Bhatnagar*

Right from the Preface, the book enlivens upon *the* manager without a formal grooming, and presumably, it educates him as to how to be a professional ! One does not have to take all that very seriously while awake; it is a good treatise before-you-go-to-sleep.

The style is straight forward and unconventional; directive but non-textual. rendering a fan of freshness. The author has covered almost all the inputs required for a manager to be a 'manager', but one may add that these remain untouched and unutilised for the Indian manager. The new manager is a perplexed employee. He remains new and perplexed all through his so-called professional career in the larger *Indian* context. Nevertheless, such reading exercises do provide an extra air to the person garbed as a manager (an adaptation of the American supervisor).

For motivating employees, the author has emphasised that, 'it is the job that holds the key' is a first rate myth. Here, we have the indicator that we need some development in the skillful art of 'adapted adoption'.

*Consultant in Behavioural Sciences, New Delhi.

We are confronted with two basic forces of negation that play havoc with *work* or *job*, viz., (i) the individual ego, and (ii) selfishness. These two human traits are battling with the professional-on-the-job, and the arena is none else but the 'Blunderland of Indian Employees'. The author has failed to highlight the techniques and skills to combat these traits, for he is an alien and the adapter is an *adapter*. The book has conceptually overlooked the pragmatic utility of these professional skills for the Indian manager.

One should endorse the adapter's acknowledgement that, indeed the author knows a lot. However, the adapter has been misled, for, his adaptation lacks the native acculturation of the American genius. He has retained the dialogues in spirit and soul but for the name sake (the names are Indian).

The typicality of the conspicuous Indian manager is that he himself fights a battle of survival in all humility with worst of humiliations to his cap. The only skill required here is that of 'bowing to the toe, to head the head',

The Indian framework has a communication network of transmitting massages, *not* messages. The reviewer infers that the adapter has not faced a situation so pragmatic enough to strike 'efficient management'.

Perhaps, in the entire book, the only part that asks for an applause is the Chapter on 'Interviewing Skills' which does pour out some cud to chew for the practitioners who need a thorough orientation of their interviewing skills.

However, the book is an intelligent scoop for a possible hit at the goal. The Epilogue is more satisfying and convincing than the dialogue. I am sure the book shall positively help the new Indian manager to better his look if not luck. □

Economic Environment of Business

M. Adhikary

Sultan Chand & Sons, 1978. pp. 466, Rs. 50.00

Reviewed by K. Nath*

The book under review attempts, interestingly, a charting of the economic enviroment of business in India. Economic environment is defined to be a subject of the 'total' environment in which business operates. While the influence of non-economic forces is taken cognisance of, they are, for the purpose of analytical simplification, treated as a given parameter, i.e., the analysis presented is acknowledgedly a partial one. Analysis is restricted to a review of the macro-economic system, the structural anatomy and functioning of the economy, policies, planning, resource endowment and the level of development—deemed constituents of the economic environment.

The book is structured logically, presenting initially, the theoretical foundations of the constituents of the economic environment and subsequently a description and mapping of the Indian economic environment. The theoretical exposition of the constituents of the economic environment is concise and elegant. Keynesian equilibrium analysis, post-Keynesian income determination models and the non-recent disequilibrium analysis models are presented lucidly. Similarly, current economic thinking on inflation is encapsulated succinctly, their policy implications : monetary, fiscal or sectoral, extended appropriately. However, part B, wherein Adhikary attempts a description and mapping of the Indian economic environment, disappoints.

In terms of classification, the Indian economic system is typified appropriately by Adhikary to be a mixed one. His perusal of constituent sectors, industrial revolutions and policy statements of successive governments, their embodiment in plan outlays and annual budgets, however, convinces him that the Indian economy can be characterised only as a hopelessly 'mixed-up' one while the conclusion is uncontestable, it is trite; one is prompted to retort 'so what else is new ?'

Adhikary's methodology comprises essentially of an adumbration of the economic units constituting the Indian economy and some macro-economic functions hoping to derive, thereby, some sort of meaningful mapping of the

*Mr. Nath is Director (Technical) with the Institute of Economic & Market Research, New Delhi.

Indian economic environment. But as he admits : " . despite our attempts to identify and describe (a) the economic units, ideas, institutions and movements and (b) the structural relations operating within the aggregate system, sometimes we just fail to understand its functioning", i. e., no meaningful conclusion about the mechanics of the Indian economy is derived thereby, at all. In the absence of such conclusion, Adhikary is restrained to delineate the Indian economic environment in terms of its constituent sectors—the household sector, private big business, the public sector, the small-scale industrial sector or the tiny sector, the capital market, management etc. Such description, however, has little analytical utility. Perhaps our current level of economic development precludes the hypothesisation of linkages/relationships, between constituent sectors with any degree of attitude. Such relationships, may, in fact, be tenous, indicating that the economic environment would largely be exogenously determined by the government in governmental policies and stategems. Adhikary indicates as much.

However, this appears to be too simplistic a stance to maintain. The pivotal constituents of the Indian economic environment are discernably Big Business and the Government. While this is recognised by Adhikary no concerted effort to trace the economic consequence of these two extant power centres is attempted whilst presumably, these would be pertinent in determining our economic environment.

This should not detract from the fact, however, that Adhikary has presented an engaging book. The theoretical chapters of the book are lucid, and his delineation of the Indian economic environment, informative. The book is readeable and distinctly worthy of perusal. □

Handbook of Effective Control of Absenteeism

S K Bhatia

Bharat Heavy Electricals Ltd., Tiruchi, pp. 96

Reviewed by Kewal Soeny*

The book is the kind of unit-based research work with which our industry should be involved. In this, the public sector should give the lead. There are numerous impediments in the way of higher productivity for which the solutions can be found within the organisations themselves. We can find means of tackling issues -- only we must discard the fire fighting strategy. Our attempt should be diagnostic and looking inwards for remedies rather than finding excuses when we are in waist-deep waters.

This is a study of absenteeism conducted at the Tiruchi unit of Bharat Heavy Electricals Ltd It aims to answer five basic questions : What is the quantum of absence ? What is the pattern ? Where is absence occuring ? How many individuals are involved and what conditions or factors cause absenteeism ? The central time office, departmental time office cells, computer output of leave data, medical department, pay roll cells, and personnel department provided the statistical details. It was found that absenteeism dropped from 17.32% in 1972 to 13.55% in 1976. The Tiruchi unit could claim lowest rate of absenteeism than the company's other units and it compared favourably with such rates in the neighbouring private sector companies like Dunlop, Madras Rubber Factory, Britannia Biscuits, etc. Broadly, absenteeism is maximum in May and November and is minimum in March, July and September. Earned leave and sick leave is availed of the most during peak production months. Only 40% of employees get their leave sanctioned in advance ; only 21% of industrial employees avail of leave encashment as against 53% in case of non-industrial employees.

For each of the reasons identified, recommendations have been made to overcome the problem. These include raising of accumulation limits, change of timings of advance credit, mutual change of shifts, allowing adjustment for personnel work with the approval of the supervisor, encouraging system of advance planning, drawing up of lists of habitual absentees and keeping track of their leave pattern, letters to wives of employees who take leave too

* Mr. Soeny is Education Officer with All India Management Association, New Delhi.

often, absenteeism to be reflected in the annual appraisal reports, earliest possible settlement of grievances, making work and work place more interesting, etc.

Many of these "methods" of controlling absenteeism are known and are being practised in industry. But, it is doubtful whether a marco study of this kind has been attempted before, for the benefit of the industry. This only proves that there is a great scope for basic research of this kind. Solutions can be found for various problems, if only some-one makes a serious study of them. All said and done, the book provides a useful material. However, it would have been better had the book been edited by a professional. This is because the presentation is loose and sketchy. The size could also have been reduced to half without disturbing the contents. Besides, no attempt has been made at proof-reading. The entire handbook is full of all kinds of proof-reading errors; they hinder smooth reading and are even jarring. Nevertheless, it is hoped that BHEL would come with similar studies in future also. □

The Design of Organisations

Pradip N. Khandwala

Harcourt Brace Jovanovich Inc., New York, 1977, pp. 713

Reviewed by J.P. Singh*

The Design of Organisations aims to "systematise an amorphous and rapidly growing body of knowledge about organistations, and to show how this knowledge can be applied to the prcatical work of designing effectively performing organisations". The author takes the position that a single body of knowledge — *Organisation Theory* — can explain the structure and functioning of a great variety of formally set up collectivities that are called organisations. He further assumes that we do not need separate theories for different kinds of organisations like hospitals, political parties, government organisations, and corporations. The unit of analysis is the organisation and individual behaviour is looked at only to the extent that it affects the

*Dr. Singh is a Director (Behavioural Science) with the National Productivity Council, New Delhi.

organisation. In author's own words "organisation *design* is the attempt to apply this knowledge constructively to improve organisational performance or at least to avoid making the mistakes that lead to disaster".

The book is intended for use in under-graduate or graduate courses on organisation theory. The author further suggests that the book can be used as a supplement in courses on policy or strategy and in courses on management.

The book is divided into two parts The first part explores the foundations of organisational analysis leading to a model of how organisations function. Part two draws on recent body of research and explores design implications of the model outlined earlier by the author.

The initial six chapters lay a foundation of organisational analysis. In this introductory section, the author analyses organisations from the perspectives of Economics, Political Science, Sociology and Psychology. Chaprer 4 studies the structural orientations in organisational theory, taking an historical view of the evolution of modern organisation theory. Special focus is laid on the Bureaucracy School of Max Weber and the founding of Modern Principles of Management by Frederick Taylor and Henry Fayol.

Chapter 5 examines behavioural orientations in organisation theory, and chapter 6 focusses on the systems and contingency approches to organisational theory. The six chapters together, comprise the basis for development of the model of organisational functioning presented in the next chapter.

The seventh chapter is the key chapter in the book, wherein the author outlines his model of organisations. The model postulates relationships among five classes of variables, namely, situational, strategic, structural, behavioural, and performance variables. The relationship are probabilistic in nature and are not deterministic. Casuality of relationship is shown for the most part as unidirectional. However, some of the relationships are bi-directional by their very nature and are indicated as such in the model.

Part II of the book brings together recent researches on various variables that are included in the model. The author discusses demographic characteristics of the organisations, like size and age, type, external environment. Goals of organisations, their formation, variety and consequences of operating goals are examined along with the style of top management, their values and beliefs. The work flow and technology of operations as they

affect organisations are examined next. Factors affecting grouping of presonnel and a firm's departmentalisation are discussed. In one chapter, the author deals with the design of human behaviour in organisations, the nature of motivation, as also the conflict and cooperation with organisations. The last chapter entitled : The Design of Organisational Performance, examines evidence regarding the relationship between organisational performance and various variables included in the model.

The six introductory chapters are at the same time the strength and the weakness of the book. Whereas the book brings together the various approaches to organisational study under one cover, the material presented therein tends to be at time sketchy. Further, these various approches are presented as somewhat unconnected pieces so that each chapter tends to become capsule course on the particular approach. No attempt at easy flow from one approach to the other is noticeable. Whereas to the novice, it brings in a nutshell, various approaches to organisations, it leaves the reader with an uneasy feeling. Of course, there are constraints of the size of the book. Especially, for a book which is already large, the choice is between coverage and depth. The strength of the book lies in its coverage.

The last eight chapters, reviewing research on organisations, are a treat to the readers. Herein, the author has brought together major research studies that have implications for organisational functioning. The review is both comprehensive and competent.

Since the contribution of the book lies in the model that the author has proposed, there are two questions that come to the mind of the present reviewer The first one relates to the distinction between the independent or causative variables and depdent or resultant variables. Although the author comments upon the casuality of the variables, no clear distinction is made in the model between them until one comes to the last chapter of the book, which is, of course, devoted to the relationship between various organisational variables and preformance. The question that arises is : What is the purpose of organisation theory and design. If the purpose is prediction of organisational performance including how to design organisations so that they achieve their objectives then the model would probably be a little different than what the author has specified it to be. But if the purpose is research and knowledge *per se,* then the model should be acceptable in its present form. In a way, this is a constraint of the authors' perception of the domain of organisational theory. In author's own words, the organisation

theory is a "systematic study of relationship" between different variables that effect the organisational functioning, The positive feature of the model is that it incorporates the systems and contigency view points.

The second question relates to system of rewards and how they affect the organisational performance. This aspect has been completely ignored by the author in formulating his model of organisational functioning. After all, in any organisation there is the work system and the reward system and both have an equal impact upon the performance of an organisation as also people therein.

An omission in Part II of the book is field researches, i.e., Work Redesign which is beginning to have a powerful impact not only on design of work but also on design of organisations. Why the book has been titled "The Design of Organisations" is not clear. The title tends to specify a narrower field than the book really covers. In that sense, the title is a little misleading and does not suggest the coverage that is there in the book.

In brief, the book is what it promises to be – it is a good book for use in under-graduate or graduate courses on organisation theory. The strength of the book lies in its being a good compendium of relevant material on theory and research on organisations. In the Indian context, the book is suitable for MBA students in the Institutes and Departments of Management. However, since the book was written while the author was at McGill University, it suffers from the lack of Indian context and research basis. But that is not the fault of the author since the target population for the author at the time of its writing was North-American University students. The book can be usefully recommended to the students of Industrial Psychology and Industrial Sociology who will find that the book gives them a wider angle to look at organisations than they are used to. The book should find a place in all libraries that specialise in organisations. ❑

Index to Current Literature on Productivity and Management

Compiled by S. N. Vig* & C. V. Rao**

Accounting

Ghosh, BC — The Significance of Accounting Data to Mathematical Models. *Management Accountant*, 14(5), May 1979, 477, 79p.

Miller, Elwood L — What is Wrong with Price-level Accounting. *Harvard Business Review*, 56(6), Nov.-Dec. 1978, 111-18 p.

Mital, KM — Social Responsibility of Business Organisation. *Vikalpa*, 4(1), Jan. 1979, 39-50 p.

Murrao, Bahadur — Accounting of Social Responsibilities of Business. *Management Accountant*, 14(1), Jan. 1979, 9-13 p.

Roy, Malay — Accounting in the Light of Management Philosophy, *Management Accountant*, 14(4), April 1979, 345-50 p.

Siegil, Joel & Sadowski, John S — Managerial Accounting Systems. *Management Accountant*, 14(4), April 1979, 341-44 p.

Agriculture

Ashish, Sri Madhava — Agricultural Economy of Kumaon Hills : Threat of Ecological Disaster. *Economic & Political Weekly*, 14(25), June 23, 1979, 1058-64 p.

Azam, M Zaki — Planning Investment in Fisheries Sector. *Eastern Economist*, 72(18), May 4, 1979, 925-28 p.

Bardhan, Pranab — On Class Relations in Indian Agriculture : A Comment. *Economic & Political Weekly*, 14(9), May 12, 1979, 857-60 p.

*Mr. Vig is Documentation and Information Officer with National Productivity Council, and
**Mr. Rao is Associate Editor *Productivity*, New Delhi.

Bhatt, Brahmakumar	Service to the Indian Farmers. *Yojana*, 23(10), June 1, 1979, 7-8 p.
Commerce Research Bureau	Crop and Commodity Survey : March 1979—Brighter Prospects for Agricultural Growth. *Commerce*, 138(3541), April 28, 1979, 712-17 p.
Commerce Research Bureau	Crop and Commodity Survey : April 1979—Brisk Wheat Procurement. *Commerce*, 138(3544), May 19, 1979, 871-76 p.
Ganorkar PL & Khonde, SR	Information Transfer Process—An Evaluation Study. *Agricultural Situation in India*, 33(11), Feb. 1979, 699-703 p.
Gupta, Basudeb	Preservation of Fruits and Vegetables. *Khadi Gramodyog*, 25(9), June 1979, 419-23 p.
Iqbal, Badar Alam	UP : Severe Constraints Retard the Growth of Agro-industries. *Capital*, 182(4554), April 19, 1979, 362-64 p.
Kahlon, AS & Verma, SR	Mechanising Punjab Agriculture : Situation and Need. *Agricultural Situation in India*, 33(11), Feb. 1979, 695-97 p.
Kurkute, Dr. Kumar	SFDA Fails in Finance. *Eastern Economist*, 72(17), April 27, 1979, 873, 875-76 p.
Misra, Bani Prasanna	Agrarian Relations in Khasi State. *Economic & Political Weekly*, 14(20), May 19, 1979, 888-92 p.
Nair,K. Narayanan	To Butcher or Not to Butcher : Cattle Holdings and Milk and Meat Production in Kerala. *Economic & Political Weekly*, 14(17), April 28, 1979, 782-88 p.
Nesamony, C	Bee Pollination and Crop Yields. *Khadi Gramodyog*, 25(9), June 1979, 427-29 p.
Singh, Bhagat	Economics of Tractor Use. *Yojana*, 23(9), May 16, 1979, 19-22 p.
Venkateswaran, RJ	Boosting Farm Exports. *Capital*, 182 (4559), May 28, 1979, 3-4 p.
—	Preventing Post-harvest Loss. *Capital*, 182 (4559), May 28, 1979, 5-6p. 36 p.

Appropriate Technology

Char, SV — Economics of Steel Technology in India. *Economic & Political Weekly*, 14(21), May 26, 1979, M-65 to M-67.

Hoda, MM — Development of Mini Spinning Technology. *Khadi Gramodyog*, 25(8), May 1979, 362-64 p.

Jain, SC — An Anti-poverty Tool : Amber Charkha. *Khadi Gramodyog*, 25(7), April 1979, 323 28 p.

Swarup, Anand — Appropriate Technology for Rural Uplift. *Yojana*, 23(11), June 16, 1979, 10-12 p.

Verma, OS — Gobar Gas plant : Installer Scientific Parsimony. *Khadi Gramodyog*, 25(8), May 1979, 365-68 p.

Behavioural Sciences

Pereira, BF — Social Distance Among Cadre Groups in Industrial Organisations. *Indian Journal of Training & Development*, 9(2), March-April 1979, 12-14 p.

Sundaramurthy. S — Is OD the Exclusive Realm of Behavioural Scientists ? *Indian Journal of Training & Development*, 9(1), Jan.-Feb. 1979, 3-7 p.

Suri, GK & Chellappa, HVV — Human Factors in Sales Organizations. *Indian Journal of Training & Development*, 9(1), Jan.-Feb. 1979, 8-14 p.

Budgetary Control

Acharya, SR — Material Budgeting. *Management Accountant*, 14(4), April 1979, 426-28 p.

Capacity Utilisation

Sastry, DU — Capacity Utilisation in the Cotton Mills Industry in India. *Management Accountant*, 14(4), April, 1979, 358-63 p.

Communication

Menon, PG — A New Exercise in Communication. *Indian Journal of Training & Development*, 9(1), Jan.-Feb. 1979, 22-25 p.

Smith, R Seymour — How to Plan for Crisis Communication. *Public Relations Journal*, 35(3), March 1979, 16-17 p.

Cooperatives

Jayalakshmi, L — Cooperatives for Rural Women. *Khadi Gramodyog*, 25(9), June 1979, 410-14 p.

Rajayan, EC — Growth of Cooperatives in SFDA Areas. *Kurukshetra* 27(18), June 16, 1979, 28-30 p.

Vishwanathan, BS — Role of Cooperatives in Dairy Development. *Yojana*, 23(10), June 1, 1979, 9-14 p.

Corporate Planning

Srinivasan, V. *et. al.* — A Technique for the Analysis of Corporate Objectives in the Public Sector. *Lok Udyog*, 13(1), April 1979, 19-23 p.

Corporate Sector

Iyer, RP — Challenges and Opportunities for Corporate Sector Industry. *Management Accountant*, 14(4), April 1979, 351-55 p.

— — Corporate Sector : Blessings of Bigness. *Economic & Political Weekly*, 14(25), June 23, 1979, 1027-28.

Data Bank

Darrow, Joel W & Belilove, James R — The Growth of Databank Sharing. *Harvard Business Review*, 56(6), Nov.-Dec. 1978, 180-94 p.

Metha, Dinesh — National Informaiion System for Planning. *Yojana*, 23(7), April 16, 1979, 13-14 p.

Distribution

Narayanan, S & Rao, DVLNV Prasad — Cereals and the Central Pool. *Eastern Economist*, 72(22), June 1, 1979, 1170-75 p.

— Essential Items Through Fair Price Shop Network. *Capital*, 182(4563), June 25, 1979, 2-3, 32 p.

— Hot Air On Public Distribution. *Economic & Political Weekly*, 14(24), June 16, 1979, 985-86 p.

— Public Distribution—Begins with a Bang. *Economic Scene*, 4(5), May 1979, 249-51 p.

— Public Distributton System, *Yojana*, 23(10), June 1, 1979, 25-30 p.

Economics

Mahajan, VS — An Assessment of Growth of Indian Economy—1. *Khadi Gramodyog*. 25(9), June 1979, 398-409 p.

Malik, AK — Grand Conceptions of Supply—Demand Theory. *Economic & Political Weekly*, 14(21), May 26, 1979, 910-12 p.

Economic Policy

Dagli, Vadilal — What Ails Indian Economy ? *Commerce*, 138(3549), June 23, 1979, 1065-71 p.

Lakdawala, DT — Draft Plan : Forces of Growth. *Commerce*, 138(3539) April 14, 1979, 587-90 p.

Lakdawala, DT — Forces of Growth. *Yojana*, 23(8), May 1, 1979, 5-14 p.

Lakdawala, DT — Plan Finances in Federal Economy, *Yojana*, 23(9), May 16, 1979, 5-14 p.

Pendse, DR — Export Incentives : A Case for Cash Compensatory Support. *Commerce*, 138(3539), April 14, 1979, 591-94 p.

— Review of 1977-78 Plan Performance. *Yojana*, 23(9), May 16, 1979, 15-18 p.

Educational Technology

Rao, E. Nagabhushna & Krishnamurthy, BC — Adult Education and Rural Development. *Khadi Gramodyog*, 25(7), April 1979, 343-46 p.

Tilak, Jandhyala BG — Education in the Sixth Plan. *Eastern Economist*, 72(20), May 18, 1979, 1054-57 p.

Tilak, Jandhyala BG — Inequality in Education in India. *Indian Journal of Industrial Relations*, 14(3), Jan. 1979, 417-36 p.

— — National Policy on Education. *Eastern Economist*, 72(20), May 18, 1979, 1067-72 p.

Electronic Data Processing

Bonini, Charles P — Computers, Modelling and Management Education. *California Management Review*, 21(2), Winter 1978, 47-55 p.

Charnak — Computer Bogey. *Capital*, 182(4555), April 30, 1979, 16, 20 p.

Charnak — Learning to Live with Computers Painlessly. *Capital*, 182 (4556), May 7, 1979, 14-16 p.

Pareek, Udai, Ghose, Amitabha & Sarupia, Dalpat — Perception of Computers in Indian Industry : A Study of Image and Attitudes in Two Textile Mills. *Indian Journal of Industrial Relations*, 14(3), January, 1979, 339-78 p.

Selsky, William L — Today's Role for the Big Computers. *Administrative Management*, 60(2), Feb. 1979, 44-48 p.

Smith, Edward R — WP Decentralization : Has it Gone Too Far ?*Administrative Management*, 60(2), February 1979, 49-50, 52 p.

Trenchard, Barbara — New Data Base for Management. *Administrative Management*, 60(2), Feb. 1979, 59-61 p.

Employment

Agarwal, SM — New Strategy for Rural Employment. *Khadi Gramodyog*, 25(8), May 1979, 377-81 p.

Andiappan, P — Public Policy and Sex Descrimination in Employment in India. *Indian Journal of Industrial Relations*, 14(3), January 1979, 395-415 p.

Basu, Sreelekha — Employment Wages and Workers. *Yojana*, 23(7), April 16, 1979, 15-20.

Royappa, P Hanumantha & Grover, Deepak — Employment Planning for Scheduled Castes and Scheduled Tribes. *Economic & Political Weekly*, 14(24), June 16, 1979, 1015-22 p.

Sabapathy, S — Full Employment. *Yojana*, 23(7), April 16, 1979, 21-24 p.

Sinha, Tapesh Kumar & Srinivasan, TC — Additional Employment of Two Lakhs. *Commerce*, 138 (3545), May 26, 1979, 907-9 p.

— — Long Line for Jobs. *Capital*, 182(4560), June 4, 1979, 4 p.

— — Towards More Jobs Through a New Tax Structure. *Capital*, 182(4560), June 4, 1979, 2-3 p.

Energy

Bhatt, VR — Nuclear Power Set Back : A Boost to Coal. *Eastern Economist*, 72(19), May 11, 1979, 972-74 p.

Dawar, GD — Power for Small Industries—A Case Study of Madhya Pradesh. *Yojana*, 23(9), May 16, 1979, 27-29 p.

Kumar Dev, S — A Manmade Crisis ? *Commerce*, 138(3541), April 28, 1979, 699 p.

Mohanti, PC — Coal : A Logistical Shortage or Lower Production ? *Commerce*, 138(3541), April 28, 1979, 700-1 p.

Mama, HP — Power Stations in Space—A Farout Source of Solar Electricity. *Economic Scene*, 4(5), May 1979, 270-72 p.

Rajadhyaksha,VG — Energy Management. *Yojana*, 23 (7), April 16, 1979, 5-8p.

Rao, S Subha, *et. al.* — Determination of Energy Intensities in the Indian Economy. *Vikalpa*, 4(2), April 1979, 149-60 p.

Esscod, David — Energy : Hard to Come By, But Easy to Save. *Works Management*, 32(2), Feb. 1979, 54-56 p.

Venkateswaran, RJ — West Bengal : Precarious Power. *Eastern Economist*, 72(17), April 27, 1979, 869-70 p.

Talwar, SP — The Alternative Fuel. *Yojana*, 23(8), May 1, 1979, 32-33 p.

— Crisis in Calcutta. *Economic Trends*, 8(8), April 16, 1979, 3 p.

— Diesel Economy. *Commerce*, 138(3549), June 23, 1979, i-viii p.

— Energy Management and Conservation. *Economic Trends*, 8(7), April 1, 1979, 5-9 p.

— New Perspective on Energy Policy. *Economic & Political Weekly*, 14(25), June 28, 1979, 1034-35 p.

— Power Capacity and Generation. *Commerce*, 138(3541), April 28, 1979, 697-98 p.

— Power Crisis Hits Economy Again. *Commerce*, 138(3541), April 28, 1979, 688-97 p.

Financial Management

Battacharya, Sukumar & Kaura, Mohinder N — Relevance of Corporate Tax Planning to Corporate Planning. *Chartered Accountant*, 27(11), May 1979, 1001-7 p.

Bloom, Robert — The Cases For and Against Multiple Financial Statement for Different Users. *Chartered Accountant*, 27(11), May 1979, 989-90 p.

Dhameja, NL — Depreciation Practices and Dividend Decisions in Joint Stock Companies. *Economic & Political Weekly*, 14(21), May 26, 1979, M-47 to M-53.

Gupta, LC — Public Financial Institutions and Control of Companies in India. *Chartered Accountant*, 27(11), May 1979, 995-98 p.

Gupta, Ramesh — Depreciation and Replacement Cost. *Vikalpa*, 4(2), April 1979, 125-34 p.

Joshi, Navin Chandra — Financial Analysis Through Current Ratio. *Management Accountant*, 14(5), May 1979, 460-62 p.

Murthy, J. Viswanatha — Performance Evaluation of Enterprises. *Chartered Accountant*, 27(10), April 1979, 916-21 p.

Pancras, U — A Simple Model for Cost Control in Branches of Bank. *Chartered Accountant*, 27(10), April 1979, 912-15 p.

Porwal, LS & Mishra, N — Effect of Changing Price Levels on Business Income. *Chartered Accountant*, 27(10), April 1979, 929-33 p.

Ramakrishnan, S — Audit of Loan Agreements with Public Financial Institutions. *Chartered Accountant*, 27(9), March 1979, 798-801p.

Singhvi, Surendra S — Post Completion Audits of Capital Investments. *Chartered Accountant*, 27(10), April 1979, 909-11 p.

Thakkar, Dipak D — Quality Control of an Audit. *Chartered Accountant*, 27(11), May 1979, 999-1000 p.

Industrial Engineering

Bhattacharya, KK — Role of Industrial Engineering in the Planning and Control of the Employment Policy of a Large Company—A Case. *Industrial Engineering Journal*, 8(3), March 1979, 25-28 p.

Industrial Policy

Kumar Dev, S — Much Needed Impetus to Exports. *Commerce*, 138(3543), May 12, 1979, 806-7 p.

Ratnam, PV — Suggestions on the Report of Sachar Committee. *Management Accountant*, 14(4), April 1979, 356-57 p.

— Review of Industrial Situation. *Economic Trends* 8(9), May 1, 1979, 5-7 p.

— Import Policy. *Economic Trends*, 8(10), May 16, 1979, 5-6 p.

— Industrialists' Panel on Licensing Procedures. *Eastern Economist*, 72(17), April 20, 1979, 838-42 p.

— Stability in Foreign Trade. *Commerce*, 138(3543), May 12, 1979, 807-9 p.

— Liberal import Policy. *Commerce*, 138(3543), May 12, 1979, 809-14 & 16 p.

— Import Policy for 1979-80. *Eastern Economist*, 72(19), May 11, 1979, 1007-12 p.

— Enthrone the Consumer. *Eastern Economist*, 72(20), May 18, 1979, 1042-43, 1046-54 p.

— A Pragmatic Import Policy. *Economic Trends*, 8(10), May 16, 1979, 3 p.

— Export Policy. *Economic Trends*, 8(7), April 1, 1979, 3p.

— FICCI Annual Session. *Economic Trends*, 8(8), April 16, 1979, 5-19 p.

Inflation

Agarwal SP — Inflation Accounting in UK—Round Four. *Chartered Accountant*, 27(9), March 1979, 785-87 p.

Gupta, Ramesh — Inflation Accounting : Some Recent Developments. *Economic & Political Weekly*, 14(21), May 26, 1979, M-55 to M-64.

Rappapport, Alfred — Measuring Company Growth Capacity During Inflation. *Harvard Business Review*, 57(1), Jan.-Feb. 1979, 91-100 p.

Inter-firm Study

Kaura, Mohinder N & Balasubramaniam — Inter firm Comparison of Financial Performance of Indian Shipping Industry, *Chartered Accountant*, 27(9), Mar. 1979, 788-91 p.

Sharma, RR Sen — Interfirm Comparison—A Necessity for Jute Industry. *Management Accountant*, 14(5), May1979, 536-38 p.

International Trade

Amarnath, W — Indonesia : A Market for Iron Ore ? *Eastern Economist*, 72(24), June 15, 1979, 1279-81 p.

Bharadwaj, NK — Blazing New-trial in Export Marketing. *Yojana*, 23(6), April 1, 1979, 21-22 p.

Panchamukhi, VR — What Not to Expect from UNCTAD. *Commerce*, 138(3542), May 5, 1979, 759-60 p.

Rao, VKRV — In My View : The Lesson of UNCTAD-V. *Commerce*, 138 (3549), June 23, 1979, 1064 p.

— A Tale of Lost Opportunity Retold. *Commerce*, 138(3541), May 12, 1979, 804-6 p.

— Economic Cooperation with ASEAN. *Eastern Economist*, 72(18), May 4, 1979, 951-54 p.

— Manila Meet. *Eastern Economist*, 72(25), June 22, 1979, 1346-58 p.

— UNCTAD V—Negative Approach of the Rich. *Commerce*, 138(3543), May 12, 1979, 817-18 p.

Job Enrichment

Alber, Antone F — Real Cost of Job Enrichment. *Business Horizons*, 22(1), Feb. 1979, 60-72 p.

Sutaria, Repande — Two Factor Theory : A Comparative Study in Three Types of Organizations. *Vikalpa*, 4(2), April 1979, 115-20 p.

Job Evaluation

Bhatia, OP — A Fresh Look at an Appraisal System. *Indian Journal of Training & Development*, 9(1), Jan.-Feb. 1979, 18-21 p.

Eonda, Nickil — Job Evaluation with Sex Determination. *Personnel Management*, 11(2), Feb. 1979, 34-37 p.

Sonnenfeld, Jeffrey — Dealing With The Aging Work Force. *Harvard Business Review*, 56(6), Nov.-Dec. 1978, 81-92 p.

Job Satisfaction

Gupta, Manju — A Study of Job Satisfaction Among Women Workers. *Indian Journal of Industrial Relations*, 14(3), January 1979; 449-59 p.

Labour

Basu, Timir — Labour-I : New Threat to Public Sector Labour. *Economic & Political Weekly*, 14(16), April 21, 1979, 727 p.

Gulati, Leela — Female Labour in The Unorganised Sector. *Economic & Political Weekly*, 14(16), April 21, 1979, 744-52 p.

Pendse, Sandeep — Labour-II : Power Award for Textile Workers. *Economic & Political Weekly*, 14(16), April 21, 1979, 728 p.

Labour Disputes

Singh, Gayatri — Bombay Port : Labour Made the Scape-goat. *Economic & Political Weekly*, 14(24), June 16, 1979, 1004-5 p.

Management

Brooklyn Devr. C — Managing Organisational Conflict : Collaboration, Bargaining and Power Approaches. *California Management Review*, 21(2), Winter 1978, 76-83 p.

Chesler, Mark A, Crawfoot, James E & Bryant Bunyan I — Power Training : An Alternative Path to Conflict Management. *California Management Review*, 21(2), Winter 1978, 84-95 p.

Corey, E. Raymond — Should Companies Centralise Procurement ? *Harvard Business Review*, 56(6), Nov.-Dec. 1978, 102-10 p.

Filley, AC — Some Normative Issues in Conflict Management. *California Management Review*, 21(2), Winter 1978, 61-66 p.

Freeman, Frank — Fresh Ways to Make Unit Load More Palatable. *Works Management*, 32(1), Jan. 1979, 68-75 p.

Ghosh, B — Quantitative Methods in Management—Applications to Health and Family Planning Programme. *Management in Government*, 10(3), Oct.-Dec. 1978, 279-93 p.

Gordon, Paul J — Management Territory : By Their Buzz Words Shall Ye Know Them. *Business Horizons*, 22(1), Feb. 1979, 57-59 p.

Gupta, BRS — Consumer Protection. *Yojana*, 23(9), May 16, 1979, 23-26 p.

Pawar, PV & Mukhopadhyay, N — Management Game in Production and Inventory Control. *Indian Journal of Training & Development*, 9(1), Jan.-Feb. 1979, 15-17 p.

Pescod, David — It is Time to Change to Flexible Working Hours. *Works Management*, 32(1), Jan. 1979, 90-93 p.

Reddin, WJ — Effective Management Job Descriptions. *Integrated Management*, 14(5), May 1979, 5-20 p.

Robbins, Stephen P — 'Conflict Management' and 'Conflict Resolution' Are not Synonymous Terms. *California Management Review*, 21 (2), Winter 1978, 67-75 p.

Saigal, K — Management of Knowledge and Nonlinear Development. *Management in Government*, 10(3), Oct.-Dec. 1978, 258-78 p.

Salsingikar, AM
Haque, M &
Mathur, BB
Management of Electric Supply for Better Service to Consumers. *Industrial Engineering Journal*, 8(5), May 1979, 13-23 p.

Thomas, Kenneth W Jamieson, David W & Moore, Kenneth R
Conflict and Callaboration : Some Concluding Observations *California Management Review*, 21(2), Winter 1978, 91-95 p.

Verma, JC
Managerial Skills for Rural Development. *Lok Udyog*, 13(1), April 1979, 29-36 p.

Management by Objectives

Kulshrestha, NK
Management by Objectives. *Management Accountant*, 14(4), April 1979, 429-32 p.

Management Development

Couch, Peter D
Learning to Be a Middle Manager. *Business Horizons*, 22(1), Feb. 1979, 33-46 p.

Guerrier, Yuonne & MacMillan, Keith
Developing Managers in a Low-growth Organization *Personnel Management*, 10(12), Dec. 1978, 34-38 p.

Keirulff, Herbert E
Finding and Keeping Corporate Entrepreneurs. *Business Horizons*, 22(1), Feb. 1979, 6-15 p.

Manpower Planning

Basu, Sreelekha
Better Deal for Labour. *Yojana*, 23(8), May 1, 1979, 15-18 p.

Prasad, KV Eswara
Education and Unemployment of Professional Manpower in India. *Economic & Political Weekly*, 14(20), May 19, 1979, 881-88 p.

Singh, SP & Thakur, CP
Manpower Utiliastion and Anti-inflation Policies. *Indian Journal of Industrial Relations*, 14(3), Jan. 1979, 379-94 p.

Srivastava, MP
Management of Manpower Resources. *Khadi Gramodyog*, 25(6), March 1979, 278-86 p.

Marketing

Shapiro, Benson P & Jockson, Barbara B — Industrial Pricing to Meet Consumer Needs, *Harvard Business Review*, 56(6), Nov.-Dec. 1978, 119-27 p.

Materials Management

Rao, NP — Materials Management. *Industrial Engineering Journal*, 8(3), March 1979, 8-11 p.

Motivation

Mehta, Prayag — Work Motivation in Public Sector Industry—Some Research Findings. *Management in Government*, 10(3), Oct.-Dec. 1978, 237-57 p.

Organisation & Methods

Dempsey, Richard B — New Look in the Offices. *Administrative Management*, 60(1), Jan. 1979, 31-33 p.

Ferrarini, Elizabeth M — Work Processing—Scenario for the Future. *Administrative Management*, 60(1), Jan 1979, 34-35 p.

Operations Research

Vortak, MN — An Overview of Operations Research : Stochastic Methods. *Industrial Engineering Journal*, 8(5), May 1979, 27-31 p.

Participative Management

Bhatia, OP — Training for Effective Participative Management. *Indian Journal of Training & Development*, 9(2), March-April 1979, 6-11 p.

Bhatia, SK — Participation—A New Dimension, *Integrated Management*, 14(5), May 1979, 21-24 p.

Upadhyaya, LP — Workers' Participation in Industry—Expectation and Experience. *Integrated Management*, 14(5), May 1979, 39-45 p.

Wainwright, David — Launching into Practice. *Personnel Management*, 10(12), Dec. 1978, 28-33, 43 p.

Woodgate, Roger — Participation in West Germany : Another Side of the Story. *Personnel Management*, 11(2), Feb. 1979, 38-42 p.

— — When Employees Run the Company. *Harvard Business Review*, 57(1), Jan.-Feb. 1979, 75-90 p.

Personnel Management

Evans, Alastair — Measures to Make the Job Ground. *Personnel Management*, 11(1), Jan. 1979, 32-35 p.

Kotter, John & Sathe, Vijay — Problems of Human Resource Management in Rapidly Growing Companies. *California Management Review*, 21 (2), Winter 1978, 29-36 p.

Livy, Bryan & Vant, James — Formula for Selecting Roughnecks and Roustabouts. *Personnel Management*, 11(2), Feb. 1979, 22-25 p.

O'Brien, John — Training to Integrate the Multi-racial. *Personnel Management*, 11(1), Jan. 1979, 20-23 p.

Still, Michael — Technicalities of Recruiting Technicians. *Personnel Management*, 10(12), Dec, 1978, 44-48 p.

— — Personnel : The New Demands on Management. *Administrative Management*, 60(1), Jan. 1979, 36-37, 49 p.

— — Personnel in Practice. *Personnel Management*, 11(2), Feb. 79, 13-15 p.

Pollution

Garg, RBL — Apathy to Pollution Control. *Capital*, 182(4562), June 18, 1979, 2-3 p.

Vakil, Arun C — Beyond Headlines : Environmental Policy for India. *Commerce*, 138(3549), June 23, 1979, 1116 p.

— — Tentacles of Contamination Everywhere. *Capital*, 182 (4562), June 18, 1979, 5-28 p.

Production Management

Hayes, Robert H & Wheelwright SC — Link Manufacturing Process and Product Life Cycles. *Harvard Business Review*, 57(1), Jan.-Feb. 1979, 133-40 p.

Production Planning & Control

Dudeja, VD — Production Planning and Control. *Integrated Management*, 14(5), May 1979, 33-38 p.

Productivity

Crandell, N Fredric & Wooton, Leland M — Developmental Strategies of Organisational Productivity. *California Management Review*, 21(2), Winter 1978, 37-46 p.

Kohli, VK — Productivity Imporvement in Foundry Process by Reycling of Waste Block Sand—A Case. *Industrial Engineering Journal*, 8(3), March 1979, 29-35 p.

Ramaswamy, NS — Productivity and Economic Development. *Industrial Engineering Journal*, 8(5), May 1979, 3-12 p.

Project Management

Allen, David — Planning a Project—Get Your Priorities Right. *Works Management*, 32(2), Feb. 1979, 41-44 p.

Lacy, Karl — Combating Corrosion—How to Start to Stop the Rot. *Works Management*, 32(2), Feb. 1979, 46-47 p.

Public Finance

Chattopadhyay, P — Export-Import Bank of India ? *Commerce*, 138(3540), April, 21, 1979, 651-53 p.

Chaudhuri, Sudip — FERA : Appearance and Reality. *Economic & Political Weekly*, 14(16), April 21, 1979, 734-44 p.

Jain, AK & Bhargava, PK — Theory and Practice of Taxation in Ancient India. *Eastern Economist*, 72(18), May 4, 1979, 930-32 p.

Jhaveri, NJ & Bahgirathi, LB — Net Foreign Exchange Earnings From Export of Industrial Manufactures, 1974-75 to 1977-78. *Economic & Political Weekly*, 14(23), June 9, 1979, 970-74 p.

Rao, VKRV — Growing Government Expenditure : The Real Issue : Functional Utility. *Commerce*, 138(3546), June 2, 1979, 950-53 p.

Shah, SG — Money; Monitoring Credit Utilisation. *Commerce*, 138 (3549), June 23, 1979, 1085 p.

Shah, SG — New Strategy for Credit Restraints, *Commerce*, 138(3546), June 2, 1979, 954-55 p.

Sundaram, K & Pandit, V — Direct Tax Reforms: Family as Tax Entity and Other Issues. *Economic & Political Weekly*, 14(17), April 28, 1979, 776-81 p.

— — Saving—Investment Gap. *Eastern Economist*, 72(18), May 4, 1979, 922-24 p.

Public Enterprise

Dayal, Vishveshwar — Appraisal Plans in Public Sector : Shortfalls and Suggestions. *Lok Udyog*, 13(2), May 1, 1979, 13-20 p.

Mathur, Naresh Dutt — Profitability of Public Enterprises. *Lok Udyog*, 13(1), April 79, 25-27 p.

— — In Defence of the Public Sector. *Commerce*, 138(3540), April 21, 1979, 643-47 p.

Public Relations

Bevk, KL — Literature Search and Analysis : Key to Vital Information. *Public Relations Journal*, 35(2), Feb. 1979, 12-13 p.

Hammond, George — Meeting Client Expectations. *Public Relations Journal*, 35(3), March 1979, 6-9 p.

Malhotra, RL — Public Relations in Government. *Management in Government*, 10(3), Oct-Dec. 1978, 294-302 p.

Spitzer, Carlton E — Where are We Getting All This Information and What Are We Doing With. *Public Relations Journal*, 35(2), Feb. 1979, 8-11 p.

White, Ferrell E — 4 Steps to Developing a Public Affairs Program. *Public Relations Journal*, 35(3), March 1979, 19 p.

Rural Development

Anandi, Krishna Swaroop — Village Industries Movement. *Khadi Gramodyog*, 25(8), May 1979, 373-76.

Dantwala, ML — Rural Employment : Facts and issues. *Economic & Political Weekly*, 14(25), June 23, 1979, 1048-57 p.

Dey, B — Rural Development in Nadia, *Khadi Gramodyog*, 25(6), March 1979, 300-5 p.

Guruswamy, MP — Village Industries and the Budget, *Khadi Gramodyog*, 25(9), June 1979, 393-97 p.

Krishna Raj — Small Farmer Development. *Economic & Political Weekly*, 14(21), May 26, 1979, 913-18 p.

Maithani, BP — Area Development Planning, *Khadi Gramodyog*, 25(7), April 1979, 329-35 p.

Mukherjee, Amitava & Sengupta, Neela — Antyodaya. *Yojana*, 23(7), April 17, 1979, 25-27 p.

Nagar, Saudimini — Regional Rural Banks : Rajasthan Experience. *Eastern Economist*, 72(24), June 15, 1979, 1281-82 p.

Prasad, Anirudh — Experiments in Granmdan. *Khadi Gramodyog*, 25(8), May 1979, 382-86 p.

Peerzade, San — Development of Khadi and Village Industries in Ratnagiri. *Khadi Gramodyog*, 25(6), March 1979, 295-99 p.

Ramachandran, V — Traditional Sector: Ist Maladies and Remedies. *Khadi Gramodyog*, 25(7), April 1979, 313-22 p.

Rajadhyaksha, VG — Managerial Skills for Rural Development. *Yojana*, 23(10), June 1, 1979, 4-6 p.

Reddy, K. Venkata — Issues in Development of Backward Regions. *Khadi Gramodyog*, 25(8), May 1979, 354-61 p.

Satyabhama, S — Small Farmers Development Agency. *Agricultural Situation in India*, 33(10), January 1979, 641-43 p.

Singh, Radha Raman — Rural Development Under Sixth Plan : An Appraisal. *Khadi Gramodyog*, 25(16), March 79, 272-77 p.

Srinivas, MN — Reflections on Rural Development. *Kurukshetra*, 27(18), June 16, 1979, 11-19 p.

— — Antyodaya—An Evaluation, *Kurukshetra*, 27(16), May 16, 1979, 5-18 p.

Small Business

Chandrasekhar, K — Risk Areas in Financing Small-scale Units. *Eastern Economist*, 72(18), May 4, 1979, 928-30 p.

Dutt, Som — Khadi and Village Industries Programme, *Yojana*, 23(6), April 1, 1979, 11-16 p.

Edmande, Stahrl W & Gumpert, David E — Growing Concerns. *Harvard Business Review*, 57(1), Jan.-Feb. 1979, 172-92 p.

Nag, Tapas Kumar — Cottage Match Industry: Ambitious Programe of Development. *Commerce*, 138 (3545), May 26, 1979, 900-4 p.

Ray, SK — Planning for Small and Village Industries, *Yojana*, 23(11), June 16, 1979, 30-31 p.

Singh, Sheobahal — Organisation of the Carpet Industry of Bhadohi, *Economic & Political Weekly*, 14(21), May 26, 1979. M-69 to M-71.

— Giant Strides by Tiny Sector. *Commerce*, 138(3545), May 26, 1979, 910-13 p.

— Handlooms in Indian Economy, *Commerce*, 138(3544) May 19, 1979, 847-51 p.

— Small Industry—Many Allurements. *Economic & Political Weekly*, 14(24), June 16, 1979, 978-79 p.

— Tamil Nadu : Handlooms Turn the Corner ? *Commerce*, 138(3544), May 19, 1979, 844-46 p.

Technology Transfer

Franko, Lawrance G — Multinationals : The End of of U. S. Dominance. *Harvard Business Review*, 56(6), Nov.-Dec. 1978, 93-101 p.

Heenan, David A & Keegan, Warren L — The Rise of Third World Multinationals. *Harvard Business Review*, 57 (1), Jan.-Feb. 1979, 101-9 p.

Steade, Richard D — Multinational Corporations and the Changing World Economic Order. *California Management Review*, 21(2), Winter 1978, 5-11 p.

Trade Unions

Dair, Patricia — Why Disclosure Could be a Non-event ? *Personnel Management*, 11(1), Jan. 1979, 24-27, 39 p.

Mendoza, Democrite T — Trade Union Rights in Asia. *Asian Labour*, 27(158), Jan. 1979, 34-39 p.

Thawatchainon, P — Growth of Trade Unions in Thailand. *Asian Labour*, 27 (161), April 1979, 9-10 p.

Training Technology

Arora, RK — Training for Development : Some Aspects of Institution Building, *Indian Journal of Training & Development*, 9(2), March-April 1979, 15-20 p.

Parsloe, Eric — Developing the Mind. *Management Today*, 150th issue, Oct. 1978, 51-57 & 61 p.

Parthasarthi, SK — Training in Industry. *Indian Journal of Training & Development*, 9(2), March-April 1979, 3-5 p.

Rao, Venkateswara & Pareek, Udai — Designing and Conducting Microlab for Training. *Indian Journal of Training & Development*, 8(6), Nov.-Dec. 1978, 3-12 p.

Satia, JK & Paul, Samuel — Managerial Evaluation of Development Programmes. *Management in Government*, 10(3), Oct.-Dec. 1978, 219-36 p.

Shivdasani, HK — Training and Devoloping Managers : Can They Train Others ? *Indian Journal of Training & Development*, 9(2), March-April 1979, 24-25 p.

Walker, Newille R — Management Training Through Chinese Eyes. *Training and Development*, 33(3), March 1979, 26-29 p.

Zeira, Yoram — The Role of the Training Director in Multinational Corporations, *Training and Development*, 33(3), March 1979, 20-25 p.

Work Study

Mahoney, Thomas P — The Rearranged Work Week: Evaluations of Different Work Schedules, *California Management Review*, 20(4), Summer 1978, 31-39 p. □

PRODUCTIVITY

SUPPLEMENT

(Vol. XX No. 2)

Labour Productivity and Output Growth in Indian Mining and Manufacturing Sectors (1951-76)

PRODUCTIVITY

SUPPLEMENT

(Vol. XX No. 2)

Labour Productivity and Output Growth in Indian Mining and Manufacturing Sectors (1951-76)

V. K. Goel & N. K. Nair

Labour Productivity and Output Growth In Indian Mining and Manufacturing Sectors During 1951-76

V. K. Goel* & N. K. Nair**

Evidences brought out by the recent research studies overwhelmingly support the contention that labour productivity in the Indian manufacturing sector is increasing during the post independence period.[1] Although quite significant a finding in the context of evolving appropriate policies towards the industrial development of the country, the above conclusion by itself could not yield any precise information regarding either the extent of contributions from such increases in labour productivity towards the output of the sector or the causes of such increases in labour productivity. The analysis with respect to the rate of growth of labour productivity and its contributions to the growth of output is crucial to the exercises in developmental planning because of the fact that in a largely labour abundant economy like India the long term growth of the economy depends on the rate of growth of employment and the rate of growth of output per unit of labour thus employed.[2] The objective of the paper is to present labour productivity in 16 broad industry groups and 9 broad mine groups during the period 1951-76 and to arrive at the contributions of labour productivity towards output growth in the Indian mining and manufacturing sectors. Section I is devoted to the development of the concept of productivity and includes a brief discussion on the nature and sources of data on which the study is based. Section II presents the indices of inputs, outputs and productivity along with their respective rates of growth. In Section III, an attempt is made to evolve a model to arrive at the contributions of productivity towards the growth of output in the mining and manufacturing sectors in India during the period

* Mr. Goel is Sub Regional Officer, National Productivity Council, Bhopal, and was till recently Director (Research), NPC, New Delhi and ** Mr. Nair is Deputy Director (Research), NPC, New Delhi. The assistance rendered by Mr. A. B, Roy, Asstt. Director, NPC, is gratefully acknowledged.

1. See for instance, National Productivity Council (1974), Goel & Nair (1976, 1978), Banerji (1971, 1975), Goel (1979), Nair (1979), Madan (1977) D. Gujarati, (1967), Diwan and Gujarati (1968), etc.
2. With a given rate of growth of capital resources there is an inherent conflict between employment maximisation and labour productivity increases. The genesis of this conflict is in the cause of productivity increases, i.e., capital substitution. This implies, that with a given rate of growth of capital resources, any increment in labour productivity would be attained by a corresponding decline in employment, other things being constant. This reasoning, however, excludes the economies due to increase in the utilisation of the already committed capital and labour resources in specific industries or activities.

1951-75. The quantitative results regarding the share of productivity, thus arrived at, are also presented in this section. The last Section (IV) is devoted to deriving the policy guidelines from the quantitative results arrived at in Sections II and III.

I

Labour Productivity

The Concept

For puposes of the present study, labour productivity is defined as an average ratio between output and labour. It is clear from the definition that labour productivity is not equivalent to labour contributions. Nor such a simple concept refers to the efficiency with which labour is utilised in a specific production process. For, the amount of labour contributions to a given output in a given process cannot be assessed unless the underlying production function can be measured. Problems of measuring and analysing the production functions do not confine themselves only to the issues relating to availability of data. Even if the statistical problems relating to the estimates of the parameters are ignored, there remains a host of other issues connected with the interpretation of empirical production functions arrived at on the basis of historical data.[3] In the first place, while a hypothetical production function determines the technological relationship between inputs and output, its empirical counterpart estimated on the basis of *ex-post* data, is not independent of the market forces.[4] Secondly, while the hypothetical production function conceives an infinite number of input-output combinations, its empirical counterpart permits only one among such combinations to be actually realised at any given time. Thus, it is not difficult to envisage the restricted scope of the production function models in the context of analysing the dynamics of productivity change.

3. For a brief discussion on the problem see Acharya and Nair (1978).

4. Mo-Huan-Hsing (1976) has come to the conclusion that the residual productivity arises not only because of the technical change alone as has been contended by Solow (1957), but also because of non-technological factors of the market. Jorgenson and Griliches (1964) find that if errors due to measurement of capital and other inputs could be eliminated and aggregation errors avoided, the observed increase in total productivity would be negligible. It is also important that the issues relating to the elasticity of substitution between factors of production are not yet settled. See also Umarkazi (1978).

In the context of Indian mining and manufacturing sectors, there exists an additional constraint in estimating production functions, i.e., with respect to the availability of data on capital. In the first place, there exists no consistent time series on the capital employed in these sectors based on any measures like book value, original value, replacement value, resale value, etc. Secondly, the available data/information from the CMI-ASI sources contain serious aggregation biases emerging mainly from the differing vintage properties of the machinery and equipment.[5] It is with this as a background, that a production function model has been discarded by the present study, and therefore a simple average relationship between labour and output has been accepted as practicable, not only from the point of view of computation but also from the interpretation and application point of view. In any case, the choice is not between alternative concepts of labour productivity—whether average or marginal—but it is in the interpretation of all of them within the background of the implicit limitations of each one. In this study, it is accepted that the variations in labour productivity is not on account of the contributions form labour alone but may be on account of variations in other inputs (either quality-wise or quantity-wise), notably capital.

Nature and Sources of Data

The principal source of output data in the Indian Manufacturing Industries is the National Accounts (Disaggregated) Tables compiled by the Central Statistical Organisation (CSO),[6] which in turn, are based on the Census of Manufacturing Industries (CMI) during years prior to 1959 and Annual Survey of Industries (ASI) during the years from 1959. For purposes of the present study output is measured in terms of net value added only. Alternative output measures like gross value added and gross value output are not considered for the simple reason that relevant data are not available separately for the industry groups.

The basic source of labour data in the Indian manufacturing industries is the returns collected on the basis of Factories Act (1948). The coverage of factories according to the Factories Act (1948) is the same as in the case of CMI-ASI. Labour data from this source relate to persons "employed, directly or through agencies, whether for wages or not, in any manufacturing process or in cleaning any part of the machinery or premises used for manufacturing process or in other kind of work incidental to or connected

5. For detailed discussion on the nature of data on capital – input in India, see Lal (1977).

6. CSO (1975, 1978).

with the manufacturing process or the subject of manufacturing process." The labour data thus available relate to an average daily employment which are furnished by each factory by averaging the total number of attendance (man-days worked) during a year by the total number of working days during that year. This measure of employment is based on attendance and not on the physical number of persons on roll. The employment figures utilised by the present study are taken from the consolidated results of the returns received under the Act and released by the Labour Bureau.[7]

The source of data on output in the mining sector is also the National Accounts (Disaggregated) Tables of the CSO.[8] These tables are, in turn, based on the information collected by the Indian Bureau of Mines under the Mineral Conservation and Development Rules (1958) framed under the Mines and Minerals (Regulation and Development) Act (1957). These rules cover all states in India except Jammu & Kashmir and apply to all minerals except petroleum and natural gas, coal, and minor minerals, and any mineral declared as proscribed substance for the purpose of Atomic Energy Act (1962). The source of data for coal and lignite for all states except Jammu & Kashmir is the Coal Controller's Office. The source of data for coal and lignite in respect of Jammu & Kashmir is the Jammu & Kashmir Minerals Limited. The data on minor minerals are from the state governments. The output of the mining sector is measured in terms of the gross value of output. Alternative concepts of output like gross value added and net value added cannot be applied for the simple reason that these are not available separately for individual mine groups.

The basic sources of data pertaining to labour in the mining sector are the reports of the Director General of Mines Safety who is empowered to collect the required information under the statutory provisions of the Mines Act (1952) and presented by the CSO annual publication Statistical Abstract of India.[9] The data thus collected relate to persons employed in mines and querries except those specially exempted by the Central Government. The concept of employment is the same as in the case of manufacturing sector,

7. Figures for years 1951-68 are from the statement on the Trends in Employment Growth in the Factory Sector in India, presented by the Reserve Bank of India (RBI 1971). For years after 1968, data are collected directly from the Labour Bureau's annual publication Indian Labour Statistics (Indian Labour Statistics various issues). Wherever necessary employment data are re-grouped on the basis of the National Industries Classification according to which the CSO's National Accounts Statistics are published.
8. CSO (1975, 1978).
9. CSO, *Statistical Abstract*, various issues.

i.e., an average daily employment based on attendance and man-days worked.

Output Values at Constant Prices of 1970-71

For purposes of the present study the year 1970-71 has been chosen as the base year. However, the output data referred to above in the case of mining and manufacturing sectors are not available at constant base year prices during the entire period under analysis, instead, industry-wise net value added figures of the CSO at 1960-61 constant base year prices are available till 1971 and at 1970-71 constant base year prices for years after 1970-71. Same is the case with respect to the output figures in the case of mining sector also. The popular method of deflating or inflating the output figures of each year to the level of a constant base year on the basis of the relevant index numbers of prices has not been tried on acount of the following reasons :

(i) Value of output at current prices are available separately for all the industries and mines only during the period after the year 1960-61.

(ii) The classification of industries and mines adopted by the CSO rendered it difficult to choose an appropriate price index from the Index Number of Wholesale Prices[10] in India for any one group of industries or mines.

(iii) The values of current inputs utilised by the industries have not been presented by the CSO separately for the industry and mine groups, instead, values of inputs consumed at current prices are presented only for the total manufacturing and total mining sectors for each year.

(iv) Even the gross value added data are available only for the total manufacturing sector and total mining sector and not separately for the industry and mine groups.

(v) The existing data on industry-wise net value added are arrived at by deducting from the gross value of output, the total value of inputs and the total value of fixed captial consumed (depreciation). Therefore,

10. Economic Advisor (Ministry of Industry), *Index Number of Wholesale Prices in India*, various issues.

output is the highest in machinery except electrical machinery (96.13 percent) followed by electricity, gas and water supply (31.18 percent), rubber and rubber products including products from petroleum and coal (30.78 percent), basic metal industries (27.65 percent), chemical and

13. See Banerji (1975), Goel & Nair (1976, 1978), etc.

Productivity, July-September 1979
S-8

chemical products (23.16 percent), etc. Most significantly, the rate of growth of output in labour intensive traditional industries like textiles, food, beverages and tobacco etc., is, in fact, very low. Output in leather and leather products has actually declined during the period. Employment also seems to have followed somewhat a similar pattern, except in the case of electricity, gas and water supply. Productivity growth rate is highest in the case of machinery except electrical machinery (21.41 percent), followed by electricity, gas and water supply(15.35 percent), miscellaneous industries (15.94 percent), electrical machinery (7.05 percent), etc. Most importantly, while productivity growth is impressive only in the case of capital intensive manufacturing industries, it is very low in case of labour intensive industries like textiles, food, etc ; it is even negative in the case of leather and leather products.

III

Contributions from Productivity to Output

Conventionally, the production function models of one variant or the other are employed to determine the shares of various factors in the output. For reasons which are already stated in Section I, such an exercise has not been undertaken by the present study. The share of productivity in the increased output between any two periods has been arrived at by the present study on the basis of the following indentity equations.[14]

$$V_o = L_o (\Sigma p_{io} q_{io} c_{io}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$V_t = L_t (\Sigma p_{io} q_{it} c_{it}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where V = Aggregate output (at constant prices)

L = Aggregate number of persons employed

p_i = Unit price of the output of the i^{th} industry

q_i = Quantity of output from the i^{th} industry per labour employ in that Industrygiven by the expression v_i/i_i

14. These equations are originally evolved by Minhas and Vaidyanathan (1965) while explaining the sources of output growth in the Indian agricultural sector between 1951 and 1961. Models of the same kind with minor modifications were empolyed by Narula and Sagar (1973) and Dharm Narain (1976). For critical evaluations of these models, see Shrivastava (1976).

v_i=Output of the i^{th} industry $\Sigma v_i = V$

l_i=Employment in i^{th} industry $\Sigma l_i = L$

c_i=Share of the i^{th} industry in aggregate employment given by the expression

$$l_i/L$$

Subscripts o and t refer to the base and comparative years respectively.

Now, the increment in output between the base year o and comparative year t would be given by

$$V_t - V_o = L_t \left(\Sigma p_{io}\, q_{it}\, c_{it} \right) - L_o \left(\Sigma p_{io}\, q_{io}\, c_{io} \right) \quad \ldots\ldots(3)$$

By simplifying and rearranging expression (3), we get

$$V_t - V_o = (L_t - L_o)\ (\Sigma p_{io}\, q_{io}\, c_{io}) \quad \ldots\ldots I$$

$$+ L_t\, p_{io} c_{io} \Sigma\, (q_{it} - q_{io}) \quad \ldots\ldots II$$

$$+ L_t p_{io}\, q_{io} \Sigma\, (c_{it} - c_{io}) \quad \ldots\ldots III$$

$$+ L_t\, p_{io} \Sigma\, (q_{it} - q_{io})\ (c_{it} - c_{io}) \quad \ldots\ldots IV$$

It may be observed that component I above stands for the increment in output due to increment in employment alone, i.e., the increment in output $(V_t - V_o)$ from the additional employment $(L_t - L_o)$, had the output labour ratio (V/L) remain constant at the base year level

$$Q_o = V_o/L_o = \Sigma \frac{p_{io}\, q_{io}}{l_{io}} \quad \ldots\ldots(4)$$

Similarly, component II stands for the increment in output $(V_t - V_o)$ due to increment in output per person employed $(Q_t - Q_o)$, Q_t being $(\Sigma p_{io} c_{io} q_{it})$ and Q_o being $(\Sigma p_{io} c_{io} q_{io})$. Note that the share of i^{th} sector in total employment is constant at the base year level c_{io}.

Component III stands for the increment in output due to changes in the structural composition of employment during the period between the

base and comparative years.[15] These changes in the structural composition of employment would be reflected in the variations in shares of i^{th} industry in total employment,[16]

$$\frac{(l_{it}}{L_t} - \frac{l_{io})}{L_o} = c_{it} - c_{io} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Component III arises as long as the rates of growth of employment in the i^{th} industry $1/t\frac{(l_{jt}-l_{jo})}{l_{jo}}$ are different even with a given rate of growth of aggregate employment $1/t\ \frac{(L_t-L_o)}{L_o}$, in such a way that $c_{io} \neq c_{it}$ and hence, $c_{jo} \neq c_{jt}$. With a given q_{io} and q_{jo} the contributions of the increased employment in the i^{th} and the j^{th} industries to the increment in output depends on the variations in the relative importance of these industries between period o and period t. For a clear understanding of the nature of the contributions from this component we need to realise when such contributions could be zero. The zero contributions from this component is attained only when

$$1/t\ \frac{(\ q_{it}\ c_{it} - q_{io}\ c_{io}\ )}{q_{io}\ c_{io}} = 1/t \frac{(\ q_{jt}\ c_{jt} - q_{jo}\ c_{jo}\ )}{q_{jo} c_{jo}}$$

The required conditions for this equation are that

$$q_{io} = q_{jo}$$

$$c_{io} = c_{jo}$$

15. In the original formulation by Minhas and Vaidyanathan (1965), this component represents the cropping pattern effect. Dharm Narain (1976), modified the relationship to segregate what is called "Pure locational shift effect," measuring the changes in productivity that would have occured as a result of locational shifts in the area under individual crops in the absence of variation on the cropping pattern and the per hectare yields of individual crops. The impact of shifts in the industrial locations has not been considered by the present study mainly because of the non-availability adequate data.

16. See Tables 10-11.

Therefore $x_{io} = x_{jo}$

where x_{io}, x_{jo} are the shares of i^{th} and j^{th} industries in total output

Also $$1/t \frac{(l_{it} - l_{io})}{l_{io}} = 1/t \frac{(l_{jt} - l_{jo})}{l_{jo}}$$

As long as the above 3 conditions are not satisfied, a non-zero contribution from component III could be expected. In actual practice, these 3 conditions are seldom satisfied, invariably one or all of these conditions being violated.

Component IV emerges as a result of the segregation of the first three components from the expression 3, and represents the effect of interactions of components I, II, and III, viz., employment effect, productivity effect and effect of changes in the structural composition of employment respectively.

These four components were arrived at in the case of both the mining and manufacturing sectors and are presented in Table 12. The results show that

1. In the case of both, mining and manufacturing sectors, productivity growth accounts for a major source of output growth during the period 1951—75, the shares being about 60 percent in the case of mining sector and 57 percent in the case of manufacturing sector.

2. The share of employment in additional output of the mining sector between 1951 and 1975 comes to only about 16 percent. However, in the case of the manufacturing sector, employment accounts for about 37 percent of the additional output during the same period.

3. In the case of both, mining and manufacturing sectors, the effect of structural changes in the composition of employment does not account for any significant source of output growth during the period 1951-75. In both the sectors its share comes to only about 3 percent during the period.

4. While the interaction effect accounts for 21 percent of the additional output in the case of mining sector, it accounts for only about 4 percent of the additional output in the case of the manufacturing sector.

5. When the entire period of 25 years between 1951 and 1975 is divided into blocks of five years, it is observed that employment accounts for a little over three-fourth of the increased output during 1951-56 and 1971-75 in the case of mining sector. However, both structural changes in the composition of employment and the interaction component contribute negatively and that too of a significant order during the first period 1951-56, with the result that the impressive contributions from employment and productivity changes to output during this period are eliminated to a large extent. Yet, it is clear that employment is the major source of output growth during the period 1971-75, productivity changes contributing only about 18 percent and variations in structural composition of employment contributing about 2 percent. The opposite nature of the contributions from the increases in employment and the increases in productivity is evident from the variations in their shares during the period 1966-71. While productivity changes contribute about 141 percent of the additional output during the period, employment changes contribute negatively to the extent of 75 percent during this period. Variations in the structural composition of employment contribute to the extent of 32 percent during the same period. The most interesting results arethose relating to the periods 1956-61 and 1961-66—the periods of the Second and Third Five Year Plans. It may be noted that while employment contributed only to the extent of 10-15 percent of the additional output during this period, increases in productivity appear to be, by far, the only major source of output in the mining sector accounting for about 61-75 percent. Although the variations in structural composition of employment contribute as high a share of about 19 percent during the Second Plan period, its share declined to about 8 percent during the Third Plan period.

6. Unlike the case of the mining sector, contributions from employment to the additional output turn out to be positive throughout the period 1951-75 in manufacturing sector. While its share is about 38 percent during the period 1951-56, it is as high as 94 percent during 1971-75. Its share declined to about27 percent during the period 1966-71. However, the share of productivity changes reaches an all time peak of 121 percent during the same period, the interaction effect contributing negatively to the extent of about 52 percent. The opposite nature of the contributions from employment and

productivity is clearly evident in the case of the manufacturing sector also during the period 1966-75, i. e., when the share of employment effect increases that of the productivity effect declines and *vice-versa*.

IV

Relevance for Policy Formulation

It is clear from the above discussion that there is a conflict between the share of employment and that of productivity in the given additional output of the sectors, i.e., when the share of employment increases that of productivity declines and *vice-versa*. This implies that there cannot be any strategy of industrial development which ensures maximisation of both employment and productivity simultaneously with a given targetted rate of growth of output. At least, during the past, the objective of maximising employment has been sacrificed in favour of maximising productivity to the extent that while the share of productivity increase ranges between 57 and 60 percent, the share of employment varies between 16 and 36 percent in the additional output of the mining and manufacturing sectors during the period 1951-75.

Had increases in productivity occured as a result of the contributions from labour there cannot be any conflict between employment and productivity maximisation.[17] But this is not what possibly could have happend. Increases in productivity occurs mainly as a result of increased capital deepening. And it is not very difficult to realise that as the economic process undergoes capital intensification the rate of growth of employment declines with any given rate of growth of real capital stock. Such capital deepening can take place through any one or both of the following processes :

1. A change in the output mix of the economy towards capital intensive sectors like heavy engineering, petrochemicals, etc. This can take place either in the setting up of the new units or in the diversification and expansion of the existing units.

2. Modernisation and rationalisation of the existing sectors/industries involving introduction of capital intensive processes.

17. Note that, here what is reffered to is productivity as a post investment management concept only.

In the context of Indian mining and manufacturing sectors, both the processes mentioned above appear to be relevant. As has already been seen (Table 7), output growth is the highest in sectors/industries whose relative capital intensity is high. For instance, the late fifties and sixties witnessed not only an expansion of the mining sector towards minerals which employ relatively more capital intensive processes like copper, zinc, iron ore, but even the labour intensive minerals like coal underwent some modernisation and rationalisation also, both leading to the capital intensification of the processes involved. The process of capital deepening is more evident in the case of manufacturing sector, where the rate of expansion is the highest in industries like non-electrical machinery (mostly items from the heavy engineering sector), basic metal industries, rubber products including products from petroleum and coal, chemical and chemical products, eletricity, gas and water supply, etc. Most importantly, labour intensive sectors like textiles, beverages and tobacco, food, leather and leather products etc., are either stagnant, or expanding at negligible rates, or in some cases declining.

Viewed from the background of the development strategies of the five year plans, this is only a natural consequence. The considerations relating to import substitution (along with the objective of self-reliance) and maximisation of long term rate of growth of the economy have resulted in adopting an investment strategy, which in general, fostered a capital intensive heavy industry sector, the labour absorption rate of which is predictably very low, thus leading to a negligible rate of growth of employment in relation to the capital these sectors continue to employ. The purpose of the present study is precisely to indicate the consequences of the past industrial development strategies on employment expansion, and as is made clear such strategies have not stimulated employment to the extent that could have been achieved. □

Table 1 : Indices of Net Value Added in the Indian Manufacturing Scetor (At 1970-71 Prices)

(Indices Base 1970-71 = 100)

Year	*Food*	*Beverage & Tobacco*	*Textiles*	*Leather & Leather Products Including Footwear*	*Wood & Wood Products Including Furniture & Fixtures*	*Paper & Paper Products Including Printing & Publishing*
1	*2*	*3*	*4*	*5*	*6*	*7*
1951-52	40.61	34.20	71.50	104.25	17.75	26.97
1952-53	41.12	29.74	75.70	83.55	19.21	27.55
1953-54	39.23	29.90	79.74	90.52	16.95	28.60
1954-55	42.55	33.05	83.09	86.26	21.31	32.29
1955-56	47.20	37.16	85.23	93.81	28.60	35.31
1956-57	50.10	42.85	92.18	104.64	32.48	38.16
1957-58	55.38	45.37	91.25	106.77	33.24	40.49
1958-59	56.12	48.41	89.04	118.18	38.78	43.22
1959-60	59.15	51.85	89.61	129.01	48.65	48.28
1960-61	63.48	59.25	93.47	148.16	54.83	53.52
1961-62	67.87	63.90	96.85	158.68	58.32	57.55
1962-63	67.14	64.63	98.82	162.28	68.30	62.21
1963-64	71.01	64.73	104.08	169.24	78.17	70.09
1964-65	74.36	76.21	108.11	147.38	93.14	74.64
1965-66	79.55	87.69	103.32	157.06	111.33	79.19
1966-67	76.74	91.95	101.09	164.60	99.64	88.71
1967-68	73.20	85.93	102.36	153.77	103.96	84.09
1968-69	79.76	97.35	102.71	139.26	105.23	90.14
1969-70	92.45	98.05	101.02	108.51	106.69	97.43
1970-71	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	101.58	107.70	98.29	85.57	105.49	89.19
1972-73	85.01	110.72	101.24	81.19	108.56	88.74
1973-74	75.95	80.52	128.83	66.72	88.72	100.72
1974-75	90.85	67.61	128.80	85.57	82.64	108.89
1975-76	97.71	90.68	125.10	51.37	77.69	102.34

(contd.)

Table 1 (Contd.)

Year	Rubber & Rubber Products Including Products from Petroleum and Coal	Chemical & Chemical Products	Non-Metallic Mineral Products	Basic Metal Industries	Metal Products except Machinery & Transport Equipment	Mechinery except Electrical Machinery
	8	9	10	11	12	13
1951-52	12.60	19.65	20.73	23.10	31.81	5.94
1952-53	10.48	21.32	21.43	23.18	30.40	4.24
1953-54	12.57	22.52	23.24	22.81	37.86	5.62
1954-55	16.72	23.29	25.45	26.03	50.05	8.68
1955-56	24.99	26.00	28.39	26.33	56.36	10.93
1956-57	27.79	26.82	32.67	27.44	56.66	14.60
1957-58	30.46	27.10	38.54	28.89	50.62	15.23
1958-59	31.15	32.91	41.60	31.84	48.42	17.41
1959-60	35.57	39.07	47.41	41.16	63.96	19.28
1960-61	40.50	43.22	51.60	51.22	80.10	27.49
1961-62	43.83	48.67	54.70	59.27	93.54	33.58
1962-63	48.23	52.06	60 88	73.61	95.78	43.27
1963-64	54.15	58.66	67.11	84.25	101.68	57.19
1964-65	57.89	63.13	72.02	85.96	106.99	75.72
1965-66	63.19	65.52	74.93	88.56	98.85	80.49
1966-67	71.66	71.09	75.99	93.12	93.05	87.99
1967-68	78.11	77.77	79.28	88.18	94.36	89.81
1968-69	92.27	84.98	79.71	99.17	89.30	103.75
1969-70	96.07	91.79	92.79	103.57	99.67	116.84
1970-71	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	106.37	117.86	99.00	97.52	102.53	110.75
1972-73	103.18	128.00	103.45	101.03	108.69	118.06
1773-74	97.55	131.13	101.65	107.79	114.06	125.63
1974-75	105.69	128.87	94.57	130.21	106.85	142.98
1975-76	110.54	125.04	101.54	135.97	103.86	138.84

(contd.)

Table 1 (Contd.)

Year	Electrical Machinery	Transport Equipment	Miscella-neous Industries	Electricity, Gas & Water Supply	Total	Gross Value Added (at 1970-71 prices) Total
	14	15	16	17	18	19
1951-52	6.66	38.93	19.45	14.31	30.56	28.93
1952-53	7.51	28.25	16.65	15.33	30.49	29.07
1953-54	7.94	32.07	17.42	16.74	31.95	30.44
1954-55	9.21	45.09	22.46	18.01	35.53	33.90
1955-56	11.63	65.56	27.17	19.93	39.74	37.95
1956-57	15.87	83.93	26.56	21.14	43.88	42.13
1957-58	17.81	85.64	25.60	24.71	45.48	43.94
1958-59	19.59	73.03	27.21	26.77	46.18	44.95
1959-60	21.67	79.67	29.87	31.56	50.48	49.10
1960-61	27.71	82.36	37.86	34.96	55.98	54.87
1961-62	31.31	101.09	42.53	40.59	61.76	60.95
1962-63	36.75	113.91	64.79	45.24	67.77	68.92
1963-64	42.33	123.66	72.49	54.91	75.09	75.24
1964-65	50.39	146.30	74.53	60.47	81.77	82.28
1965-66	56.74	151.07	65.47	66.98	84.25	84.87
1966-67	64.82	129.52	75.12	71.60	85.53	86.68
1967-68	67.73	117.22	80.64	77.79	86.54	88.26
1968-69	78.79	121.28	98.35	86.07	93.75	95.98
1969-70	91.16	124.23	109.12	92.71	100.19	100.79
1970-71	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	115.39	113.58	86.32	104.56	102.11	101.91
1972-73	127.16	113.12	92.93	109.56	106.54	106.05
1973-74	146.64	104.27	83.29	111.87	111.52	111.38
1974-75	135.15	104.13	78.30	121.39	115.36	111.54
1975-76	147.41	96.30	79.13	128.81	116.40	113.25

Table 2 : Indices of Gross Value of Output in the Indian Mining Sector (At 1970-71 Prices)

(Base 1970-71=100)

Year	Coal & Lignite	Iron Ore	Manganese	Copper	Gold
1	2	3	4	5	6
1951-52	46.32	12.99	109.21	71.38	200.49
1952-53	47.58	13.80	120.24	62.63	224.20
1953-54	47.19	15.06	150.51	45.79	197.78
1954-55	49.61	17.87	116.30	65.99	211.85
1955-56	50.87	21.57	123.18	68.01	186.91
1956-57	53.09	23.27	128.04	74.41	185.43
1957-58	58.39	25.04	118.83	77.78	158.76
1958-59	60.91	27.49	97.57	78.11	150.62
1959-60	63.55	33.33	95.85	76.77	146.42
1960-61	72.54	51.54	87.55	80.14	140.00
1961-62	72.27	59.82	86.94	86.20	140.74
1962-63	83.54	59.34	87.65	93.14	137.78
1963-64	87.00	62.41	79.35	89.56	123.45
1964-65	84.59	65.59	93.73	91.25	132.35
1965-66	92.57	75.40	117.31	88.55	109.88
1966-67	93.52	78.43	117.41	87.88	100.74
1967-68	95.04	78.10	114.57	93.60	93.09
1968-69	99.50	87.57	95.34	91.58	102.72
1969-70	105.35	91.20	86.84	100.00	82.47
1970-71	100.00	100.00	100.00	100.00	100.00
1971-72	100.66	105.71	104.70	141.42	100.76
1972-73	106.36	108.13	97.83	173.43	94.48
1973-74	108.50	110.23	84.09	216.10	91.79
1974-75	121.63	115.16	91.85	296.02	87.56
1975-76	136.84	131.50	93.89	370.29	83.07

(contd.)

Table 2 (Contd.)

Year	*Limestone*	*Mica*	*Others*	*Total*
	7	*8*	*9*	*10*
1951-52	12.98	297.82	7.73	38.56
1952-53	12.60	231.20	8.11	39.72
1953-54	16.50	196 45	8.86	40.28
1954-55	27.25	159.57	11.34	41.94
1955-56	31.51	144.68	10.81	42.88
1956-57	35.03	174.47	13.10	45.34
1957-58	40.04	194.32	14.42	48.42
1958-59	43.84	204.96	15.82	49.74
1959-60	44.58	178.72	20.76	52.73
1960-61	55.79	175.89	25.53	60.69
1961-62	64.32	167.37	35.83	64.17
1962-63	68.95	163.12	47.66	73.51
1963-64	71.46	139.01	51.59	76.12
1964-65	72.94	136.88	58.95	77.53
1965-66	83.69	144.68	75.58	87.85
1966-67	81.56	137.59	85.88	90.89
1967-68	82.02	104.26	95.17	93.63
1968-69	89.71	110.64	93.37	96.39
1969-70	94.72	108.51	97.84	100.77
1970-71	100.00	100.00	100.00	100.00
1971-72	100.08	86.25	104.26	102.35
1972-73	104.82	83.88	106.97	106.82
1973-74	106.84	80.09	104.94	107.98
1974-75	104.78	82.46	104.56	116.61
1975-76	112.71	63.50	110.03	129.70

Table 3 : Indices of Employment in the Indian Manufacturing Sector (Base 1970-71=100)

Year	Food	Beverages & Tobacco	Textiles	Leather & Leather Products Including Footwear	Wood & Wood Products Including Furniture & Fixtures	Paper & Paper Products Including Printing & Publishing
1	2	3	4	5	6	7
1951-52	64.74	108.63	89.59	48.38	35.23	51.70
1952-53	60.29	96.40	94.63	53.22	39.04	52.19
1953-54	58.37	102.15	93.35	56.45	35.23	48.78
1954-55	61.77	112.95	93.83	56.45	37.14	53.17
1955-56	63.85	114.38	94.23	54.83	40.00	54.63
1956-57	70.51	135.25	99.19	61.29	48.57	58.53
1957-58	72.14	134.53	98.59	62.90	51.42	60.97
1958-59	72.44	142.44	91.35	62.90	54.28	62.92
1959-60	76.29	133.81	94.95	62.90	62.85	67.80
1960-61	79.70	133.09	93.99	64.51	64.76	70.73
1961-62	82.51	130.93	96.55	70.96	65.71	73.65
1962-63	84.88	130.21	98.95	79.03	71.42	77.07
1963-64	86.07	133.09	101.84	98.38	82.85	80.00
1964-65	89.48	137.41	106.48	109.67	86.66	85.36
1965-66	91.25	128.05	104.80	111.29	92.38	87.80
1966-67	89.03	123.74	100.96	106.45	91.42	89.26
1967-68	88.88	130.93	101.28	100.00	93.33	91.21
1968-69	91.25	124.46	98.47	96.77	94.28	93.65
1969-70	94.66	111.51	96.95	98.38	90.47	95.61
1970-71	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	100.14	105.03	112.97	93.54	93.33	101.46
1972-73	104.59	134.53	119.93	93.54	93.33	105.85
1973-74	109.77	141.00	120.09	91.93	98.09	107.31
1974-75	116.14	110.79	122.57	93.54	101.90	110.24
1975-76	120.44	110.79	122.17	114.51	100.00	111.70

(contd.)

Table 3 (Contd.)

Year	Rubber & Rubber Products Including Products from Petroleum & Coal	Chemical & Chemical Products	Non Metallic Mineral Products	Basic Metal Industries	Metal products Except achinery & Transport Equip-ment	Machinery Except Electrical Machinery
	8	9	10	11	12	13
1951-52	38.29	36.58	57.91	35.41	29.38	29.72
1952-53	37.23	36.17	56.75	35.06	31.28	26.66
1953-54	36.17	36.58	54.82	31.94	27.48	25.55
1954-55	40.42	38.21	46.33	32.63	27.96	26.38
1955-56	42.55	41.46	48.64	35.76	31.28	29.72
1956-57	50.00	42.27	53.28	39.23	36.96	37.22
1957-58	50.00	43.88	58.68	41.66	40.75	39.44
1958-59	51.06	48.37	61.00	46.18	49.28	40.55
1959-60	54.25	53.25	68.72	53.12	53.55	45.00
1960-61	58.51	56.50	72.58	54.86	58.29	53.88
1961-62	60.63	59.35	74.51	61.80	63.98	59.72
1962-63	64.89	63.82	79.15	67.36	71.66	25.27
1963-64	70.21	71.54	84.94	79.86	83.41	71.66
1964-65	81.91	78.04	87.64	86.80	90.52	78.61
1965-66	85.10	80.08	91.50	89.58	96.20	90.27
1966-67	82.97	83.74	90.73	91.66	95.26	95.83
1967-68	84.04	86.17	93.82	90.97	96.68	95.83
1968-69	90 42	91.05	92.66	91.66	96.68	91.94
1969-70	95.74	96.74	95.75	93.75	97.63	95.55
1970-71	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	114.89	109.35	105.01	112.84	87.67	102.77
1972-73	120.21	115.04	107.72	121.87	91.46	105.27
1973-74	126.59	117.48	113.51	125.69	92.41	110.00
1974-75	135.10	125.20	115.83	131.94	95.26	116.38
1975-76	134.04	134.14	115.85	138.88	92.41	114.16

(contd.)

(contd.)

Productivity, July-September 1979

Table 4 (Contd.)

Year	Limestone	Mica	Others	Total
	7	8	9	10
1951-52	30.27	375.29	34.50	86.02
1952-53	27.40	295.11	37.18	87.61
1953-54	71.12	250.72	15.55	93.05
1954-55	48.78	196.54	45.65	89.03
1955-56	52.38	220.24	48.18	92.56
1956-57	58.15	244.26	52.92	98.48
1957-58	62.04	253.57	51.21	102.05
1958-59	74.86	241.21	53.65	101.74
1959-60	69.03	233.59	53.56	96.83
1960-61	84.12	239.57	62.09	102.16
1961-62	103.49	213.07	66.98	105.13
1962-63	104.16	187.60	75.93	107.20
1963-64	120.09	167.15	81.98	110.25
1964-65	108.33	143.59	89.08	107.60
1965-66	108.48	150.55	88.09	108.38
1966-67	105.34	141.82	93.54	109.56
1967-68	97.52	120.19	85.71	105.18
1968-69	100.13	121.60	90.14	100.94
1969-70	98.38	114.69	95.79	100.04
1970-71	100.00	100.00	100.00	100.00
1971-72	100.85	88.05	103.20	98.82
1972-73	95.41	86.95	108.06	103.24
1973-74	198.50	80.06	108.36	112.63
1974-75	103.40	73.25	102.59	116.91
1975-76	96.60	71.90	105.16	120.17

Table 5 : Indices of Net Value Added (At 1970-71 Prices) per Employee in the Indian Manufacturing Sector (Base 1970-71=100)

Year	*Food*	*Beverages & Tobacco*	*Textiles*	*Leather & Leather Products Including Footwear*	*Wood & Wood Products Including Furniture Fixtures*	*Paper & Paper Products Including Printing & Publishing*
	1	*2*	*3*	*4*	*5*	*6*
1951-52	62.73	31.49	79.81	215.46	50.37	52.16
1952-53	68.20	30.85	79.99	156.99	49.21	52.80
1953-54	67.21	29.27	85.41	160.35	48.12	58.63
1954-55	68.88	29.26	88.54	152.81	57.38	60.72
1955-56	73.93	32.49	90.45	171.06	71.71	64.64
1956-57	71.16	31.68	92.92	170.73	66.88	65.20
1957-58	76.76	33.73	92.59	169.73	64.63	66.40
1958-59	77.43	33.99	97.47	187.87	71.45	68.69
1959-60	77.53	38.74	94.37	205.09	77.40	71.20
1960-61	79.65	44.52	99.44	229.65	84.66	75.67
1961-62	82.25	48.81	100.31	223.49	88.74	78.13
1962-63	79.10	49.63	99.86	205.33	95.62	80.72
1963-64	82.50	48.64	102.20	172.02	94.34	87.62
1964-65	83.10	55.46	101.52	134.38	107.47	87.43
1965-66	87.16	68.48	98.59	141.12	120.51	90.19
1966-67	66.19	74.31	100.13	154.62	108.98	90.41
1967-68	82.44	65.63	101.07	153.77	111.38	92.18
1968-69	87.40	78.22	104.30	143.90	111.60	96.34
1969-70	97.66	87.93	104.19	110.28	117.92	101.91
1970-71	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	81.46	102.54	87.00	91.47	113.03	87.90
1972-73	81.28	82.30	84.41	86.79	119.32	83.83
1973-74	69.18	57.10	107.27	72.57	90.44	93.86
1974-75	78.22	61.02	105.08	91.47	81.09	98.77
1975-76	81.13	81 85	102.39	44.86	77.69	91.61

(contd.)

1967-68	79.87	125.43	84.00	82.30	90.90	92.71
1968-69	93.45	128.56	106.90	88.50	98.88	101.23
1969-70	101.07	128.12	113.67	95.33	104.15	104.77
1970-71	100.00	100.00	100.00	100.00	100.00	100.00
1971-72	112.09	185.89	269.77	106.02	103.68	103.47
1972-73	115.29	182.63	285.33	126.94	102.85	102.37
1973-74	126.75	158.49	238.97	125.64	104.60	104·47
1974-75	114.40	158.55	221.03	132.26	105.32	101.83
1975-76	120.28	134.01	230.82	108.08	104.11	101.29

Table 5 (Contd.)

Year	Rubber & Rubber	Chemical & Chemical	Non Metallic Mineral	Basic Metal	Metal Products	Machinery Except

Table 6 : Indices of Gross Value of Output (At 1970-71 Prices) per Employee in the Indian Mining Sector (Base 1970-71=100)

Year	Coal & Limestone	Iron Ore	Manganese	Copper	Gold
1	2	3	4	5	6
1951-52	51.53	33.23	57.61	136.57	109.71
1952-53	53.43	27.06	47.12	114.57	132.16
1953-54	54.15	27.64	39.77	88.20	103.44
1954-55	56.97	30.05	40.15	115.60	140.44
1955-56	57.24	32.62	40.14	117.35	125.77
1956-57	58.99	32.29	34.12	129.77	124.05
1957-58	61.75	32.13	31.58	122.60	111.19
1958-59	62.40	32.95	32.91	126.01	107.05
1959-60	64.84	41.60	46.85	121.03	105.35
1960-61	71.45	54.45	45.11	126.20	104.12
1961-62	68.80	56.76	54.28	146.26	103.37
1962-63	75.56	61.27	65.60	169.71	100.56
1963-64	75.58	72.05	63.47	160.82	95.70
1964-65	76.89	57.72	90.04	167.36	109.16
1965-66	85.38	66.34	76.18	144.93	126.93
1966-67	86.05	67.27	73.21	130.06	104.01
1967-68	89.07	72.77	74.94	128.01	98.03
1968-69	98.54	86.76	75.05	106.85	105.94
1969-70	104.07	97.03	82.16	110.94	84.04
1970-71	100.00	100.00	100.00	100.00	100.00
1971-72	103.10	103.57	100.99	200.04	97.58
1972-73	101.62	111.62	97.68	147.35	90.68
1973-74	70.03	118.89	89.67	156.73	91.15
1974-75	94.32	126.39	104.26	205.17	91.84
1975-76	102.64	128.40	105.79	238.94	99.42

(contd.)

Table 6 (Contd.)

Year	*Limestone*	*Mica*	*Others*	*Total*
	7	*8*	*9*	10
1951-52	42.86	79.37	22.39	44.82
1952-53	46.00	78.35	21.81	45.33
1953-54	23.19	78.35	57.02	43.29
1954-55	55.86	81.19	24.85	47.11
1955-56	60.16	65.69	22.44	46.32
1956-57	60.24	71.42	24.75	46.03
1957-58	64.53	76.64	28.15	47.44
1958-59	58.56	84.97	29.49	48.89
1959-60	64.57	76.51	38.76	54.46
1960-61	66.32	73.51	40.82	59.40
1961-62	62.15	78.55	53.49	61.04
1962-63	66.20	86.95	62.77	68.57
1963-64	59.50	83.16	62.93	69.04
1964-65	67.33	95.32	66.17	72.05
1965-66	77.14	96.10	85.79	81.06
1966-67	77.42	97.01	91.81	82.96
1967-68	84.10	86.74	111.03	89.02
1968-69	89.59	90.98	103.58	95.48
1969-70	96.27	94.61	102.14	100.72
1970-71	100.00	100.00	100.00	100.00
1971-72	99.24	97.96	101.06	103 57
1972-73	109.86	96.46	98.98	103.47
1973-74	108.46	100.03	96.84	95.86
1974-75	101.33	112.57	101.92	99.74
1975-76	116.67	88.32	104.63	107.40

Table 7 : Rate of Growth of Output in Indian Manufacturing and Mining Sectors

MANUFACTURING SECTOR

(Percent per annum)

Sl. No.	Industry Group	1951-56	1956-61	1961-66	1966-71	1971-75	1951-75
1.	Food	3.25	5.30	3.44	6.06	(—)12.49	5.15
2.	Beverages and Tobacco	1.73	7.65	7.44	1.75	(—) 9.30	4.07
3.	Textiles	3.84	0.29	1.33	(—)0.22	7.78	3.34
4.	Leather & Leather Products Including Footwear	(—)2.00	(—)8.35	(—)0.19	(—)7.85	0.00	(—)0.75
5.	Wood & Wood Products Including Furniture & Fixtures	12.23	13.76	18.18	0.07	(—) 5.42	15.23
6.	Paper & Paper Products Including Printing & Publishing	6.18	8 05	7 52	4.78	5.52	12.66
7.	Rubber & Rubber Products Including Products Petroleum & Coal	19.66	9.15	8.83	7.90	(—) 0.16	30.78
8.	Chemical & Chemical Products	6.46	12.89	6.92	8.13	2.34	23.16
9.	Non-Metallic Minerals Products	7.39	11.59	7.40	6.32	(—) 1.12	14.84
10.	Basic Metal Industries	2 80	17.33	9.88	1.48	8.38	27.65
11.	Metal Products Except Machinery and Transport Equipment	15.44	8.27	1.13	1.49	1.05	9.83
12.	Machinery Except Electrical Machinery	16.80	17.65	27.94	2.73	7 28	96.13
13.	Electrical Machinery	14.92	14.92	16.24	10.85	4.28	8.64
14.	Transport Equipment	13.68	(—)0.40	9.89	(—)4.56	(—) 2.08	6.98
15.	Miscellaneous Industries	7.94	8.51	10.78	6.62	(—) 2.32	12.60
16.	Electricity, Gas and Water Supply	7.85	13.07	13.00	7.93	4.02	31.18
17.	Total	6.01	5.52	7.28	3.38	3.24	11.56

(contd.)

Table 7 (Contd.)
MINING SECTOR

Sl. No.	Mine Group	1951-56	1955-61	1961-66	1966-71	1971-75	1951-75
1.	Coal & Lignite	1.96	7.33	5.61	1.39	5.21	6.77
2.	Irone Ore	13.21	24.36	5.21	5.50	2.23	32.77
3.	Manganese Ore	2.56	(—)6.32	6.98	(—)2.97	(—)3.08	(—)7.67
4.	Copper	(—)0.94	1.54	0.55	2.76	27.33	13.11
5.	Gold	(—)1.35	(—)4.90	(—)4.39	(—)0.73	(—)3.27	(—)2.35
6.	Limestone	28.55	11.85	6.02	4.52	(—)0.01	29.47
7.	Mica	(—)10.28	0.16	(—)2.71	(—)5.46	(—)1.10	(—)3.01
8.	Others	7.97	18.70	22.19	3.29	0.06	52.19
9.	Total	2.24	6.77	7.38	2.00	3.48	8.43

Table 8 : Rate of Growth of Employment in Indian Manufacturing and Mining Sectors

MANUFACTURING SECTOR (Percent per annum)

Sl. No.	Industry Group	1951-56	1956-61	1961-66	1966-71	1971-75	1951-75
1.	Food	(—)0.27	2.60	2.12	2.46	3.99	3.31
2.	Beverages and Tobacco	1.06	(—)0.32	(—)1.66	(—)3.84	1.37	0.08
3.	Textiles	1.04	(—)1.05	1.71	(—)0.19	2.12	1.53
4.	Leather & Leather Products Including Footwear	2.67	1.05	11.37	(—)1.21	0.00	3.89
5.	Wood & Wood Products Including Furniture & Fixtures	2.72	6.67	8 12	1.88	2.30	7.89
6.	Paper & Paper Products Including Printing & Publishing	1.13	4.17	3.84	2.41	2.16	4.72
7.	Rubber & Rubber Products Including Petroleum & Coal	2.23	3.40	8.07	4.11	4.40	10.53
8.	Chemical & Chemical Products	2.67	6.73	6.99	3.88	3.62	10.09
9.	Non-Metallic Minerals Products	(—)3.20	7.24	4.56	2.04	2.58	4.17
10.	Basic Metal Industries	0.20	7.97	8.99	1.82	4.23	11.36
11.	Metal Products Except Machinery & Transport Equipment	1.29	11.54	10.07	1.00	2.16	9.34
12.	Machinery Except Electrical Machinery	0.00	8.95	10.23	0.87	3.31	12.15
13.	Electrical Machinery	1.25	16.68	15.18	5.66	3.69	27.22
14.	Transport Equipment	3.67	4.20	4.41	1.86	2.73	2.58
15.	Miscellaneous Industries	17.18	(—)3.29	5.69	1.09	2.67	(—)0.53
16.	Electricity, Gas and Water Supply	0.00	4.00	3.08	2.46	1.74	3.37
17.	Total	1.25	2.23	4.28	1.27	2.80	3.79

(contd.)

Table 8 (Contd.)
MINING SECTOR

Sl. No.	*Mine Group*	*1951-56*	*1956-61*	*1961-66*	*1966-71*	*1971-75*	*1951-75*
1.	Coal & Lignite	(−)0.23	2.55	0.65	(−)1.59	8.02	1.81
2.	Iron Ore	13.83	6.76	1.57	(−)2.85	(−)2.68	5.55
3.	Manganese Ore	12.38	(−)9.66	(−)0.77	(−)7.52	(−)3.75	(−)2.23
4.	Copper	2.19	2.15	0.74	9.60	26.03	7.34
5.	Gold	(−)3.74	(−)2.01	(−)7.28	(−)0.65	(−)1.92	(−)1.99
6.	Limestone	14.61	8.93	0.96	(−)1.01	0.63	10.07
7.	Mica	(−)8.26	(−)0.41	(−)5.87	(−)5.90	(−)4.20	(−)4.42
8.	Others	7.93	3.47	6.30	1.38	(−)0.15	8.22
9.	Total	1.52	0.75	0.62	(−)1.75	4.58	1.50

Table 9 : Rate of Growth of Output per Employee In Indian Manufacturing and Mining Sectors

MANUFACTURING SECTOR

(Percent per annum)

Sl. No.	Industry Group	1951-56	1956-61	1961-66	1966-71	1971-75	1951-75
1.	Food	3.57	2.39	1.19	3.20	(—)0.80	1.03
2.	Beverages and Tobacco	0.64	8.11	8.06	6.91	(—)8.10	3.91
3.	Textiles	2.67	1.40	(—)0.34	0.03	4.16	1.32
4.	Leather & Leather Products Including Footwear	(—)4.12	6.90	(—)7.37	(—)7.06	0.00	(—)2.40
5.	Wood & Wood Products Including Furniture & Fixtures	8.47	5.32	7.16	(—)1.65	(—)5.65	2.54
6.	Paper & Paper Products Including Printing & Publishing	4.79	3.21	3.09	2.12	2.47	3.72
7.	Rubber & Rubber Products Including Petroleum & Coal	15.69	4.91	0.55	(—)3.16	(—)3.10	5.74
8.	Chemical & Chemical Products	3.35	4.12	(—)0.05	3.56	(—)0.90	3.82
9.	Non-Metallic Minerals Products	12.60	3.18	2.31	3.88	(—)2.68	5.34
10.	Basic Metal Industries	2.57	6.70	0.62	(—)0.31	2.84	2.13
11.	Metal Products Except Machinery and Transport Equipment	13.28	(—)2.07	(—)5.94	0.48	(—)0.82	0.15
12.	Machinery Except Electrical Machinery	16.77	6.01	11.72	1.78	2.80	21.41
13.	Electrical Machinery	12.89	(—)0.96	0.61	6.43	0.41	7.05
14.	Transport Equipment	8.45	3.78	4.48	(—)5.87	(—)3.47	2.72
15.	Miscellaneous Industries	(—)4.98	14.12	3.96	5.26	(—)3.61	15.04
16.	Electricity, Gas and Water Supply	7.85	7.55	8.60	4.87	4.97	15.35
17.	Total	4.48	2.96	2.47	1.99	0.40	4.07

(contd.)

Table 9 (Contd.)
MINING SECTOR

Sl. No.	Mine Group	1951-56	1956-61	1961-66	1966-71	1971-75	1951-75
1.	Coal & Lignite	2.22	4.23	4.82	3.24	2.13	3.46
2.	Iron Ore	(—)0.37	13.10	3.38	9.73	5.51	11.68
3.	Manganese Ore	(—)6.06	6.46	8.07	7.32	0.81	3.43
4.	Copper	(—)2.81	(—)0.55	(—)0.18	(—)4.62	0.64	2.09
5.	Gold	(—)2.93	(—)3.21	4.56	(—)0.77	(—)1.48	(—)0.68
6.	Limestone	8.07	2.02	4.82	5.83	0.53	5.68
7.	Mica	(—)3.45	0.59	4.47	0.62	3.72	1.74
8.	Others	0.04	12.99	12.08	1.78	0.21	18.96
9.	Total	0.67	5.81	6.56	4.12	(—)0.92	5.11

Table 10 : Percentage Share of Individual Industry Groups on Employment and Output

Sl. No.	Industry Groups	1951		1956		1961		1966		1971		1977	
		Employment	Output	Employment	Output	Employment	Output	Employment	Output	Employment	Output	Employment	Output
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1.	Food	15.75	10.39	14.72	8.96	14.81	8.68	13.21	7.29	14.18	6.52	15.08	9.86
2.	Beverages & Tobaccco	5.44	3.24	5.81	2.83	4.84	3.02	3.79	3.19	3.06	3.18	2.86	2.35
3.	Textiles	40.34	4.76	38.31	36.68	32.07	27.59	27.71	21.14	29.61	17.51	28.31	19.55
4.	Leather & Leather Products including Footwear	1.08	2.25	1.18	1.57	1.17	1.71	1.45	1.30	1.22	0.58	1.32	0.80
5.	Wood & Wood Products including Furniture & Fixtures	1.33	0.52	1.58	0.67	1.84	0.86	2.11	1.08	2.06	0.97	1.95	0.63
6	Paper & Paper products including Printing & Publishing	3.82	3.85	3.71	3.80	4.02	4.11	4.02	4.23	4.36	3.98	4.25	4.01
7.	Rubber & Rubber Products including Products from Petroleum & Coal	1.30	1.61	1.45	2.47	1 52	2.79	1.71	3.35	2.27	4.24	2.34	3.86
8.	Chemical & Chemical Products	3.24	6.88	3.22	6.56	3.88	8.52	4.53	9.14	5.64	12.90	6.12	12 01
9.	Non metallic Minerals Products	5.40	2.26	4.23	2.48	5.13	2.97	5.16	3.03	5.70	3.37	5.53	3.03

(contd.)

Table 10 (Contd.)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
10.	Basic Metal Industries	3.68	6.27	3.49	5.20	4.73	8.04	5.80	9.28	6.82	8.28	7.42	10.12
11.	Metal Products Except Machinery and Transport Equipment	2.24	2.87	2.41	3.57	3.59	4.22	4.42	3.08	3.88	2.89	3.62	2.57
12.	Machinery Except Electrical Machinery	3.86	1.10	4.14	1.89	5.72	3.10	7.58	5.97	7.76	6.40	7.63	7.04
13.	Electrical Machinery	1.15	1.16	1.30	1.93	2.31	2.72	3.49	4.13	4.41	6.27	4.64	7.02
14.	Transport Equipment	7.46	9.07	8.84	13.62	9.52	11.76	9.93	11.06	6.33	8.26	6.59	6.15
15.	Miscellaenous Industries	2.56	3.12	4.33	3.30	3.46	3.78	3.65	4.91	1.17	4.80	1.11	3.86
16.	Electricity, Gas and Water supply	1.33	4.31	1.24	4.44	1.38	6.11	1.43	7.91	1.51	9.84	1.24	10.63

Table 11 : Percentage Share of Individual Mine Groups on Employment and Output

Sl. No.	Mine Group	1951		1956		1961		1966		1971		1975	
		Employment	Output	Employment	Output	Employment	Output	Employment	Output	Employment	Output	Employment	Output
1.	Coal & Lignite	64.11	71.00	56.07	69.02	61.29	64.97	60.85	59.40	60.60	56.51	68.06	60.91
2.	Iron ore	3.68	2.85	5.93	4.34	8.13	7.72	8.63	7.15	8.37	8.51	6.91	8.40
3.	Manganese	10.11	4.90	17.49	4.87	6.99	2.29	6.72	2.18	4.82	1.72	3.39	1.22
4.	Copper	0.68	1.95	0.65	1.72	0.62	1.38	0.68	0.99	0.80	1.41	1.43	2.94
5.	Gold	3.98	8.93	2.85	7.01	2.43	3.68	1.66	1.86	1.96	1.64	1.30	1.08
6.	Limestone	2.91	1.77	4.88	4.04	8.14	5.13	7.95	4.60	8.44	4.99	6.65	4.46
7.	Mica	9.51	3.59	5.40	1.78	4.42	1.18	2.76	0.69	1.94	0.38	1.30	0.22
8.	Others	5.02	5.02	6.72	7.21	7.97	13.65	10.69	23.13	13.07	24.82	10.95	20.77

Table 12 : Sources of Output Growth in Mining and Manufacturing Sectors During 1951-75

(Percentages)

Source/Period	*1951-56*	*1956-61*	*1961-66*	*1966-71*	*1971-75*	*1951-76*
MANUFACTURING SECTOR						
Employment Effect	38.33	40.99	57.99	27.31	93.60	35.62
Productivity Effect	59.24	49.65	30 26	120.52	16.42	56.69
Effects of Changes in the structural composition of Employment	3.30	7.96	10.34	4.45	(—)3.82	2.86
Interaction Effect	(—)0.87	1.40	1.42	(—)52.28	(—)6.20	4 83
MINING SECTOR						
Employment Effect	80.87	15.12	10.14	(—)74.49	82.75	16.25
Productivity Effect	64.96	60.79	74.56	140.74	18.12	60.18
Effects of Changes in the structural composition of Employment	(—)31.09	18.50	7.48	31.93	1.54	2.80
Interaction Effect	(—)14.74	5.59	7.81	1.82	(—)2.41	20.78

REFERENCES

1. Acharya S, & Nair, NK — Empirical Issues in Total Productivity Measurement: An Experiment with Cement Industry in India. *Productivity* (1978). Vol. XIX, No. 3 pp. 365.

2. Banerji, Asit — Productivity Growth and Factor Substitution. *Indian Economic Review*, (1971).

3. Banerji, Asit — *Capital Intensity and Productivity in Indian Industry*, MacMillan Company of India, (1975).

4. Central Statistical Organization (CSO) — *Statistical Abstract of India*, Various Issues.

5. Central Statistical Organization (CSO) — *National Accounts (Disaggregated)* Statistics (1975).

6. Central Statistical Organization (CSO) — *National Accounts Tables* (1978).

7. Dharm Narain — *Growth of Productivity in Indian Agriculture*, Department of Agricultural Economics, Cornell University, Occasional Paper No. 93. (1976). *Mimeographed.*

8. Diwan, RK & Gujarati, DN — Employment and Productivity in Indian Industries. *Artha Vijnana*, (1968).

9. Economic Advisor (Ministry of Industry), — *Index Number of Wholesale Prices in India*, Various Issues.

10. Goel, VK — *Productivity Trends in the Mining & Manufacturing Sectors*, Report Presented at the Third International Symposium on Measurement of Productivity, Convened by the Asian Productivity Organization in Singapore, (Jan. 1979). *Mimeographed.*

11. Goel, VK & Nair, NK — *Productivity Trends in Cotton Textile Industry in India*, National Productivity Council (1976).

12. Goel, VK & Nair, NK — *Productivity Trends in Cement Industry in India*, National Productivity Council (1978).

13. Gujartal, D — Sources of Output Growth in Indian Manufacturing", *Indian Journal of Industrial Relations* (1967).

14. Jorgenson, DW & Grilliches, Z — The Explanation of Productivity Change, *Review of Economic Studies*, (1968).

15. Lal, RN — *Capital Formation and Its Financing in India*. Allied Publishers Private Ltd. (1977).

16. Labour Bureau — *Indian Labour Statistics*, Various Issues.

17. Madan, BK — *Real Wages of Industrial Labour in India*. Management Development Institute, (1977).

18. Minhas, BS & Vaidyanathan, A — Growth of Crops Output in India, 1951-54 to 1958-61 : An Analysis by Component Elements. *Journal of the Indian Society of Agricultural Statistics* (1965).

19. Mo-Huan-Hsing — *Residual Productivity : Technical Change and Production Function*, Economics Research Centre, Chinese University of HonKong (1976). *Mimeographed*.

20. Nair, NK — Productivity, Employment and Distribution of Income in Indian Economy. *Productivity News*, (1979).

21. Narula, SS & Sagar, V — Methodology for Working Out Contribution of Area and Yield in Increase in Production, *Agricultural Situation in India* (1973).

22. National Productivity Council — *Productivity Trends in the Iron & Steel Industry in India*, (1974).

23. Reserve Bank of India — Trends in Employment Growth in the Factory Sector in India. *Reserve Bank of India Bulletin*, (1971).

24. Shrivastava, CK — Decomposition of Change in Agricultural Production : A Review, *Productivity* Vol. XVII, No. 3. (1976).

25. Umarkazi — Production Function with Variable Elasticity of Substitution. *Artha Vijnana*, (1978).

Some Aspects of Time Management

P. K. Doraiswamy*

Time has a certain mysterious quality. Like a Divine force, it has no beginning, no end and its speed, direction and passage are ineluctable. No wonder, therefore, that it has inspired several beautiful quotations in literature. "The Moving Finger writes", said Omar Khayyam, "And having writ, moves on. Not all our piety or wit or wisdom can lure it back to cancel half a line, or all our tears wash out one single word of it". Man and Time have been compared to a hunter and a tiger stalking each other. And again, "At my back" wrote Andrew Marvell, "I always hear the winged Chariot of Time drawing near, and all around me I see deserts of vast Eternity". Almost as if to soften the fatalistic rigour of his earlier quotation, Omar Khayyam buries himself in the present and says "Dead Yesterday, unborn Tomorrow; why fret if Today be sweet?"

It is rather difficult to make much managerial sense out of such poetic exuberances and a more systematic down-to-earth study of time management is essential if time, as a resource, is to yield the maximum return in the managerial context. The paradox is that while the availability or the price of time is more predictable and its distribution more equitable than other resources like men, money and materials, it is the former which is managed more inefficiently ! In fact, the modern view is that the basic raw materials of the management process are time, decisions and communication. Management of time involves two stages of awareness: (a) realising the importance of managing time; and (b) the technique of time management.

As with most objectives, an awareness of its importance is a *sine qua non* of efficient time management. Though it appears to be too obvious to deserve any special emphasis, the preciousness of time is often in conflict with prevalent socio-cultural values. In an ancient, rural, agriculture-minded society, life is, by and large, an alternating cycle of activity and idleness (or, at any rate, gross under-activity). Sustained

*Mr. Doraiswamy is Chairman-cum-Managing Director, National Textile Corporation (TN&P) Ltd., Coimbatore.

and planned activity day in and day out is essentially a characteristic of an urban, business-minded society and the psychological transition from the former type of society to the latter is still largely incomplete in our country. Even today factory workers absent themselves for no other reason than just a desire to be inactive. Insistence on a prior appointment is even today resented by the large majority of our people who regard such behaviour as "snobbish", "bureaucratic" and "inaccessibility to the common man". Unlike in western countries, it is very common for people in India to visit their friends and relatives without prior notice even when they intend a long stay with the latter.

Again, everyone in our country wants to do business only with the top man in an organisation even if the matter can easily be settled at a lower level. This is particularly true of Government Departments dealing with the ordinary public. Political leaders, in particular, would like to demonstrate, visibly to their followers, their easy accessibility to the sources of authority. The ancient ideal of an all-powerful Emperor directly listening to and redressing the grievances of his subjects still has a nostalgic appeal for us. Whereas a booking clerk in USA is likely to become impatient and restless if the customers in a queue try to engage him in small talk, an Indian railway booking clerk merrily chit-chats with the first man in the queue, blissfully unaware that several others are waiting for his service !

There seems to be, therefore, an inherent propensity in us to discount time as a resource and a failure to realise that time is indeed the source of all other resources. How many of the well-educated, senior public servants in our country know that every day of delay in commissioning a modern super thermal station would result in a loss of production valued at Rs. 100 million ? The first step in time management is, therefore, a well-planned campaign to drive home not only its importance, but its inescapability.

Two other cultural factors which complicate time management may be mentioned here :

(a) Emphasis on Employment : Though labour-saving technologies simplify the problem of time management by creating more "slack", in many areas we are unable to take advantage of them in our peculiar economic and cultural conditions of mass poverty and unemployment. Excessive staff-

ing places a high demand on time for meeting the social and psychological needs of the employees, sometimes even to the detriment of the task needs. According to Peter Drucker, if executives have to spend more than 10% of their time on human relations, then the organisation is over-staffed. It is, therefore, all the more necessary in Indian organisations to manage time more efficiently in other areas in order to neutralise the constraint in this area.

(b) Participative Management : Compared to the authoritarian style of management based on unity of command and implicit obedience, the modern participative approach is inherently far more time-consuming. Consensus and conversion of views place a large demand on the executive's time which, even if justified by the long-term results, must necessarily be compensated by time saved in other areas.

Though time management is important for everyone, it is more important for a manager likely to deal with variegated and unstructured situations than for a worker doing largely repetitive, familiar work, day after day. In the case of the former, there is not only the peculiar problem of "budgeting" time but finding time to do unplanned, unforeseen things ! The 'physical' technique of managing time has four main aspects :

(a) Key Result Areas : "The importance of knowledge", said Confucius, "is, having it, to use it". This is equally true of time. Time, like capital, is an asset to be invested and not spent. A well-known company put up a prominent notice for the benefit of its employees : "If you have nothing to do, please don't do it here!" It is the heart and soul of time management to spend the available time on Key Result Areas. KRAs are not, as often happens in Government, areas or matters where the top-man or a VIP is interested but areas where, from the point of view of the organisation's objectives, success is vital and failure is fatal. Contrary to the common misconception, work-tension arises not out of the decisions taken or work done by a manager but out of the important decisions not taken or important work not done by the manager, often for want of time ! Keeping one's eyes glued to the KRAs is a surer way of minimising, if not eliminating, this source of tension in a Manager's life. It is worth mentioning here that KRAs should not leave out the future. Omar Khayyams who "ignore the unborn tomorrow" and lose themselves in "sweet today" have no place in management – at any rate in higher management. As Peter Drucker says, the manager who

allocates time to assess the furturity of his present decision is really inventing the future of his organisation instead of accepting that it is all "in the womb of time".

(b) Method Study : Having decided what to do, how do we do it at the minimum inherent time cost ? Here we are concerned only with the least time-consuming method of doing an activity and not with individual speed or skill.

(c) Skill : Skill in performing an activity in a time-efficient way in a sustained manner may depend on practice, knowledge, habits and motivation. Attention has, therefore, to be paid to each of these areas so that the 'intensity' of time-utilisation is sustained. Time has to be utilised both extensively and intensively since the available supply, ultimately, is fixed. Speed is here treated as part of skill and is an important instrument of time management. As Einstein said, "the only way to slow down time is to travel at the speed of light!" If you don't, according to Parkinson's Law, work expands to fill up the time available for its completion ! In other words, speed leads to intensive time utilisation which, in turn, forestalls "time inflation".

(d) Fitness : A high degree of physical and mental fitness not only helps to avoid time loss on account of forced idleness but greatly assists in fuller and more intensive utilisation of time. A recent study in a Government office has shown that the slow pace of work and frequent visits of the clerical staff to the canteen were not due to indiscipline or laziness but due to poor stamina and malnutrition !

There are two general aspects of time management which deserve reference as they are relevant to all managers :

(a) Consideration for Others' Time : It is possible for a manager to be so efficient in managing his personal time that his subordinates are left with no time even to draw up a time-budget, leave alone implementing it ! To a subordinate, the boss may easily be his biggest time-waster. Management of Time, like Management by Objectives, involves a careful dovetailing of the time budgets of all concerned.

(b) Balancing Career and Personal Life : An important source of tension and frequently of failure in management is the conflict between a manager's career and his personal life. From the point of view of time

management, these two are intractable competitors for a manager's time except in rare cases where the Manager has no family or hobbies, or cases where the entire family is working together for a living. The precise and proper allocation of time between one's career and personal life admits of no generalised formula and is essentially a hard, open-ended choice to be made by each manager. The allocation has also necessarily to be dynamic as a man ages and circumstances change. In many of the Seminars or Managerial Effectiveness, an impression is sought to be created that an outstanding manager has necessarily to deny time to other aspects of his life. Whether one wants to be an outstandingly good manager and an outstandingly bad parent or a reasonably good manager and an excellent parent is a value-laden decision based on one's own philosophy of life. Suffice it to say here that this choice has to be *faced* and avoided and the necessary allocation of time made if a manager has to avoid endless tension and frustration.

These then are some of the aspects of our attempt to "fill the unforgiving minute with sixty seconds worth of distance run". In the absence of a Time Machine which will take us backwards in time, all we can do is to try and "catch the transient hour and improve each moment as it flies". □

Forecasting : Concepts and Applications

Narendra K. Sethi*

Forecasting is an attempt to foresee the future by examining the past. It consists of generating unbiased estimates of the future magnitute of some variable, such as sales, on the basis of past and present knowledge and experience. Indeed, the essence of forecasting is estimating future events based on past patterns and applying judgement to projection of past patterns. Mere extensions of past sales tendencies into the future do not constitute forecasting. Projections are mechanical functions ; forecasts require judgement.

Most estimates obtained in quality forecasting are derived in an objective and systematic fashion and do not depend solely on subjective guesses and hunches of the analyst. An analyst carefully selects a forecasting tool such as equation and applies it to quantitative data; it is then that the result is a forecast.

Forecasts are not to be confused with guesses. Guesses are estimates of future happenings, but are not necessarily unbiased or objectively calculated. Through intuition, some self-styled prophets envision devastating earthquakes in San Francisco, but in business, executives often predict that a union will strike or that competitors will not retaliate when the firm introduces a new product.

Many of the opinions are based on issues or hunches that do not require objective methods of prediction and formulation. Thus, they can reflect an executive's lack of knowledge or inaccurate frames of references regarding the behaviour of the variables estimated. In the business world, forecasting is not devoid of managerial judgement, although it is perhaps more an art than a science. Judgement is needed in selecting or constructing a particular forecasting tool.

FORECASTING ROLE IN PLANNING

Forecasts are essential for the modern business enterprises; they must be made, they must be redefined and they must be constantly revised

*Dr. Sethi is Professor of Management, St. John's University, New York.

Forecasting is necessary because if change occurs when it is not anticipated, the results can be disastrous. An enterprise prepares for change by planning, which, in turn, requires making the forecasts, and determining how these goals are to be reached. In short, forecasting is an integral part of the planning process.

There are two general types of forecasts which are developed in corporate planning; those concerning the environment-macro forecasts-and those involving company sale and production, etc.-micro forecasts.

In many ways economic forecasts are not much different from non-quantitative or qualitative planning premises, since they are basically refined estimates, translated into numbers of probably future circumstances. The definition or probable events through forecasts only gives the planner or manager a framework within which to work, and this also enables him to determine the plans that must be drawn up. The more accurate and detailed the forecasts are, the earlier is the manager's job. But such accuracy is often an illusion and is secondary to knowing the possible range of deviations of actual performance from forecasts, the probability of their occurrence, and the magnitude of the effect of such deviations on corporate operations in quantitative terms. What management needs to know is, what margin or error in the forecast it should plan for. Then, the manager's job is to create operational plans to meet and exploit predicted future occurrences. For example, in a retail sales operation, it is impossible to predict exactly what the level of consumer spending will be and so impossible to predict exactly how much merchandise will be sold. The crafty merchant, therefore, develops outlets through which he can dispose of a specific amount of excess inventory, or spaces his promotions in a way as to limit his risk and his investment in inventory. The planning information that the merchant needs is a forecast of the maximum and minimum amount of the merchandise that he is likely to have to dispose of in this way. However, he should not expect to have exact predictions or forecasts of future events, and, in fact, the forecaster is not expected to produce them. The best a manager will ever know is the likelihood and probable range of future events, their Impact on his operation and the risks involved in the various courses of action.

Another thing which a manager should know is that to use a forecast as a substitute for planning is a dangerous process. It removes much

of the resourcefulness, vitality and ingenuity for managerial decision-making and forces the firm into a position where management tends to react to its environments instead of developing creative strategies. The optimum procedure is to consider planning and forecasting as complimentary in nature and not to use one as a substitute for the other.

FORECASTING AND DECISION-MAKING

States of nature are characterised as uncontrollable variables or factors in the decision making process because of the elements in decision-making to which they relate. In other words, incorporation of states of nature reflects the fact that the businessman makes his decision in a framework of economic and competitive conditions. Conceptually, then, the decision process becomes a matter of manipulating available information within a prescribed framework, utilising statistical techniques specifically equipped to deal with problems of insufficient data. In effect, the implications of this framework for decision clearly emerges: the better and more complete data, the better the decisions will tend to be. Traditional decision theory, then, includes forecasting as an integral part of the business system approach to decision.

From a business standpoint, the decision model involves the decision-maker in an active evaluation of both internal and external factors affecting the decision. Therefore, the role of forecasting is now crystal clear. The businessman's typical decision problem concerns a choice of one of many possible strategies open to him. The choice of strategy in terms of payoffs is materially affected by the possible occurrence of conditions over which the businessman cannot exert any significant degree of control. Therefore, in the absence of this ability to control states of nature, how does the rational businessman proceed to advance his objectives as represented in his payoffs? To this question, the decision matrix framework provides the answer. In order to choose intelligently a businessman must assemble and analyse all posible information available to him concerning the states of nature that will affect his decision. This information will relate to general business conditions and to competitive conditions within his own industry. Forecasts relating to time series of macroeconomic variables, industry sales and growth, and the firm sale series essentially will provide the businessman with the information he needs in order to reduce uncertainty relative to states of

nature which make impact upon his goal-seeking and attainment. Although uncertainty concerning decision cannot be eliminated, good business planning sense will alleviate uncertainty by shedding light on the situation through forecasting and intelligent decision-making.

Therefore, given the inputs provided by macro and micro forecasting activities—appropriate information decision data storage and manipulating capabilities and suitable decision-making subsystem—the operating unit can expect to proceed in a logical and calculated manner towards objective attainment.

TYPES OF FORECASTS

Forecasts vary according to whether they apply to a large aggregate, *e.g.*, the economy, or to a component of this aggregate, *e.g.*, individual company. They also differ according to the future time span which they encompass, the products considered, means of measurement, consumer categories, and the area.

Macro and Micro—Some forecasts are macro in nature, in that they apply to some aggregate measures, such as the output of an entire economy, region or industry. Other forecasts are micro in nature ; they are situationally defined and as such, relate to only one firm.

Long and Short-Run Forecasts—Some forecasts cover only the immediate future, such as one month or one year. These are called short-run forecasts and normally cover time periods not exceeding five years. Those that do exceed five years are termed long-run forecasts.

Short-term forecasts are employed to aid decisions which must be made in the near future, such as determining the needed levels of inventory, numbers of employees to be hired, working capital to be acquired and supplies to be secured. Conversely, in decision-making situations where the impact of the chosen alternative will influence the financial position of the firm over a period of years, long-run forecasts are required. Thus, management needs these estimates to resolve such questions as whether or not to construct a new plant, which foreign markets to enter and whether or not to modernise production facilities. These are major decisions, and their impact over the long-