Index to Advertisers

Restructuring the Organisation

D. K. Jain*

Introduction

Organisation is a mechanism or structure that enables living things to work together effectively. The basic elements of organisation are division of labour and source of authority and relationship. This is true of all forms of living organisations.

Management organisation in these terms means first identifying the work that must be accomplished to attain objectives, then grouping that work in logically-related and balanced positions. Responsibility and authority are defined and delegated. As a final step, relationships are established between positions and units to facilitate harmonious teamwork.

Changing concepts of organisation require distinction between the formal, defined, and highly structured organisation and the informal, personal organisation. Both kinds exist and are necessary. The aim of the manager should be to develop a formal organisation of such scope as to encompass the varying, highly personal needs of the informal organisation. Organisation, as described, is extremely important to the business enterprise. It facilitates administration, encourages sound, balanced growth and diversification, provides for best use of human beings and stimulates creativity.

Designing the Company Organisation Structure

There is a common assumption that the design of the company organisation structure is largely a matter of striking an acceptable balance among an assortment of rectangles on an organisation chart. This is a fallacy. This organisation depicts the structure that has been created. It is the last step in design and not the first. Even experienced practitioners find it difficult to describe the process they follow while designing the basic structure. Much of their work is intuitive. From long experience, they know that certain kinds of work belong together, that

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others are incompatible. There are a few accepted principles of design, but there is no step-by-step procedure which gives detailed instructions to determine the kind of structure that is needed.

In order to decide the kind of structure a company needs, it is important to determine the kind of work that must be performed.

The company desirous of developing the organisation structure best suited to its needs can simplify its task by recognising that there are only two basic forms of company organisation structure : the functional, in which all work of the same kind is put into one unit, and the divisionalised, in which all the different kinds of work necessary to accomplish a specific end-result are put into another unit. The different kinds of work required to make up a division may be grouped either on a product or on a geographic basis.

The problem of organisation is simplified by the fact that every company starts with a basic functional organisation. The functional organisation is the structure of choice when the company is small and has only one or closely related group of products. Here, it encourages specialisation, facilitates coordination, is most economical, provides economic flexibility and ready projection of outstanding skills of one or a few top people to the primary activities of the company.

Change is indicated largely by factors which result from growth and diversification. Thus, centralisation becomes excessive; there is increasing delay in decision-making; it becomes difficult to exercise effective controls; coordination between functions diminishes; and shortages in management talent occur.

When the company outgrows its functional organisation, reorganisation should be undertaken to divide the large, functional structure into smaller units that can be managed as relatively independent administrative units, each accountable for its own objectives. Divisionalisation may be either in terms of product or geography.

Product divisionalisation involves grouping in a division all functions related to each product or closely related group of products. This is the organisation of choice when maximum emphasis is to be placed on product expansion and diversification and when the product and market characteristics are favourable.

Geographic divisionalisation should be selected when the special characteristics of the market and product indicate regional emphasis.

Divisionalisation is a radical procedure, involving dismemberment of the existing structure. Administrative preparation for divisionalisation

should include a full measure of decentralisation to vitalise the management of the divisionalised units; adequate management talent must be developed or recruited to staff the organisation; increased capital and administrative costs must be anticipated. Also, provision must be made for coordination of the separate divisions and an adequate control system must be developed. Above all, the company planning to divisionalise must provide adequate time for the change to be consummated.

Steps in Organisation Change

A definite sequence of activity should be followed in changing the organisation. This applies equally to the overall company structure and to units and components within the company. This sequence anticipates major administrative requirements prerequisite to effective change. It provides a constant organisational goal towards which change proceeds and it makes full provision for the people in the organisation.

Effective organisation change is dependent upon certain planning steps which must be undertaken first. This includes the formulation of objectives, policies, and other plans which will specify the work that the organisation is to accomplish. If objectives and plans already exist, they should be carefully reviewed as a basis for determining the appropriate organisation structure.

Once we have clearly identified what we expect the organisation to accomplish, we analyse and evaluate the existing organisation structure to determine its adequacy for the company's long-term needs. We then prepare an ideal or master organisation plan which becomes the pattern for guiding all interim changes. To reach this goal, we develop a series of phase plans, which enable us to advance toward our organisational objective with minimum disruption of operations and full utilisation of the people now in the company. These steps can be outlined in the following sequence :

1. Develop objectives and other plans,
2. Analyse the existing organisation,
3. Prepare an ideal plan,
4. Try out the plan,
5. Prepare phase plans,
6. Establish uniform designations.
7. Overcome resistance to change.

Develop Objectives and Other Plans

As we have seen, all work done in the organisation must be pointed to the accomplishment of predetermined objectives, policies, and programmes. If work does not contribute to the implementation of objectives and plans already established, it is not necessary and should not be performed. This is also true of each element of the organisation. Each section, department and division should have clearly defined objectives and other plans which are part of, and consonant with the total objectives and plans of the organisation. Each unit should perform only that work which is necessary to reach objectives.

No company is static. Its goals may change for many reasons. For each such change there should be a concomitant modification of the organisation structure. Unfortunately, this is not always the case. Many a company—and its divisions and functions—has followed the easier course. Instead of changing the basic structure to meet long-term needs, it has simply reapportioned duties among the people in the organisation. The invariable result is a jerry-built structure, with a function tacked on here and a department added there but with no underlying and progressive movement towards a balanced, integrated plan.

Analyse the Existing Organisation

Once the company has decided upon its objectives, analysis of the existing organisation should be undertaken. This process of organisation inventory encompasses study and cataloguing of the work that is being performed, the authority that is delegated, and the relationships that have been established. This helps to identify existing strengths and weaknesses. Comparison of the existing structure with an ideal plan will indicate the changes that must be made to implement the organisation the company has decided to adopt.

Organisation analysis is an indispensable prerequisite to planned and orderly organisation change. It can stand by itself as a means of eliminating overlapping and duplication, minimising friction and confusion resulting from faulty organisation relationships, improving administrative procedures, and for other values.

Information Required

As a first step in organisation analysis, information must be collected and analysed and basic decisions made concerning the nature of the organisation structure. This includes the following :

1. What primary work must be performed to accomplish the objectives established ?

2. How can the functions comprising this work be grouped to provide an organisation structure that will anticipate the long-term needs of the enterprise ? A decision must be made at this point as to the type of basic structure best suited to the long-term needs of the company. Should it be functional ? product division, geographic division, or a combination of both ? Once the over-all structure is determined, the best pattern of grouping can be derived.

3. What work can be seggregated and grouped as staff to provide for specialisation and to make services available to several units at lowest cost and with greatest effectiveness ?

4. What management positions must be created to provide for effective planning, organising, coordination, motivation, and control ?

Interview Approach

The information required for organisation analysis is available within the company by interviewing people doing the work. From key managers, it is possible to obtain basic data covering major functional areas and if the coverage is broader, then personal interview of each position is desirable.

The usual procedure in organisation interview is to start at the top and work down. The theory is that if we follow the pattern of delegation and redelegation of responsibility and authority from one level to the next, we will, in the process, identify the important work areas. This is only partly true. The primary activities of the company take place only at the level where the end results of the enterprise are accomplished. This is at the point of contact with the customer or the level at which the product is designed or manufactured or serviced. Consequently to identify accurately the work being done in an organisation, it is necessary to interview each level independently, from the bottom up as well as from the top down, and then to reconcile the data.

If we interview only the manager of each unit, which is often done, we find that he will tend to rationalise the extent and importance of his job. In particular, he will tend to affirm that he does management work which he knows he should perform, but in actuality he may not do so. The data the manager offers can best be substantiated in terms of the evidence offered from the work performed by those he supervises.

Responsibility Analysis

The first step in organisation analysis is to identify accurately and concisely the work that is being done in each position. If we are to build a pattern of management work for each job, we should analyse it in terms of management activities. If the analysis is undertaken properly, we can, at one time, identify the management work which is being performed and also that which is not. Identification of omissions can be an important means of building each position to the full scope of management responsibility and of ensuring that each manager is concerning himself primarily with management work.

Authority Analysis

The authority vested in each position should be determined, preferably, concurrently with responsibility analysis. In analysing authority, we are concerned primarily with limits, not gradations within those limits. We want to know how far a manager can go in exercising his rights and powers, not what he might do for each of several specific cases.

Authority analysis should be consistent with the over-all concept of management and organisation that we have established and should help to round out the picture of each management position. Authority should be analysed in relation to each item of work the manager performs. This relationship will establish the manager's accountability for that work, because we can hold him accountable only to the extent that we give him authority to perform. It will also help to identify omissions in delegation of authority from his superior.

Preparation of Position Guide

A position guide is a means to define responsibility, authority, and relationships for each position. It enables the organisation analyst to classify and formalise the data he has already secured. Position guides should be prepared in draft from the questionnaire and interview data secured during organisation analysis and reconciled before final statements are prepared. An example is shown in Fig. I.

Opposing Viewpoints

Two distinct schools of thought should be noted as to the desirability of written definitions of responsibility. One holds that writing out a manager's responsibility puts him in a strait-jacket. By strictly limiting him to one area of work, the written definition stunts his management

growth and makes it impossible for him to be other than a narrow specialist. Furthermore, definition is said to hamper team work and group action because it precludes one person coming to the aid of another or helping to fill in for him when he is overburdened. Definition of responsibility is also supposed to put too much emphasis on accountability. By making managers overly conscious of what they may be held for, it encourages buck passing and reluctance to take on work unless it is specifically written into the responsibility definition.

The general conclusion of this line of thought is that managers should be given general areas of work and authority. They should be permitted to take over additional work and exercise authority as they show capacity for it. As time goes on, the argument proceeds, everybody will find his best place, differences will be recognised, and a team will be developed that is tailored to the special strengths and skills of its members. This argument has some validity. As long as the enterprise grows and develops its people from within so that they can adjust and gradually fit into the pattern, as long as expansion and diversification do not require the introduction of large numbers of new employees, and as long as job requirements remain relatively static, so long lack of definition may not work undue hardship. However, it has serious disadvantages when applied to the rapidly growing and diversifying business in which this stabilised situation does not prevail. When this is the case, the strong and aggressive tend to take over the work that they like best, or that which gives them greatest recognition. There is haphazard and unequal distribution of work. The same activities may be performed in two or three different places, or some management work may not get done at all because nobody wants to do it.

When properly undertaken, written definition of responsibility and authority is of enduring benefit to the company. In practice, the responsibility specification does not limit a manager to specific actions but, rather, puts up fences beyond which he cannot pass without encroaching on another. Within the area of work allotted to him, the individual can use his imagination, ingenuity, and initiative to the utmost. In doing so, he is assured, however, that he will not overlap or arouse resentment in a fellow-manager.

Since he is confined to the performance of specific work, the manager can be appraised on the manner in which he does that work and be trained to do it better. If he is being doveloped for bigger job, the responsibility specification for that position enables him to anticipate and prepare for the duties that he will be required to assume.

Clear-cut, written definition is the best basis for delegation. It enables a manager to determine what part of his work to reserve and what to delegate. Written definition is also a basis for executive control. It

is difficult to hold people to account for mistakes or ommissions unless there is clear understanding as to who is to do what work.

Prepare an Ideal Plan

The ideal plan has several valuable purposes in organisation planning. Representing, as it does, the structure towards which the company will work over a period of perhaps five or more years, the plan serves as a guide for all organisation changes. When temporary deviations are necessary because of unforeseen contingencies, personality difficulties, or other factors, the long-range ideal plan provides an objective, carefully formulated constant to which such changes can be related. An Air lines Company reflects the best current thinking when it says, "The purpose of the long-range plan is to establish the ideal organisation to fit conditions expected at some future date. It is generally recognised that this ideal organisation will probably never be actually effected. But it does help to establish policies and philosophies which will serve as guides in making short-term studies."

Objectivity in Preparation

Perhaps the most difficult aspect of preparing the ideal organisation plan is that of examining the long-term goals and needs of the company with perspective and objectivity. The tendency is to project into the future the personalities and problems that now beset the organisation. This inevitably colours the master organisation plan, carry bodily over to it some of the deficiencies the company currently suffers from.

Check Points

A list of check points for the ideal plan is as follows :

1. Have qualitative and quantitative Goals and Objectives been clearly defined for the organisation ?

   Are they broken up into each level of working ?

2. Have organisation standards and measures of accountability been clearly established ?

3. Have short-term and long-term manpower forecasts been developed for the organisation ?

4. Has the organisation structure been designed to meet the total business objectives of the firm or agency in the most effective and economical manner ?

5. Is the organisation structure design suited to the type of engineering work at hand ?

6. Are there provisions for ensuring periodic reviews of organisation effectiveness ?

   Are data requirements adequate ?

7. Is the span of management control within the organisation adequate?

8. Is Management willing to delegate responsibility and authority ?

9. Have the responsibility and authority (decision-making) been designated to the point of action ?

10. Have organisation redundancies and duplication of efforts been eliminated ?

11. Have position descriptions been prepared for all organisation activities ?

12. Have identified tasks been matched with abilities of individual personnel assigned to complete the task ?

13. Does each individual in the organisation know who reports to him and to whom he should report ?

14. Are the organisation's efforts accomplished both effectively and efficiently ?

15. Are the needs of the individual in the organisation adequately considered ?

16. Are the individuals assigned to the jobs adequately trained ?

17. Is there consistency in the existing designations ?

18. Has career planning been made for each individual ?

19. Are the dead posts removed from the organisation ?

20. Are there clear-cut linkages between units and head office ?

21. Is there a provision of making Technical, Managerial, Financial Audit ?

Try out the Plan

Should the company commit itself irretrievably to a major organisational change before it knows whether the plan will work successfully in practice ? It is obviously wise to pre-test the final plan before large commitments are made. A pilot run of the new organisation can usually be made by implementing the change in just one unit of the organisation. For example, if a functional organisation is to be changed to product or geographic divisions, a single product or geographic division can first be established and its operation carefully observed. Difficulties in administration of the change and deficiencies in the resulting structure can be identified and corrected before the over-all change is attempted.

Prepare Phase Plans

After the potential pitfalls have been identified through a pilot operation, the company can install the over-all changes with assurance. We now must bridge the gap between the existing organisation and the ideal organisation we have set up as a goal. This transition is accomplished by the use of phase plans. These are intermediate organisation steps, designed to implement the organisation objectives as quickly and effectively as possible.

Consider Personalities

The phase plans should take into full account the individual personalities now in organisation positions. They should be designed in terms of people. The goal now is to make fullest possible use of human assets by training, developing, upgrading, and promoting. If the phasing of the organisation is to be successful, it is imperative that it proceed in terms of an over-all plan of management appraisal and development. To leave this aspect to chance or neglect to provide for the maximum utilisation of people who have already given faithful service to the organisation is short-sighted.

Phase plans may require temporary deviations from the master plan to accommodate individuals with special combinations of skills or who have a special place in the organisation. However, every such digression should be temporary. It should lead inevitably to the over-all pattern established by the ideal organisation plan.

Phase plans can most effectively be integrated with personnel changes. When people are transferred, promoted, retired, or terminated, this should be made the occasion for organisationnal changes.

As a general rule, reorganisation should not result in loss of pay to individuals affected; nor (as far as possible) in demotion or loss of position. In some cases individuals cannot be accommodated within the confines of the phase plans and special provision has to be made for them.

Establish Uniform Designations

A consistent and systematic system of designations should be developed for naming positions and elements within the organisation. Haphazard title structures are the rule, rather than the exception; as a result, many a company has "supervisors" at the head of a sales crew in one district, "managers" and even "directors" in others. When localised and restricted this probably does little harm. However, as soon as these inconsistencies come into opposition, either by reason of salary, status, transfers, or organisational level, friction is certain to ensue.

Titles are among the least expensive and most effective means of affording personal recognition and establishing some degree of consistency among levels of the organisation. From an organisational point of view, if consistent titles are used and if definite relationships are established among titles, the company will benefit in many ways : A title can be made to indicate the kinds of the work a person does, his approximate level and degree of authority, and the organisation component to which he belongs. If a proper sequence is established, a "foreman" will always be at a lower organisational level than a "superintendent."

Overcome Resistance to Change

"There is nothing more difficult to success, nor more dangerous to handle, than to initiate a new order of things," said Machiavelli some five hundred years ago. The truth of this is forcibly brought home to the manager attempting to put into effect an organisational change. Planning an effective strategy for reorganisation involves recognition that there are two phases to the process. First is the design of the structure itself; second is the movement and rearrangement of the people involved. When both phases are properly integrated and effectively implemented reorganisation can have many far-reaching benefits for the enterprise. If one or both are improperly handled, however, the repercussions are likely to be immediate and troublesome. The greatest difficulty and danger lie in overcoming resistance of the people who will be affected by the organisation change. Reorganisation can be a highly disruptive force. Need for change may be recognised only at the height of crisis. Sweeping reforms may be initiated, new methods introduced, and many new managers hired. People are torn from their long-established social groupings. Frequently demotions

and discharges take place. The net result is fear, insecurity, discontent, and diminished efficiency.

A large manufacturing company undertook an organisation survey in an attempt to identify the reason for a slackening of sales and profit. Over a period of several months a crew of analysts visited the plants and offices of the company, studying operations, questioning managers, and investigating reports and records. It was obvious to everybody that a major study was under way and that it was being directed from top management. The grapevine was soon loaded with rumors : a merger was in the offing; a large stockholder was trying to wrest control from the incumbent management; a major economy drive was under way. Uneasiness spread. A gradual increase in turnover of younger managers occurred; absence and tardiness became more noticeable.

Fitting people to the organisation plan and motivating them to work at high productlvity within its confines is probably the most difficultad ministrative problem confronting company management. Resistance arises to organisational change because it is a threat, direct or implied, to the position, status and opportunities of every person in the company. Of primary concern to the organisation planner is how to anticipate and overcome this resistance, how to get people to accept a change and even to welcome it with some enthusiasm. The factors that will ease the transition are those basic to all sound motivation—participation, communication, and education.

Participation

People who have an opportunity to participate in planning for organisational changes will have some feeling of commanding their own destiny and not of being pushed around like so many pawns on a chess-board. Participation helps to give the people involved in the organisation change a feeling of importance. It makes it obvious that the company needs and wants their opinions and ideas and is unwilling to go ahead without taking them into account. This is highly reassuring and facilitates the transition from one order of things to another.

As a general rule, those people who will be directly concerned and affected by a certain organisation change should be given opportunity to participate in that change before the final decision is reached. Top officers participate in the design of the overall structure and subordinates in organising their departments and sections.

Communication

Last but not the least, every effort should be made to let people know about organisational changes. This involves not only people within the

company but also dealers, stockholders, and the public. The best practice is to tell as much as possible, as soon as possible. In some cases, specific details may have to be omitted for competitive or other reasons. However, simple announcement that the company or division or plant is undertaking an organisation study to plan for its long-term growth, to improve efficiency, or for other reasons will answer many questions and can have little repercussion.

Fig. 1 : Position Guide Sheet

UNIT :	DATE :
Position Title & Grade *Immediate Supvr. & Grade*	*Designation & Grade of Officers supervised*
	1. 2. 3. 4.
	No. of Staff

Broad Functions & targets to be achieved :

Responsibility for work of others, money, operational:

Authorities :

Qualification & Experience Requirements :

Remarks (Mention lateral relationships and any difficulties in discharging duties being faced now) :

Planning for Careers

Manish Nandy*

There is an emergent interest in India in the practice of career planning and this is viewed by two contrary sentiments. The first is the skeptical one that career planning is an alien, new-fangled fad of scant relevance to our context. The other is the supportive attitude that, since career opportunities are relatively limited in this country compared to the country of its origin, it should be of particular interest to us.

Based on work experience with career planning in the USA and the much longer experience with its absence in India, the author believes the latter to be so much the saner view.

Though the following exposition is an outcome of a personal dip in the theory and practice of career planning, the author thinks it also constitutes a summation of the state of the art.

Nature of Career Planning

Career planning embodies a systematic approach to the identification and development of individual careers in an organisation for the benefit of both individuals and the organisation.

This is the simplest possible definition of career planning and it is predicated on two basic ideas : first, that it is advantageous to working individuals to have careers, and second, that it is useful for organisations to have identifiable career lines. Both these propositions are demonstrable fairly easily. Workers work better, not only when they know what their individual tasks are leading up to, but also when they know what their working life is leading up to. They have a sense of purpose and, equally important, a sense of satisfaction. If anything, it is clearer that it is an advantage for an organisation to identify careers so that it knows at what points of time what skills will be at its disposal. That alone can enable it to plan its capabilities to meet the challenges that it expects to encounter.

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Career planning practices differ quite a lot from organisation to organisation; this is only to be expected since career planning is a relatively new-comer in the field of human resources management. Despite this diversity, one can identify some common features in the major programmes of the better known organisations, like IBM and ITT, TRW and Xerox, General Electric and General Motors. Essentially, these features are four in number :

i. *Exchange :* Invariably career planning activities require a much higher degree of interaction between individuals and their supervisors, sometimes the supervisors' supervisors or consultants.

ii. *Assistance :* Career planning in every case implies provision of more information to employees about career options and opprtunities. This, of course, can be achieved in many different ways, including formal seminars on the subject or informal channels of counselling.

iii. *Sharing :* While the organisation shares more information about opportunities with individuals, in career planning the individuals also share their real preferences with the organisation. This involves clarification and expression of their values, goals, timetables.

iv. *Perception :* The career planning mechanism always includes some feedback to employees which helps them to strengthen themselves by knowing others' perception of them. The mechanism may involve personal counselling or group discussion, but at the end of it, employees realise their strengths and weaknesses better, especially as these affect their expectations.

Objectives of Career Planning

Career planning may serve to fulfil a number of objectives and more than one of the following may be reason enough for any organisation in starting a career planning programme.

(a) One major objective may be the desire to develop and promote employees from within the organisation. This can help to meet future organisational needs for specific types of skilled and experienced people.

(b) A second objective is often to satisfy a demand from people within the organisation for a better idea of what their future prospects may be. This demand typically comes from two sets of people : from high-fliers who wish to continue the sharply rising curve of their progression and from activists who insist on the title to know what the organisation holds in store for them.

(c) A related but different objective is to attract talented people who will only come if they see a fair assurance of a good career. This, of course, is based on a realisation of scarce managerial talent and the necessity of attracting the best people both from universities and from other organisations. To avoid in-breeding, external intake is essential, but its quality can be vouchsafed only by good career prospects.

(d) The statutory responsibility of recruiting disadvantaged people, like persons from Scheduled Castes and Scheduled Tribes, provides another objective for career planning. Such planning can identify ways of better utilising people who may have entered the organisation on standards more lax than usual.

(e) In a similar case, demoralised people within the organisation, who may have been promoted for a long time despite long experience on account of limited qualification, can be another major objective with career planning. It would show them, first, that the organisation cares and, second, that they too can go places with some effort.

(f) Finally, the all-important objective is simply to promote greater satisfaction amongst employees in general by letting them see clearly what career avenues are available in the organisation and thus develop more realistic career expectations. This, in turn, is often related to the more basic objectives of reducing employee turnover or enhancing employee productivity.

Rationale of Career Planning

The value of career planning depends on the ways in which it is able to serve an organisation and its constituents. Therefore, it is important to examine the rationale of career planning.

Some people tend to associate career planning with certain risks. They feel, for example, that career planning may raise the expectations of employees excessively and create greater problems later on when the expectations are not fulfilled. A variation of this fear is that the preoccupation with career considerations may heighten individual anxiety about possible success or failure and may generate problems that did not exist before. Some even feel that while career planning itself may be a good thing, to carry it out imposes burdens which may very well outweigh the benefits. For instance, employees may start demanding for greater career development opportunities by way of training than the organisation can possibly afford; or supervisors may become overburdened with counselling and other responsibilities that are

the direct consequence of career planning. Some feel these factors detract from the rationale of career planning.

But the fundamental rationale of career planning does not lie in raising employee expectation, but rather in clarifying expectations and making them more realistic. It helps to pinpoint the role of an employee, bring out alternatives where none seemed to exist before, equip a person to plan his career or plan it better than he did before, and it simply makes much better use of whatever opportunities exist in an organisation. In this way, it promotes a better commitment to career plans and related development plans, which, in turn, leads to enhanced perfromance and superior utilisation of personnel talent.

Most people who enter an organisation continue in it for years with a very limited notion of what a career may entail. Their concept of success in a career is extremely limited, and so for them it is an easy slide into a sense of failure and consequent demoralisation. Career planning gives them the chance to abandon the misleading up-or-out notion of a career and give up thinking of promotion as the only way of "getting ahead". Experience in several countries has shown that lateral job switches and careers in special locations or specialised jobs may be extremely satisfying to many employees with conscious preferences.

Some people find it impossible to accept the idea of what can be a kind of out-placement : an organisation offers opportunities to its employees to clarify their career notions, which then induces them to take a hard look at their existing careers, and they eventually decide to leave the organisation. It may seem curious advice to counsel an employee virtually out of the organisation. However, on second thought, it seems questionable if a company is ever well served by employees who stay with it out of ignorance or sheer apathy.

Career Planning Activities

Let us consider the major types of activities organisations engage in as part of their career planning programme. These activities constitute a wide spectrum, but we can broadly group them into four types :

A. The first type of activity involves the communication of job opportunities to employees, in the form of some basic reading material coupled with several periodic publications. The basic reading material normally includes compilations of :

i. Organisation charts of different branches, functions and divisions of the company ;

ii. All job titles and designations obtaining in the company, classified in different manners ;

iii. Job descriptions to illustrate the various titles and designations ;

iv. Income scales or grades corresponding to the different jobs in the company ;

v. Benefits and perquisities which are attached to different jobs ;

vi. Required education and experience for the different jobs, wherever stipulations have been formalised by the company.

The basic reading material also includes a delineation of the so-called career paths or career ladders, that is, the lines of ascent a person must follow to go up from job to job and acquire progressively greater responsibility. Every company has its own special set of career ladders, subserving its needs for specialisation, rotation and general exposure. Career planning literature simply spells out such information, to make it possible for those interested to know what are the options open in a particular position and which are the directions in which one can go. Such reading material, of course, is essential to building up realistic awareness of career prospects among employees and also shaping practical career aspirations among enthusiastic career-conscious youth.

Besides the basic reading materials, the communication of job opportunities may take the form of periodic publications, special brochures, information in company journals and other publications, and announcements in company's notice-boards. This will ensure the exact reverse of the situation wherein employees get to know about new job opportunities in their own organisations from newspapers or outsiders. From time to time, every organisation needs some special skills; such skills may even be needed in a large measure if an organisation is expanding or diversifying. Organisations which take their career planning seriously, invariably try to give internal employees the opportunity to be the first to respond in case they have special skills which the organisation needs. Some organisations even identify the willingness of existing employees to undertake effort to acquire those skills, and take the responsibility and bear the expenses of re-training their employees to acquire the needed skills. The whole process can only start when, in addition to basic information about the company's jobs and job opportunities, there is adequate and timely flow of information about new careers emerging in the organisation.

B. The second major type of activity in career planning has been the provision for guided planning through institutional means. The idea is to help the individual employee determine something of his interests, preferences and abilities. Once the provision of such guidance is con-

sidered a legitimate activity, an organisation can fairly easily develop the means to provide such guidance. Pioneering organisations, for instance, have developed fairly elaborate self-directed workbooks, which take employees step by step through a whole series of exercises and let them know something of their own predilections and aptitudes. Many other organisations have bought general workbooks, which are available in the market, for the use of their employees or have commissioned consultants to develop workbooks appropriate to their organisation.

A second common means of helping the employee plan his career is to develop assessment centres within the organisation which use a battery of behavioural exercises to assess a person from different angles. Assessment centres are an excellent means of assessing job-seekers for employment and employees for promotion ; many organisations which have developed such centres and trained their managers as assessors, often use the centres for offering valuable guidance to interested employees.

Yet another variation on the method of providing guidance is to let the employees undergo testing by an expert at company's expense. Normally it is of two kinds. The first kind is psychological testing which enables the employees to get an objective picture of their psychological profile and use that information to decide what career option they consider for themselves. The second kind is testing of aptitudes and interests, which may help the employees clarify their minds about what truly interests them and thus consciously make career options.

C. A third way that organisations are giving career planning assistance to employees is through workshops. The most common type of workshops relate to life and career planning. These workshops try to help an individual to do three kinds of things :

i. Assess oneself to arrive at a self-identity and answer the question 'who am I'. This exercise involves making an inventory of one's interests and skills and knowing one's leadership potential.

ii. Determine one's future possibilities and answer the question 'what can I achieve?' This exercise is of planning one's goals, calarifying one's options and coping with possible changes.

iii. Ascertain individual action through group assessment and answer 'how do I achieve it'. This exercise involves peer perception and guidance.

Some organisations also conduct workshops on inter-personal relationship, to clarify a very significant variable in career choices, as well as on job performance and development planning, which helps employees to take a critical look at their past performance and on that basis evolve a

constructive plan about their future development and work accomplishment. Some organisations also conduct workshops to help employees prepare for retirement by developing new interests and activities.

D. The fourth and final type of activity which normally characterises career planning involves offering career counselling to employees through one of the following counsellors :

i. *Employees' supervisors :* This has the advantage that the boss would talk about work and also talk about the subordinate's development, and can most easily and effectively monitor the impact of counselling on development. Supervisory counselling, therefore, is developing very fast, and many organisations are taking pains to train their managers in counselling, especially as it has many incidental benefits in the areas of day-to-day functioning and employee relations.

ii. *Personnel staff :* Counselling is beginning to be seen as an important aspect of the work of personnel specialists, and often career counselling is entrusted to them.

iii. *Staff counsellors :* Organisations are also developing internal counsellors, sometimes working on a part-time basis, to assist in the process of career counselling. This involves, of course, training the counsellors first in the organisational framework and feeding them adequate information about career possibilities and their implications.

iv. *External counsellors :* A fourth alternative is to requisition the services of professional counsellors from outside to work part-time with the organisation to assist its employees with counselling. This ensures a higher degree of professional expertise in counselling, which is excellent in the areas of personal identity problems and value clarification, but often is less effective in the more specific areas of career guidance to employees.

Counselling, whether formal or informal, can be a very powerful tool in clarifying employees' conception of career choices and their meaning in the total context of their life. It can help employees clarify their individual preferences and problems and make effective decisions to plan their future career path.

Career Planning System

Career planning is a relatively new concept and, therefore, streamlined systems are yet to develop in most organisations to guide discrete acti-

vities undertaken. In fact, it is essential to develop some conceptual framework to make sure that the four types of activities mentioned earlier converge to a meaningful focus.

Essentially, the career planning system revolves round the constellation of three kinds of assessments :

i. *Personnel assessment :* This involves an assessment by the organisation of employees, either the whole range of employees or, as some choose to restrict it at the start, all the managerial employees. The assessment requires drawing up of a balance-sheet of the employees' performance as well as potential, with reference to some standards, derived through MBO (Management By Objectives) or BARS (Behaviourally Anchored Rating Scheme) or any other technique appropriate for the purpose. This assessment would identify the development needs of the various individuals as well as of various groups.

ii. *Personnel assessment :* This involves employees' own assessment of themselves and their career goals. The assessment includes taking an inventory of all their skills, interests and values on the one hand and of the proficiency requirement of their coveted jobs on the other. In this assessment, the employees can depend on their own resources, utilise the workbooks or tests provided by the organisation, or have the advantage of one-to-one counselling and peer counselling to make up their minds.

iii. *Organisational assessment :* This includes an analysis by the organisation of career paths for key jobs. Naturally, this requires a preliminary understanding of the jobs themselves and then a formulation of their requirement in terms of knowledge and skills. In practical terms, this may mean an analysis of required qualifications, special and general training, and work exposure and experience, along with specific time frames for mandatory experience.

Organisational assessment and personnel assessment form the two critical elements of organisational career planning, whereas personal assessment provides the basis for individual career planning. Their reconciliation will depend on a prognosis of future trends in respect of :

a) The business of the organisation

b) The nature of its clientele and markets

c) Future organisation strategy

d) Potential growth of business

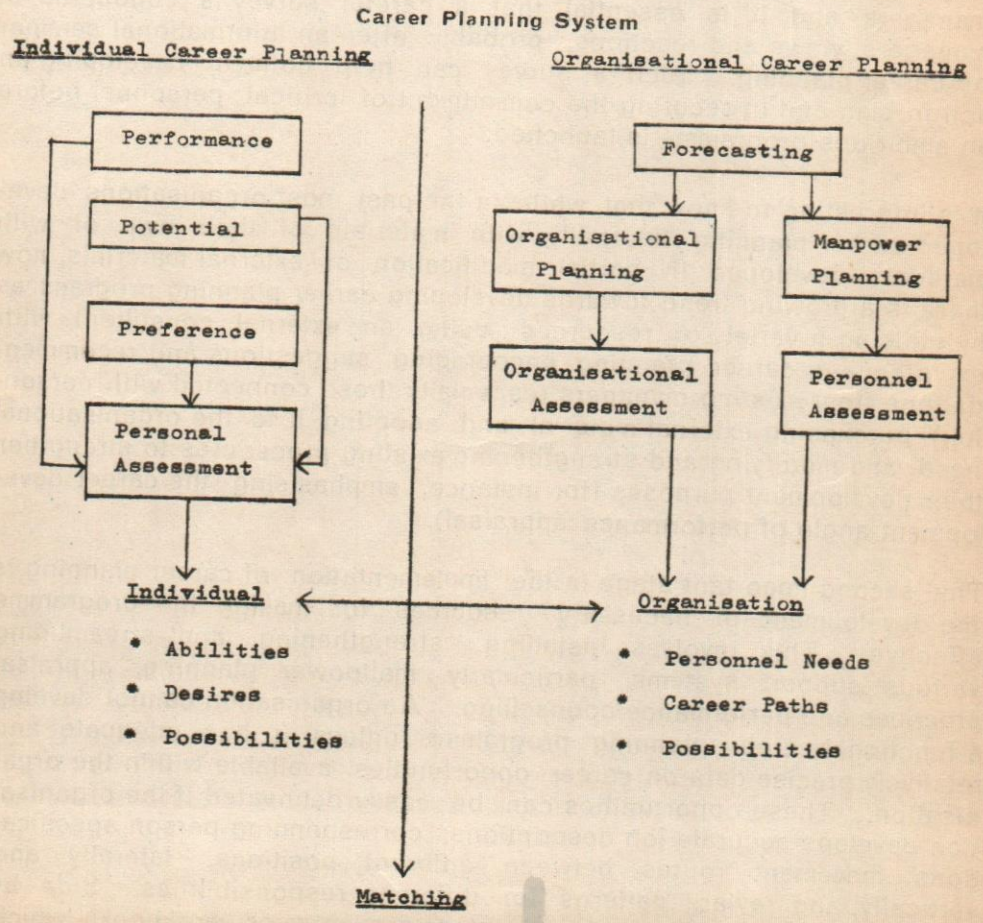
e) Planned diversification

f) The environmental context.

But it will also depend on the specific philosphy and policies which the organisation adopts in the face of its manifold challenges. The policies will be expressed through the forms organisational career planning and manpower planning take in the organisation.

Wherever the effort to piece together individual career planning and organisational career planning results in a mismatch, attempts will have to be made in two directions : to bring greater realism to personal assessment through better counselling, and achieve greater effectiveness in organisational and personnel assessments so that individual requirements are better taken account of.

The accompanying diagram illustrates the career planning system.



Developing a comprehensive conceptual framework for career planning systems is yet unaccomplished. The fundamental reason seems to be

that we still do not have a viable and satisfactory theory of careers in general. The vast amount of work done at the Massachussetts Institute of Technology have highlighted how the career concept undergoes identifiable changes over one's life-cycle and how important it is to recognise these changes in developing a theoretical framework of organisational careers. We, therefore, know today some of the ingredients for an adequate theory of careers, but the theoretical framework necessary to develop an effective system is just not there.

Implementation of Career Planning

There are some distinct stages in implementing a programme of career planning. The first stage is the determination, of organisational need and the development of an appropriate strategy. Career planning cuts very close to the strongest feelings of employees, especially professional managers, and it is essential that a careful survey is conducted of managers' views and reactions, probably after an informational seminar on career planning. Such a survey can help both in developing an action plan and in securing the commitment of critical personnel before an ambitious programme is launched.

It is interesting to know that, while in the past most organisations developed career planning internally with materials of their own or with materials developed in partial modification of external materials, now there is a growing trend towards developing career planning programmes by utilising a variety of resources : using an external consultant with experience in career planning, encouraging suggestions and recommendations from existing managers (especially those connected with personnel), purchasing external material and adopting it to the organisational need, and modifying and strengthening existing procedures to strengthen their development purposes (for instance, emphasising the career development angle of performance appraisal).

The second important stage in the implementation of career planning is the development of necessary resources for making the programme effective. This involves installing, strengthening and streamlining various support systems, particularly manpower planning, appraisal practices and performance counselling. An organisation cannot develop a functional career planning programme unless it has adequate and relatively precise data on career opportunities available within the organisation. These opportunities can be easily delineated if the organisation develops accurate job descriptions, corresponding person specifications, movement routes between different positions, laterally and vertically, and reward patterns for different responsibilities. Side by side, the organisation can also develop seminars or workbooks which share information with employees on career planning that are likely to be of interest to them.

In general, introduction of career planning requires a second look at a number of support systems including the following (broadly in the order of their importance) :

* Performance review system
* Promotion and transfer practices
* Educational assistance
* Training programmes
* Management succession policy
* Recruitment practices
* Personnel information system
* Job description and job evaluation
* Manpower planning
* Compensation policy
* Skills inventory
* Rotational programmes
* Counselling service.

The third stage in the implementation of career planning is a pilot introduction of the programme. Organisations which have successfully introduced career planning have normally first pretested the programme in one location or division or class of employees, evaluated the results very carefully, made refinements in the programme in the light of the first results, and then gone on to an extension of the programme. This raises the question whether any particular group of employees normally receive special attention in career planning programmes. The practice of the major companies seems to indicate that some categories of employees are normally singled out for special attention in career planning activities. In a ranking of importance, these groups are usually :

* Management trainees
* High potential managers
* Women employees
* Disadvantaged employees
* Employees facing retirement
* Mid-career employees.

The final stage in the implementation of career planning is, of course, the full introduction of the programme. It is essential before this stage to take stock of what has gone before, prior to widening the operation of the programme. For example, a resource centre must be developed

and equipped, perhaps in the personnel department; appropriate workshops must be designed and ready for launching; self-informational and self-instructional publications should be finalised and available for use. Above all, once again the critical decision-makers of the organisation, preferably all managers should be informed and consulted before the final stage of full introduction is taken up. Their commitment and support would be essential to the success of any large-scale programme.

Future of Career Planning

Anticipating the future of a management innovation is always hazardous. Yet, it seems safe to expect that an innovation that builds principally on the growing demand for individual autonomy and a planned mechanism for matching it with organisational purposes, is likely to grow in importance in the eighties. The outlook for career planning, therefore, seems bright. In fact, pressures for its acceptance are certain to build up in the larger organisations where there is a distinct sense of apathy and alienation.

We are likely, therefore, to see, in the years to come, a strengthening of some primary career planning practices :

i. Greater provision of information on the job spectrum
ii. Stress on performance appraisal and performance planning
iii. Linking of personnel policies to career considerations
iv. Training of managers in career guidance
v. Expansion of career instructional workshops
vi. Substantial growth of career counselling.

In a significant sense, career planning is intrinsically a response to the challenge of humanising the workplace. To the extent that many of our offices and factories represent for their employees a distasteful, demoralising experience, career planning programmes constitute an attempt to reverse the situation and is, therefore, at least as desirable as it is feasible. □

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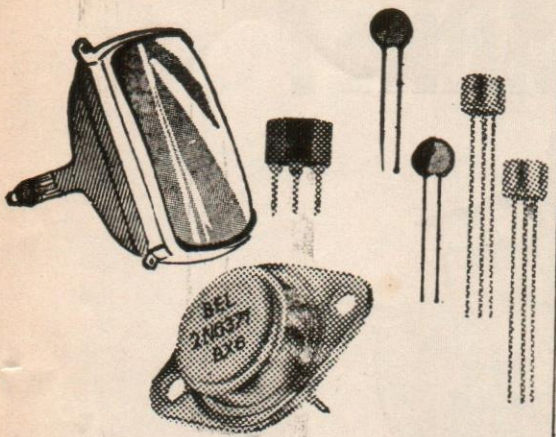
Holding the price line —even bringing it down!



Right now BEL, a Public Sector Undertaking under the Ministry of Defence, are reducing the prices of some of their electronic components for TV and Radio Receivers—TV PICTURE TUBES AND GERMANIUM TRANSISTORS AND POWER DEVICES.

This has been possible because of the concessions given in the customs duty in the Annual Budget for 1980-81 presented by the Finance Minister.

BEL, as the premier manufacturer of vital components for the electronics industry, have on many occasions set the trend in reducing the prices of components. BEL's progressive marketing policy has always been to hold the price line even in the face of spiralling escalation of costs of raw materials like gold, indium, etc., power, wages, transportation and other inputs.

In Silicon Semiconductors, another vital component for Radio and TV Receiver Sets, prices have remained the same over the last four years, except for a mere 5 paise last year to offset the excise duty increase. BEL's continuing technological innovation has made this possible. Similarly, prices of Ceramic Capacitors, too, have remained the same for the past 16 months.

For over 20 years now, BEL's progressive policy and state-of-the-art technology have made available to the electronics industry components of high reliability at maximum economy.

The reduced prices of the components are as follows:

TV PICTURE TUBES:

Size	Existing Wholesale Price	Reduced Wholesale Price
	Rs.	Rs.
310 mm (12")	290	280
470 mm (19")	465	450
500 mm (20")	405	395
590 mm (23")	715	685
610 mm (24")	835	795

GERMANIUM SEMICONDUCTORS:

Transistors:

Type No.	Existing Wholesale Price	Reduced Wholesale Pri
AC 125	3.20	3.10
AC 126	3.30	3.20
AC 127	2.90	2.80
AC 128	2.90	2.80
AC 132	2.90	2.80
AC 176	3.10	3.00
AC 187	3.30	3.20
AC 188	3.30	3.20
PT 4	11.00	10.70
PT 6	10.00	9.70
AD 149	11.50	11.20
2N4241	12.00	11.70
ASZ 15	17.60	17.20
ASZ 16	16.85	16.45
ASZ 17	16.60	16.20
ASZ 18	17.40	17.00
Transistors (Matched Pairs)		
2 × AC 128	5.80	5.60
2 × AC 188	6.60	6.40
AC 127/128	5.80	5.60
AC 128/176	6.00	5.80
AC 187/188	6.60	6.40
PT 4/PT 6	21.00	20.40
2 × AD 149	23.00	22.40
Transistors with Block Heat Sinks		
AC 128/01	3.35	3.25
AC 188/01	3.75	3.65
AC 187/188/01	7.50	7.3
Photo Transistor		
ACP 132	3.50	3.40

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Mortality in Industrial Estates in Haryana

Kamal Kishore*

The failure of some of the enterprises in the industrial estates has a demonstration effect to the new comers. The existing enterprises are also affected adversely due to high mortality of units because these are complementary to and dependent on each other. The failure of some enterprises may cause a drain on the raw material source of another enterprise or may check its marketing outlet. Thus the success of the industrial estate is very much dependent on the mortality rate.

For the purpose of the present study the term 'mortality' means the de-facto 'cessation' of operations of small enterprises in the industrial estates though they might exist in the records of State Authorities. According to aging pattern of mortality (Table 1), the ceased units are classified as follows :

(i) Industrial units which never started production since the time of occupation of their sheds and still continue to occupy the sheds in the industrial estates ;

(ii) Industrial units which left the estate after working for some time ;

(iii) Industrial units which closed operations after working for some time but still continue to occupy sheds in the industrial estates; and

(iv) Units which occupied the sheds but left the estate without starting production.

It is noted that the percentage of mortality based on the total number of enterprises which entered the industrial estates (urban and rural) is much higher in case of Rural Industrial Estates as compared to Urban Industrial Estates.

A study of Table 1 further discloses that 112 units in Urban Industrial Estate (69.5 percent[1] of the total number of enterprises entering the

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1 A total of 161 units entered the urban industrial estates at different times but only 49 are actually working now; thus 69.5% of the enterprises faced mortality. In Rural Industrial Estates, total of 42 units entered the estate but only 5 are actually working, which means 88.09 percent of the enterprises faced mortality.

Table 1

Aging Pattern of Mortality of the Units in Urban Industrial Estates as on 31.3.1975

Name of the Estate	*Less than one year*	*1—3 years*	*3—5 years*	*5—7 years*	*7—9 years*	*Above 9 years*	*Total units*	*Percentage based on 112*
Ambala	—	1	3	3	—	—	7	6.25
Gurgaon	6	11	5	3	9	—	34	30.36
Hissar	9	4	2	3	6	1	25	22.32
Nilokheri	5	2	1	1	—	5	14	12.50
Narnaul	10	10	—	1	1	—	22	19.64
Sonepat	2	—	—	2	1	5	19	8.93
Total	32	28	11	13	17	11	112	100.00
Percentage based on 112	28.57	25.0	9.82	11.61	15.18	9.82	—	100.00

Source : Field Investigation.

Table 2

Aging Pattern of Mortality of the Units in Rural Industrial Estates as on 31.3.1975.

Name of the Estate	*Less than one year*	*1 - 3*	*3 —5*	*5—7*	*7—9*	*Above 9 years*	*Total*	*Percentage*
Pinjore	1	2	1	1	—	—	5	13.52
Palwal	1	—	—	—	—	—	1	2.70
Sohna	2	1	3	—	—	—	6	16.22
Barwala	—	—	1	—	—	1	2	5.40
Fatehabad	1	1	—	—	—	—	2	5.40
Kaithal	2	—	—	5	—	—	7	18.92
Kohand	4	—	—	—	—	—	4	10.80
Mohindergarh	4	1	—	—	—	—	5	13 52
Rai	—	1	2	—	1	1	5	13.52
Total	15	6	7	6	1	2	37	100.00
Percentage	40 54	16.22	18.92	16.22	2.70	5.40	100.00	

Source : Field Investigation.

estates) faced death between less than a year and 11 years. The higher rate of mortality has been of units which worked for less than one year. Of the 112 units which faced death within varying periods, 28.57 percent failed within one year while 25 percent of the units failed 1 to 3 years of occupation. Cases of failure are less among units which could exist longer and it is to be noted that of the units which survived for 3 to 5 years only 9.82 percent faced failures. Table 1 also reveals that of the 112 units facing mortality, the maximum closure of units (30.36 percent) was in the industrial estate of Gurgaon, followed by Hissar (22.32 percent) and Narnaul (19.64 percent). In all these estates the largest number of closures occurred within one year.

The mortality of units in Rural Industrial Estates was 37 (Table 2) which is 88.09 percent of the total enterprises entering the industrial estates, whereas the mortality in urban industrial estates was only 69.5 percent. A distinctive feature of this phenomenon is that about 40 percent of the units in rural industrial estates died before attaining the age of one year, which is about $\frac{1}{4}$ (28.57%) of this type of early mortality in case of urban industrial estates. This leads us to the conclusion that most of the entrepreneurs tried to get rid of their liability in rural industrial estates as early as possible.

Kaithal was the only rural industrial estate which could attract a maximim of 7 enterprises but all these units failed within 5-7 years. In fact, two units never started any operation while 5 units belonged to one party. All the five units closed abruptly due to political apathy. This underscores the lesson that as far as possible ownership should be widespread.

Causes of Mortality

A study of the ceased units in the industrial estates in Haryana according to the class of mortality (Table 3) shows that 35 entrepreneurs falling in category 1 registered themselves as entrepreneurs but did not start production till now, though they continue occupying sheds in the estate. Most of them were not interested in running the industrial enterprise but wished to earn a handsome premium in the market on the sale of raw materials received at controlled or subsidised rates. Because of occupying sheds in the estates, they would be entitled to the quota of scarce raw materials which could be sold in black market. They also expected a capital gain by selling the sheds after the estate is fully developed. The only risk for them was payment of a nominal monthly rent which they could easily afford as a business risk. Non-provision of promised incentives by the government, inadequate finance, shortage of raw materials and unfavourable market conditions were other reasons for the closure of the units in this category.

Table 3

Mortality Classification of the Ceased Units from the Period of their Occupation/Commencing Production.

	Classification of Mortality	*Less than one year*	*1—3*	*3—5*	*5—7*	*7—9*	*Above 9 years*	*Total*	*Percentage*
I.	Units which never started production from the time of occupation but continue to occupy the sheds.	35	—	—	—	—	—	35	23.49
II.	Units which left the estate after working for some time.	4	10	2	4	4	6	30	20.13
III.	Units which closed their operations after working for some time but still continue to occupy the sheds.	3	14	13	15	13	6	64	42.95
IV.	Units which occupied the sheds but left the estate without working.	5	10	3	—	1	1	20	13.43
Total		47	34	18	19	18	13	149	100.00

Source : Field Investigation.

20.13 percent of the failed units fall in the second category wherein the entrepreneurs started operations but ran away from the estate after a short while as they did not see any hope of success even in the near future. Most of them left the estates after working for 1 to 5 years because of lack of finance, want of perseverance and absence of industrial climate in the estates. In some cases, the sheds were occupied by established industrialists who left the estates because the margin of profit was below their expectation and they had better opportunities for investment elsewhere.

The largest number of failed units (64 out of 149) fall in the third category wherein entrepreneurs started their operations enthusiastically but discontinued because of finding it not economical and they continue to occupy the sheds expecting good luck later on.

There are only 20 industrial units falling in the fourth group which did not venture to start any operation and did not even maintain their occupancy because of seeing no ray of hope for success even in future.

All this leads us to conclude that in most cases of the failed units, entrepreneurs were not interested in setting up ventures and in some cases their ventures failed for several reasons, one such being that the industrial climate of the industrial estates could not maintain/boost up their morale.

In fact, the haphazard 'First Come First Served' policy pursued by the State Government with regard to the admission of entrepreneurs to the industrial estates has resulted in the occupation of the sheds by those who were least interested in manufacturing but wanted to earn a premium either on sale of the sheds or on the sale of scarce raw materials they would be allotted by virtue of their occupation of sheds. This short-sighted policy has raised the mortality rate of industrial enterprises in the industrial estates which has cast an adverse demonstration-effect on the prospective entrants to the industrial estates.

Further, bureaucratic adiministration has been the most notable weakness of the programme of industrial estates. In fact, the Directorate of Industries was lacking the experience and flexibility needed to deal with entrepreneurs. The ostrich-like attitude of the officials in solving the pre-gestation and post-gestation problems of the small entrepreneurs has proved to be a discouraging factor in the growth and development of the enterprises as well as of the industrial estates. The officials of the District Industries Office who manage and supervise the programme at the district level have been acting merely as rent collectors without effectively sponsring new industries or assisting existing enterprises to bloom. There has been a general lack of leadership on the part of the estates managements to attract entrepreneurs and help the units·

The Third Plan Working Group rightly observed :

> "The administration of an industrial estate is quite a new experience for a Government Department and the present rules and procedures in Government are rather too rigid to promote the adjustment necessary to meet the day-to-day requirements. The agency responsible for administration of the Estate should, besides putting up the factory sheds and providing the minimum facilities, study carefully the suitability of particular industries for locating them in a particular estate, their interests, the need of the locality and a number of other factors. The provision of common service facilities to units in the Industrial Estates, the supply of raw materials, the arrangements for marketing, etc. are matters in which the agency administering the Industrial Estates, will have to play an increasingly larger part if the Industrial Estates are to help entrepreneurs effectively. : Government machinery may not be equal to such a situation....."[2]

Suggested Solution

In the light of the above as well as in view of the present state of affairs of the management of estates in Haryana, it is suggested that the responsibility of management of the existing industrial estates should be handed over to an autonomous corporation which might be set up for this purpose by the State Government. The admission policy based on, 'First come First Served' principle with regard to the admission of the entrepreneurs should be done away with. A more realistic policy based on economic consideration needs to be followed. The applications should be thoroughly screened with reference to the qualifications and experience of the entrepreneurs and the nature of the proposed enterprise should be carefully examined, taking into consideration the overall requirements of the area, availabillity of raw material, human skills and potential of the local market to absorb the product. After being satisfied in the manner suggested above, the entrepreneurs may be allotted the sheds. Efforts should be made to select, as far as possible, a homogeneous group of industrial enterprises. This will make the task of sponsoring authorities easy in providing utilities and common services to the tenant industrial units.

Prompt action should be taken against tenants who have not storted any operation even since occupation of the sheds, since the sheds have been constructed for promotion of small scale industries and not for keeping idle indefinitely. Idle sheds have an adverse demonstration-effect on new entrepreneurs, who may have entertaining vague ideas on

2 Report of the working Group on Small Scale Industries Programme of work for the Third Plan Period, Government of India, December, 1959, pp 73-74.

projects to concretise their schemes through the instrument of industrial estates. Enterprises which have ceased operations after working for some time but still continue to occupy the sheds should be thoroughly assisted by the estate authorities. The problems of each industrial enterprises should be carefully investigated and corrective action taken to remedy them. The production credit, marketing and other related problems should be generously solved by the estates managements. The attitude of 'assistance' instead of indifference on the part of the estate authorities will certainly give a new lease of life to the units which have ceased functioning and have been awaiting their revival for quite some time. □

Production Analysis : A Case

N. D. Mathur* & Pramod Dasot**

India is one of the major tobacco producing countries of the world. It had the first place under the British rule but after the seperation of Burma it stands third after U.S.A. and China. India produces about one fourth of the world tobacco. Bidi industry is a forest-based industry with tremendous employment potential, even in the remote regions. Bidi manufacturing, which is confined to cottage sector is concentrated in Madhya Pradesh, Maharashtra, West-Bengal, Bihar, Mysore, Orissa and Tamilnadu.

Bidi industry though having an important place has not developed in Rajasthan from the employment basis. During 1975-76 approximately 14000 families were engaged in this industry. The present population of Tonk city is about seventy thousand and their life is quite unsophisticated and hardly expensive. Approximately 2000 families are engaged in this industry in this city. The average income of a worker in this industry is about Rs. 150 per month. Factors affecting the location of this industry at Tonk are : (1) availability of cheap land and building, (2) cheap labour, (3) raw material, (4) wrapper, thread and thin paper (5) gunny bags and bamboo trays, (6) Patti and labels (7) availability of enterprise and efficient management, (8) Developed means of transportation and communication (9) Market for the product. All these factors have combined together in determining the location of this industry in Tonk.

Our objectives here, is to find out input-output relationship in this industry. We have fitted the production function of three major bidi producing firms of Tonk, named below :

i) Id-Mohd. Nizzamuddin — Factory I
ii) Isar Das Khattan Brothers — Factory II
iii) Usman Bhai Islam Bhai — Factory III

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In our further analysis these factories are referred to as Factory I, II and III.

Production Sale and Profit

Initially we are starting with production and sale, profit and profit sale ratio of this Industry.

Table No. 1 : Production and Sale of Bidi (in crore No.)

Year	Factory I		Factory II		Factory III	
	Production	Sale	Production	Sale	Production	Sale
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1967-68	33.95	32.67	28.18	26.77	21.26	20.20
1968-69	37.55	39.56	31.63	30.05	24.96	23.71
1969-70	41.64	43.32	36.94	35.09	27.75	29.36
1970-71	45.60	46.30	38.72	36.78	30.81	29.27
1971-72	48.74	48.30	40.94	38.89	34.80	33.06
1972-73	50.98	48.43	43.62	41.44	36.35	34.53
1973-74	52.60	49.97	46.53	44.20	37.75	35.86
1974-75	55.85	53.06	48.37	45.95	41.74	39.65
1975-76	60.00	57.00	51.00	48.45	43.46	41.29

Columns 2, 4, and 6 of Table 1 shows that the total output of the three factories has been increasing continuously during 1967-68 to 1975-76. It is interesting to note that output has now been doubled in all the three factories in 1975-76 as compared to 1967-68. Factory I is an old one and produces more than II and III. Factory II and III are newly established as compared to I and still they are in developing stage. Columns 3, 5 and 7 show the sale performance of the factories till 1975-76 from 1967-68. It can be seen that Sale of all the three factories has been increasing continuously in this period. This is due to continuous increase in demand.

Table No. 2 shows Total profit and profit per crore bidi sold. Columns 2, 4 and 6 show total profit earned by three factories. It has been found that in first four years factory I and II are earning nearly two lakhs of Rupees, where III factory is earning nearly one and half lakh rupees. During 1971-72 there is sudden downfall in the profits due to increase in raw material cost. After this year again profit increased with the increase in production and attained maximum 7.6 lakhs rupees

Table 2 : Profit Earned (In lakhs of Rs.)

Year	Factory I		Factory II		Factory III	
	Profit	Profit Sale	Profit	Profit Sale	Profit	Profit Sale
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1967-68	2.06	0.0640	1 94	0.0724	1.60	0.0794
1968-69	2.86	0.0803	2.05	0.0683	1.47	0.0633
1969-70	1.79	0.0453	1.64	0.0467	1.01	0.0384
1970-71	2.38	0 0549	2.31	0.0628	1.64	0.0560
1971 72	0.49	0.0106	1.20	0.0309	0.78	0 0236
1972-73	2.74	0.0566	2.69	0 0651	2.01	0.0582
1973-74	2 77	0.0555	3.19	0.0723	1.94	0 0542
1974-75	3.53	0.0665	3.83	0.0834	2.81	0.0709
1975-76	7.60	0.1334	4.63	0.0953	6.04	0.1463

in factory I. Columns 3, 5 and 7 show profit per crore bidi which have been found out about five to seven thousand rupees up to 1974-75 but it doubled in 1975-76 and reached to 12-13 thousand rupees per crore.

Production Function

The relationship between factors of production and output can be analysed in two ways, one is termed as the theory of Production and other as the theory of cost. The theory of production presents an analysis of the physical relationship between input and output. The theory of cost however, presents the relationship between the level(s) of output and the outley incurred on different inputs used in producing a good(s) in question. We have fitted cobb-douglas production junction of these three factories. From of the function is :

$$X = ALR^{\alpha}U^{\beta}$$

Where X is output, A is positive constant, L and R stand for abour and raw material and α and β are their respective elasticitiesl. U is Random disturbance term.

Table 3 : Data of output Labour and Raw Material for fitting Production function

(Output in Crore bidies)
Labour and Raw Material (in lakhs Rs.)

S. No	Year	Factory I			Factory II			Factory III		
		Output	Labour	Raw material	Output	Labour	Raw-material	Output	Labour	Raw-material
1	2	3	4	5	6	7	8	9	10	11
1.	1967-68	33.95	6.19	5.77	28.18	4.93	4.79	21.26	3.58	3.61
2	1968-69	37.55	6.85	6.68	31.63	6.33	5.63	24.95	5.15	4.34
3.	1969-70	41.64	9.43	7.86	36.94	8 31	6.98	27.75	6.45	5.24
4.	1970-71	45.60	10.61	10.03	38.72	8.71	8.52	30.85	7.12	6.78
5.	1971-72	48.74	13.08	13.16	40.94	10.23	11.04	34.80	8.93	9.40
6.	1972-73	50.98	15.68	14.28	43.62	13.09	12.21	36.35	11.31	10.18
7	1973-74	52.60	17.88	20.99	46.52	5.12	18.57	37.75	12.79	15.16
8.	1974-75	55.85	20.38	24.98	48.39	16.93	21.38	41.75	15.17	18.35
9.	1975-76	60.00	27.80	30.00	51.00	22.95	28.50	43.46	20.01	21.83

Columns 3, 6 and 9 show output of different bidi producing factories. Further, columns 4, 7 and 10 show labour input and columns 5,8 and 11 show the Raw material.

Table 4 : Production Function Regression Results

S. No.	Name of Factory	Constant	Coefficient of independent variable		Coefficient of determination
			Labour	Raw material	
		(A)	(α)	(β)	(R^2)
1	2	3	4	5	6
1.	Factory I	21.07	0.0018 (9.11)	0.3113 (9.04)	0.9513
2.	Factory II	15.15	0.4836 (3.56)	—0.0721 (0.65)	0.9710
3.	Factory III	16.71	0.3630 (0.62)	—0.0608 (0.12)	0.9538

Note : Brackets show 't' values.

Table 4 shows that output is dependent variable and labour and raw material are independent variables. Column 3 shows positive constant

(A) of the function for different factories. Columns 4 and 5 show elasticity of labour (∞) and elasticity of Raw material (β) respectively. Column 6 shows coefficient of determination (R^2)

In Factory I, it has been concluded that positive constant has been found to be significant. Labour elasticity is almost zero (0.0018) in this factory. Moreover it is not significant up to 50 percent level. However, elasticity of raw material (0.3113) in this factory has been found to be more influential than elasticity of labour. 95 percent of the variation in output has been explained by the estimated relationship.

In Factory II, labour is more influential (0.4836) than raw material (-0.0721). In this, predictive power of the factory measured as R^2 is higher (.9710); only the estimate of ∞ is significant at 5% level of significance. In factory III also labour is more influential than raw material. Elasticity of labour is 0.3630 and elasticity of raw material is 0.0608 in this factory. In this case predictive power of the equation as measured by R^2 is high, i. e., 0.9538. However, no regression coefficient turns out to be significant at 5% level. A look at the results reveals that Standard Errors are very high though the prices are very high. This points to the existence of high inter-relation between the explanatory variable. It is also found that variable R is a dominiant variable in our analysis of production function, Hence we drop this variable and form of the function is :

$$X = ALU$$

Table 5 : Production Function Regression Results after Dropping Dominant Variable (R)

S. No.	*Name of Factory*	*Constant* (A)	*Coefficient of indepandent variable Labour* α	*Ccefficient of determination* (R^2)
1.	Factory I	40.92	0.3390	0.9206
2.	Factory II	6.71	0.7490	0.9672
3.	Factory III	12.50	0.4390	0.9274

In Factory I, after dropping the dominient variable positive constant has been found to be significant. Elasticity of labour (0.3390) is found to be significant, 92 percent of variation in the output has been explained by the estimated relationship after dropping the dominient variable. In Factory II positive constant has been found to be significant. Elasticity of labour (0.7490) has been found to be more significant than the first factory and 96% variation in the output has been explained by the esti-

mated relationship. In Factory III positive constant has been found to be significant. Elasticity of labour (0.4390) is found to be less significant than I and II factories and 92% variations in output has been explained by the estimated relationship after dropping the dominient variable. In respect of variations in output, factory I and II has been found to be similar. Comparison of R^2 in Table 4. and 5 reveals that R^2 has not improved significantly by introducing one more variable. Hence in bidi industry labour payments are able to explain the change in production. Elasticity of output with reference to labour payments is the highest in the case of Factory II. Factory I and III are in similar position. The elasticity in all the three cases is less than 1, i.e., all the factories are getting diminishing returns. The results are vitiated to some extent. Since we have taken labour in money terms but this could not be helped.

Value Added

In this part we shall deal with value added. Value added is the total cost minus cost of Raw material. We have fitted Cobb-Douglas production function and dropped the dominient variable (R).

Table 6: Data for Value Added Labour and Raw Material for Fitting Production Function

(All in terms of lakhs. Rs.)

S No.	Year	Factory I		Factory II		Factory III	
		Value added V	Labour L	Value added V	Labour L	Value added V	Labour L
1	2	3	4	5	6	7	8
1.	1967-68	6.67	6.19	5.32	4.93	3.87	3.58
2.	1968-69	7.39	6.85	6.80	6.33	5.53	5.15
3.	1969-70	10.12	9.43	8.92	8.31	6.92	6.45
4.	1970-71	11.42	10.61	9.40	8.71	7.68	7 12
5.	1971-72	14.13	13.08	11.09	10.23	9.66	8.93
6.	1972-73	16.88	15.68	14.10	13.09	11.98	11.31
7.	1973-74	19.46	17.88	16.47	15.12	13.91	12.79
8.	1974-75	22.18	20.38	18.46	16.93	16.51	15.17
9.	1975-76	28.03	27.80	25 01	22.95	21.78	20.01

Table 7 : Production function regression results of value added as dependent variable and after dropping dominent variabie (R).

S, No.	*Name of the Factory*	*Constant (A) (A)*	*Coefficient of independent Variable Labour ($\propto$)*	*Coefficient or determination (R^2)*
1.	Factory	1.1560	0.9715	0.9958
2.	Factory II	1.0290	1.0244	0.9986
3.	Factory III	1.0070	1.0344	0.9614

From of the function which we have fitted is as follows :-

$$V = A L^{\propto} U$$

Where V is value added, A is positive constant L is labour, $\propto$ is labour elasticity and U is disturbance term.

Columns 3, 5 and 7 of Table 6 show value added in different years and columns 4, 6 and 8 show labour in different years for different factories. Value added with reference to labour input in unity in all the cases, and R^2 is very high. Thus an increase by 1 percent in labour input ensures a nearly 1 percent increase in value added in this industry. There are thus constant returns to labour in this industry. It should be noted that in the previous model where dependent variable was number of bidies produced (X) decreasing returns were obtained in all the three factories. To see whether the contradictory pictures emerging from the two studies is because of change in money wage. Wage rates for different years are not avaliable so we have computed output labour ratio.

Trend

Table 8 shows output labour ratio for 1967-68 to 1975-76 in all the three factores. Table clearly shows that rate of increase in labour payment is greater than the rate of increase in output. This is because labour is in denominator, wage rate is continuously increasing, conclusion is same for all the three factories. Table 8 shows output-labour ratio actually estimated and output both in quantity terms as well as in value term. Columns 2, 5 and 8 show (actual) output labour ratio in terms of value which indicates that rate of increase in labour wages as well as rate of increase in output prices seems to be increasing constantly for all the factories. Columns 3, 6 and 9 show actual output labour ratio in quantity term which indicates, that rate of increase in labour wages is higher than rate of increase in output

Table 8 : Output Labour Ratio

Year	Factory I				Factory II			Factory III		
	Output/Labour in value	Labour in value	Output/Labour in Qty.	Estimated output/ Labour	Output/Labour in value	Labour in value	Estimated Output/ Labour	Output/Labour in value	Output/Labour in Qty.	Estimated Output/ Labour
1	2		3	4	5	6	7	8	9	10
1967-68	2.0090		5.4793	5.5685	2.0501	5.7161	5.5777	2.0890	5.9336	5.5307
1968-69	2.0541		5.4801	5.1393	1.9655	5.0000	5.1580	1.9021	4.8485	5.1044
1969-70	1.9067		4.4143	4.7099	1.9137	4.4447	4.7383	1.8853	4.2996	4.6961
1970-71	2.0214		4.2978	4.2805	2.0568	4.4444	4.3186	2.0295	4.3248	4.2698
1971-72	2.0061		3 7260	3.8511	2.1623	4.0000	3.8989	2.1346	3.8983	3.8435
1972-73	1.9871		3.2511	3.4217	2.0107	3.3333	3.4792	1.9909	3.2656	3.4172
1973-74	2.2615		2.9410	2.9923	2.3168	3.0769	3.0595	2.2725	2.9506	2.9909
1974-75	2.2976		2.7402	2.5629	2.3535	2.8572	2.6398	2.2980	2.7517	2.5646
1975-76	2.2491		2 3256	2.1335	2.3315	2.2222	2.2201	2.1646	2.1623	2.1383

for all the factories because wages are increasing continuously. Columns 4, 7 and 10 show estimated output labour ratio which indicates the same results as above.

Table 9 : Raw Material Labour Ratio

Year	Factory I		Factory II		Factory III	
	Rawmaterial Actual	Labour Estimated	Rawmaterial Actual	Labour Estimated	Rawmaterial Actual	Labour Estimated
1	2	3	4	5	6	7
1967-68	0.9317	0.8164	0.9614	0.7895	1.0086	0.8215
1968-69	0.9752	0.8956	0.8899	0.8919	0.8438	0.8951
1969-70	0.8334	0.9352	0.8401	0.9431	0.8127	0.9319
1970-71	0.9451	0.9748	0.9777	0.9943	0.9514	0.9657
1971-72	1.0059	1.0144	1.0791	1,0455	1.0525	1.0055
1972-73	0.9107	1.0540	0.9333	1.0967	0.9144	1.0423
1973-74	1.1734	1.0936	1.2277	1.1479	1.1851	1.0791
1974-75	1.2112	1.1332	1.2629	1.1991	1.2096	1.1159
1975-76	1.1628	1.1728	1.2418	1.2503	1.0861	1.1527

Columns 2, 4 and 6 show actual raw material labour ratio, both in value term. This indicates that there are fluctuations in the ratio with an increasing trend. Tables 8 and 9 reveal that wages have been increasing. The output (No)/wage ratio is decreasing continuously. This may be due to two factors, first decreasing return to labour and wage rate. Output (Rs.)/ wage ratio has decreased first and then has slow increase in the rate, which gives 'U' shaped productivity curves. Output (No)/ wage ratio when contradit with output (Rs.)/ wage indicates that though the wage rate has been rising continuously, productivity has begun to rise this may be because of two factors :

(i) Returns for factory

(ii) Changes in the prices of labour relative to prices of bidis

The results obtained regarding output (No.) / wages are supported by our results obtained by production function.

$$X = A L^{\alpha} U$$

The results reached by output (No)/ wages indicate that perhaps the price of bidi has increased more than the wage rate, so much so that the tendency towards decreasing production (Returns) if any is over compensated by increasse in average production. □

Measurement of Productivity in Mining : A Case

M. V. V. Peri Sastry*

Bharat Gold Mines Limited, under the control of the Ministry of Steel, Mines & Coal, is the principal gold mining industry in India, Hutti Gold Mine Company Ltd., a Karnataka State Government Undertaking being the only other Gold Mining Unit. While the concepts and techniques of measurement of productivity widely differ, as far as the mining industry in general and Bharat Gold Mines in particular are concerned, output per man-shift (O. M. S.) or per capita output can be used as an index of productivity.

The National Labour Commission observed : "Labour Productivity and changes therein are difficult to measure and there are no reliable indices available in this respect. All that we have is information about changes in output per worker." Here again, while the output per man-shift (O.M.S.) of the worker is, no doubt, the best indicator of the operational efficiency of the worker, "this can be at best only a rough approximation, since a major part of the increased output may be due to greater capital-intensive investment, technological improvements and introduction of automation etc., – that is, the productivity of the men and machine put together and not labour productivity alone. The increasing importance of indirect inputs such as training leading to improved functional skills, motivation, management calibre also cannot be lost sight of". Any improvement in the O. M. S. over a period has to be viewed in this perspective.

Scope and Coverage

Presently, there are three working mines in Kolar Gold Fields, viz., Mysore, Champion Reef and Nundydroog Mines. The figures of output per man-shift have been compiled for all the three mines section-wise from 1972-73 onwards, i.e., the year in which the company came into being. Output per man-shift has been worked out for all underground sections of the three mines separately for productive underground workers and all underground workers. 'Productive workers' are those who are directly engaged in productive activity and 'non-productive workers may be defined as those

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who do not produce the ore themselves but help the productive workers in their task by providing them with the essential services. Staff of the Engineering Department, Survey Department, Ventilation and other miscellaneous workers in the mine come under the category of non-productive workers.

Data for the year 1972-73 could not be obtained from Champion Reef Mine for want of past records. In the case of Mysore Mine, E. S. P. Section (Edgar's Shaft Pillars) has not been considered for the reason that production from this source was coming only till 1974-75. Bisanatham Section of the same mine, which came into production in 1974-75, has been included.

While BGML has some schemes of diversification like manufacture of mining machinery and equipment, recovery of scheelite—a highly valued strategic material—taking up contract works of mine construction and shaft sinking in which the company has expertise of a high order, gold production is still its predominant line of activity. The efforts of diversification are gradually getting off the ground and have, of late, shown some signs of progress. The plant for recovery of scheelite is under erection.

As far as the workshops are concerned, at present there is no precise idea about the productivity, because production is regulated to be in tune with the Company's own requirements use and sales to outsiders. On account of this practical difficulty, workshops could not be brought under the purview of the present study on productivity. This would not, however, matter much as the sales of workshop products account for hardly 2 to 3% of the overall sales of BGML. It would thus be seen that Bharat Gold Mines Limited may still be regarded as a single-product industry.

Standard Output as Basis for Comparison

Determination of theoretical output which is co-terminous with "standard output" is the function of the Industrial Engineering Department or Methods Department, depending upon the Organisational set up of the manufacturing unit. Industrial Engineering or work study is meant for determining the methods of manufacture as well as fixation of time required for different operations. These standards, moreover, have to be re-examined and re-fixed periodically with changing conditions of work in the unit. The standard output per man-shift has not been worked out for BGML for quite some time now and for this reason, the average output per man-shift for the three-year period 1973-74 to 1975-76 which was, by and large, a normal period in the life of the Company, has been adopted as an alternative to the standard output for the purpose of the present study.

Computation of Productivity Indices : O. M. S. is worked out for each section of the mine by dividing the measured ore[1] broken/mined with the number of man-shifts worked in that section. O. M. S. for each mine and then the entire field is calculated after aggregating the sectional figure of ore broken and shifts worked. Then the indices of productivity are worked out for each section. Mine and Field indices are also worked out in a like manner. As the indices are calculated by taking into account the actual quantity of ore broken and shifts worked in each mine and field, no separate weighting is necessary to work out the group (mine) and overall (field) indices.

Results : The mine and aggregate field productivity indices thus calculated show that the O.M.S. had been steadily increasing from 1972-73 onwards till 1975-76 and then spurted remarkably in 1976-77 when the production of gold from BGML mines was an all-time record since its inception in 1972-73. Thereafter, though the productivity in Mysore and Champion Reef Mines was maintained in 1977-78 and 1978-79 more or less at the 1976-77 level, productivity at the field level slipped somewhat on account of a less-than-expected level of performance of the Nundydroog Mine. These observations hold good both with respect to the performance of productive underground workers considered separately and also that of productive and non-productive underground workers taken together.

The mine-wise aggregate productivity indices appear in Table 1

Table 1 : Mine-Wise Aggregate Productivity Indices

(Base 1973-76=100)

Year/Description		Mysore Mine		Champion Reef Mine		Nundydroog Mine		Field	
		P.	P&NP	P.	P&NP	P.	P&NP		P&NP
1972-73	O.M.S.)	0.299	0.276	NA	NA	0.320	0.286	NA	NA
	Index)	92.6	93.6	NA	NA	90.4	88.0	NA	NA
1973-74	O.M.S.)	0.313	0.286	0.317	0.284	0.335	0.305	0.325	0.295
	Index)	96.9	96.9	94.1	94.7	94.6	93.8	95.3	100.3
1974-75	O.M.S.)	0.326	0.303	0.309	0.273	0.339	0.312	0.327	0.299
	Index)	100.9	102.7	91.7	91.0	95.8	96.0	95.9	101.7
1975-76	O.M.S.)	0.329	0.296	0.386	0.342	0.389	0.359	0.371	0.337
	Index)	101.9	100.3	114.5	114.0	109.9	110.5	108.0	114.6
1976-77	O.M.S.)	0.392	0.344	0.438	0.366	0.540	0.495	0.470	0.415
	Index)	121.4	116.6	130.0	122.0	152.5	152.3	137.8	141.2
1977-78	O.M.S.)	0.386	0.344	0.442	0.358	0.483	0.439	0.446	0.391
	Index)	119.5	116.6	131.2	119.3	136.4	135.1	130.8	133.0
1978-79	O.M.S.)	0.397	0.358	0.446	0.362	0.502	0.444	0.458	0.398
	Index)	122.9	121.4	132.3	120.7	141.8	136.4	134.3	135.0

O.M.S. : Output per man-shift in tonnes
P : Productive underground workers.
P&NP : Productive and non-productive workers underground.
N.A. : Not Available.

1. Measured ore broken includes not only gold-bearing rock (quartz) but also such small quantity of waste rock which, of necessity, has to be broken during mining of gold-bearing rock.

The indices of productivity at the mine and field levels would help the management at the apex to get themselves acquainted with what is happening with regard to the performance of the workers in the industry in broad terms. But the managers at the mine level have to have this information for each productive section of the mine so that weak spots could be identified and timely action taken to remove bottlenecks and improve the level of performance wherever necessary. The detailed sectional indices of productivity built up for the three mines are given in Annexures I and II.

Output per Machine-Shift

Output per man-shift is a fair indicator of the operational efficiency of the worker, or in other words, of the labour productivity in a labour-intensive industry or firm. However, any variation in the O.M.S. is not necessarily the result of an increase or decrease in labour productivity alone, but is the net result of the inter-play of several other factors like capital investment and technological improvement represented by the installation of additional or improved machinery and equipment and managerial efficiency among others. Therefore, under certain conditions, it might be necessary to study how efficiently the machinery is utilised in the productive process. Just as output per man-shift gives an idea about the efficiency with which the man on job works in a labour-intensive unit, the output per machine-shift indicates how effectively the equipment is put to use in a mechanised and capital-intensive unit. While an increase in the output per machine-shift is indicative of a more efficient and optimum utilisation of the equipment, any slippage would be suggestive of either a poor quality of the machine or poor maintenance or inadequate use of the machinery reflected by increased idle time and so on. In the case of highly mechanised units, therefore, it would be worthwhile to build up indices for output per machine shift in the same manner in which indices for output per man-shift have been worked out for the mines of BGML.

Measurement of Productivity in Multi-Product Industries

Measurement of productivity in a multi-product set up is rendered complicated by the significantly different physical and other characteristics of the products turned out. A case in point is the Gold-Mining Industry in K. G. F. itself, where besides gold, which is the main product, different types of mining equipment ranging from drill rods to double drum winders and traction locomotives are manufactured in the workshops. Here, the problems encountered in building up the aggregate productivity index covering the entire gamut of activities could be surmounted by reducing the output of different products into standard units of the main product, *viz.*, gold, by giving a suitable weightage in terms of the value per unit

of each product. Since there is no precise idea about the productivity in the workshops, for reasons set out earlier, this ideal approach for building up the aggregate productivity index for BGML is unattainable. Under these circumstances, indices covering all the products could, however, be built up in the nature of a rough approximation by the 'value added' method.

Productivity Index by Value Added Method

The essence of this method consists in working out the productivity per worker, by dividing the 'value added' of the different activities of the company in the accounting period by the total number of persons on rolls. In accordance with the guidelines issued by the Bureau of Public Enterprises, value added is arrived at by deducting from the gross value of output of different products manufactured by the Company, the cost of direct materials including fuel and electricity consumed but excluding wages and salaries. The gross value of output during the period itself is derived from the 'sales' by making adjustments for variations in opening and closing stocks. Symbolically, the index may be denoted as :

$$I = \left[(S_1 - C_1)/N_1 \div (S_o - C_o)/N_o \right] X\ 100$$

Where I = the index of Productivity.

S_1 & S_o = the value of output comprising gold, silver and workshop products in the current and base periods.

C_1 & C_o = the value of direct materials consumed including fuel and electricity but excluding wage cost in the current and base periods.

N_1 & N_o = the number of persons on roll during the current and base periods.

$(S_1 - C_1)$ & $(S_o - C_o)$ = the value added in the current period and base period respectively.

The index has to be deflated or inflated for increase or decrease respectively in prices of both the outputs and inputs in order that the variations in the value added per worker truely reflect the performance of men unaffected by fluctuations in prices.

For the present study, the value of output of gold has been adjusted by the international prices of gold which are relevant in deciding on the price payable for the gold made over to the Government by the BGML,

the value of silver by the Indian Spot Prices, the value of workshop products by the Economic Adviser's wholesale price index for the group of machinery and equipment and the value of inputs (C) by the General Index of wholesale prices. The indices of productivity thus worked out for purposes of illustration are as follows :

Index of Productivity by Value Added Method

(Base 1974-75=100)

Year	*Index*
1974-75	100.0
1975-76	86.7
1976-77	178.7
1977-78	159.2
1978-79	126.7

The full particulars of economic indicators used in adjusting the prices of inputs and outputs are given in Annexure III and the detailed working results are furnished in Annexure IV.

The low index for 1975-76 which stands at 86.7 may be ascribed to prolonged strikes by the workers of the company leading to a stoppage in all round production coupled with a high cost of production of gold which is the highest on record. The high cost and reduced output resulted in a significant diminution in 'value added' in 1975-76.

A record level of extraction of ore at the highest average grade of 5.71 grams per tonne since the formation of BGML led to a steep increase in the index for 1976-77. Even though the tonnage of ore crushed was maintained at 0.37 million tonnes in the next two years, which was only slightly lower than the record level of 0.39 million tonnes of 1976-77, a gradual decline in the average grade of ore crushed from 5.71 gr/tonne in 1976-77 to 5.21 gr./tonne in 1977-78 and further to 4.81 gr./tonne in 1978-79 resulted in a lower output of gold and hence of value added in 1977-78 and 1978-79.

Conclusion

Improved productivity which results in a reduction in unit cost and enhancement of profitability is a desirable objective for any industrial undertaking, more so when the price received for the product of the firm is in accordance with a pre-determined formula as in the case of the gold

mining industry in K. G. F. Though increase or decrease in the output per man-shift need not entirely be ascribed to a better or less-than-expected performance of the worker, in a labour-intensive industry like the gold mining industry in Kolar Gold Fields, one is not very much off the mark to link the O. M. S. with labour productivity.

Gold mining in Kolar Gold Fields is by now a century-old industry with expertise of a high order in deep level underground mining handed down from generation to generation. With the passage of time, the proven reserves of gold in Kolar Gold Fields are fast depleting. The mines have reached ultra-depths where the environment is oppressively hot and mining conditions are hazardous. The output per man-shift which is being maintained in the current level of 0.4 tonnes of ore for the last three years has to be viewed in the context of the increasingly difficult mining conditions prevailing in the mines. □

Annexure I

BHARAT GOLD MINES LIMITED

(A Government of India Enterprise)

Indices of Productivity in Terms of Output per Man-shift for Productive Workers (Underground)

Sl. No.	Mine/Section	Standard Output per man-shift		1976/77		1977/78		1978/79	
		Average output per man-shift (1973/76)	Index	O.M.S.	Index	O.M.S.	Index	O.M.S.	Index
1	2	3	4	5	6	7	8	9	10
1.	**Mysore Mine**								
	(a) Crockers, Rowse's 25th level, West Reefs, 1, 2 & 4 Shafts.	0.346	100.0	0.493	142.5	0.467	135.0	0.411	118.8
	(b) McT. Incline & Plummers No. 2	0.355	100,0	0.282	79.4	0.329	92.7	0.414	116.6
	(c) Gilberts & Hancocks	0.338	100.0	0.405	119.8	0.344	101.8	0.405	119.8
	(d) Edgars Aux. & R'Dales Aux.	0.254	100.0	0.356	140.2	0 382	150.4	0.406	159.8
	(e) McT. Vertical & West Prospect Shaft	0.249	100.0	0.407	163.5	0.348	139.8	0.358	143.8
	(f) Bisanatham	0.263	100.0	0.568	216.0	0.382	145.3	0.351	133.5
	ALL SECTIONS:	0.323	100.0	0.392	121.4	0.386	119.5	0.397	122.9
2.	**Champion Reef Mine**								
	(a) T-1 Section	0.440	100.0	0.618	140.5	0.795	180.7	0.833	189 3
	(b) T-2 Section	0.442	100.0	0.557	126.0	0.523	118.3	0.501	113.3
	(c) T-3 Section	0.317	100.0	0.605	191.9	0.825	260.3	1.114	351.4

(Contd.)

1	2	3	4	5	6	7	8	9	10
	(d) S-1 & S-2 Sections*	0.301	100.0	0.359	119.3	0.384	127 6	0.389	129.2
	(e) N-1 Section	0.312	100.0	0.418	134.0	0.409	131.1	0.406	130.1
	(f) N-2 Section	0.242	100.0	0.319	131.8	0.305	126.0	0.305	126.0
	ALL SECTIONS :	0 337	100.0	0.438	130 0	0.442	131.2	0.446	132.3
3	**Nundydroog Mine**								
	(a) 'A' South & 'A' North	0.310	100.0	0.429	138.4	0.404	130 3	0.425	137.1
	(b) B	0.349	100.0	0.513	147.0	0.417	119.5	0.374	107.2
	(c) C	0.431	100.0	0.544	126 2	0.441	102.3	0.484	112.3
	(d) D, E & F	0.365	100.0	0.420	115.1	0.372	101.9	0.481	131.8
	(e) G	0.434	100.0	0.524	120 7	0.410	94.5	0.564	130.0
	(f) H	0.346	100.0	0.457	132.0	0.436	126.0	0.630	182.1
	(g) J-South & J-North	3.359	100.0	0.523	145.7	0.495	137.9	0.496	138.2
	(h) K	0.292	100.0	0.549	188.0	0.518	177.4	0.533	182.5
	(i) N.G.P.	0 623	100.0	1.643	263.7	1.514	243.0	0.826	132.6
	ALL SECTIONS :	0.354	100.0	0.540	152.5	0.483	136.4	0.502	141.8
4.	FIELD :	0.341	100.0	0.470	137.8	0.446	130.8	0.458	134.3

UM :

*S-1 Section was closed from July 1978.

Annexure II

BHARAT GOLD MINES LIMITED

(A Government of India Enterprise)

Indices of Productivity in Terms of Output Per Man-shift for Productive & Non-Productive Workers (Underground)

Sl. No.	Mine/Section	Standard output per Man Shift (Average output per man-shift 1973/76)	Index	1976/77 O.M.S.	Index	1977/78 O.M.S	Index	1978/79 O.M.S.	Index
1	2	3	4	5	6	7	8	9	10
1.	**Mysore Mine**								
	a) Crocker's, Rowses & 25th Level, West Reefs, 1, 2, & 4, Shafts	0.325	100.0	0 459	141.2	0.434	133.5	0.387	119.1
	(b) McT. Incline & Plummers No. 2	0.334	100.0	0.248	74.3	0.279	83.5	0.359	107.5
	(c) Gilbert's & Hancocks.	0.291	100.0	0.349	119.9	0.314	107.9	0.378	129.9
	(d) Edgar's Aux. R' Dales Aux.	0.218	100.0	0.315	144.5	0.340	156.0	0.362	166.1
	(e) McT. Vertical & West Project Shaft	0.225	100.0	0.317	140.9	0.295	131.1	0.303	134.7
	(f) Bisanatham	0.230	100.0	0 528	229.6	0.363	157.8	0.335	145.7
	ALL SECTIONS	0.295	100.0	0.344	116.6	0.344	116.6	0.358	121.4
2.	**Champion Reef Mine**								
	(a) T-1 Section	0.361	100.0	0.449	124.4	0.459	127.2	0.423	117.2
	(b) T-2 Section	0.412	100.0	0.489	118.7	0.455	110.4	0 434	105.3
	(c) T-3 Section	0.230	100.0	0.315	137.0	0.315	137.0	0.445	193.5

(Contd.)

1	2	3	4	5	6	7	8	9	10
	(d) S1 & S2 Section*	0.281	100.0	0.325	115.7	0.338	120 3	0.348	123.8
	(e) N. 1 Section	0 288	100.0	0.355	123.3	0.358	124.3	0.365	126.7
	(f) N-2 Section	0.225	100.0	0.289	128.4	0.277	123.1	0.274	121.8
	ALL SECTIONS	0.300	100.0	0.366	122.0	0.358	119.3	0.362	120.7
3.	**Nundydroog Mine**								
	(a) 'A' South & 'A' North	0.295	100.0	0.418	141.7	0.387	131.2	0.410	139.0
	(b) B	0.332	100.0	0.481	144.9	0.387	116.6	0.345	103.9
	(c) C	0 407	100.0	0.520	127.8	0.424	104.2	0.436	107.1
	(d) D, E & F	0.324	100.0	0.402	124.1	0.361	111.4	0.411	126.9
	(e) G	0.425	100.0	0.509	119.8	0.396	93.2	0.529	124.5
	(f) H	0.327	100.0	0.406	124.1	0.350	107.0	0.511	156.3
	(g) 'J' South & 'J' North	0.336	100 0	0.446	132.7	0.435	129.5	0.473	140.8
	(h) K	0.273	100.0	0.474	173.6	0.472	172.9	0.489	179.1
	(i) N.G.P.	0.202	100.0	1.300	643.6	1.009	499.5	0.321	158.9
	ALL SECTIONS	0.325	100.0	0.495	152.3	0.439	135.1	0.444	136.6
4.	**Field**	0.294	100.0	0.415	141.2	0.391	133.0	0.398	135.4

SCP.

* S_1 Section was closed from July, 1978.

Annexure III

Selected Indicators

Year	International Market Prices of Gold (Yearly averages) $/Ounce	Indian Prices of Silver (Yearly Averages) Rs/10 gms.	Index Number of Wholesale prices Base 1970-71 = 100	
			All commodities	Machinery and Transport equipment
1974-75	166.69	11.22	174.9	156.4
1975-76	149.47	11.69	173.0	172.6
1976-77	126.40	12.49	176.6	170.1
1977-78	157.79	12.41	185.8	172.5
1978-79	207.66	15.00	185.7	183.3

Annexure IV

Indices of Productivity by Value Added Method

Year	Value of Gold		Value of Silver		Value of Workshop Sales		Total Value		Direct Material Cost including Fuel and Electricity		Value added (S-C) (Rs. lakhs)	No. of workers on roll (N)	Productivity in Rs. (S-C)/N	Index of Productivity (Base 1974-75 =100)
	Actual (Rupees lakhs)	Adjusted (Rupees lakhs)	Actual (Rupees lakhs)	Adjusted (Rupees lakhs)	Actual (Rupees lakhs)	Adjusted (Rupees lakhs)	Actual (Rupees lakhs)	Adjusted (Rs. lakhs) (S)	Actual (Rupees lakhs)	Adjusted (Rs. lakhs) (C)				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1974-75	787.46	787.46	1.18	1.18	30.19	30.19	818.83	818.83	346.38	346.38	472.45	12260	3854	100.00
1975-76	705.43	786.70	1.35	1.30	13.77	12.48	720.55	800.48	401.74	406.15	394.33	11799	3342	86.7
1976-77	917.84	1210.40	1.58	1.42	35.40	32.55	954.82	1244.37	445.76	441.47	802.90	11658	6887	178.7
1977-78	1075.35	1136.00	1.46	1.32	40.98	37.13	1117.79	1174.45	458.19	431.31	743.14	12113	6135	159.2
1978-79	1223.37	986.02	1.84	1.38	35.19	30.03	1265 40	1017.43	458.22	431.57	585.86	11999	4883	126.7

MIS in Public Sector Undertakings : Need for Further Research

D. D. Sharma*

The public sector undertakings are large-sized and have geographically dispersed divisions, plants and branches. The complexity and diversity of operations in these enterprises necessitate an elaborate and accurate flow of information between the central office and the constituent parts for streamlined strategic thinking. To recognise information as a component of resource flow elements system and a vital coordinating force, a design of management information systems is called for, in the public sector enterprises.

Review of Literature

In the ensuing sections an analysis is done of literature available in various books, reports, journals, etc. The relevant material has been arranged under the following three heads :

a) Studies on the public sector indirectly related with management information systems ;

b) General studies on management information systems irrespective of their relation with the public sector; and

c) Studies on management information systems carried out in the context of public sector.

The studies under each of the above sections have been aggregated again in order to achieve a sub-objective of conceptual clarity. Thus a conceptual grouping forms the edifice of analysis and not the chronological order of studies. According to this framework, the studies under the head (a) above, have been arranged in order of objectives of the public sector, operational performance, and management development in the public sector. The studies underlying the heads (b) and (c) above have been grouped into basic concepts of MIS, data processing systems,

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data base systems, decision making systems, control systems, and reporting systems.

a) Studies on the Public Sector indirectly related to Management Information Systems

The sole objective of the public sector in the Indian economy is to attain a socialistic pattern of society. The list of sub-objectives encompasses a number of them (1). The objective of the public sector as "egalitarian" in nature has been supported by a number of experts. (2 & 3). In addition to social goal, financial and economic objectives have been highlighted in some studies (4). In view of the social objective, a survey is conducted to see the image of the public sector as compared to the private sector in the minds of people. The public sector is challenged to attain the sole objective established for it [6 & 7].

The emphasis of research has been on the operational performance of public sector enterprises. Studies on operational performance form the bulk of research work so far conducted [8, 9, 10, 11, 12, 13, 14, & 15]. In most of the studies it has been realised that inefficiency in the public sector is due to managerial problems, lack of management development programmes, and operational control. The contemporary problems of organisational forms, parliamentary accountability, relations with the Ministers, audit and efficiency, and price and profit policies have been analysed and various recommendations put forth [16, 17, 18 & 19]. It is explained that environment influences the management development programmes [20]. Under-utilisation of installed capacity is attributed to defective management [21]. Financial and control aspects form the basis for certain studies [22]. The other aspects studied are : gestation lag [23], managerial compensation and motivation [24], organisational pattern of the Boards of Directors [25], managerial turnover [26], and lack of management development programmes [27 & 28]. Some studies attempted to suggest management audit programmes as a measure to improve working of public enterprises [29]. The coordination of planning of the public sector and the nation as a whole is envisaged in some studies [30]. Some researchers advocate the professionalisation of management [31]. Overall management factors and techniques to improve operational efficiency have been discussed in many studies [32, 33 & 34].

b) General Studies on Management Information Systems :

i) Academicians and professionals carry out a large number of studies explaining various concepts underlying management information systems. Their viewpoints differ as they see things from different angles. While defining MIS, majority of researchers agree that it is a most recent

dimension of management techniques emerged to facilitate decision making. Some experts view MIS as an "integration" of "man-machine systems" [35]. It is also described as a "complex of men, machines and procedures" [36]. It is also regarded as "planning and control of physical and human resources" [37]. MIS is described as a "common system" coordinating the functioning of resource flow elements [38]. Some people call it a combination of three "attributes", viz., impact of decisions, impact of environment, and reaction in an appropriate time-frame to a situation [39]. MIS is also regarded to be an "assemblage" of components related to data processing, decision-making, and reporting [40]. It is known as an "orderly method" to direct and control the information [41]. One also views it as an "operational function" [42], or "man-machine digital system" [43]. MIS may be viewed by some authors as a system for "furnishing relevant data" in useful form to the right person, at the right time, for use in management decisions [44].

Basic components of MIS are hardware, software, data base, procedures and operating personnel [46]. Some experts exclude the data base from the above list [47]. Procedure, equipment, information methods, people, organisation and money are given as elements of MIS by some researchers [48]. Sometimes academicians refer to information storage and retrieval devices as components of MIS [49]. Management levels (top, middle and operational), information type (business or technical) and system (synergism) are regarded as MIS elements by some professionals [50].

The words data and information which are interchangeably used in general practice, require attention. Most of the authors make very vivid distinction between these two terms. Information may be the data "mechanically arranged" and is an "end result", but data are "raw material" from which information may be the "stuff of paperwork" [51]. Some authors treat information as a "piece of knowledge" with an "element of surprise" [52]. Data are regarded as "raw facts in isolation" and "unevaluated messages" and information as "message preceivable" by the "recipient" with the help of his "sense" [53]. In other words, data are "signs", generally "recorded observations" not affecting 'behaviour" immediately but information affecting behaviour with the "passage of time" [54]. Information is also explained as data processed into "meaningful and perceivable form" for use by the "recipient" in decisions-making. The relationship between information and data is that of "finished goods" and "raw-material" [55].

Taking the fundamental concepts of MIS into consideration, a number of researchers have attempted conceptual and empirical studies. Some of these studies are elementary in nature and devoted to further clarify the existing knowledge by adding a few viewpoints of their own (56, 57,) 58, 59, 60, 61, 62, 63, 64, 65, 66 & 67). Some experts attempted to highlight communication process, barriers of communication, communication gap, communication ladder and various other aspects

underlying communication. (68, 69, 70, 71, 72, 73, 74 & 75). Behavioural aspects of MIS also attracted the attention and efforts of various experts and thinkers [76, 77, 78 & 79]. Under the behavioural aspects of MIS, studies devoted attention on human factor while designing and implementing MIS models, installation of computer and its effect on employees' behaviour, and establishing relationship between MIS people and other functional departments' people. A number of descriptive models have been developed and thrown open for thinkers' perusal [80, 81, 82, 83 & 84]. The objectives and applications of Delphi Technique are also explained by a few researchers [85]. In order to save executives who are associated with computer applications, from frustration, it is suggested that "pitfalls" from MIS design may be removed [86]. The telephone mangement system is recommended as a solution to set "coordination links" to manage "long distances" in diversifying companies [87]. Financial, accounting, marketing, production, personnel and R & D information systems are developed and discussed under certain studies [88, 89, 90 & 91].

ii) Data which are raw facts, are processed to extract information for use in decision making. The extraction may be carried out manually, electromechanically, with the help of punched cards or with the help of computers. The data goes through several operations before usable information for decision-making can be obtained. The process of converting data into information is termed data processing system. Data processing process may be regarded as "manipulation" of given facts to obtain "desired results" in the form of printed material [92]. Data processing systems are referred to as one of the "building blocks" of MIS [93] and the process is designated as "data reduction" involving operations, viz., "classifications, organisation, summarising, filtering and inference". The process may also be called as an "orderly" and "planned series" of operations, carried out on information, commonly with data processing equipment [94]. The automatic data processing may be described as a "combination" of four "characteristics", viz., "speed, automatic operation, flexibility, and decision-making" [95]. Some experts explain the process of converting data into information, as "data life-cycle" which encompasses operations such as "generation, storage, conversion, transportation, reproduction, classification, synthesis, manipulation, utilisation, evaluation, and destruction" [96]. In other words, these operations may involve "capturing, verifying, classifying, storing, retrieving, reproducing and disseminating or communicating" of data [97]. In a summarised version of the above, the operations may include "classifying, sorting, calculating and summarising" [98] of data processing. The computer is regarded as the "fourth great breakthrough" in the economic history to aid man in his thinking process and decision-making ability [99]. The other three are : invention of writing process, emergence of Arabic numerals system, and the invention of analytical geometory and calculus.

A large number of studies both of empirical and conceptual nature have been carried out by academicians and practitioners on data processing systems. Various applications to which cybernetics can be put are discussed [100]. The computers are finding application for solving diversified and complex problems in changing organisational environment [101, 102 & 103]. Such a vast use of computers in solving management problems is attributed to recent advances in computer technology capabilities of MIS and interaction between the two [104]. Some experts on computers have studied the distribution aspects of computer applications [105 & 106]. There are numerous computer models varying in size and functional ability. Therefore, companies anxious to go for electronic data processing face serious problems while selecting a computer model. Strategic decisions are needed in selecting a computer model [107] and its use for managers [108 & 109]. Some people explain that "the first computer is the worst—if the inexperienced user goes it alone" [110 & 111]. Even if the staff is experienced in using computer, there is lack of integration of management and computer staff, the computer will be hardly of any use [112]. Another problem of electronic data processing is that affects employment opportunities [113] and also the existing organisational set up [114]. Some academic studies described computer as an "evil" and blamed it for "killing certain systems" in organisations [115 & 116]. Moreover, computer is a costly equipment and every organisation cannot afford to instal one, though it can buy computer-time on some fractional payments [117] For making the best use of computer, an organisation must emphasise on integration of managerial and technical staff [118] with the help of systems approach [119]. Some studies opine that the human factor must be taken into account while going for a computer installation [120] and on operation, behavioural and technical changes may be understood properly for healthy growth of EDP facility. A comprehensive design must be ready before a computer is installed and after installing a computer the organisation must support the design of MIS [121].

iii) The data base system is also one important constituent part of MIS. It is also referred to as data bank. The data base is the data which is stored for retrieval in decision situations [122]. A "collection" of data designed to be used by "different programmers" is termed as a data base [123]. The data base is regarded as the "foundation" of MIS [124]. There may be a "software", "administration", and "procedures" in a data base system [125]. The data base or "data bank" can be compared to a "money bank" and there can be three types—multiple, single and network type [126]. The data base system is designed to check paper work explosion and to enhance inter-departmental coordination [127]. The data base may be manual, using files, file-cabinets etc., or computer-based, using magnetic discs, magnetic or proper tapes, punched cards, etc., as storage, media and computer

memory as storage device. In any type of data base system there may be three components, viz., standardised creation and maintenance of records, enquiring capabilities, and report generation [128]. There are four levels of data organisation in a data base system item, record, file and data base [129], the file devices being sequential or direct access type.

Various studies have been conducted [130] on data base systems. A large number of reports about different companies and environment are published and sold by certain data sharing organisations. This facilitates different commercial and industrial undertakings to make effective decisions [131 & 132]. For the best utilisation of data bases an "inter-level, cross-functional integration" of a data base is needed in organisations which may prevent "machine readable data" to become a "frozen asset" [133]. The data base use can be spread over to the Board of Directors if proper integration takes place at lower levels [134]. It may be from the experiences of large companies to think about strategic decisions for data base [136]. It is proved by some empirical studies that by providing useful information for decision needs the MIS "pays off from risky-investment" [137].

iv) MIS is a technique for decision making and decision with proper information is referred to as strategic planning. Actually we are not in a position to develop certain models for decision making where MIS can find the best application. Two models have been suggested for strategic planning, viz., "merry-go-round model of functional information networks" and "data flow model for strategic planning". The strategic decision models are required for the Board of Directors, in particular [138 & 139]. Even models which are developed faced a problem of implementation. The success of models depends on the availability of managerial and technical skills in the organisation [140]. Some studies stress on developing a conceptual structure of MIS for corporate strategic planning for helping top-level decision making [141]. The best utilisation of MIS depends upon the existing relationship between "perceptions of MIS user's, of the computer system, perceived variables exogenous to the system, attitudes and system usage" [142]. Some experts attempt to find out a "relationship among models of communication, the communication environment and organisational structure" [143]. Some experimental studies have been conducted to establish a "relationship between the effectiveness of aggregate production planning decisions and form of MIS used to support the decision-making" [144]. The underlying theme of all these studies is to develop MIS for decision making [145]. Information required for decision makers at different management levels is highlighted in certain studies [146].

v) Some studies have been dedicated to control systems. Out of the

internal and external control strategies, which strategy is the best for a particular company, can be decided by analysing the positive and negative responses each may elicit [147]. "Various mixes" of "regulating mechanisms" result in different kinds of control by top management and an analysis may be carried out to find the most "satisfactory" way to "handle the computer resources" [148]. To evaluate corporate management information system's performance, profit centre control analysis on organisational basis is needed [149]. The control centre concept is emerging fast in the multinational corporations [150].

(vi) To keep the people informed about operations of organisation, reporting system becomes an integral part of MIS. At present, the emphasis of reporting system is on financial matters. Much significance is not attached to the other functional areas. Moreover, every affair is represented in monetary terms and this causes an impression that the report is concerning finance. A few studies reported are also restricted to finance function. A study highlights "balance reporting", that is, reporting for management of daily cash position [151]. One study views the "legal liability of accountants and reporting obligations of financial executives". Reporting is meant for improving the knowledge of average investor and not for relenting individual pressures [152].

c) Studies on MIS in the Public Sector Context

The Board of Directors is the prime authority on decision making in the Indian public sector. The need is to make available appropriate information to the Board of Directors by developing and practising a MIS design. The "top level organisation planning" as reviewed by some experts need certain changes in structural pattern and ways and means of getting information [153]. There is need of bridging divisions, plants and branches with central office through proper quality and quantity of information [154]. The existing gap between enterprises and the Ministries can be filled through a regular flow of 'exception reporting' information. Keeping in view the "organisational accountability" of public sector enterprises an "integrated reporting system" is required to be evolved [155]. The large scale accountability of public sector is also visualised in a study relating to a trading organisation and need for "integrated reporting" is suggested [156]. This accountability of public sector to the Administrative Ministries can be met through a "Ministry-wide monitoring and information system for plan implementation" [157]. The public sector is also required to maintain good relations with the society at large and to achieve this end, MIS can be helpful to develop better "public relations" [158]. The "coordination" of public sector enterprises among themselves is also of great significance [159]. The role of management in computer system development is highlighted in some studies [160 & 161]. A study on

"MIS in airlines industry" is also carried out [162]. The "computer applications in HAL are analysed in a study" [163]. In another study, an assessment of upward communication is made [164]. In order to develop an information system for coordinating the Administrative Ministries and the public sector enterprises some attempts are made [165].

Estimating the Research Gap

The survey of research on MIS attempted in the earlier sections points to the fact that the major thrust of research has been conceptual rather than empirical. Conceptually, a theory of information systems is slowly heading towards scientific precision with the advent of scientific research on cybernetics, systems, and communication. The social sciences being at their best are imperfect sciences and to claim universal applications for any model developed for MIS, is too tall a claim to be a perfect guide for decision-making. The public sector in India, as already pointed out, has emerged as the means of attaining certain ideological goals of the state policy. Huge investment of public money made in the public sector makes it the most important sector of our national economy.

From the review of research on the public sector, a general concern for operational efficiency can be observed. Entirely commercial standards, however, cannot be good yardsticks for measuring the performance of public sector undertakings. Achievement of goals envisaged for this sector in the policy statements of the successive governments of independent India, should be the major guide in determining the efficiency of these enterprises. It is due to this fact that public sector undertakings are made accountable to the Parliament, the Administrative Ministries and the Public at large.

Decision making in these undertakings assume new dimensions due to increased responsibilities to the larger systems. The sheer size and geographical dispersion of the public enterprises pose executive problems of a serious nature. Strangely, in spite of this realisation in most of the studies reviewed on the public sector, very little is available to be directly useful for streamlining decisions and thereby improving the efficiency of these systems. An adequate and smooth information flow is the spinal cord of the process of decision-making. Hence, there is the importance of information and feedback systems in improving the economic performance of any business house. The concern for wider systems and the large size of undertakings in the public sector makes MIS all the more important for these enterprises. Not only that the quantity of information needed is large, but also the quality of information needed undergoes a significant change because economic indicators of corporate performance are inadequate guides for decision-making.

There is a yawning gap between the theory and practice of MIS in the Indian context. A general despise for data is a characteristic phenomenon in the business houses of our country. Of late, some multinationals and progressive business houses in the public sector have recognised the fact that management is basically an information function. Consultancy assignments for installing information systems have been given by some units in both sectors of Indian economy. A general flow of studies conducted by consultants; however, is their blind adaptation of the existing models of information systems. In the name of empiricism the consultants, oblivious of the domestic business realities, carve out situations to fit in models. The real scientific process, however, would be to study the realities in business situations existing in all the sectors of the economy and develop models accordingly. After having a general descriptive account of information needs of public sector undertakings, we should venture to effect conceptual innovations and thus develop model for MIS.

As is obvious from the review, the problem of information has been dealt with by some authors and various aspects of the problem have received serious considerations. A general framework, however, is still to be developed, encompassing the findings of various researchers. It is with this view that the present exercise has been attempted. □

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Simulation of Stochastic Assembly Lines

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Introduction

The problem of assembly line balancing (ALB) has been studied by several authors and an early review of the suggested techniques to solve it has been made by Ignall [8]. Other approaches have been attempted since then (see for instance [15, 19]). Briefly, the ALB problem arises in the context of mass production flow line systems. An excellent exposition of these can be found in [24]. The optimisation problem studied by various authors, in the ALB context, is two-fold :

(1) to minimise the number of work stations on the line, for a given assembly work content and output rate specified by the management.

(2) to minimise the cycle time (i.e., maximise the line output rate), for an existing line with fixed number of work stations.

In both cases, the accent is on minimising unproductive time on the line. A more fundamental problem that has not received much research attention so far [19], is one of designing individual assembly lines within multiline parallel assembly systems. Here, the problem involves specifying optimal values of all the parameters of the system, i.e., (i) cycle time (line output rates), (ii) number of work stations (on individual lines), and (iii) number of parallel lines. The objective is to minimise the unproductive time of the total assembly system. Such systems are often resorted to for reconciling the conflicting requirements of mass production and seasonal demands, to provide system flexibility and to control the line length; particularly in low capital investment manual assembly systems. Much of the research has been focused on heuristic and optimisation techniques to solve the first problem. The second problem is often solved by using the corresponding solution to the first problem as a starting point, and further successive improvements are sought till no further increase in output is possible. Very few direct approaches are available to solve the second problem. The third

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problem does not seem to have attracted any attention at all. In addition, in much of the research, individual task times are assumed to be deterministic, and there is no study to examine how critical this assumption is to line performance. Consideration of variability in task performance times is of comparatively recent origin. Hicks and Young[6] have found that time to complete a work element on the assembly line can be treated as normal random variate, and that the random variables for the various work element times, can be assumed to be independent of each other. This has led to the concept of *stochastic assembly lines.* In this paper, we present discussions and results of a simulation study carried out at IIMA, on stochastic assembly lines. We first review briefly previous research on such lines.

Review of Earlier Research

Moodie and Young [17] provided pioneering work on stochastic assembly lines. In their heuristic method which can be used for deterministic lines as well, the optimisation criterion for stochastic assembly line balancing (SALB) problem is

$$\text{to minimise} \quad \sum_{j=1}^{k} \left[C - \sum_{i \varepsilon j} E_i - r \left(\sum_{i \varepsilon j} V_i \right)^{\frac{1}{2}} \right]$$

where k = number of stations on the line

C = cycle time

E_i = mean performance time for task i

V_i = variance of task time i

r = fractile corresponding to a particular confidence level.

In other words, for the SALB problem, Moodie and Young station time, for some station j is

$$S_j = \sum_{i \varepsilon j} \left[E_{i \varepsilon j} + r \left(V_{i \varepsilon j} \right)^{\frac{1}{2}} \right]$$

Suppose r is set equal to 2 and the line is perfectly balanced. In this case, probability of a unit not being completed at a particular station will be 0.025. Hence, if there are k stations on the line, since the stations are independent, the probability that a unit will emerge from the line within cycle time will be approximately $(1 - 0.025k)$, contrary to $(1 - 0.025)$ as claimed by Moodie and Young [17].

This feature is incorporated in Brenneeke's model [3]. In this model, Brenneeke lets management determine the optimal percentage of non-completion of unit within cycle time (for the case of paced line). The trade off is between a low cycle time and non-completion cost on the one hand and a high cycle time and idle time cost on the other. A heuristic method based on the 'controlling station' concept and optimal percentage of non-completion, is proposed to solve the SALB problem.

Mansoor and Ben-Tuvia [15] introduce the idea of incentive schemes to influence cycle times. The approach is cost based and an attempt is made to see whether a reduction of cycle time through the incentive scheme reduces per unit cost. Allowing limits on incentive schemes and decrease in cycle time, a minimum labour cost cycle time is sought, through an iterative scheme. The SALB problem is then reduced to deterministic ALB problem.

Explicit consideration of cost of idle time and cost of incompletion in SALB problem is due to Kottas and Lau [13] in their computationally efficient, cost-based heuristic which leads to near-minimum cost line design, within the context of a paced assembly line. The authors use the concept of 'marginal desirability' of a task for station allocation. The task is marginally desirable if its expected incompletion cost is less than labour savings generated. Station assignment is made on the basis of highest marginal desirability of tasks.

Vrat and Virani [23] have tested a modified version of the above heuristic, by allowing parallel stations for tasks exceeding cycle time, for an assembly line of motors. Kottas and Lau heuristic is claimed to be more efficient than Moodie and Young's.

Edward Kao [10] has proposed a preference order dynamic programming approach similar to that of Held, Karp, Shareslian [4]. Kao's procedure is only practicable for problems of small size.

It appears, from the review made above, that efforts to solve SALB problem are still in preliminary stages. The major solution techniques are heavily dependent upon—

(i) Assumption of distribution for task times;

(ii) Predetermined optimal percentage of incompletion of assembly units within cycle time;

(iii) Explicit knowledge about cost of idle time and cost of incompletion;

(iv) Efficacy of the heuristic used to balance assembly line; and

(v) Assumption of rigidly paced assembly line.

Simulation Approach

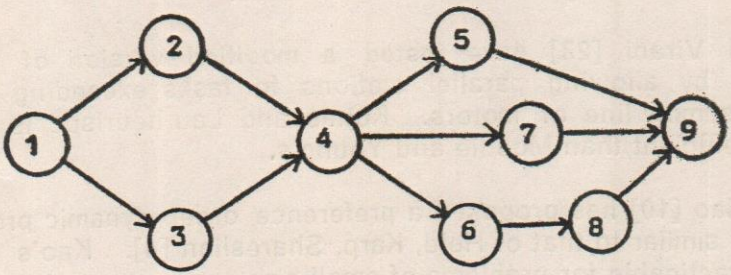
Experimental research was undertaken at IIMA to extend simulation approach to balancing of stochastic assembly lines. The present paper is based on the first phase findings of the research. We believed that simulation approach is ideally suited to SALB problem, as apart from balancing the line, it would enable to evaluate the effect, if any, of changes in task and station parameters on line balance. Specifically, it was decided to study the following :

i) The effect, if any, of changes in task and station time variability on the output of a balanced assembly line ;

(ii) To examine if, for a given SALB problem, there exist one or a few feasible combinations of tasks allocation to stations, which dominate other feasible combinations, in terms of their ability to achieve best balance, over a number of simulations of the assembly line.

The line chosen was that of Moodie and Young [17] for which the precedence diagram and task times are given in Exhibit 1.

Exhibit 1



The Moodie And Young Problem

Element Number	*Element Times (Deterministic)*
1	5
2	3
3	4
4	5
5	1
6	4
7	5
8	4
9	6

Experiment I

For the first experiment, the line was first balanced with a deterministic cycle time of 13 and 3 stations on the line. The station time variances were allowed to vary from 0.05 to 1.4 times the corresponding mean station times. The line was then simulated over an 8-hour shift, using a typical single-server facilities in series queing model. The following assumptions of the model are noteworthy :

(i) The line is not paced. But an operator waits if his predecessor has not completed the previous job, and there is no in-process inventory. Moreover, a job waits between stations, if the operator concerned has not finished assembling the previous piece;

(ii) Work time at each station follows a normal distribution dictated by its component tasks, and complete independence between tasks and stations is assumed.

Exhibit 2 shows the average cycle times based on output over 8-hour shifts (replicated three times for each value of $(\sigma/\mu$ for station time). Exhibit 3 gives a plot of cycle time *versus* the coefficient of variation for the station assigned time. The following conclusions are derived :

(i) The overall mean stochastic cycle time is 13.07 with a standard deviation of 0.08. It is found by testing that mean stochastic cycle time is not significantly different from deterministic cycle time; for the range of variation allowed for the task times;

(ii) The plot of cycle time *versus* coefficient of variation of station time, is not indicative of any trend whatsoever, indicating that increase in variability of task times does not necessarily lead to deterioration of line performance;

(iii) The line output (productivity) over 8-hour shift is not adversely affected by increase in *stochasticity* in the line. The total loss of output, taken over all 8-hour shift simulations, *vis-a-vis* a deterministic line is only to the extent of 0.53%.

It would, therefore, appear, from the above experience, that no significant errors are likely to be committed by balancing a line using mean task times. The finding, of course, relates to the unpaced assembly lines.

Exhibit 2

Variance/Mean	*STD DEV/MEAN**	*Av. Output (in 8-hr Shift)*	*Cycle Time (deci-minutes)*
0.05	0.06	368	13.04
0.10	0.09	366	13.11
0.15	0.12	365.5	13.13
0.20	0.13	369.3	12.99
0.25	0.14	366.7	13.09
0.30	0.16	368.3	13.03
0.35	0.17	368.3	13.03
0.40	0.18	367.3	13.07
0.45	0.19	366	13.11
0.50	0.20	368.3	13.03
0.55	0.21	370.3	12.96
0.60	0.22	364.3	13.17
0.65	0.23	366.7	13.09
0.75	0.25	369	13.01
0.85	0.27	365.7	13.13
0.95	0.28	365	13.15
1	0.29	371	12.93
1.1	0.30	364.3	13.17
1.2	0.32	362.7	13.23
1.3	0.33	367.3	13.07
1.4	0.34	370.7	12.94

*Standard deviation of task element times is approximately 1.7 times of standard deviation of station times. Hence, the above results show outputs where standard deviations of task elements have been varied from 0—0.6 times the mean. The overall mean cycle time is 13.07 and standard deviation is 0.08 and hence the hypothesis that stochastic cycle time mean is not greater than deterministic cycle time mean *cannot be rejected* at 10% significance.

Experiment II

To study the dominance property, if any, of task combinations, simulation approach was used to balance stochastic unpaced assembly lines. The network used was the same as in Exhibit 1. Standard deviation of each task time was assumed to be 25% of its mean, and each task time was assumed to be normally distributed.

Simulated values of each task time were sampled from the given distributions. The line was balanced using each set of simulated values of task times. The procedure was repeated over 200 simulations, each time using 3 stations on the line. In the actual experiment, 5 feasible near-optimal combinations of tasks were identified, as shown in

Exhibit 4, based on deterministic task times. During each simulation, cycle time for each of the 5 combinations was determined and the combination that resulted in minimum cycle time was listed as the best, using a computer programme. Exhibit 5 gives results of this simulation study. The following conclusions emerge :

(i) It is seen that Combination II (which, incidentally also gives the best balance in deterministic case) outperforms the remaining combinations both in terms of number of times it leads to minimum cycle time, as also the lowest mean and standard deviations of cycle times achieved.

(ii) Although combinations I, II, V are equally efficient in the deterministic case, combination III gives better results in the stochastic case.

(iii) In all cases, the mean stochastic cycle time is higher than corresponding deterministic cycle time.

(iv) For a given SALB problem specified by appropriate task distributions, the above findings can be fruitfully used to define '*balanceability index* (BI)' of a task combination, in the following way :

$$\text{BI of task combination } i = \frac{n_i}{N}$$

where n_i = number of times combination i gives best balance

N = total number of simulations.

In our case, combination II has obviously the highest BI, given by

$$\text{(BI) of combination II} = \frac{74}{200} = 0.37$$

(v) The above approach to SALB problem can also be used to design a paced line. Suppose it is desired to design paced lines which are required to produce a certain level of output with a desired degree of confidence, the means and standard deviations of the stochastic cycle times obtained by simulating the line with each task combination, can be used. Suppose, cycle time corresponding to the desired output level is T_o. Let T_i and σ_i be the mean and standard deviation, respectively of stochastic cycle times obtained for combination i, on simulation.

Let $T_o = T_i + k_i \sigma_i$

Clearly, the combination with maximum k_i leads to highest degree of

confidence and will be chosen. For example, in our case, if it is desired to have an output level of 300 units during an 8-hour shift, combination II will clearly be chosen since it leads to the maximum confidence level of nearly 95%.

Exhibit 3

Plot of Standard Deviation/Mean of Station Time Against Cycle Time

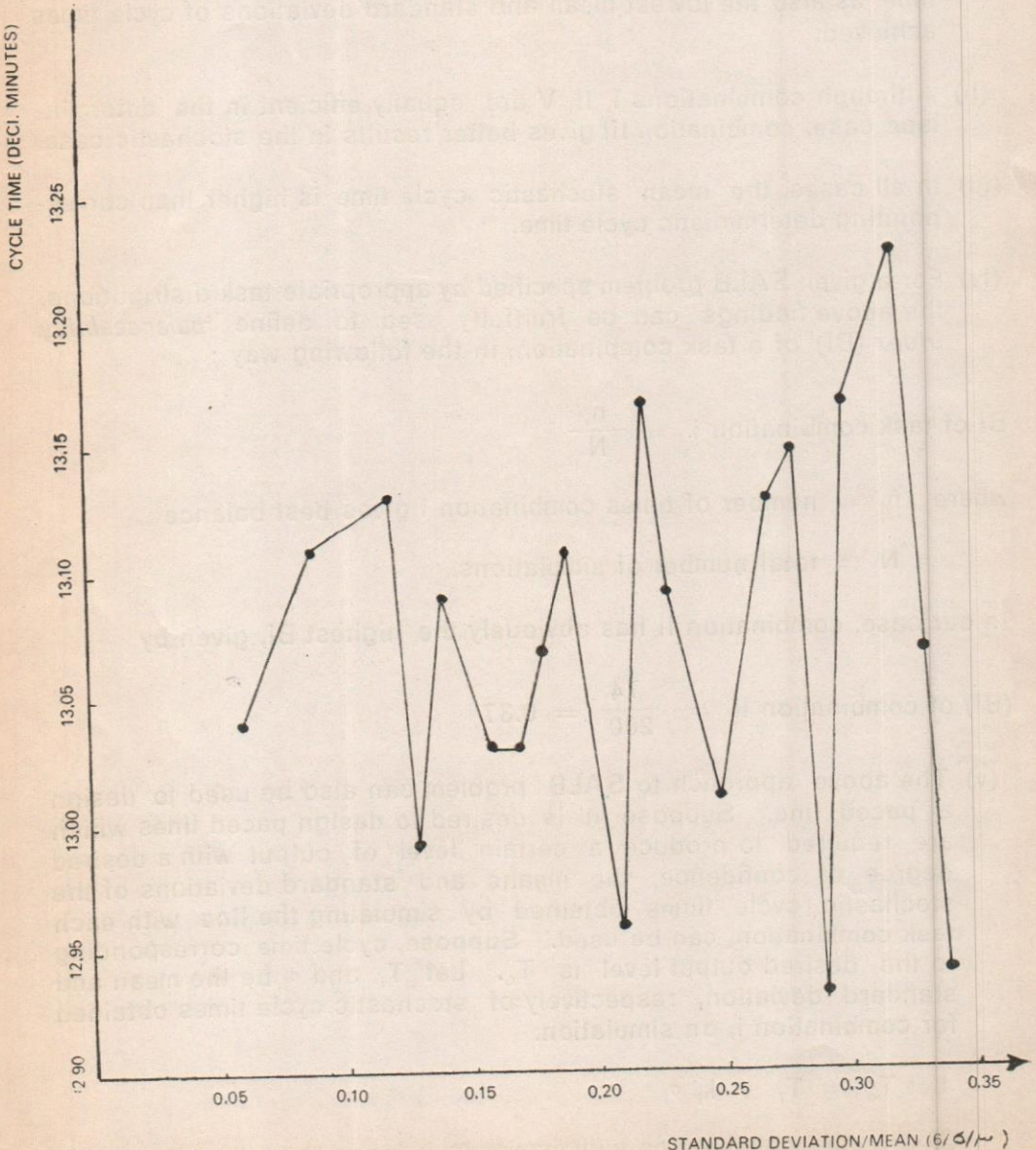


Exhibit 4

Combination	Combination selected for simulation — Work Stations			Deterministic cycle time
	1	2	3	
I	1, 2, 3	4, 5, 7	6, 8, 9	14
II	1, 2, 3	4, 6, 8	5, 7, 9	13
III	1, 2, 3	4, 6, 7	5, 8, 9	14
IV	1, 2, 3	4, 5, 6	7, 8, 9	15
V	1, 3	2, 4, 5, 7	6, 8, 9	14

Exhibit 5

Result of 200 Simulations**

Combination	No. of times it gave min. cycle time*	Mean	Standard deviation	Deterministic cycle time
I	47	14.58	1.61	14
II	74	13.92	1.3	13
III	63	14.12	1.49	14
IV	27	15.55	1.82	15
V	23	14.79	1.45	14

* When there was a tie, *all* the tying combinations were considered.
** The simulation was done using a standard deviation equal to 25% of the mean task time.

Conclusion

From the experiments undertaken, it is found that for a given deterministically-balanced assembly lines, variability of task time does not significantly affect the line performance, in terms of average line output or variations in the output. Secondly, the research points to the possibility of a few task combinations dominating others, in terms of their ability to achieve best balance, as reflected by their corresponding balanceability indices (BIs), and resulting mean cycle times. The concept of BI should, we believe, be particularly useful since it provides alternative combinations of tasks, which are particularly more efficient, as compared to others. Thus, if, due to some reasons, the best combination is difficult to use, BI concept could lead to a selection of a suitable alternative combination.

It must be emphasised, however, that current encouraging findings are based on small size SALB problem. The above findings need to be tested for validity, for large size SALB problems, which we propose to undertake during the second phase of the research. The simulation approach also lends itself readily to accommodation of any other task time distribution, and it should be worthwhile to investigate if specific task time distributions alter the above findings. □

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Management Development

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Preview

The dynamic environment in which organisations operate today poses multifaceted managerial problems that make the task of managing risky and uncertain. A slight error in managerial decisions may sometimes become a question of survival for them as tommorow is going to be different in the context of individuals, technology and society. This is an environment of change which needs to be effectively managed with a view to realise the organisational goals.

It is imperative, therefore, to inject planned learning behaviour in the managerial personnel so that it can effectively tame change (predict, inject, meet, manoeuvre change) to realise pre-set organisational goals. This is the *raison d'etre* of Management Development.

Managerial competence is enhanced through organised learning, so that the destiny of the organisation is not allowed to be drifted according to the tune of environment. Organisations should shape their environment for effective functioning rather than be shaped by it.

The dynamic environment necessitates dynamic organisations which can be created only by dynamic management. The dynamic management is the product of management development.

The concept of management is multi-dimensional, which need be recognised in any programme of management development (MDP). As a process, management is a distinct duty calling for planning, organisation, co-ordinating, controlling, directing and staffing. As a responsibility it is accountability of the Superiors for subordinates' performance and is discharged by getting things done through other people; as a technique it is leadership which is involved in influencing the behaviour of others so that one does what is wanted and not what he wants; in terms of object, it is organisation where management strives to create, maintain

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and develop viable organisations and finally in terms of effectiveness it is management of change. Further, the charisma of management reflects much deviation in practice from the earliest concept of governing/ruling/managing others to that of 'be managed'; from participative style, ultimately to 'manage self'. In fact, how to 'manage self' so that one functions as effective executive, in the context of change, should equally be the mission of any programme on Management Development.

HRD Concepts

All Human Resource Development (HRD) Programmes reflect 'Training' or 'Development'. Training is imparted with a view to create 'specific learning behaviour' through inculcation of requisite knowledge, skills and attitudes. It is based upon the 'needs gap' approach, where participants imbibe the knowledge, skills and attitudes necessary for efficient performance and which they either lack or possess inadequately for job needs. Further training is based upon the maxim, 'there are always some best ways of doing jobs' which should be picked up in order to be efficient. The main object of training is MAINTENANCE—maintaining the efficient performance level of employees.

As opposed to MAINTENANCE, Development is growth-oriented and signifies enhancement of competence. It involves professional growth, management effectiveness and ultimately organisational development. It *injects planned learning behaviours* but not *specific* as is in *training*. Further development is based upon what the participants have (as opposed to 'needs gap' approach in training) and the way to improve it in the context of managerial effectiveness. So it calls for capitalizing on 'strength' of employees rather than hammering their weakness or disabilities.

MDP and EDP Programmes

In the context of development two types of programmes for executives are normally conducted—one is Executive Development (EDP) and other is Management Development (MDP). A hair line destinction between these programmes is indeed difficult. However, in EDP's, the idea is to enable the executives to man future higher positions in the organisation with confidence and competence. These programmes are based upon development of various skills like, public, social, human, conceptual analytical and certain basic attitudes. Often these programmes are conducted by management institutes or professional bodies in the form of sandwich/capsule courses. These programmes are for executives who have put in 6-11 years of service in Government of India.

The participants in MDP are generally of higher level who have put in

11-15 years of service. The focus and strategy in MDP is bound to be different from that of EDP.

In this context, MDP are 'Knowledge Sharing' Oriented Programmes conducted by group discussions or other participative approach. They facilitate sharing of experience with a view to increase 'awareness regarding knowledge of management practices' in other organisations elsewhere.

All MDP programmes are designed for transferring 'knowledge' through appropriate media and injecting 'attitudinal change' through Behavioural Change Technology (BCT). The ultimate theme in MDP programmes is arousing of 'creativity' amongst the participants so that they develop inner urges to 'innovate' and bring innovation in their parent organisation on being back from MDP Programmes.

Administrative Logistics of MDP

There are certain essentialities in MDP's. First, the personality profiles of the participants sets the entire content and context of the programme. These higher level of executives have inflated ego with high profiles. As they are mid-career executives who have successfully pivoted their organisations against heavy odds, they have too much confidence in their ability and are not motivated to learn. Their thinking is convergent, often believing in tried ways of doing things and, therefore, not receptive to new notions or practices. They are not prepared to receive any knowledge unless they are asked to give. They want to be 'teacher and pupil' both and not pure 'pupil'. Group Methods of training alone, therefore, meet their personality profiles.

Secondly, the venue and physical facilities are important. It must provide an environment away from the jobs so that participants can breathe freely, think freely, feel fresh to ponder over their contrived experiences. Normally the venue should be away from their place of working for preventing interruptions of office calls. Generally these programmes are noticeable in 4 star or 5 star hotels.

Thirdly, the time and duration of such programmes should receive proper attention. The operations of the organisation, which they represent should be at low-ebb in those days when such programmes are conducted. For top people the programme may extend to 3 or 4 days as they are very busy people. If the programme is to extend more than a week and is local, it should be a half-day daily programme, extending to last day of the programme duration. Normally it should not exceed 4 weeks if the programme is conducted within national corridors, away from their place of working. For programmes conducted abroad, no such time limit can be specified. The general consensus is that all MDP programmes should be of shorter duration. The programme schedules, as announced, must be rigidly adhered, to imbibe their faith

in the programme. Too often, substitution of sessions will reduce the credibility in the programme.

Fourthly, the programme should be knowledge-oriented where experts disseminate knowledge based upon their experience and research. It need not be highly quantitative-technique oriented, as Senior Executive need not be experts but they should be able to appreciate the significance of proposals involving the use of such techniques put to them by subordinates.

Fifthly, there should be substantiality, validity and relevancy in the programme.

The subject matter should be dealt with in sufficient depth and comprehension. It should furnish information which is reliable, factual and valid, encouraging free and thorough exploration of content. The relevancy is equally important as the minds of executives will not receive new ideas merely for the sake of knowledge. If these ideas are knowledge-oriented and completely new, then they should be asked to write a note on their applicability to jobs in their own organisations. This will involve their receptivity to new concepts and bring relevance in their programme.

Sixthly, there should be efficacy in the programme. The objectives of the programme should be distinct and clear so as to enable the participants and others to measure the impact of the programme. It should be followed by critical scrutiny and evaluation.

Designing and Directing of MDP's

The following issues need consideration :

1. What should be the objectives of the programme ?
2. What should be the programme content ?
3. What should be the strategy of the programme ?
4. What type of infrastructure-venue, physical facilities, ancillaries like meals and coffee arrangements, faculty inputs, reading material and brochure, Bibliography, etc., to be chosen.

Objectives

The MDP Programmes are designed to :

1. Enhance the understanding of the participants regarding the socio-

politico, economic and technical environment in which the organisations operate.

2. Expose the participants to the modern concepts and tools practices of management together with its behavioural aspects.
3. Provoke administrative thinking on managerial lines by motivating the participants to apply modern concepts in their organisations and prepare a paper on that aspect. This paper becomes a subject for mutual discussion and deliberation and much of the learning is transferred during these discussions silently.
4. Provide a forum for sharing knowledge and experience regarding practices of management in their parent organisation.
5. Develop professional skills by Action Research and Project Study.
6. Inculcate the habit of reading and self-study to which they may not be accustomed.
7. Provide an opportunity for mutual learning, so that everybody becomes others' teacher and pupil. This is possible only in 'group discussion' approach.

Programme Contents

The focus of the MDP Programme should be conceptual, but highly practice-oriented. The following phases may be covered :

1. *Management Concepts and Philosphy :* The Management Process, Organisation Theory : Dimensions of Public Administration; Management Philosophies.
2. *Management Techniques :* Quantitative Approach, like PERT/CPM, OR, MIS, Computer, Management Accounting.
3. *Management Areas :* Production, Finance and Personnel.
4. *Behavioural Aspects :* Leadership style, MBO, Organisational-Development, Organisational Behaviour Group Dynamics and Transactional Analysis, Motivation.
5. *Development Administration :* Project Management and Management of Agricultural Programmes including Cost-Benefit Analysis.
6. *Economic Management :* The Economic Environment and Planning and Management of Public Undertakings.
7. *Special Projects for Management Studies :* Management of Sick units Socio-economic Impact Study; Problems of Coordination in Particular Project; Organisational Analysis; Inventory Management, etc.

8 *Self Study :* Out of the bibliography given to them, each participant may be asked to present a book-review by a lecture-cum-discussion approach.

9. *Action Research* . Participants may select any topic suiting their experience in the organisation and may be asked to present a paper.

The programme content may be fixed and decided before hand. In such a situation, the Programme Director should interview each participant and find out what are his needs and expectations. The needs and expectations of the individual participants may be adjusted in field study/ project study/self study. Alternatively, as happens in International Programmes, programme content may be reviewed every week and changes and restrictions made accordingly. Then the programme will be highly participant-oriented, invoking deep 'involvement'. This is possible only when the faculty is available on "tap" and if the core faculty is mainly of outside guests, then weekly restructuring of Programme contents is not possible.

However, the programme contents as designed and prepared should be as far as possible, rigidly followed in practice, as otherwise the credibility in the MDP programme is very much shaken.

STRATEGY OF MDP's

The Programme Directors' skill and ingenuity is needed in selecting the appropriate media of transferring planned learning to enhance managerial competence. The following are some of the approaches to the transfer of learning :

1. Verbal Transfer of Learning :
   (a) Lecture method
   (b) Group method of learning.
2. Contrived Experience :

   Case Study, In-basket; Incident Process; Games; Simulation; Sensitivity Training.
3. Dramatic Participation :

   Role Play, Psychodrama, Mock Trials.
4. Demonstration : Simulation, Field Trips/Assignment, Project Study.
5. Visual Transfer of Learning : Cartoons, Films, Pictograms, Flip Chart, Film Slides; Overhead-Projectors, Transparencies.

6. Audio-Visual : TV, Video-Tapes and Disc Recordings.

7. Written Transfer of Learning : Action Research, Programmed Instruction/Self Study.

Lecture Method

It is the most traditional from of transfer of learning orally by an expert who addresses the participants after doing preparations. When substantial knowledge is to be transferred this method is most economical in terms of cost and time. The teacher-pupil style inherent in it is not suitable for MDP programmes though, to some extent, it is necessary in EDP Programmes. The participants are patient listeners and the degree to which learning is transferred depends upon the personality, knowledge, and communication skill of the teacher. This 'one way traffic approach' prevents involvement of the participants who start feeling bored after some time.

Though generally decried in all MDP/EDP programmes, yet it is universal and its input is there in all different aforesaid strategies. For MDP programmes, Broken Lecture Method is considered very effective. In such a lecture, the participants may interrupt when they feel like interrupting.

Group Method of Learning

Under this method, the participants are divided into groups formed to discuss a particular theme in the presence/assistance of an authority on the subject. It is considered as modern approach to create change amongst the participants through group inter-actions and the delibrations. There is a free and frank exchanges of views and each participants is deeply involved in such exchanges so that trainees become mutual teachers and learners.

The basic premise of these methods is that Management is not an individually-based discipline, since getting things done though other people calls for achieving results through groups of people varying in size, expertise, tasks, abilities and attitudes. Basically it is an exercise in sharing experience in group and thereby acquiring the art of management practices involved in leading, communicating, innovating, improving, knowledge sharing, team work and motivation. These methods are very effective in passing silently managerial skills through group interraction and deliberations. There are several types of group methods adopted to produce divergent thinking amongst the participants. Some of them are as follows :

Syndicate Method : This method was developed by Administrative Staff College, Honeley-on-Thames, England, for senior-middle level executive development programme.

A syndicate is a small group carved out of a bigger group representing different shades of organisation/expertise functioning as a team to share their experiences on a particular assigned task and report back the inter-actions in the joint plenary session. The small groups are completely self-managed and the trainer acts/tenders advice only when asked for. Each group, after finalising its report, submits to the Programme-Director and other group members on dead line date, who put it for discussion in the Joint Plenary Session. Some concrete inter-actions emerge out of discussion of several group reports in joint plenary session which may assume the form of final recommendations. Syndicate Method is Multi-dimensional and all other training strategies like case study, role playing, leadership, team building, communication, knowledge-sharing, creativity, lecture method etc., are embodied in it. It is identified as one of the best methods of learning for MDP programme.

Discussion Group : It is designed to enable the participants to know and understand different angles of vision. However, it is not expected to produce a consensus at the end of discussion. As opposed to Syndicate, the size of discussion group is large and the trainers guides, frequently interrupts and actively monitors discussions. The participants learn the art of generating ideas, handling them, argue out and formulate concepts. Sometimes it may be a forum for emotional release of participants.

Symposium : It is a debate where participants hear the views and contributions of persons who have authority in their respective fields. Speakers in symposium do not converse with each other, but make presentation to audience/participants.

Committee : It is a group of persons committed to deliberate and interact on 'purpose' agenda items and report back its findings to parents body. Unlike syndicate it may have several items on agenda and the chairman and Secretary are appointed by the parent authority appointing the committee. The group of members is also structured at the instance of the parent authority. The committee usually get extension of time, unlike syndicate, and is more formal in procedure and approach.

Conference : It is a carefully-planned meeting of a group of people of different organisations for exploring problems and issues, getting information and attempt to find solution. The idea is to enhance mutual cooperation.

Workshop : It is designed to give a first-hand knowledge and experience

of the application of a technique through practice. The leader of the workshop is an expert and who guides the group of participants. It is a very good technique for EDP Programme. It enhances individual proficiency and understanding.

Convention : It is an assembly of delegates of various units who are professionals, held to explore problems of mutual interest. It requires lot of preliminary planning and financial commitments unlike other group methods.

Seminar : A Seminar is a group discussion amongst experts who discuss and inter-act upon the research finding of the Seminar leader. Sometimes the audience in a Seminar is more knowledgeable and so is able to analyse the research findings critically.

Panel Discussion : A panel consists of 3-6 persons, who are experts and converse on an assigned topic. They usually converse with each other and there is no audience participation. The role of the trainer is simply to moderate the discussion so as to enhance the understanding of the participants, who listen to various views on the topic.

Colloquy : It is a modified version of Panel Discussion where besides, experts, some representatives of the audience also sit on the stage. These representatives ask questions, express opinions and raise issues to be treated by experts.

Clinic : It is a meeting of Group of people for the purpose of diagnosing, analysing and seeking solutions to specific problems.

Real-life situations are taken to establish the manner of meeting them successfully. The basis for diagnosis and solution of problems is case study, demonstration, role plays, speeches, field trips, etc.

Other Methods

Role Playing : It is a technique in which participants are asked to act out dramatic roles of people involved in a situation. The training officer can use audio video tapes to record the role-playing so that the participants may discuss the performance afterwards. Malcolm Shaw has theorised four kinds of learning that can take place through role planning; learning by doing (practising the desired skill), learning through imitation (participants imitate designed behaviour), learning through observation and conceptualisation. For too self-conscious people this exercise is difficult and sometimes the acted out roles do not befit the situation and so lead to loss of confidence in the actor. The entire development effort then becomes dysfunctional.

Case Study : This technique is most respected in MDP/EDP programmes. The method was developed in Harvard Law School. A case represents a real-life situation brought to the Class-room in the form of history relating the decisions taken in that situation. It is complete in itself and requires meticulous preparation. The purpose of the Case Study method is to acquaint particpants with the type of situation to be faced, increase their individual diagnostic skills of solving problems and enabling them to understand the rational decision-taking on the basis of information. Often it is 'do-how' method of group training. The trainer should be an expert who can define the parametres of case study and give finality to discussions. However, the participants do not feel total commitment/involvement in the problem as they look to the Programme-Director who has some model answer to the case and so start guessing about it.

Incident Process : A variant of the Case-Study method, this was developed by Paul and Faith Pigers of Massachusetts Institute of Technology to enhance problem-solving skills of the participants. A basic incident is reported to the trainees and other vital information is withheld by the leader who supplies only when asked for by the participants. The participants first of all find the facts by asking for any additional information; the next is identification of issues and finally each participant writes his solution for discussion amongst the participants.

In-Basket Method : It increases the professional skills of the administrators in handling day-to-day matter efficiently. It can be a part of EDP programme with a view to enhance the Disposal Efficiency of the participants. A pack of paper like letters, Memoranda, Reports, etc., are given to participants and they are asked to deal with them within a specific time. Participants thus learn the art of giving priorities and decision-making.

Brain Storming Method : A small group of participants is made to sit in a specific style and a problem is posed by the Programme-Director. Each participant is allotted a definite time and asked to give his solution based on spontaneous imagination unconventional and non-conformist. The suggestion is immediately recorded on the black board or on paper by the Programme-Director. In this way a heap of possible alternatives is gathered. which are analysed and discussed threadbare on merits and demerits. A number of worthwhile solutions emerge from such sessions. The brain of the participants is really stormed in producing spontaneous and instantaneous solution.

Sensitivity Training/T-Groups : One of the most prominent behavioural change methods is the T. Group Method. Often it is known as 'Leaderless and Agendaless' group of normally twelve participants—(may vary some times) assemble as strangers for fifteen days in an isolated spot. This is basically a group exercise in 'self awareness' where members of

the group get an opportunity to see themselves as others see them. As there is no agenda, participants in the group assembled at isolated spot throw up problems for discussion. The leader is in the background but he watches the group discussions. Participants see their 'inner-self' and thereby improve in behavioural skills. Hence the attempt is to promote visceral/emotional learning as opposed to intellectual learning. The trainer interprets the behavioural interractions of the participants to enable them to have a deep insight. He should be fully qualified to handle such training programmes. This is important for MDP/EDP programmes, since in critical situations, the inner urges hopes and fears govern the behaviour of executives.

Simulation : To Simulate means to imitate. The group of trainees are asked to simulate the job they are supposed to take by using dummy materials, documents, etc. Often it is used for highly technical or skilled jobs. However, in MDP programme it takes the form of case study, role planning, in-basket, managerial games etc.

Programme Instructions : Under this method, the type and amount of learning to be transferred to the participants is pre-decided and subdivided into several progressive stages. For each stage, written exercises are developed carefully in the form of training material and a well-designed questionnaire is annexed to the exercise. The trainer is supposed to indicate his understanding, by giving his response in filling vacant places. The participant progresses with his learning at a proper rate in a sequence. The entire matter is so presented that the learner should have digested the preceeding material before passing on to a new item.

Management Games : Gaming is basically an exercise in strategic decision making where strategies of competitors are taken into consideration in an ever-changing environment. Initially the participants are supplied the data on the basis of which they take decisions by assuming their impact on cost and profits. Further, ever-changing information is given to them continuously leading to a chain of decision-making by the group of participants. The final decisions taken by the participants are compared with the solutions given by the Programme-Director who explains the mistakes committed by each group. Throughout this execrcise, the Programme-Director acts as supplier of information in the light of which further decisions have to be taken. This is a very good method for MDP Programmes.

Visits and Tours : A group of trainees may be asked to visit different places/organisations/projects and gather knowledge about them in detail and submit field reports after completion of the visit. This is a knowledge practice-oriented technique.

Project Study : The trainees are divided into small groups which are

assigned different projects for study and report. They go to the field to collect data and information and then prepare and present reports. The reports are discussed with Programme Director and participants. As compared to field visit, this involves more study. It is highly useful for MDP programme.

Action Research : Any research conducted to improve the action with a view to enhance competance or effectiveness may be defined as Action Research. The participants are encouraged to identify problems that interfere in their effective functioning and are motivated to study their own problems, experiment with more promising practices, materials, methods and other relevant literatures with a view to present a written monograph for discussion amongst the participants. The participants are encouraged to improve themselves in self study. This is a very good technique for management development, where the participants have disfilled experience of several years.

Self Study/Written Assignments : This may assume several forms, participants may be given several latest books suiting their tastes, and they may be asked to present a lecture. The other participants listen to the lecture and analyse his style of delivery and content. Another form may be to guide the participants on the literature mentioned in the Bibliography of the brochure or other material and ask them to apply these concepts in their present job position. In such a case, they are supposed to present a paper which is to be presented for discussion amongst all participants. Experience shows that this method has proved to be one of the best in imparting applied learning in MDP programmes, the reason being that participants have deep knowledge of their jobs and are able to apply the concepts immediately write a note. They feel satisfied in applying the concepts to their jobs and experience enhancement in their comprehension. This all brings 'relevance' where, for example, several management concepts of planning, organisation, controlling, staffing etc., are applied to the organisation. Some times this takes the form of Action Research—project-study, field visit, reports, etc.

All the organised strategies are to be combined with audio-visual aids like overhead projectors, films, slides, tapes etc., to create an indelible impression of the programme contents in the minds of participants. This is a must in MDP programme.

Experience shows that an effective strategy of Management Development Programmes (not EDP) incorporates broken lecture, audio-visual aids like films cassette tapes, overhead projectors, Flip-chart, maps, syndicate sessions having some case study and role planning, T-group training, self-study project, exercise and field visit, action research and management games. It will require the ingenuity and skill of the Programme-Director to select the programme contents suitable for the aforesaid

strategic devices in proper proportion in the Programme. Further sequencing of various strategies in the time schedule is very crucial for success of MDP programme.

Infrastructure

The venue of MDP programme should be away from their job, for uninterrupted participation. Physical facilities, together with auxiliary services like tea, coffee, meals, etc., should suit their status, so that conducive environment will be generated for the participants to interact and develop to the maximum extent. The bibliography should be submitted so as to give authencity in the programme. It should be on material available in the library. First-rate reading material may be distributed as training material. The role of faculty is first like casts in cinema. Their status, competence, experience etc., give credibility in the programme to motivate senior executives to participate in the programme whole heartedly. There should be proper blend of academics, consultants, and administratives in the faculty mix. A detailed brochure should be prepared, giving the objective, strategy, time-schedule, faculty, Bibliography, etc.

It must be realised that designing an MDP programme needs a dynamic and experienced trainer. His ingenuity, knowledge, skill, depth of study alone bring relevance and dynamism. The Programme-Director also develops himself or enhances his competence as he directs the MDP programme. A dynamic organisation needs dynamic management which can be developed only by a dynamic programme director. All MDP programmes, therefore, are based on the learning-together approach. □

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Impact of New Farm Technology on Farm Produce in Punjab

G. S. Kainth*

The technological breakthrough in Indian agriculture, known as green revolution, was the most important recent development affecting rural areas. The green revolution consisted of a change from traditional farming to a production syndrome encompassing the use of high-yielding grain seed jenotypes (H Y V), Chemical Fertilizers, pesticides, fungicides, weedicides, non-traditional farm mangement techniques, modern irrigation methods and farm machinery such as tractors, threshers, etc.

The adoption of new farm technology has been widely recognised for its production potentials in the agricultural sector. Rutton and Hayami[1] have shown that agricultural development has no longer remained merely a precondition to total development; it has become a process of development in itself. Besides, business outlook of the farmers has also improved. Farming has made a big leap forward from merely a way of life to a well-conceived business enterprise.

Farm innovations have set in motion a sequence of events which have varying degrees of multiplier effects and many direct and indirect implications for different sectors of the economy. In this paper, an attempt has been made to examine the impact of new farm technology in the agriculture of Punjab where the green revolution is said to have the maximum impact. This paper, therefore, examines (i) The impact of new farm technology on the structure of agriculture in Punjab, and (ii) the performance of new farm technology on output of cereals, foodgrains and commercial crops in Punjab. The relevant data used in this paper were drawn from the different issues of Statistical Abstracts of Punjab, an annual publication of Punjab Government.

The State of Punjab lies within latitudes 29°—31′ to 32°—30′ North and longitudes 73°—55′ to 70°—50′ East in Indo-Gangetic plain of northern India. Except for a strip of the Siwalik Hills along its eastern border the entire area is a flat alluvial plain with height above sea level, ranging between 180 and 290 metres. Its population of 13.55 millions (1971 census) constitutes nearly 2.5 percent of the total population of India.

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1 Hayami, Y. and Rutton W. V., *Agricultural Development ; An International Perspective*, the Johns Hopkins Press, 1971

The projected population of Punjab, worked out on the basis of growth rate of 21.7 percent from 1961 to 1971, is estimated at 15.38 millions in 1977-78. The density of population is 269 per square Kilometre as against 182 in India. The rural population of Punjab constitutes 76.3 percent of the total as against 81.1 percent for the country. There are 16.65 lakh cultivators and 7.86 lakh agricultural labourers. The percentage of literacy is 33.7 as compared to 29.3 for the country.

The impact of the adoption of new farm technology on the structure of agriculture can be studied from various angles. Recognising the new technology as a technical revolution, one can examine the impact of new strategy on agricultural development on such things as production, productivity and land resource allocation.

The data pertaining to the land use classification in the state of Punjab is given in Table 1. It shows that significant changes in the land use pattern have occurred in 1970-71 and 1976-77, compared to 1964-65. The net sown area in 1976-77 was 4167 thousand hectares which formed 82.79 percent of the total reporting area of 5033 thousand hectares. The net area sown in the State increased from 3900 thousand hectares in 1964-65 to 4167 thousand hectares in 1976-77, showing thereby an increase of 6.85 percent. However, the recent increase is very negligible. As compared to 1971-72 the increase in 1976-77 works out only to 91 thousand hectares. In terms of percentage, it was as low as 2.23 percent. This shows that, that State has almost reached the saturation point in the matter of increasing net area sown.

The forest wealth of the Punjab State is also very poor. The area under forests was reported at 205 thousand hectares in 1976-77. This was a little over 4 percent of the total reported area. Area under forest increased from 74 thousand hectares in 1964-65 to 205 thousand hectares in 1976-77, showing thereby an increase of 177.03 percent. Land not available for cultivation has shown a decline of 16.87 percent during this period.

Again, other uncultivated land excluding fallow land sharply declined from 189 thousand hectares in 1964-65 to 58 thousand hectares in 1976-77, showing a steep decline of 69.31 percent.

As a result of intensive cultivation measures, it is encouraging to note that area under double or multiple cropping increased considerably. It increased from 1225 thousand hectares in 1964-65 to 2118 thousand hectares in 1976-77, showing thereby an increase of 72.89 percent.

As a result of the shifts in land acreage from the cultivable waste land and fallow land to cultivated land and also because of intensive cultivation, the total cropped area in the State increased significantly. It increased

from 5125 thousand hectares in 1964-65 to 6285 thousand hectares in 1976-77, showing thereby an increase of 22.63 percent.

Table 1. : Classification of Land Area in Punjab.

(Hectares Thousand)

Year	Reporting area for land utilisation purposes	Area under forest	Land not available for cultivation	Other uncultivated land excluding fallow land	Fallow land	Not sown area	Area sown more than once	Total cropped area
1	2	3	4	5	6	7	8	9
1964-65	5029	74	646	189	220	3900	1225	5125
1970-71	5031	123	614	92	130	4053	1625	5678
1971-72	5031	127	614	88	126	4076	1648	5724
1972-73	5031	141	600	82	122	4080	1845	5931
1973-74	5031	139	602	76	101	4113	1924	6037
1974-75	5033	211	531	74	125	4092	1812	5904
1975-76	5033	209	531	68	67	4158	2097	6255
1976-77	5033	205	537	58	66	4167	2118	6285
Percentage change in 1976-77 over 1964-65	+0.03	+ 77.03	−13.87	−39.31	−70.00	+6.85	+72.89	+22.63

In a situation where through the lapse of time there occurred shifts in the land use patterns between the major categories of land utilisation, one can imagine that cropping intensity would eventually undergo a change. The cropping intensity Statistics of different years in the State were calculated as under :

Year	*Cropping Intensity*
1964-65	131.41
1970-71	140.09
1971-72	140.43
1972-73	145.15
1973-74	146.78
1974-75	144.28
1975-76	150.72
1976-77	150.83

It is evident that the cropping intensity in the State showed an upward trend. It increased from 131.41 percent in 1964-65 to 150.83 percent in 1976-77, showing thereby an increase of 14.76 percent. Furthermore,

it is to be noted that the area under double/multiple cropping increased from 31.41 percent in 1964-65 to 50.83 percent 1976-77.

The technology embodied in the new HYV has provided the potentials for increasing production. It is a well known fact that new strategy was mainly concentrated on foodgrains. It will be better to examine whether the introduction and adoption of HYVs have led to a significant shifts towards cereals, commercial crops and pulses. The production of cereals, pulses and commercial crop under the two plan periods are shown in Table No. 2.

Table 2 : Production of Foodgrains and Cash Crops Before and After Green Revolution Period in Punjab

(Production in '000 Metric tonnes)

Commodity	*Pre-green revolution period (1961-65)*	*Post-green revolution period (1967-77)*	*Difference between Col. 2. and Col. 3*	*Percentage of the difference to Col. 2.*
1	*2*	*3*	*4*	*5*
Cereals	2719	6860	+4141	+152.30
Pulses	640	357	— 283	— 44.22
Foodgrains	3359	7217	+3858	+114.86
Sugarcane	407	533	+ 126	+ 30.96
Cotton*	772	940	+ 168	+ 21.76
Oil seeds	149	260	+ 111	+ 74.50

*Thousands of bales of 180 Kgs. each.

It will be seen from Table 2 that the level of production of foodgrains underwent a sharp upward rise. The level of production of foodgrains increased from 3359 thousand metric tonnes in pre-green revolution period to 7217 thousand metric tonnes in the post-green revolution period, showing an increase of 114.86 per cent. The production of cereals is the dominant partner in this achievement. The production of cereals increased from 2719 thousand metric tonnes in the pre-green revolution period to 6860 thousand metric tonnes in the post-green revolution period, showing thereby an increase of 152.30 percent. However, the production of pulses underwent a decline of 44.22 percent.

Although the green revolution was not directed at the commercial crops, yet the performance of oil seeds, sugarcane and cotton did not lag behind that of cereals in the State. The production of oil seeds, sugarcane and cotton showed an increase of 74.50, 30.96 and 21.76 percent respectively in the post-green revolution period over the pre-green revolution period. Thus the analysis shows that it is not merely a cereal revolution in Punjab, but a real green revolution which has influenced agriculture as a whole.

The Punjab farmers have brought about a shift in the agricultural production function by readily accepting new improved varieties of crops. The adoption of the Mexican wheat and dwarf paddy have been more spectacular than others, but they all have contributed to the recent increases in agricultural output. The new varieties possess two distinct characteristics, namely, dwarfness and disease resistance. Both these characteristics have much economic importance. The dwarfness of plants ensures a higher intake of nutrients, through the increased use of manures and fertilizers to obtain greater yields. The genetically inherited disease-resistant character reduces the probability of reduction in yield and of quality deterioration. These characters stabilise yields at higher levels per unit area.[2] The introduction of HYV replaced the traditional varieties which were known for their excessive vegetative growth and poor response to fertilizers and other crops nutrients.

Table 3 indicates the area under high yielding varieties in the Punjab State. It is evident that the adoption of these varieties has been very rapid in the State. It will be seen from Table 3 that the area under HYV of wheat was 2376 thousand hectares which formed 90.34 percent of the total area under wheat crop. The area under HYV of wheat increased from 1502 thousand hectares in 1969-70 to 2376 thousand hectares in 1976-77, showing thereby an increase of 58.19 percent. The percentage of area under HYV of wheat to total area under wheat crop increased sharply. It increased from 69.34 percent in 1969-70 to 90.34 percent in 1976-77. Again, the area under HYV of rice increased from 72 thousand hectares in 1969-70 to 601 thousand hectares in 1976-77 showing thereby an increase of 734.72 percent. The percentage of area under HYV of rice also sharply increased. It increased from 20.06 percent in 1969-70 to 88.25 percent in 1976-77. Similarly the percentage of area under HYV of maize increased from 9.74 percent in 1969-70 to 20.07 percent in 1976-77. This clearly means that hybrid maize could not become popular with the farmers. This was largely due to its greater susceptibility to maize borer and other pests and diseases.

Thus a significant change has occurred in Punjab State in respect of the adoption of HYV of wheat and rice. Referring to the quick propagation of HYV of wheat in Punjab, Dr. Randhawa[3] remarked that the speed with which Indian scientists have achieved this has hardly been witnessed anywhere else in the world. Even MEXICO, where dwarf wheat were introduced earlier, needed 15 years to do what Punjab has done in five years.

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2. Kahlon, A. S., *The Dynamics of Punjab Agriculture*, Department of Economics and Sociology, Punjab Agricultural University, Ludhiana, 1972, pp. 7-8.
3. Randhawa, M. S., *Green Revolution in Punjab*, Punjab Agricultural University, Ludhiana, October 1975, p. 19.

Table 3 : Area Under High-Yielding Varieties of Wheat, Rice and Maize in Punjab 1969-70 Through 1976-77

(000' Metric Tonnes)

Year	Wheat			Rice			Maize		
	Total Area	Area under HYV	Area under HYV as a percent of total area	Total Area	Area under HYV	Area under HYV as a percent of total area	Total Area	Area under HYV	Area under HYV as a percent of total area
1	2	3	4	5	6	7	8	9	10
1969-70	2166	1502	69.34	359	72	20.06	534	52	9.74
1970-71	2299	1589	69.12	390	130	33.33	555	49	8.83
1971-72	2336	1695	72.56	450	311	69.11	548	40	7.30
1972-73	2404	1748	72.71	476	388	81.51	562	15	2.67
1973-74	2338	1970	84.26	499	433	86.77	567	26	4.59
1974-75	2207	1956	88.63	569	481	84.53	522	88	16.86
1975-76	2439	2195	89.99	567	517	91.18	577	100	17.33
1976-77	2630	2376	90.34	681	601	88.25	538	108	20.07
Percentage increase in 1976-77 over 1969-70	21.42	58.19	30.29	89.69	734.72	339.93	+0.75	107.69	106.06

The new HYV are much more responsive to fertilizers as compared with the traditional varieties. Without the balanced use of fertilizers, it is not possible to optimise the returns from HYV crops especially in case of multiple cropping. Therefore, most of the fertilizers plants, in future, ought to produce complex or compound fertilizers of required grades. Particularly, such mixed fertilizers containing NPK may be used as a basal dressing. The increased level of fertilizer use will further reduce the inter-plot and inter-year variation in yield and income. Table 4 shows the quantities of fertilizers consumption in the State during the period 1970-71 to 1976-77.

Table 4 : Consumption of Fertilisers in Punjab, 1970-71 through 1976-77

(000' Nutrients Tonnes)

Year	Fertilizer Consumption of			
	Nitrogen (N)	*Phosphatic (P_2 O_5)*	*Potassic (K_2 O_5)*	*Total*
1970-71	175 (82.16)	31 (14.55)	7 (3.29)	213 (100.00)
1971-72	225 (77.59)	53 (18.27)	12 (4.14)	290 (100.00)
1972-73	240 (73.85)	66 (20.30)	19 (5.85)	325 (100.00)
1973-74	218 (71.01)	68 (22.15)	21 (.6.84)	307 (100.00)
1974-75	189 (77.46)	42 (17.21)	13 (5.33)	244 (100.00)
1975-76	232 (78.64)	53 (17.97)	10 (?.39)	295 (100.00)
1976-77	258 (69.17)	94 (25.20)	21 (5.63)	373 (100 00)
Percentage increase in 1976-77 and 1970-71	47.73	203.23	200.00	75.12

It will be seen from Table 4 that the total consumption of fertilizers during the period under consideration has made a rapid increase. The total consumption of fertilizers during 1970-71 was estimated at 213 thousand nutrients tonnes and this increased to 373 thousand nutrients in 1976-77, showing thereby an increase of 75,12 percent. The increase was sharp in phosphatic and Potassic fertilizers whose consumption increased by 203.23 and 200.00 percent respectively. Again, it will be noted that of all the chemicals fertilizers, the consumption of nitrogen remains a dominant feature of the Punjab region. The consumption of

Nitrogen varied in the range of 175 thousand nutrients tonnes in 1970-71 to 258 thousand nutrients tonnes in 1976-77, showing the variation of 12.71 percent. The corresponding figure for phosphatic and potassic nutrients was 311 to 94 thousand nutrients tonnes and 7 to 21 thousand nutrients tonnes respectively.

We now proceed to compare the production of period I, i.e., the period proceeding the green revolution with the period II that is, the period of green revolution to assess the effect of the new technology on the performance of the cereals to which it has been applied. Table 5 indicates production of major foodgrain crops in the two periods.

Table 5 : Production of Cereals in Punjab

(Production in 000' Metric Tonnes)

Crop	*Pre-green revolution period*	*Post-green revolution period*	*Difference between Col. 2 & 3*	*Percentage of the difference to Col. 2*
Rice	269	897	+628	+233.46
Bajra	62	174	+112	+180.64
Barley	55	100	+45	+81.82
Maize	425	784	+359	+118.38
Wheat	1906	4902	+2996	+157.80
All Cereals	2719	6860	+4141	+152.30

It will be seen from Table 5 that the reproduction of cereals underwent a substantial increase. The production of cereals as a group increased from 2719 thousand metric tonnes in the pre-green revolution period to 6860 thousand metric tonnes in the post-green revolution period, showing thereby an increase of 152.30 percent. The production of rice is the dominant partner in this achievement while wheat and bajra has done reasonably well as compared to the previous performance. The percentage increase in the production of rice, bazra and wheat in the post-green revolution period over the pre-green revolution period was recorded at 223.46, 180.64 and 157.19 percent respectively. However, the production of barley and maize has not shown much progress. Thus there can be no doubt about the effectiveness of the new technology in raising the production of foodgrains.

While it is clear that the green revolution period as a whole marked significant progress from the earlier period, it is important to see its impact on the rate of growth, as it is the rate of growth which is relevant for projecting its impact into future. The compound growth rates were worked out for the different crops and the results are shown in Table 6.

Table 6 : Compound Growth Rates of Production of Cereals, Pulses and Total Foodgrains in Punjab

Crops	*Pre-Green Revolution Period*	*Post-green Revolution Period*
Wheat	7.1	7.9
Rice	10.8	17.6
Maize	7.2	1.1
Barley	3.6	2.5
Bajra	—3.71	—4.12
Total Cereals	7.2	7.5
Total Pulses	—4.81	—3.32
Total Oil Seeds	16.2	—0.37
Total Foodgrains	4.7	4.4

It will be seen from Table 6 that there has been an improvement in the rate of production of rice, wheat, cereals and pulses but an improvement that can be termed at best as nominal. It is hard to take this small improvement as being significant enough to merit the term Revolution. The growth rate of rice, wheat, cereal and pulses increased from 10.8, 7.1, 7.2 and —4.81 in pre-green revolution period to 17.6, 7.9, 7.5 and —3.32 respectively in the post-green revolution period. On the contrary, the growth rate of maize, barley, bajra, oilseeds and foodgrains as a group could not even maintain the growth rate in the production in the post-green revolution period as compared to pre-green revolution period. The growth rate of maize, barley bajra, oilseeds and foodgrain declined from 7.2, 3.6, —3.71, 16.2 and 4.7 in pre-green revolution period to 1.1, 2.5, —4.12, —0.37 and 4.4 percent respectively in post-green revolution period. This evaluation may very well suggest that the green revolution has not raised the long-run trend rates of growth of foodgrains in Punjab. Rao's[4] observations are relevant when he says that new farm technology is, no doubt, scale neutral but it is not resource neutral.

It may be relevant to indicate here some of the important changes which have taken place in the agricultural economy of the state during the last few years in the course of the increase which has been effected in agricultural production both during the green revolution period and that preceding it. The point to be emphasised is the change that has taken

4. Rao, C. H. H., *Technological change and Distribution of Gains in Indian Agriculture.*, MacMillan Co. 1975.

place in the crop pattern. The data pertaining to percentage share of the production of cereals and pulses to total foodgrains production in Punjab is given in Table 7.

Table 7 : Percentage of Cereals and Pulses to Foodgrain Output in Punjab

Year	*Cereals*	*Pulses*	*Total*
1960-61	77.58	22 42	100.00
1964-65	82.97	17.03	100 00
1971-72	96.18	3.82	100.00
1972-73	96.19	3.81	100.00
1973-74	95.42	4 58	100.00
1974-75	96.95	3 05	100 00
1975-76	95.46	4.54	100.00
1976-77	96.43	3 57	100.00

It will be seen from Table 7 that cereals have grown in importance as compared to pulses in the output of foodgrains. The share of cereals increased from 77.58 percent in 1960-61 to 96.43 percent in 1976-77, showing thereby an increase of 24.30 percent On the contrary, the share of pulses has declined from 22.42 percent in 1960-61 to 3.57 percent in 1976-77 showing thereby a fall of 84.08 percent. It must be added that the rise in the share of cereals and fall in that of pulses had begun even before the green revolution is set in Indian agriculture. The data pertaining to production of cereals in Punjab State was further analysed. This was done by considering the share of wheat and rice production to the total production of cereals. The relevant data is presented in Table 8.

Table 8 : Percentage of Rice and Wheat to Cereals Production in Punjab

Year	*Rice*	*Wheat*	*Coarse grain*	*Total*
1960-61	7.24	55 09	37.67	100.00
1964-65	8.71	58.76	32.53	100.00
1971-72	11.61	70.89	17.50	100.00
1972-73	12.41	69.79	17.80	100.00
1973-74	14.83	67.49	17.68	100.00
1975-76	16.39	65.57	18.04	100.00
1976-77	19.02	68.46	12.52	100.00

It will be seen from Table 8 that among cereals rice and wheat have gained at the expense of the coarse grain. The share of the rice increased from 7.24 percent in 1960-61 to 19.02 percent in 1976-77, showing thereby an increase of 162.71 percent. Similarly, the share of wheat increased from 55.09 percent in 1960-1961 to 68.46 percent in 1976-77, showing thereby an increase of 24.27 percent. On the other hand, the share of coarse grain declined from 37.67 percent in 1960-61 to 12.52 per cent in 1970-77, showing thereby a fall of 84.9 percent. This is indicative of the fact that rice and wheat output has increased substantially in recent years as explained earlier. It is important to add here that the rise in the share of rice and wheat and fall in that of coarse grain had begun even before the green revolution set in Indian agriculture.

The most immediate impact of the new farm technology was that the yield rates registered an increase as compared to the pre-green revolution period when the traditional varieties were in use. The data pertaining to the yield rates of the major foodgrains are shown in Table 9.

Table 9 : Yield per Hectare of Major Foodgrains in Punjab

(Kilogram/Hectare)

Foodgrains	*Average for 1960-61 to 1964-65*	*1971-72*	*1976-77*	*Percentage change in 1971-72 over average of 1960-61 to 1964-65*	*Percentage age change in 1976-77 over average of 1960-61 to 1964-65*
Rice	1074	2045	2605	+90.41	+142.55
Wheat	1278	2406	2432	+88.26	+ 90.30
Maize	1147	1564	1144	+36.36	— 0.26
Grain	724	841	892	+16.16	+ 23.20

It will be seen from Table 9 that due to the adoption of new farm technology, the yield rates of rice, wheat, maize and grain increased from 1074, 1278, 1147 and 724 Kgs. (average of 1960-61 to 1964-65) to 2045, 2406, 1564 and 841 Kgs. in 1971-72, showing thereby an increase of 90.41, 88.26, 36.36 and 16.16 percent respectively. However, the yield rates at 1971-72 level could not be stabilised in 1976-77, when the yield rates increased further except for maize. The yield rates of rice, wheat and grain increased further to 2605, 2432 and 892 Kgs. respectively in 1976-77, showing thereby an increase of 142.55, 90.30 and 23.20 percent. The yield rate of maize remained fluctuating in the range of 1144 Kgs. to 1564 Kgs. during this period.

No doubt, the yield per hectare of wheat and rice was much higher than the yield rate for the country as a whole, though the yield rate in general are amongst the lowest in the world. For example, in case of wheat the yield per hectare is as low as 2432 Kg. in Punjab while it was as high as 4579 Kg. in France, 4378 Kg. in Denmark, 4224 Kg. in U.K. and 3102 Kg. in Egypt. In Punjab per hectare yield of paddy was only 2605 Kg. as against 5334 Kg. in Egypt, 5847 Kg. in Japan, 6033 Kg. in Korean Republic and 3377 Kg. in Sri Lanka.[5] These figures, however, suggest that there exists tremendous scope for expanding agricultural production by raising yields to the highest known level in the world.

Due to the recent breakthrough in farm technology and the intensive use of chemical fertilizers, the relative profitability of wheat and paddy increased *vis-a-vis* other crops. As a result, the area sown under different foodgrains underwent an abrupt change. This was studied by comparing the area allocation under foodgrains over a period of time. The relevant data are shown in Table 10.

Table 10 : Area under Principal Foodgrains in Punjab

Crops	*Average for 1960-61 to 1964-65*	*1971-72*	*1976-77*	*Percentage average in 1971-72 over average of 1964-65*	*Percentage change in 1976-77 over average of 1960-61 to 1964-65*
Rice	249	450	681	+80.72	+173.49
Wheat	1488	2336	2630	+56.99	+ 76.45
Maize	352	548	536	+55.68	+ 52.27
Grain	803	335	352	—58.14	+ 56.16
Barley	60	48	61	—20.00	+ 1.47
Bajra	125	145	154	+16.00	+ 23.2

It will be seen in Table 10 that area under rice, wheat, maize and bajra increased from 249, 1488, 352 and 125 thousand hectares to 681, 2630, 536 and 154 thousand hectares in 1976-77, showing thereby an increase of 173.49, 76.45, 52.27 and 232 percent respectively. Area under barley in the range of 48 thousand hectares to 61 thousand hectares during the study period. No clear-cut trend in respect of barley was observed. Area under grain sharply declined from 803 thousand hectares (average of 1960-61 to 1964-65) to 335 thousand hectares in 1971-72, showing thereby a decline of 58.14 percent. The analysis suggests that the farmers are substituting high value food crops like wheat and rice for the low value food crops. Thus, with the introduction HYVs of wheat and rice

5. F. A. O. *Monthly Bulletin of Agricultural Economics and Statistics*, Vol. 26, No. 9, September 1977, p. 8.

coupled with the price support policy, these foodgrains have out-compared and claimed more area under these crops. Dr. Kahlons[6] observations are relevant when he says : "In fact, the higher relative returns in such profitable enterprises as wheat resulted in an increase of area under new wheat". Thus the area increase was quite prominent in case of these HYV and hybrid which are found highly profitable.

The study brought out that the adoption of new farm technology effected the following changes in the farm structure of Punjab :

1) A major portion of waste land was reclaimed. Consequently, land not available for cultivation, other uncultivated land and fallow land declined by 16.87, 69.31 and 70 percent respectively in 1976-77 over 1964-65.

2) Area sown more than once increased by 72.89 percent during the period under study.

3) Intensity of cropping increased from 131.41 percent in 1964-65 to 150.83 percent in 1976-77, showing an increase of 14.76 percent.

4) The percentage of area under high-yielding varieties to total area of rice, wheat and maize increased by 30.29, 339.23 and 106.06 percent during the period under study.

5) Rice, Bajra and Wheat have done well in the cereals production as compared to the pre-green revolution period. There has been a slight improvement in the rate of growth of rice, wheat and pulses production. Maize, Barley, Bajra, Oil seeds and foodgrains as a group could not even maintain the growth rate of production in the post-green revolution period suggesting that green revolution has not raised the long run trend rates of growth of foodgrain production in Punjab.

6) Cereals have grown in importance as compared to pulses in the output of foodgrains. Among cereals rice and wheat have gained at the expenses of coarse grain. Rice and wheat now claims 19.02 and 68.46 percent of the cereals output as compared to 7.84 and 55.09 percent in 1960-61.

7) There was a shift in cropping pattern in favour of wheat and rice and area under them registered an increase of 76.45 and 173.49 percent in 1976-77 over average for 1960-61 to 1964-65.

8) The yield per hectare of rice, wheat and grain registered an increase of 142.55, 90.30 and 23.20 percent in 1976-77 over the average level of 1960-61 to 1964-65. □

6. Kahlon, A. S., The Green Revolution, Its Promise, Performance and Prospects, in *Agricultural Development in Developing Countries—Comparative Experience*, The Indian Society of Agricultural Economics, Bombay, 1972, p. 403.

Optimal Assignment of Looms in a Textile Unit—An Application of Queuing Theory

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Vinay Mills,[1] one of the leading textile mills in the country, was set up in 1962 in UP to produce high quality cotton and synthetic fabrics, sarees, shirtings, suitings, etc. The mill started from 10,000 spindles and 150 semi-automatic looms and grew to 76,744 spindles and 250 automatic looms and 750 semi-automatic looms by November 1979. With the substantial expansion, the management was interested in streamlining the operations of the various departments. This paper presents a study on the optimal assignment of semi-automatic looms to a weaver, in view of the problem of machine interference.

Machine Interference Phenomenon

When one operator is assigned two machines, there is a probability (sometimes very small but depending on the ratio of man time to machine time) that one machine will require his services while he is engaged in work on the other. If the number of machines is increased, the probability of one interfering with the normal cycle of another is similarly increased. Any variation of the number of machines or the ratio of man time to machine time will affect the degree of interference.[2] Machine interference is a common phenomenon in textile processing and loom shed in particular.

Machine interference has been responsible for inefficient operations in the loom shed, where a weaver is in charge of a certain number of looms which run continuously but fail from time to time and need servicing. If a loom fails when the weaver is attending another loom, the former has to wait and this results in loss of production. The problem in such a situation is to find out the optimum number of looms a weaver should control.

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1 The name of the Company has been disguised.

2. Joseph A Parico, "Queuing Theory", *Prentice Hall*, 1967.

Machine interference can be explained with the help of Fig. 1.

Loom No. 1 _____ x _____

Loom No. 2 _____ y z w _____

Loom No. 3 _____ p q _____

Fig. 1 : Analytical approach to machine interference

Let us assume that a weaver is controlling three looms.

Loom No. 1 stops at time x and from time x to z is being attended by the weaver. Loom No. 2 stops at y while the weaver is still busy attending Loom No. 1. Consequently, Loom No. 2 is in a state of delay, waiting for the weaver to service it. From the time z to w, Loom No. 2 is serviced and put into operation. Loom No. 3 stops at time p and the weaver is idle from w to p. It will be observed that the machine efficiency reduces as a result of the delay in receiving the attention of the weaver (the downtime of Loom No. 2 is from y to w instead of z to w). The random occurrences of stoppages also increase the idle time of the operator, thus reducing the operator utilisation. Whereas, the operator is idle from w to p, Loom No. 2 has to remain idle from y to z on account of misplanned distribution of workload.[3]

Different types of fabrics are woven in looms. The workload of the weaver depends upon the type of fabric, size of the looms and conditions of looms. Generally 6 to 32 looms are allotted per weaver according to the size of the loom and types of fabrics.

Methodology

The assignment of looms to a weaver depends largely on the following factors :

a) Rate of stoppages of looms,
b) Service rate of a weaver for a breakdown,
c) Performance rating of weaver,
d) Types of fabrics,
e) Types of looms and their conditions,
f) Number of looms controlled by a weaver,
g) Travelling time of a weaver,

The looms, for the present study were of the same type and in good condition. To determine the number of looms to be allotted to a weaver,

3. Benson F. & Miller J. G., *Journal of Text. Inst.* 1953, Vol. 44, pp. T-619—T-644.

study of breakage pattern of a loom running a particular fabric and study of service time were taken. The problem of assignment is attempted by using Limited Source Model.[4] The assignment of looms was tried on 2, 4, 6, 8, 10, 12, 14 and 16 looms.

Collection of Data

The data in respect of arrival time and service time were collected by using a stop watch. However for this purpose, the following three factors were taken into account :

a) Types of looms : : Sakamoto looms of the same size were selected for the study.

b) Quality of cloth : : For the purpose of the study 10 types of fabrics were selected out of different cloth that were running on the looms. The details of the 10 types of fabrics are given in Table I.

c) Selection of the Weavers. : : 10 weavers, each controlling different number of looms were selected. These weavers were spread over different parts of the loom shed.

After selecting looms, types of fabrics and weavers, studies of inter arrival time, service time and idle time were conducted using a stop watch. The data was collected in the following format :

Assignment to weaver :
Types of fabric running :
Loom R.P.M. :
Name of the Weaver :

Break-down Time	*Inter-Arrival Time*	*Service Time*	*Idle Time*
A		X	U
B	(B—A) — (X+U)	Y	T
C	(C—B) — (Y+T)	Z	W

Table 2 gives the data in respect of fabric No. LP 7.

4. For details see Hillier, F. S. & Liberman, G. J., Introduction to Operations Research, *Holden-Day*, 1974.

Number of Observations

To determine the minimum number of observations that must be taken so that 25 times out of 100, the average of the sample remains within $\pm$ 5% of the true average representing the universe, the following formula can be used.[5]

$$N = \frac{(40\sqrt{n\left(\Sigma x^2 - (\Sigma x)^2\right)})^2}{\Sigma x}$$

where N = Maximum number of readings that should be taken.

n = Number readings taken

X = Sample data.

The value of N in the present study for one of the fabrics was around 3200. Since the average arrival time is approximately 8 to 12 minutes, it will take a long time if 3200 observations are taken. In view of this it was decided to take 100 to 140 observations for the purpose of fitting the curve.

Analysis of Data

i) *Testing the Distribution :* Chi-square test was applied to test the distributions. Tables 3 and 4 give the representative calculations for Chi-square test for fabrics LP3 and LP 2 relating to Inter-Arrival Time and Service Time respectively. Out of the 10 types of fabrics, the data in respect of 7 exhibited exponential distribution for inter-arrival and service time. So the Limited Source Model was applied for the 7 types of fabrics which followed exponential distribution. Simulation could be used for the other 3 fabrics which did not follow exponential distribution. However, this paper is confined to only those fabrics which followed exponential distribution.

ii) *Calculations for Machine Idle Time Cost Per Hour :*

Loom R.P.M.	=	176
Picks per minute	=	R.P.M. x 60
	=	176 x 60

5. Fields, Alan, Method Study, *Cassell & Company Ltd., London* 1969.

$$\text{Length of cloth woven per hour} = \frac{176 \times 60 \times 0.91^{*} \text{ meters}}{\text{picks per inch} \times 12 \times 3}$$

$$\text{Cost per hour per loom} = \frac{\text{Rs. } 176 \times 60 \times 0.91 \times C}{\text{picks per inch} \times 12 \times 3}$$

where C = opportunity cost per meter = Selling price per meter — % of marginal profit on selling price.

Savings of power per loom per hour = Rs. 0.81

Therefore, Idle Time cost

$$\text{per Loom per hour} = \frac{\text{Rs. } 176 \times 60 \times 0.91}{\text{picks per inch} \times 12 \times 3} \times C = \text{Rs. } 0.81.$$

iii) *Cost Analysis*

The following cost model was applied :

$$\text{Objective function 'X'} = C(S) + \frac{C(W)\left[\frac{L+\lambda a}{60}\right]}{M}$$

where X = Total cost per loom per hour.

C(S) = Variable Weaver wage per loom per hour.

C(W) = Machine idle time cost per loom per hour.

L = Expected number of looms in the system.

λ = Average arrival rate (in units/minutes) in the System

a = Expected time taken by the weaver to reach a loom to service it from the location point

M = Number of looms

The above objective functions are to be minimised for allocating optimum number of looms per weaver. The cost of weaver for different performance ratings is given in Table V.

Tables 7 (A) to (G) give the results obtained by the above method

*0.91 is used as conversion factor for converting yards into meters.

in respect of the type of fabrics which followed exponential distribution for inter-arrival time and service time.

Results and Conclusions

Tables 7 (A) to 7 (G) give the details of the cost analysis for the 7 types of fabrics using 'Limited Source Model'. The problem of assignment of looms to weavers has been attempted for 75%, 100% and 130% performance rating of the weaver. For this purpose different wages were taken into account for the three performance ratings (Table 5).

The performance rating of the weaver was determined by stop watch method. The speed of the weaver was found out by noting down the time taken by the weaver to travel a known distance. The normal walking speed of a person is 4 ft. per second. In other words, a person with 100% performance, covers a distance at the rate of 4 ft. per second. With the help of this, the performance rating of the weaver was determined. The Expected Time taken by the weaver to reach a loom to service it from the location point for different performance ratings is given in Table 6.

Based on the result shown in Tables 7 (A) to 7 (G), the proposed assignment of looms to a weaver vis-a-vis existing assignment is given in the following table for a 100% performance rater. The savings per loom per year are also indicated

Fabric Type	*Existing Assignment*	*Proposed Assignment*	*Savings per shift per loom (Rs.)*	*Savings per shift per loom for 3 shift operation (Rs.)*	*Savings per year per loom (Rs.)*
LP 1	16	6	15.36	1382.40	16588.80
LP 2	12	8	0.48	43.20	518.40
LP 3	8	6	3.60	324.00	3888.00
LP 4	8	6	0.64	57.60	691.20
LP 5	8	6	2.56	230.40	2764.80
LP 6	8	6	3.04	273.60	3283.20
LP 7	8	6	6.80	612.00	7344.00

Total Savings = Rs. 3578.40

Table 1 : Particulars of the Fabrics being Studied

Code No.	*Type of Fabric*	*Warp Count*	*Weft Count*	*Reed*	*Picks*	*No. of looms operated by a weaver*
LP 1	Coarse Cloth	9	12	40	36	16
LP 2	Coarse Cloth	24	24	54	60	12
LP 3	Fine Cloth	24	24	72	44	8
LP 4	Fine Cloth	34	34	88	64	8
LP 5	Coarse Cloth	34	34	80	72	8
LP 6	Fine Cloth	34	34	96	72	8
LP 7	Fine Cloth	30	36	88	56	8
LP 8	Coarse Cloth	14	18	44	40	12
LP 9	Sheeting	10	10	32	36	16
LP 10	Coarse Cloth	30	36	56	48	8

Table 2 : Inter Arrival & Service Time Data for Fabric No. LP 7

Loom started	*Loom stops*	*Inter-arrival time*			*Service time*			*Idle time*		
		Min.		*sec.*	*min*		*sec.*	*min.*		*sec.*
	8-30-57	—	-	—	—	—	08.7	—	—	55.6
8-32-02	8-37-00	4	—	58	1	—	50.5		—	5.1
8-38-56	8-39-58	1	—	02		—	22.0		—	12.2
8-40-32	8-42-12	1	—	40		—	27.8	1	—	22.3
8-44-02	8-46-10	2	—	08		—	24.6		—	4.1
8-46-39	8-50-47	4	—	08	1	—	38.4		—	32.3
8-52-58	8-53-49	0	—	51	3	—	05.4		—	28.4
8-57-23	9-01-05	3	—	42		—	47.3		—	15.4
9-02-08	9-05-15	3	—	07	3	—	07.8	1	—	11.4
9-09-34	9-12-13	2	—	39		—	25.4	2	—	22.6
9-15-01	9-25-35	10	—	34	1	—	42.4	1	—	36.3
9-28-54	9-29-30	0	—	36		—	07.4		—	11.2
9-29-49	9-38-15	8	—	26	1	—	03.7		—	12.4
9-39-31	9-42-25	2	—	54		—	27.0		—	54.6
9-43-47	9-45-50	2	—	03		—	26.4	3	—	29.8
9-49-46	9-50-20	0	—	34	1	—	53.2		—	21.8
9-52-35	9-59-52	7	—	17		—	31.2		—	0.0
10-00-33	10-00-48	0	—	25		—	37.2	2	—	24.5
10-03-50	10-11-15	7	—	25	1	—	18.9		—	5.1
10-12-39	10-12-43	0	—	04		—	32.5		—	0.0
10-13-16	10-16-15	2	—	59	3	—	32.4	2	—	3.9
10-21-51	10-22-40	0	—	49	5	—	31.4		—	17.8

Table 3 : Chi-Square (ψ^2) Goodness of Fit Test* For Inter Arrival Time

Fabric Type : LP 3.
Arrival Rate (λ) : 0.125 arrivals per minute

Tn (in min)	*Tn+1 (in min)*	*OF*		*CF*		$\frac{(OF-CF^2)}{CF}$	$\frac{(OF-CF)^2}{CF}$
0	4.65	59.0		58.6265		0.0024	
4.65	9.30	34.0		32.7839		0.0451	
9.30	13.95	17.0		18.3327		0.0969	
13.95	18.60	9.0		10.2516		0.1528	
18.60	23.25	6.0		5.7327		0.0125	0.4939
23.25	27.90	4.0		3.2057			
27.90	32.55	1.0		1.7926		0.1842	
32.55	37.20	2.0	8.0	1.0024	6.8748		
37.20	41.85	0.0		0.5606			
41.85	46.50	1.0		0.3135			

Note : Tn to Tn+1 is the interval within which observations are made.
OF is the observed frequency and CF is the Calculated Frequency.
$CF = N(e^{-\lambda Tn} - e^{-\lambda Tn-1})$, where N = Number of observations.
Calculated value of $\psi^2 = 0.4939$. From standard table ψ^2 with 95% confidence level = 0.711, which is greater than calculated value of ψ^2. This means that the distribution is exponential in nature with 95% confidence level. Similar calculations were done for other qualities of fabrics. Except for fabrics LP 8, LP 9 and LP 10, the distribution for all other types of fabrics was exponential in nature.

*For details one may refer to any text book on Statistical Analysis.

Table 4 : Chi Square (ψ^2) Test of Fit For Service Time

Fabric Type : LP 2
Service Rate (μ) : 0.01553 services per second.

Tn (in Secs)	*Tn+1* (in Sec.)	*OF*	*CF*	$\frac{(OF-CF)^2}{CF}$	$\frac{(OF-CF)^2}{CF}$
0	28.4	46.0	55.45	1.61	
28.4	56.8	38.0	35.34	0.20	
56.8	85.2	29.0	24.48	0.83	
85.2	113.6	17.0	14.44	0.45	
113.6	142.0	12.0	9.94	0.43	
142.0	170.4	6.0	5.06	0.18	5.19
170.4	198.8	3.0			
198.8	227.2	1 0	8.58	1.49	
227.2	255.6	0.0	5.0		
255.6	284.0	1.0			

Notes : $CF = N(e^{-\mu Tn} - e^{-\mu Tn+1})$, where N = Number of observations.
Calculated value of $\psi^2 = 5.19$. From standard table ψ^2 with a confidence level of 50% = 5.35. This distribution is also exponential in nature with a confidence level of 50%. The results of Chi-Square Test in the case of other fabrics, except for LP 8, LP 9 and LP 10, showed that the service Time Distribution was exponential in nature.

Table 5 : Weavers Wage Rate (Variable) With Different Performance Rating*

(Value in Rupees)

Performance Rating	*75%*		*100%*		*130%*	
No. of Looms	*per loom per shift*	*per loom per shift*	*per loom per shift*	*per loom per shift*	*per loom per shift*	*per loom per shift*
2	7.11	0.89	7.61	0.95	7.86	0.98
4	3.66	0.46	4.04	0.51	4.41	0.55
6	2.56	0 32	2.90	0.36	3.23	0.40
8	1.94	0.24	2.19	0.27	2.44	0.31
10	1.59	0.20	1.79	0.22	1.99	0.25
12	1.33	0.17	1.50	0.19	1.66	0.21
14	1.18	0.15	1.32	0.17	1.47	0.18
16	1.04	0.13	1.17	0.15	1.29	0.16

*The variable cost per loom per shift is changing with the number of looms because of the difference in proportionate time a weaver is expected to spend on a loom.

Table 6a : Expected Time taken* (by Weaver to Reach a Loom to Service it from the Location Point. (Time in seconds)

	a=Expected Time in Seconds		
Performance Rating	*75%*	*100%*	*130%*
No. of Looms			
2	3.16	2.22	1.91
4	3.51	2.69	2.02
6	4.02	3.02	2.32
8	5.08	3.81	2.93
10	11.56	8.67	6.67
12	10.96	8.22	6.32
14	10.58	7.89	6.07
16	11.68	8.76	6.74

*The expected times have been calculated with respect to a specific layout and type of weaver movement.

Table 7 : Cost Analysis (A)

Fabric Type : LP 1

Performance rating	75%					100%				
Number of looms	L	C(S)	C(W)	Cost per loom per hr. (Rs.)	L		C(S)	C(W)	Cost per loom per hr. (Rs.)
2	0.4480	0.2700	0.89		2.91	0.3200	0.2907	0.95		2.40
4	0.8104	0.5888	0.46		2.30	0.4903	0.6174	0.51		1.64
6	1.1616	0.8419	0.32		2.09	0.8100	0.9031	0.36		1.61
8	1.9644	1.0502	0.24		2.48	1.3190	1.1625	0.27		1.79
10	3.1014	1.2004	0.20		3.11	2.0381	1.3854	0.22		2.18
12	4.5889	1.2895	0.17	8.74	3.68	3.0318	1 5605	0.19	8.74	2.55
14	6.3517	1.3308	0.15		4.26	4.3387	1.6811	0.17		3.02
16	8.2688	1.3452	0.13		4.78	5.9387	1.7507	0.15		3.53
			130%							
2	0.2663	0.3017	0.98		2.19					
4	0.3977	0.6338	0.55		1.47					
6	0.5847	0.9423	0.40		1.30					
8	0.9155	1.2327	0.31		1.38					
10	1.3629	1.5029	0.25		1.59					
12	1.9716	1.7449	0.21	8.74	1.78					
14	2.7937	1.9499	0.18		2.05					
16	3.8767	2.1095	0.16		2.41					

Table 7 : Cost Analysis (E)

Fabric Type : LP 5

Performance Rating	75%					100%				
Number of Looms	L		C(S)	C(W)	Cost per loom per hr. (Rs.)	L		C(S)	C(W)	Cost per loom per hr (Rs.)
2	0.5365	0.1793	0.89		2.81	0.4328	0.1920	0.95		2.50
4	1.1534	0.3756	0.46		2.53	0.8224	0.4063	0.51		1.99
6	1.7831	0.5166	0.32		2.45	1.2637	0.5802	0.36		1.88
8	3.0614	0.6050	0.24		2.98	2.1510	0.7165	0.27		2.20
10	4.7140	0.6475	0.20		3.61	3.3995	0.8091	0.22		2.69
12	6.5964	0.6619	0.17	7.04	4.11	4.9855	0.8593	0.19	7.04	3.18
14	8.5686	0.6653	0.15		4.52	6.8169	0.8799	0.17		3.66
16	10.5639	0.6659	0.13		4.84	8.7654	0.8862	0.15		4.06
					130%					
2	0.3044	0.2077	0.98		2.07					
4	0.6647	0.4331	0.55		1.75					
6	0.9105	0.6235	0.40		1.50					
8	1.5029	0.7959	0.31		1.67					
10	2.3462	0.9376	0.25		1.98					
12	3.5013	1.0411	0.21	7.04	2.33					
14	4.9797	1.1050	0.18		2.74					
16	6.7195	1.1369	0.16		3.17					

Table 8 : Cost Analysis (F)

Fabric Type : LP 6

Performance Rating	75%					100%				
Number of Looms	L		C(S)	C(W)	Cost per loom per hr. (Rs.)	L		C(S)	C(W)	Cost per loom per hr. (Rs)
2	0.5309	0 1645	0.89		3.14	0.5000	0.1680	0.95		3.06
4	0.9181	0.3452	0.46		2 42	0.7530	0.3670	0.51		2.11
6	1.7410	0.4771	0.32		2.78	1.2116	0.5363	0.36		2.08
8	2.9890	0.5612	0.24		3 41	2.0559	0.6657	0.27		2.46
10	4.6164	0 6030	0.20		4.15	3.2466	0.7564	0.22		3.02
12	6.4853	0.6176	0.17	8.34	4.76	4.7865	0.8079	6.19	8.34	3.59
14	8.4530	0.6213	0.15		5 25	6.5857	0.8304	0.17		4.16
16	10.4473	0.6219	0.13		5·64	8.5199	0.8373	0.15		4.65
					130%					
2	0.3337	0.1866	0.98		2.40					
4	0.4883	0 3944	0.55		1.60					
6	0.8724	0.5743	0.40		1.64					
8	1 4331	0.7355	0.31		1.84					
10	2.2295	0.8703	0.25		2.19					
12	3.3249	0.9716	0.21	8.34	2.59					
14	4.7424	1.0369	0.18		3.07					
16	6.4352	1.0713	0.16		3.58					

Table 9 : Cost Analysis (G)

Fabric Type : LP 7

Performance Rating		75%						100%		
Number of Looms	L		C(S)	C(W)	Cost per loom per hr. (Rs.)	L		C(S)	C(W)	Cost per loom per hr. (Rs.)
2	0.7220	0.2224	0.89		4149	0.5979	0.2440	0.95		3.93
4	1.4797	0.4385	0.46		4.15	1.3482	0.5065	0.51		3.87
6	2.7503	0.5655	0.32		4.88	2.0758	0 6828	0.36		3.81
8	4.5088	0.6075	0.24		5.83	3.5352	0.7769	0.27		4.66
10	6.4527	0.6172	0.20		6.65	5.3247	0.8135	0.22		5.56
12	8.4445	0.6186	0.17	9.81	7.17	7.2698	0.3231	0.19	9 81	6 23
14	10.4437	0.6188	0.15		7.54	9.2600	0.8248	0.17		6.73
16	12.4437	0.6188	0.13		7.83	11.2587	0 8250	0 15		7.13
					130%					
2	0.5068	0.2598	0.98		3.51					
4	1.1516	0.5478	0.55		3.42					
6	1.5394	0.7761	0.40		2.97					
8	2 6438	0.9320	0.31		3.60					
10	3.1822	1.0207	0.25		3.48					
12	5.9185	1.0582	0.21	9.81	5.14					
14	7.8532	1.0625	0.18		5.76					
16	9.8389	1.0720	0.16		6.27					

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Book Reviews

Education for Development

AVARD (Association of Voluntary Agencies for Rural Development, New Delhi) pp. 128, Rs. 45.00

Reviewed by Biman Sen*

"Education for Development" – The title of the book does not suggest its contents. It is, in fact, a comprehensive project report on the integrated development of Vellanad block, located in the district of Trivandrum, Kerala. The report was prepared by AVARD for another voluntary organisation, Mitraniketan, which is engaged in the developmental work of Vellanad Block. Vellanad Block is one of the twelve community development blocks of Trivandrum district, covering an area of 231.68 Sq. Km. exclusive of unsurveyed reserve forests.

The report has been divided into eight chapters. The first three chapters deal with land and people with settlement pattern, topography, natural resources, climatic condition, population, occupational structure, economic baseline and many other useful data required for micro-level planning. The fourth chapter is devoted to the question of development leadership and Mitraniketan's contribution to manpower development for the Block. It covers vocational training programmes, non-formal education, health education, etc. The title of the book, perhaps, derives from the contents of this chapter.

The fifth, sixth and seventh chapters deal with the problems and strategies of development. They give a panoramic view of the existing situations and suggested development programmes to improve them. These include land development, extension services, training of manpower, storage and marketing of products, outlay on various activities like dairy, livestock, poultry development, infrastructural and industrial development, production and employment, etc.

The eighth chapter gives the conclusion and recommendations of the AVARD.

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Economics of backyard poultry unit, and semi-commercial poultry unit and details of 500 goals projection schemes are given at the appendices. The information may be useful to others engaged in rural development in similar parts of the country. The book contains a large number of statistical tables and maps, which constitute a complete socio-economic profile of the Vellanad block.

The information and data given in the book would be very useful for the district and state authorities responsible for planning and administration at regional and block level. It can serve as a model guide book for those engaged in the micro-level planning at village or block level.

The book inadvertantly reveals inherent weakness, constraints and limitations of micro-level planning, without reference to overall macro-level planning strategy. Planning is a complex exercise. The block level and rural development cannot solve the complex problem of the country. It can utmost solve some immediate local problems.

It should not be forgotten, that in the modern world, neither an individual nor a small community can sustain in isolation and make itself self-reliant or self-sufficient. It can only survive as an integral part of a larger community. The micro-level planning can only be successful as a part of a well-conceived integrated macro-level planning at national level with broad outlook and vision based on overall national long-term goal and aspiration. □

Economics of Marketing Cooperatives

M. V. Kapade

National Publishing House, New Delhi, pp 206, Rs. 60.00

Reviewed by S. P. Gupta*

The book entitled 'Economics of Marketing Cooperatives', published by National Publishing House, provides an analysis of marketing cooperatives of Ajmer district.

Though there are a number of studies on Cooperative Marketing in India, Dr. Kapade's study is both analytical and critical in nature—it is not purely descriptive like some other studies on the subject.

Though the study relates to only one district of Rajastan, its intensity of

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probe and findings are likely to be useful in designing appropriate policies for cooperative marketing and its development. Also the methodology, statistical tools and models used could be of some help in further studies of this nature.

However, the book seems to be based on Ph.D. thesis of the author. That is why even though it is published in 1979 it contains data only up to 1967-68. To serve a more meaningful purpose, it is suggested that the next edition should be based on latest data. □

Dynamics of India's Population Growth

By V. C. Sinha

National Publishing House, Darya Ganj, New Delhi, 1979, pp. 506, Rs. 130.00

Reviewed by P. S. Mehta*

"India is confronted with a burst of population growth and even the best laid plans of economic development are not able to achieve any satisfactory result. A well-thought-out approach is called for to stem the explosion of the human resource". Shri V. C. Sinha has made these frank observations while trying to analyse the facts and the main features of the Indian population and the demographic factors affecting the pace and level of economic development in the country. He goes on to say, "the entire battle against poverty is thwarted by the rapid increase in the population. Without reduction in the rate of population increase, the cherished hopes of the people for better life are doomed to frustration". In the present context of India, what is needed is the increase in our productive capacity to support a large population on the one hand and the reduction in fertility rates on the other, so that growth of population is stabilised at a lower level. Shri Sinha also warns that the excessive growth of population, unmatched by commensurate expansion of investment and output, as also indiscrete educational and manpower planning, has led to the zooming of the gruesome monster of unemployment, which has damaged the moral tone of the community and has resulted in a large-scale wastage of human capital.

Various Ministries of the Government of India and the Planning Commission are seized with the menacing problem of population explosion and they are deeply concerned with the damaging effects that this problem is causing to the developmental activities in different fields. Shri V. C. Sinha's study on this subject throws a world of information and background material on

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its different aspects and from varied angles. While on the one hand, it projects a theory of demographic transition, population cycle in India and population projections for the world, it also deals with the two basic demographic variables, namely, the birth rate and death rate in India. He goes on to discuss the prospects for fertility determinants in India and the reproduction rate. While providing a realistic appraisal of the data of labour force in India, Shri Sinha examines the occupational structure, keeping in mind the recent shifts and their association with planned levels of economic development.

The present study does not confine itself to the demographic aspects alone. It also brings to the fore the qualitative aspects of Indian population; it brings out the low level of health and the low level of education, which are the two broad indicators of the poor quality of human capital in India. This automatically, highlights the need for improving the health services and standards as also promoting education on as wide a scale as possible.

Planned efforts to provide a better deal to the people and to raise their standard of living have been nullified to a considerable extent by the continued rapid increase of population. In the field of agriculture, which is the main stay of Indian economy, the unchecked population growth, without any corresponding outlet in employment, has intensified the pressure on land and manifested in sub-division and fragmentation of agricultural holdings. In this context, Shri Sinha has stressed the need for accelerating growth rate in agriculture as also for the formulation of a rational foodgrains distributional policy, in order to cater to the growing needs of the ever-increasing population in India.

India needs a population policy because its population problem cannot just be solved by pretence and wishful thinking. The author emphasises that we must increase our productive capacity to support a large population and simulaneously make determined efforts to bring about a noticeable reduction in the fertility rate. He cautions that if the population is not well-controlled, instead of attaining economic prosperity and scientific glory, India will remain a poverty-stricken and backward country. He emphasises that the Family Planning Programme must, therefore, be tackled on a war-footing and it should be relentlessly pressed forward. Economic devlopment is, no doubt, the best contraceptive, but the country cannot wait till development takes place. He asserts that with rapid industrialisation and sustained economic growth, the birth rate in this country can certainly be much lower than what it is now. The Family Planning Programme should be viewed as a social and cultural revolution, aimed at changing the traditional values which favour large families and it should not be simply treated as a medical programme.

In this study, Shri Sinha has tackled the all-pervasive problem of India's population growth in a very systematic and scientific manner. It contains

comprehensive and well-tabulated material. It is not only informative and educative but, quite legitimately, it has also become a store-house of valuable reference material.

The Publishers, M/s National Publishing House, have done full justice with this study and have brought it out as an impressive and presentable publication. □

Economic Growth and Social Change

Capitalism, Primitive and Modern : Some Aspects of Tolai Economic Growth in T. Scarlett Epstein

Hidustan Publishing Corporation, 1979, price not mentioned

Reviewed by V. S. Mahajan*

This is the Indian edition of Epstein's book which was first published in 1968. It is based on the field study that the author undertook in the Tolai area situated in North-East mainland of New Guinea. The story of transformation of this region is fascinating. "The Tolai are reported to have been cannibals until about the end of last century..., yet today they are regarded as one of the most sophisticated and advanced people of the whole of the territory of Papua and New Guinea." What factors have contributed to such transformation from cannibalism to modern social and economic behaviour in a period of a few decades is the subject of investigation by the author.

One finds that, even before being exposed to foreign culture and economic norms, the natives of Tolai were already familiar with the use of local shell currency called Tambu. It is said to have the attributes of a modern currency. "It is durable and can be easily stored as small change for everyday purchases." Thus the use of shell money was helpful in the expansion of the local economy and in the accumulation of primitive capital in the pre-contact times. "There was a high degree of specialisation in the Gazelle Peninsula, even before European contact: inland natives produced a surplus of taro and food crops which they sold to coastal Tolai and in turn brought fish, salt water and wild fowl eggs, as well as lime prepared by burning coral deposits for use in chewing with arecanuts."

In the post-contact period one notices two distinct phases of economic and social change – the transitional period and other post-transitional period, the latter starting from the beginning of this century. During the transitional phase, the Tolai natives were pepared to act on the economic stimuli provided by expanding demand of foreigners for the local copra and this encouraged

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large-scale plantation of cocoanut trees. But the natives were not prepared to accept the new metallic currency and the variety of goods offered by foreigners. They were still keen to accumulate the local currency, Tambu, which commanded social prestige and helped accumulation of primitive capital. While this attitude of the locals slowed down the process of transformation from primitive to modern capitalism, it shows that the local social customs and values were so strong that it was not an easy job to change these, despite the efforts made by the Germans, who ruled over this area before the First World War, to ban the use of local shell currency.

After the transitional period, there was indeed a rapid expansion of the local economy. Commercial plantation of cocoanut trees and other agricultural activities were undertaken in a big way, which yielded encouraging income to the locals and a liberal part of it was spent on imported goods. "The prospect of a higher and more varied level of consumption served to induce production for the market. This involved the creation of capital through the extension and improvement of agricultural properties, facilitated by the availability of imported steel tools." Thus imported capital goods helped to clear more and more of land which was eventually put to cash crops, particularly cocoanut, for copra was a big cash earner.

After the First World War, the administration of Tolai passed into the hands of Australians and the local population experienced a new phase of economic growth and social change, particularly in post-world depression period. During this period, the transport sector had made a rapid growth, as also the plantation of cocoa in place of cocoanuts. During the world depression the prices of copra fell by more than 50 per cent and hit the production of copra. Thanks to the Government encouragement, the local population soon switched to the production of cocoa which fetched relatively higher price. The locals also got interested in the purchase of trucks as a new mode of goods transport and a symbol of social prestige and of capital formation.

The economy of Tolai has been undergoing further changes since the Second World War. New modes of production in agriculture and industry, education, houses, trade, etc., have emerged. Thus the story of Tolai's emergence from primitive to modern capitalism, spanning over a few decades before 1970, shows how a small underdeveloped economy behaves when exposed to external stimuli. The lesson that is to be learnt from the Tolai experience is that the process of economic and social change can be quickened if the Government provides appropriate opportunities. The stimuli that the Tolai economy received under the Government leadership for cocoanut plantation earlier and cocoa plantation subsequently shows that such help can go a long way in changing the economic and social behaviour of the local population.

Epstein had made a scholarly contribution. Her work will be read with interest by social scientists. □

A Management Approach to Project Appraisal and Evaluation

N. Imboden

Development Centres of OECD, Paris, 1980, IDBI, pp. 172, Rs. 14.00.

Reviewed by C. S. Parthasarathy*

This book on 'Management Approach To Project Appraisal and Evaluation', with special reference to non-directly productive projects, by Development Centre of the Organisation for Economic Cooperation and Development (Paris), is designed to provide the requisite information to development managers with a view to constituting an appraisal/evaluation machinery. It deals with the various concepts and frameworks involved, and the various factors to be taken into account in deciding upon and selecting such a machinery. Broadly, it consists of three parts : part I on project appraisal and methodologies; part II is devoted to management approach to development activities and part III covers setting up a monitoring/evaluation system for social programmes.

The sub-heads under part I relate to introductions and definitions, planning, project selection, appraisal and evaluation and project appraisal methodologies, Part II goes into project cycle, social indicators as elements of an information system, different levels of analysis, project appraisal within a management system. The themes constituting part III are current reporting/evaluation practices and efforts and problems thereof, types of evaluation, setting up a monitoring system for a Govt. agency and for a specific programme or project, institutional aspect of monitoring/evaluation, etc. Part I outlines the evaluation of the concepts of development and defines the role of project analysis in the planning process. The iterative approach in part II considers planning policy formulation, policy execution and evaluation as an inter related circular search process, providing new information on the social development process. Project appraisal/evaluation serves as a management tool not only for project implementation but also for the monitoring of social policy and decision-making in general. Outlined in part II are social indicators for collection and structuring of requisite data. Part III presents an approach to project appraisal/evaluation. Project evaluation needs to be integrated into a management system. How a useful evaluation system can be installed in the absence of a management system is also dwelt upon. Current reporting practices are reviewed briefly and their deficiencies pointed out. Part III also sets out the steps needed to instal a monitoring/evaluation system at the agency and programme/project level.

A distinction is attempted between the traditonal economic projects and the so-called social projects. Project appraisal may be defined as the

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analysis of costs and benefits of a project with a view to ensuring a rational allocation of limited funds among alternative investment opportunities in view of achieving certain specific goals. Project appraisal is also necessary to make a choice among alternative projects. A choice implies necessarily a comparison of different alternatives. The appraisal involves identification of effects of the project and valuation of these effects. It is possible that the same effect may constitute a benefit and a cost at the same time. In this book, project *appraisal* is looked upon as the Ex-ante analysis of a proposed new project; whereas project *evaluation* is the Ex-post analysis of a completed project. Methods of project appraisal are the analytical frameworks used to ensure optimum allocation of scarce resources to achieve pre-established goal (s). The only rational method of alternative programmes/projects will be to choose the project (s) that achieve the identified goal (s) at minimal cost possible, or those obtaining the highest degree of goal achievement with the given resources available. Essentially, therefore, any project appraisal methodology involves a cost-benefits analysis. A Project is considered acceptable if its net benefits exceed those of the next best alternative course of action. An interesting graphical presentation of the management system for development activities is given in chapter II of part I (page 25). It is stated that the managemet system discussed in the book represents an ideal situation "which is rarely (or never) found in the real world". It is not clear why a sentence like this should find a place in a book like this, one of the objectives of which is to make those charged with the project appraisal responsibility move towards, and come closer to, the ideal situation in regard to project appraisal. The more desirable characterastics of a project appraisal methodology are clearly set out in chapter II of part I (pages 30-31). One of the crucial chapters (chapter III of part I) is regarding social cost-benefit analysis. The origins of social cost-benefit analysis, inclusion of distributional objectives into social cost-benefit analysis, the problems of such analysis, cost-effectiveness analysis, etc., are well dealt with in this chapter.

Social cost-benefit analysis is distinct from the cost-benefit analysis in as much as the project effects are not evaluated in accordance with their profitability to the operating entity, but according to their impact on the society as a whole. The difference between social cost-benefit analysis and financial analysis lies in what they consider as a cost and what is considered as a benefit; i.e , the concept of financial profit is not the same as the social profit.

Problem identification and development of alternatives are important elements in project formulation; what is more essential is the analysis rather than the appraisal methodology chosen. Any project appraisal methodology relies on a multitude of implicit or explicit hypothesis about the society and its development goals to evaluate the effects of a project and the value of the development management system is judged by its usefulness to the decision-maker. The book lays emphasis

rightly on social indicators apart from the economic ones. According to the book, an integrated management approach to project appraisal requires information not only on economic variables but also on social ones. Social indicators may be taken as elements of a general information system of direct interest to policy makers. Social indicators may not, however, ensure good analysis. The approach suggested in the book recognises the close relationship of social indicators with analysis. Social indicators are the numerical expression of various measurable aspects of abstract social concepts that are used as variables and parameters within an integrated system for decision-maker. A phenomenon can only be measured if it is conceptually quantifiable. Social concerns may not all be quantifiable except certain aspects. Social indicators are not value free. Value judgements do enter at different levels of the construction of social indicators. These indicators should be relevant, include aggregate, structural and distributive characters of the society, be economical, be understandable to laymen, be objective and should relate to people and be real rather than monetary. The number of indicators should be kept as low as possible. It is at times better to have imperfect information on a relevant question rather than ideal statistics for an irrelevant question. In chapter IV of part II, dealing with different levels of analysis, reference is made of the five-year plan of India as an example of partial specification of goals, objectives, means and alternatives. The criteria for evaluating the performance of social sectors are efficiency of the sector performance, relevance and coverage.

Project appraisal consists of (i) determination of expected contributions of alternative actions to various goals, (ii) determination of costs and benefits of various actions and (iii) design of conceptual framework to the monitor and evaluate the proposer action. The objective of project appraisal is simply to identify the optimal solution by comparing the contribution of possible actions to the chosen goals. 'Environment' is one of the major concerns that should be considered in determining the benefits of a project. The conceptual framework for determination of costs and benefits of the project has been discussed in some detail without going into quantitative aspects of the techiques for establishing the relationship between benefits and costs. Addition of these techniques of relevance would have enhanced the value of the book, in the absence of which, the book remains more qualitative in nature. It is important in project appraisal not only to determine the positive impacts but also all effects of the project on all different goals of development.

Costs and benefits of a project do not all occur at the same point in time. With a view to comparing alternative project proposals, it is necessary to reduce the stream of benefits and costs over time to the present. The fact that the determination of social discount rate is difficult is merely mentioned without treating the subject in any detail. The problem of uncertainty in project appraisal may be handled by inclusion of uncertainties into an analysis of benefit stream through sensitivity and risk analysis. It is important to be

clear about the relative importance of individual variables comprising the cost-benefit stream. Uncertainties may be minimised by analysis and information gathering. According to the book, the management approach considers the distinction between social and economic projects as unjustified; economic and social factors are interdependent and should not be treated in isolation; hence the need for a unified and integrated approach for appraisal of non-directly productive and directly productive projects alike. More resources and time will have to be made available for social analysis if decision-making on project selection from among alternatives is to improve. Feed-back from project evaluation to planning analysis will need to be institutionalised.

An excellent treatment of the monitoring and evaluation system for social programmes forms part of this book. Traditional reporting and evaluation practices are generally not adopted to the information needs of an efficient management of development project/programme. Each monitoring and evaluation frame-work has to be tailor-made. A clear understanding of the objectives of the evaluation has to be established between the user and the evaluator before the evaluation process is actually initiated. A suitable management information system for monitoring and evaluation of development project/programme would need to be designed, installed and operated.

The book includes a short annotated bibiliography referring to selected works which would enable the reader to go in depth, into some of the concepts and approaches contained in the book. It is a useful book for those engaged in the task of project/programme appraisal and evaluation and will prove to be a worthwhile addition to the library. □

Cost Accounting—Principles and Practice Student's Edition

By S. P. Iyengar

Sultan Chand & Sons, New Delhi, Price Rs. 35.00

Reviewed by B. P. Rao*

The main value of the book to the Cost Accountants and Students of Cost Accounting lies in the fact that what Mr. Iyengar has to say is written in a straight-forward and practical manner. He has a thorough knowledge of his subject, and is able to expound it without excessive use of technical

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language, thus avoiding anything approaching pedantry. There is certainly justification for the implied contention that what is contained in the book is capable of being understood by anyone possessing average intelligence and an interest in the subject. It gives a logical approach, is wel-illustrated, and contains a large number of questions set by various Universities and Accountancy bodies.

Such topics as Budgetary Control, Standard Costing, Marginal Costing and Management Reporting, Cost Control and Cost Reduction, to mention just a few, are included. Although the topics dealt with are many, the author has covered each one with thoroughness.

In addition to the value students will gain from this work, the practising accountant will also find it extremely helpful, as it enables him to provide efficient and up-to-date service to management.

The major criticism which can be levelled against the book is that while most of the 265 illustrations and 1364 questions given are worthwhile, there is a tendency for them to be so elaborate that the general principles are obscured. This also makes for heavy reading. Instead. the author could have used the space to introduce and discuss the use of Electronic Data Processing equipment which has already made a positive impact on the means of recording, processing and reporting accounting and cost information. □

Conciliation in Industrial Disputes : A Practical Guide

Indian Edition 1980, AIMA, pp. 133, Rs. 20.00 ILO Publication

Grievence Arbitration : A Practical Guide

ILO Publication, pp 71, Rs. 15

Reviewed by Rahul Bhatnagar*

At a time when industrial disputes are rampant and the government machinery is falling apart in redressing them, it is imperative that we must restructure and rejuvenate our efforts to meet the demands of the industry. Industrial disputes are a natural consequence of labour-management friction. But what is more important is to make their redressal both judicious and expeditious. The review is not the forum to highlight and evaluate the causes of the great number of industrial disputes going to courts after collective

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bargaining and conciliation have failed, but one can categorically pin-point that we have not been able to create a climate for conciliation.

The first guide is a practical treatise on conciliation and to conciliators. It provides a spoon-fed methodological approach to profesionals concerned. The coverage is explicitly exhaustive and to freshers working in the course of settling industrial disputes, it is both a teaching guide and a learning manual.

Today, such organised, systematic, pragmatic and enlightening literature is very much required. Though the Indian edition has come out quite late, it is better late than never.

Chapters 4, 5, 7, and 9 need a careful study. They provide an insight into the making and working of a conciliator. They also provide very useful information which forms the genesis of successful and effective conciliation proceedings. The appendix is equally inviting. It is the austere and lucid presentation of ideas that tempts one to read this monologue.

While the industrial relations climate is charged with suspicion and distrust, it is imperative that adequate measures for grievance redressal are put into action. Grievance generates differences and disputes if they are not settled in the genetic stages. More often than not, managements do not bother to have appropriate procedures of resolving them at plant level, with the result that industrial relations are always at the mercy of litigation.

The second guide is a practical framework of the procedures and provides a pragmatic approach towards the enhancement of prospects of harmonious labour-magement relations. The guide lays special emphasis on settlement of petty grievances by informal and amicable means.

Chapters 4, 5 and 6 provide an enriching material helpful in the effective conduct of hearings. The diction has a simplicity of style and freshness of thought The guide is addressed to government policy makers, employers, trade unionists and practising arbitrators to help establish a system of mutual confidence and respect. Our courts can be considerably unloaded of litigation cases if the grievances are resolved at the departmental or unit level. ILO has done a great service by providing the material which can be of utmost utility, if cared for. □

Business Is People

C. Northcote Parkinson & M. K. Rustomji

Published by IBH Publishing Company, Bombay, Revised Edition, 1980, pp. 123, price : Rs. 16.

Reviewed by Manish Nandy*

First things first. I propose a toast to Mr. V. B. Halbe (I make the sexist assumption that Halbe is a man; there was no way I could check it.)

Who is Mr. Halbe ? Halbe is the man by whose name the book under review should be known. He is the man to whom should go 80 percent of the credit of this book. He is a cartoonist who makes this book lively, amusing, interesting, eye-catching, intriguing and worthwhile. His is the wit that lends this book its pep and punch and point. His is the imagination (I have no doubt at all) that invited the hundred favourable reviews that are strewn over the body of this book. His is the hand that launched a hundred thousand customers (that is the number of people who are supposed to have bought this tome). Alas ! the name of Halbe appears nowhere on the cover.

This book goes by the name of Northcote Parkinson and Rustomji. I do not know how the two collaborated across national boundaries. But certainly Parkinson's influence has been sadly diluted by the proverbial seven seas and thirteen rivers. The subtle wit and acerbic irony that one associates with Parkinson, on the basis of Parkinson's Law and other books in that series, are conspicuous by their absence in the present book. I like the crisp, simple way it is written, but crispness and simplicity are about all I can find to say in favour of the written text. There are no surprises, no gentle twists to make you sit up and take notice, no subtlety at all. It was a pretty bland affair for me, after I had whetted my appetite in anticipation of that special Parkinson-like effervescence.

For the hard-nosed realist, let me turn to the content of the book. Pleasantly presented as it is, how substantial is it ? Let it be said first that the book is essentially in the nature of a series of Do's and Dont's. To illustrate this, let me give below a sample analysis of the second chapter (I am leaving aside the first chapter since it is essentially introductory in nature).

Chapter II, the Spirit of the Organisation, has 22 parts or frames—both texts and cartoons—which say essentially the following :

(1) Don't display your authority; be modest.

(2) Don't try to know the details of subordinates' work.

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(3) Don't check others' work too much.

(4) Discuss problems; don't hide them.

(5) Don't interfere in others' work.

(6) Don't spoonfeed your people.

(7) Keep the workplace clean.

(8) Anticipate crises and remedial action.

(9) Listen to grievances.

(10) Encourage new ideas.

(11) Offer incentives other than monetary ones.

(12) Prevent mistakes instead of blaming people for them.

(13) Find what, not who, is responsible for error.

(14) Focus on the objective.

(15) Encourage suggestions.

(16) Explain policies to lower echelons.

(17) Handle critical moments carefully.

(18) Explore reasons for bad work.

(19) Give support and loyalty to the boss.

(20) Don't criticise for the sake of criticism.

(21) Appreciate honesty and reliability.

(22) Don't lose your temper.

Let us take an integrated look at the whole of Chapter II.

The first 6 admonitions relate to leadership style, like, Don't be Overbearing or Don't Be Persnickety. Suddenly comes the totally unrelated advice to keep the workplace neat (7), followed by a jump to the concept of contingency planning : Stay Prepared for crisis (8). By (9) you are back to leadership style and being told to Listen to Gripes and then to Promote Fresh Ideas (10). I would have expected Prompt Suggestions (15) to come right after that, but it is preempted by two injunctions on mistakes and a vague one on objectives (14). Since objective-setting is related to the problem of hierarchical levels, Explain Policy to Subordinates (16) should have followed (14), but it doesn't. Handle Special Moments Specially (17) is not particularly enlightening, but in the context it is quite irrelevant. Explore Reasons For Bad Work (18) should obviously have come close to (12) and (13) which deal with error, but have been unaccountably separated. The advice about criticising (20) and losing temper (22) too could be related to the same subject; it is also scattered about the

chapter, interspersed with singular homilies like, Support The Boss (19) and Appreciate Honesty (21). Both of the latter sound strangely quaint today; after all, the real questions are about the nature of the support (how to distinguish it from sycophancy) and of honesty (how to ascertain it organisationally). I am trying less to cavil at the content of the book than to demonstrate that the authors' message will be largely lost because of the disorganised fashion in which it has been presented. No message endures or makes an impact unless it has a certain coherence to it. Discrete parts of it need to stick together through logical ordering or sequencing. I see scant evidence of that kind of thinking through, either in Chapter II and in the other parts of the book.

When you are faced with a series of imperatives—like this book offers you—you cannot really check the argument behind them because it is not spelt out. Personally and temperamentally, I find it hard to take seriously any advice which is not followed by a detailed piece of reasoning; but then, apparently, there are many others of a different kind. In fact, the popular success of this book, while perhaps not undeserved, is a striking commentary on our management practitioners who seek simplistic prescriptions as a most suitable guide to their action. In that sense, this book tells us more than it means to.

Yet, on the whole, I find this book just as that eminently sensible man, Mr. J.R.D. Tata, finds it : "An effective and attractive publication". No more, no less. And that brings me to my final *obiter dictum*. I don't quite see the point of strewing so many ecstatic appraisals all over the book and inside it, included a repeated quotation from Peter Drucker and a quite silly one from Prince Philip. If the object was to overwhelm the weak-kneed and lily-livered reviewer, I hope I have successfully resisted the influence. □

Management in Japan and India with reference to the United States

William A. Long & K. K. Seo

Praeger Publishers, 200 Park Avenue, New York, NY, 10017, pp. 300.

Reviewed by Kewal Soeny*

The authors' thesis is that successful management practices are inescapably fashioned to fit the social and cultural environment. This observation compeltely fits Japan where there is a homogeneous people with one history, one language, one culture. Yet it is equally valid in India where there is a kaleidoscope of caste, religion and language, and in the United States where

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there is a heterogeneous, pluralistic society with roots in every nation on earth.

To make a study of three cultures and societies to arrive at some worthwhile conclusions must have been an uphill task, but the authors have admirably succeeded, and though the book cannot boast of original research (for the authors have depended heavily on other authors' published material) they have been clear in their concepts and have done a good job. They deserve congratulations for this achievement.

Are good management practices universal? It appears that the functions of management are similar, but there are definite and sometimes profound differences in the management practices used to perform the functions, which call for deep study, if the differences have to be clearly understood. A business organisation being a social entity operating in a social environment, its tasks are as much social as they are economic and technological, and if the business enterprise does not conform to its social and cultural environment, the political environment or legal environment, it can come to grief. Even religion has its influence on management practices, in the sense that business ethics and, therefore, business customs have their roots in the doctrines of religion. The Western Protestant ethic, the multiplcity and tolerance of religion, superscribed by attacks from outside, which gave us the caste system, and in Japan, a blending of Shinto, Buddhism and Confucianism which brought about familism that governs the entire Japanese society and business, are cases in point.

Accordingly, these national characteristics have led to characteristic management practices—life-time employment, loyalty to the organisation, group decision-making, consideration of seniority in promotion and compensation, paternalism, etc., in Japan; paternalism, nepotism, consultative decision-making by the *karta*, bureaucratic behaviour, etc., which characterise the Indian system and the individualism, work specialisation rather than general-sation, high labour mobility, compensation based on performance rather than seniority as distinguishing features of the American system. The study of these strong, different under-currents in the operations of business and management in these three cultures, should, thus be most useful, particularly for the manager who operates in all these systems or wants to understand and make changes in his own.

Though the authors' observations are, by and large, without any attempts at providing their likes and dislikes, they do not seem to see any good in the Indian system and an Indian reader gets the impression that Long and Seo are prejudiced in favour of first the Japanse system and then the American. Of course, the phenomenal economic achievements of Japan and USA must perhaps also prove that their systems have proved better and produced results, yet the Indian system has its own merits (or does it have any?). The individual reader has to make his own judgement but neverthless the great

success of these nations should be a lesson to others and a source of inspiration, too.

Long and Seo have depended on a large variety of sources for their material and the book would be useful for not only study of the subject but also quick referencing. □

Fundamentals of Management Accounting

Robert N. Anthony & Glenn A. Welsch

Richard D. Irwin, Inc., Homewood, Illinois, Revised Edition, 1977, Price not mentioned.

Management Accounting : An Introduction

Allan R. Drebin & Harold Bierman, Jr.

W. B. Saunders Company, Philadelphia, Third Edition, 1978, Price not mentioned.
(Available in India through Messrs Macmillan Company of India Limited, New Delhi)

Reviewed by P. Chattopadhyay*

These two textbooks on the fundamentals of management accounting are by authors who have already made their mark as teachers and researchers of considerable standing and international reputation. Professor Robert N. Anthony of Harvard Business School is well known to Indian authors for his books on management control systems and management accounting. Professor Glenn A. Welsch of the University of Texas has authored a fairly widely-read book on budgetary control. Also reputed are Professor Allan R. Drebin of North Western University, Illinois, and Professor Harold Bierman, Jr. of Cornell University. In fact, Professor Bierman's Capital Budgeting Decision and Topics on Cost Accounting are well-known to all students of the subject. When such well-known authors team up to write textbooks, they start with a certain measure of success already. They deliberately attempt in these books to establish credibility with students of management who have to have a good assimilation of the subject and the typicalities of different elements of management accounting, the role it plays, the techniques it employs and the areas that it highlights. The intricacies of management accounting appear scaring to the uninitiated but once the elements are known and understood clearly, management accounting enhances the levels of confidence in mangers, particularly in telling them what to seek and for what purpose.

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In the first volume, Anthony and Welsch start with explaining the nature of management accounting, the characteristic features of different types of cost accounting, particularly full cost information and its uses, cost accounting systems, manufacturing overhead costs and other aspects of cost accounting such as distribution costs, R & D costs, general and administration costs and capital costs, variable costing, pricing, etc. Explaining the elemental functions of differential accounting, the authors underline its three related facets, namely, differential costs, differential revenues and differential investment. The application of the differential accounting principles is discussed in the context of different business problems. In this respect, the context of alternative choice decisions and capital investment decisions are analysed in some detail. The third part of the book deals with responsibility accounting in which the authors discuss the management control structure, the management control process, programming and budget preparation, standard costs, variance analysis, control reports and their uses and information processing. The last chapter of the book sums up the discussion in the book on different problematic aspects of management accounting which should be kept in view.

In the second book, though the authors deal with more or less similar problems, there are several distinctive marks as well. Treatment of depreciation and return on investment, joint costs and transfer pricing, reporting the effects of price changes, accounting for price changes and the economics of information are highlighted by the learned authors with reference to the state-of-the-art, complexities to be accommodated and emphasis on application. Of particular interest to students of management accounting is the chapter on the economics of information in which the authors discuss the elements of information theory, value of information and cost control Addressed to students, the authors have not chosen to go into elaborative detail. However, most of the significant aspects find their place in explaining the tricky areas in management accounting Illustrative exercises and case problems have been provided for helping to size up different topics of the subject.

Both the volumes provide considerable insight of the authors not only in choosing the areas for analysis but also in adopting styles of presentation. Both the volumes carry the stamp of authority. Though the background material is American, the relevance of the volumes to Indian conditions suggests itself. □

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* High Silicon-Iron Alloys
* Corrosion of Winding Ropes

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Index to Advertisers

TECHNICAL CONSIDERATIONS IN FORMING PROCESS FOR MANAGEMENT

Joseph Stanislao & Charles F. James Jr.

The theory of mechanical working of metals is not yet capable of predicting the effects of process variables. In selecting a press and press equipment for making a sheet metal part, analysis is usually made of the work-piece, the type of tooling and the relation of the part and tooling requirement to the press features. However, the final decision is based on costs, lead time and availability of equipment. Thus, experience and application are still the major factors in understanding and predicting the Forming Process behaviour in industry today *(Page 505)*.

INCREASING PRODUCTIVITY BY DEFECT ELIMINATION —AN ORGANISED APPROACH

H. Lal

When a manufacturer finds that his end-products show defects, he is faced with a choice between stopping the process till the cause of the defect is eliminated and allowing it to continue, overlooking the defects. The decision can affect customer good-will. In order to eliminate defects in end-products, it is desirable on the part of a manufacturer to collect data, investigate and identify the source of the defect. On the basis of the analysis of data, remedial measures can be adopted after proper evaluation as to what is the best course. Besides, quality should be checked often to test whether the remedy has yielded fruits *(Page 515)*.

MONITORING OF PHYSICAL PROGRESS —A CASE

B. M. Naik & R. K. Sachdeva

Measurement and monitoring of project progress in the conventional way based on financial progress does not project a correct picture of physical progress. The actual project situations being complex, demand application of modern concepts based on measurement of financial as well as physical progress. Physical progress of individual activities is generally measured in terms of quantity of work. This does not give a consolidated picture of the project to top management so as to facilitate initiation of corrective action.

This case study shows a method of measurement and monitoring of physical progress based on effort. This method helps in measuring productivity of labour and adjusting the strength of work-force from time to time to achieve the target and also allows integration of financial and physical progress *(Page 523)*.

OPERATION TIME FOR DRILLING

R. P. Mohanty & N. Patnaik

Setting correct time standards in machine operation enables proper production planning, scheduling and cost allocation. Drilling is no exception to this. Drilling time can have five sub-divisions, operation-wise, viz., feeding time, rapid transverse time, load and unload time, set up time, drill charge time.

In this paper, the author has attempted to derive a base for drilling time standard with high degree of production planning and scheduling processes in a job shop. It could be that under the influence of several complex parameters of operation, the effort of time aggregation of deterministic and random components may not respond optimally to the real process. But the lumping effect has been taken care of in the study and in processing of information while deriving the time formula *(Page 531)*.

AN ANALYSIS OF STRUCTURAL CHANGES IN AGRICULTURE : A CASE OF PUNJAB

K. S. Dhindsa

This is a study on productivity, based on the analysis of changes in resource structure of agriculture, changes in distribution of land holdings, changes in composition of workers and percentage changes in the contribution to Net State Domestic Product from agriculture, animal husbandry, fishery and forestry in Punjab *(Page 541)*.

NETWORK ANALYSIS-BASED MULTI-PROJECT SCHEDULING FOR A LARGE SHOP —A CASE

D. K .Banwet

In any enterprise there are many projects, each comprising a series of related jobs all of which are directed towards a major output. Project managers have to co-ordinate the resources of men, money and minutes, so as to make them available at the place and the moment they are needed. PERT and CPM are the popular tools used to achieve this. This paper is a case study of a large job shop where multi-project scheduling was done *(Page 553)*.