



## RESEARCH ARTICLE

### AN EFFORT TO APPLY WORK CONTENT AND INEFFECTIVE TIME IN PRODUCTION INDUSTRIES FOR ENHANCING PRODUCTIVITY

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#### ABSTRACT

Association necessitate to comprehend its application not just from approach of production enhancement or finance augmentation or resource exploitation, but also should tackle decisively the spongy region of workers to confer the best to not only for accommodating the productivity solutions, but also be a element on vanguard during tangible accomplishment to compose the learning in fact value its instance and effort. This paper spotlights on the decisive area of productivity enhancement with the intelligent use of techniques. The methodical application to enhance productivity, reduce costs and increase profits.

#### INTRODUCTION

He and his family are hardly ever able completely to convince their starvation, to clothe themselves correctly or to get pleasure from housing conditions in which they can be contented and healthy. The countries in which the ordinary man and his family are able to enjoy not only all the necessities for a healthy life but also many things which might be classed as luxuries, are still too few. In too many parts of the world the ordinary man is hardly able to obtain even the indispensable things. A poor man in the United States and in some countries of Western Europe would be a rich man in other countries. The standard of living of the representative man or family in the dissimilar nations or communities of the world varies greatly. The standard of living of any man is the extent to which he is able to provide himself and his family with the things that are necessary for underneathing and enjoying life. What are the necessities of a minimum decent standard of living? Mainly, they are food, clothing, housing, hygiene. Enough food every day to replace the energy used in living and working. Enough clothes to consent cleanliness and give security from the climate. Housing of a standard to give protection under healthy conditions; and sanitation and medical care to give protection against disease and treatment in illness.

To these may be added security and education. Security against robbery or violence, against loss of the opportunity to work, against poverty due to illness or old age; and education to enable every man, woman and child to develop to the full their talents and abilities. Food, clothing and housing are generally things which a man has to obtain for himself. In order to have them he must pay for them, either in money or work. Hygiene, security and education are generally matters for governments and other public authorities. The services of public authorities have to be paid for, generally by individual citizens, so each man must earn enough to pay his contribution to the common services as well as to support himself and his family. We can have more and cheaper food by increasing the productivity of agriculture, more and cheaper clothing and housing by increasing the productivity of industry, more hygiene, security and education by increasing all productivity and earning power, leaving more from which to pay for them. Whenever there is unemployment or underemployment efforts to increase employment are very important and should go hand in hand with efforts to increase the productivity of those who are already employed. But it is with the latter task that we are here concerned. If in any community there are men and women who are able to work and who want work but who are unable to find work, or who are able to find only part-time work, the output of goods and services can be increased if full-time productive work can be provided for them, i.e. if employment can be increased. There are two main ways of increasing the amount of goods and services produced.

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One is to increase employment; the other is to increase productivity. The greater the amount of goods and services produced in any community, the higher its average standard of living will be. Each nation or community must, in the long run, be self-supporting. The standard of living achieved will be that which the representative citizen is able to achieve through his own efforts and those of all his fellow citizens.

### Literature review

Gilbreth (1909), Cadbury and Marshall profoundly disparaged Taylor and encompassed his work with partisanship. Cadbury in reply to Thompson stated that under scientific management employee skills and initiatives are passed from the individual to manage, they relied heavily on individual interpretations of what workers actually do and Gilbreth's were indicted with the undertaking of demonstrating that motion study chiefly, and scientific management generally, augmented industrial output in ways which improved and did not detract from workers' mental and physical strength. The very fact that the oral management was converted to scientific management, with all facts, data analysis to enhance productivity irrespective of the physiological cost to the worker. The study reveals that lots of coordination efforts was put with managerial positions to prepare the path for human relations to supersede scientific management in terms of literary success and managerial application. The application of science to business problems, with the use of time-study methods in standard setting and the planning of work, was pioneered by Frederick Winslow Taylor, with emphasis on fair day work

### Productivity

In short, higher productivity means that more is produced with the same expenditure of resources, i.e. at the same cost in terms of land, materials, machine time or labour; or alternatively that the same amount is produced at less cost in terms of land, materials, machine time or labour used up, thus releasing some of these resources for the production of other things. In each of these deliberately simple examples output per production has also increased, and in each case by exactly the same percentage as the increase in production does not by itself indicate an increase in productivity. If the input of resources goes up in direct proportion to the increase in output the productivity will stay the same. And if input increases by a greater percentage than output, then higher production will be being achieved at the expense of a reduction in productivity.

Productivity of men means If a potter has been producing thirteen plates an hour and improved methods of work enable him to produce forty plates an hour, the productivity of that man has increased by 331/3 per cent. Productivity of machines means if a machine tool has been producing 100 pieces per working day and through the use of improved cutting tools its output in the same time is increased to one hundred twenty pieces, then the productivity of that machine has been increased by twenty per cent. Productivity of materials means. If a skilful tailor is able to cut eleven suits from a bale of cloth from which an unskilful tailor can only cut ten, then in the hands of the skilful tailor the bale was used with ten per cent. greater productivity. Productivity of land means If by using better seed, better methods of cultivation and more fertilizer the yield of corn from a particular hectare of land can be augmented from two quintals to three quintals, then the productivity of that land, in the agricultural sense, has been

increased by fifty per cent. The productivity of land used for industrial purposes may be said to have been increased if the output of goods or services within that area of land is increased by whatever means. We may find that the productivity of labour, land, materials or machines in any establishment, industry or country has increased, but the bare fact does not in itself tell us anything about the reasons why it has increased. An increase in the productivity of labour, for example, may be due to better planning of the work on the part of the management or to the installation of new machinery. An increase in the productivity of materials may be due to greater skill on the part of workers, to improved designs, and so on. It may be defined as follows: Productivity is the ratio between output and input. This definition applies in an venture, an industry or an economy as a whole. In simpler terms, productivity, in the sense in which the word is used here, nothing more than the arithmetical ratio between the amount produced and the amount of any resources used in the course of production. These resources may be land, materials, plant, machines, tools, the services of men or, as is generally the case, a combination of all four. Higher productivity provides opportunities for raising the general standard of living, including opportunities for larger supplies both of consumer goods and of capital goods at lower costs and lower prices; higher real earnings; improvements in working and living conditions, including shorter hours of work; and in general, a strengthening of the economic foundations of human well being. We can now see more clearly how higher productivity can contribute to a higher standard of living. If more is produced at the same cost, or the same amount is produced at less cost, there is a gain to the community as a whole, which may various forms. A meeting of experts on Productivity in production industries convened by the I.L.O. in december 1952 summed up.

Productivity will be treated as one of making the best possible use of all the available resources, attention will constantly be drawn to cases where the productivity of materials or plant is increased. Most practical managers know this, but many people have been misled into thinking of productivity exclusively as the productivity of labour, mainly because labour productivity usually forms the basis for published statistics on the subject. It often pays to increase the number of unskilled workers if by doing so an expensive machine or a group of skilled craftsmen are enabled to increase output. In nations where assets and expertise are dumpy, even as inexperienced labor is bounteous and inadequately paid, it is especially important that higher productivity should be looked for by increasing the output per machine or piece of plant or per skilled worker. The importance to be given to the productivity of each of the resources land, materials, machines or men depends on the enterprise, the industry and possibly the country. In industries where labour costs are low evaluated with material costs or compared with the capital invested in plant and equipment better use of materials or plant may give the greatest scope for cost reduction. The greater the productivity of the establishments making these things, the greater are the opportunities of producing them abundantly and cheaply in quantities and at prices which will meet the requirements of every family in the community railway engines and carriages, motor trucks, electric generators, telephones, electric cables, all require expensive machines to make them, special equipment to handle them and an army of workers of many different skills.

The greater the productivity of the establishments making these things, the greater are the opportunities of producing them abundantly and cheaply in quantities and at prices which will meet the requirements of every family in the community. The techniques of work study described in it can, however, be used with success wherever work is done, in factories or offices, in shops or public services, and even on farms. The problems of raising the productivity of the land and of livestock are the field of the agricultural expert. Employers and workers also have vital elements to participate. The main responsibility or raising productivity in an individual enterprise rests with the management. Only the management can carry out a productivity programme in each company. Only the management can create good human relations and so obtain the cooperation of the workers which is essential for real success, though this requires the goodwill of the workers too. Trade unions can actively encourage their members to give such cooperation when they are satisfied that the programme is in the interests of the workers, as well as of the country as a whole. This is especially important in developing countries where unemployment is a big problem. Governments can create conditions favourable to the efforts of employers and workers to raise productivity. For these it is necessary, among other things, to have balanced programmes of economic development; to take the steps necessary to maintain employment; to try to make opportunities for employment for those who are unemployed or under employed, and for any who may become redundant as a result of productivity enhancement in individual industries.

Even with written guarantees, steps taken to raise productivity will probably meet with resistance. This resistance can generally be reduced to a minimum if everybody concerned understands the nature of and reason for each step taken and some say in its implementation. Workers' representatives should be trained in the techniques of increasing productivity so that they will be able both to explain them to their fellow workers and to use their knowledge to ensure that no steps are which are directly harmful to them. Many of the safeguards mentioned above can best be implemented through joint productivity committees and works councils. An example of action on these lines is the agreement reached by representatives of employers and labour in the Indian cotton industry at a meeting called by the Indian Government at Delhi in February 1951. Essentially the same points were embodied in India's first five year plan, which was launched in 1952. Besides the steps which governments may take to maintain the general level of employment, something more is needed to help workers who become temporarily unemployed. With this in mind the I.L.O. Meeting of Experts on Productivity in Manufacturing Industries (Geneva, 1952) made certain recommendations. It recommended that there should be advance planning by employers of changes in industrial processes and equipment, and advance notification of displacements expected to result from these; that where changes are planned which would make certain jobs redundant, consideration should be given to reducing or suspending new recruitment with a view to retaining redundant workers until sufficient jobs become available for them as a result of normal labour turnover; that employers should give preference to displaced workers when filling vacancies in other departments, due account being taken of efficiency, good conduct and seniority; that training and retraining courses should, where appropriate, be provided to enable workers to be transferred to other work; that improvements should be made, where

necessary, in the organisation of employment services; that measures should be taken to make it easier for workers to move, if other places where jobs are available; and that measures should be taken, through unemployment insurance schemes and in other ways, to protect the living standards of workers who might lose their jobs. Since this is so, workers, unless they are assured of adequate assistance in meeting their problems, may resist any steps which they fear, rightly or wrongly, will make them redundant, even though their period of unemployment may only be a short one, while they are changing jobs. Since this is so, workers, unless they are assured of adequate assistance in meeting their problems, may resist any steps which they fear, rightly or wrongly, will make them redundant, even though their period of unemployment may only be a short one, while they are changing jobs. Even in the economically developed countries where employment has for years been at a very high level this fear is very real to those who knew unemployment in the past. This fear is greatest when unemployment already exists and a worker who loses his job will find it hard to get another. Workers fear that they will work themselves out of their jobs. One of the greatest difficulties in obtaining the active cooperation of the workers is the fear that raising productivity will lead to unemployment. These resources consist of real things and services. When they are used up in the process of production real costs are therefore incurred. Their cost also be measured in terms of money. Since higher productivity means more output from the same resources it also means lower money costs and higher net returns per unit of output. The use which is made of all these resources combined determines the productivity of the enterprise as manpower, machines, materials, lands and building. Men and women to perform the manufacturing operations; to plan and control; to do clerical work; to design and do research; to buy and sell. Industry, equipment and tools necessary to carry out operations of produce and the handling and transport of materials; heating, ventilating and power plant; office equipment and furniture. Materials that can be converted into products to be sold. They include fuel, chemicals for use in the processes of manufacture, and materials. Land in a convenient location on which to erect the buildings and other facilities necessary for the operations of the enterprise, and the buildings erected on it. The productivity of a certain set of resources (input) is therefore the amount of goods or services (output) which is produced from them. Productivity was defined as the ratio between output and input in an enterprise, an industry or an economy as a whole.

To motivate means to provide a motive or reason for doing something. Used in the context of management it means, in effect, to make people want to do something. It is of little use the management carrying out the other activities getting facts, planning and so on if the people who are supposed to carry out the plans do not want to do so, although they may have to. Coercion is no substitute for voluntary action. It is one of the tasks of the management, and perhaps most difficult task, to make people want to co-operate; the management can only succeed fully by enlisting the willing and active participation of workers at all levels. This is not the place to discuss the activities by which the management achieves the transformation of the resources at its disposal finished products. It may not be out of place. However, to say something the term "motivate", since it may be unfamiliar to some readers. The enterprise, like a driverless coach, moves forward jerkily, now held up for lack of now for lack of equipment; because machines are badly chosen and even badly

maintained, or because employees are unable or unwilling to do their best. In any concern larger than a one man business, the work of balancing the use of one resource against another and of coordinating the efforts of everyone in the association to achieve the best results is the job of the management. If the management fails to do what is necessary then the enterprise will fail in the end. In such a case the four uncoordinated like the efforts of four horses without a driver. The enterprise, like a driverless coach, moves forward jerkily, now held up for lack of now for lack of equipment; because machines are badly chosen and even badly maintained, or because employees are unable or unwilling to do their best. Who is responsible for making sure that the best use is made of all these resources? Who is responsible for seeing that they are combined in such a way as to achieve the greatest productivity? The management of the enterprise.

The question of material saving is so important to many countries that a separate volume would be needed to discuss it. At the process or operation stage, by ensuring that the process used is the right one; by ensuring that it is being operated correctly; by ensuring that operatives are properly trained and motivated so that they will not turn out faulty work which has to be rejected, leading to loss of material; by ensuring proper handling and storage at all stages from raw materials to finished products, first eliminating all unnecessary handling and movement; and by proper packaging to avoid damage in transit to the customer. At the design stage or time of specification, by ensuring that the design is such that the product can be manufactured with the least possible use of materials, especially when they are scarce or cherished; by ensuring that plant and equipment specified for purchase is the most economical possible in terms of materials consumed in its operation as fuel for a given level of performance.

To do this we have to start thinking in terms of time, since it is the output of good production from a machine or from a worker in a given time which is used in calculating productivity. Productivity is frequently measured as the output of goods or services in a given number of man hours or machine hours. We now come to consider the productivity of industry, machinery and equipment and of the services of men and women. Let us take another look at the nature of productivity, which in simple terms was described as the arithmetical ratio between the amount produced and the amount of any resources used in the of production. The effective utilisation or maximum productivity of land and buildings is an important source of cost reduction, especially when an enterprise is expanding and needs increased working space. Any reduction in the original specification which can be effected before land is purchased or buildings erected represents a saving in capital outlay (or rental) of land and buildings, a saving in materials, particularly fittings, which may have to be imported, and a probable saving in taxes as well as a saving in future maintenance costs.

### Work content and ineffective time

Let us now examine each of these sets of causes of excess time (excess work content or ineffective time) in turn and look at some of the reasons for them detail. The relative sizes of the different sections have no special significance and will vary from operation to operation and from undertaking to taking even for the same operation. The relevance of work study has frequently completed it doable to condense operation times to

one-half or even a third of their alues without by any means exhausting the possibilities of further reduction. Ineffective time within the control of the worker is time during which man or machine or both are idle for reasons within the control of the worker himself. The basic work content assumes uninterrupted working. In practice, however, uninterrupted working is exceptional, even in very well run associations. All interruptions which cause the worker or machine or both to cease producing or carrying out the operations on which they are supposed to be engaged, whatever may be the cause, must be regarded as ineffective time because no work effective towards completing the operation in hand is being done during the period of the interruption. Ineffective time reduces productivity by adding to the duration of the operation. Apart from interruptions from sources outside the control of any one in the association, such as a power breakdown or a sudden rainstorm, ineffective time may be due to two sources, ineffective time due to shortcomings on the part of the management. Time during which man or machine or both are idle because the management has failed to plan, direct, co-ordinate or control efficiently.

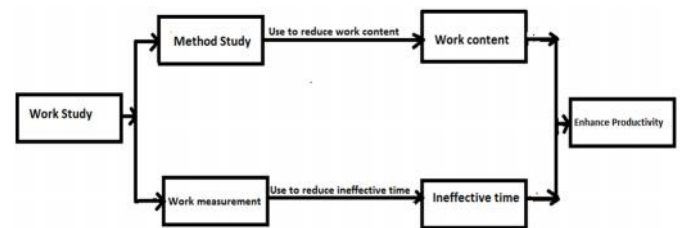


Fig. 1. Work content and Ineffective time

Vaiious factors affect productivity. First, in general far more ineffective time is due to management shortcomings than to causes within the control of workers. In many industries, the individual worker has very little control over the conditions under which he is required to operate. This is especially true of industries using a lot of plant and machinery and making a complex product. Finally, how can action (or inaction) on the part of the workers themselves cause ineffective time? By failing to observe safety regulations and by having or causing accidents through carelessness, by careless workmanship causing scrap or making it necessary for work to be done again. Work which has to be done again means wasted time, and scrap means wasted materials, by workers taking time off work without good cause: by lateness, failing to start work immediately after clocking in, by idling at work or by deliberately working slowly. Second, how can shortcomings on the part of the management affect it? Let us now consider the ineffective time in the production or operating cycle. By failing to take proper precautions for the safety of workers. This causes lost time due to accidents, by failing to provide working conditions in which the operative can work steadily, by allowing plant and machinery to be operated in bad condition so that work is scrapped or returned for rectification and has to be done again. Time spent in rework is ineffective, by failing to maintain plant and machines properly. This leads to stop pages due to machine breakdowns, by failing to ensure a supply of raw materials, tools and other equipment, necessary to do the work, so that industry and labour are kept waiting, by failing to plan the flow of work and of orders, with the result that one order does not follow immediately on another. Industry and labour are not continuously employed, by failing to ensure that designs are properly developed or that customers

requirements are met from the beginning. This results in changes of design causing stoppages of work and loss of machine and man hours as well as waste of material, by failing to standardise component parts as far as possible between products or within product. This has the same effect that is, short runs and idle time. By a marketing policy which demands an unnecessarily large number of types of product. This causes short runs of each type, and machines idle while they are being changed over to manufacture different products. The workers do not have the opportunity to acquire skill and speed in any one operation. Third, it will be seen that all the items in the excess work content may be attributed to deficiencies on the part of the management.

This is true even of bad working methods on the part of the operatives if these are due to failure of the management to see that operatives are properly trained and supervised. Optimum productivity from the process will only be reached if it is operated with the least waste of movement, time and effort and under the most efficient conditions. All features which would cause the worker to make unnecessary movements, whether around the shop or at the workplace, should be eliminated. It should be noted that the idea of work content in terms of time is based on the assumption of operation at a steady average working pace. The additional time taken owing to a slowing up of the working pace might be considered as ineffective time, but this is unimportant for the present discussion. How can inefficient operation of the process or inefficient methods of production or operation affect the work content of the job? If the working methods of the operative cause wasted movement, time or effort, if the layout of the factory, shop or workplace causes wasted movement, time or effort, if the wrong hand tools are used, if the process is not operating properly, that is at the correct feed, speed, rate of flow, temperature, density of solution or whatever conditions, govern its operation, or if the plant or machine is in bad condition, if the wrong type or size of machine is used, one which has a lower output than the correct one.

Fourth, how can features of the product affect the work content of a given operation? The first step towards raising productivity and lowering the cost of the product is therefore to eliminate as far as possible all features in its design and specification that are likely to cause excess work content, including non standard products demanded by customers where a standard product would serve as well. The components of a product may be so designed that an excessive amount of material has to be removed to bring them to their final shape. This increases the work content of the job and wastes material as well. Incorrect quality standards, whether too high or too low, may work content. In engineering practice close tolerances, requiring machining, are often put on dimensions where they are quite unnecessary. There will thus be more rejects and a corresponding waste. On the other hand, material of too low a quality may make it difficult to work to the finish required or may make additional preparation of the product, such as cleaning, necessary to make it usable. The quality of material becomes especially important in connection with automation. Excessive variety of products or lack of standardization of components may mean that batches of work have to be small and cannot be put on special-purpose high-production machines but have to be done on slower general purpose machines. The product and its components may be so designed that it is impossible to use the most economical processes or methods of manufacture. This applies especially

to the metalworking industries and most where large scale production is undertaken. Components may not be designed to take advantage of high-production machinery.

### **Techniques for reducing work content and effective time**

Techniques are systematic procedures of investigation, planning or control which can be applied to management problems. The key word is systematically. The systematic approach to the solution of problems, proceeding step by step from the known to the un known, always on a basis of ascertained fact is the prime characteristic which differentiates science from magic, alchemy and all the other attempts to penetrate the secrets of the universe which preceded it. The systematic approach is at the root of all sound modern management theory. Management is both a science and an art. There are a number of techniques or tools of management which, systematically and correctly applied, will produce results that can be forecast reasonably accurately. The word association, here used in a broad sense, includes the activities of planning on the basis of facts obtained, direction and coordination. They are not as hard and fast as many techniques in science or and usually have to be adapted to the requirements of the existing situation. These techniques can be learned in the classroom or from a textbook, but practical experience is always necessary before they can be safely applied in a factory. They can only be successfully applied by someone who has learned to understand people by experience of dealing with this aspect of management in its relation to work study will be dealt with later, so it is unnecessary to say more about it here. Management deals with human beings, it can never be scientific, and must be regarded partly as an art.

The reason for this is that while scientific techniques are applied to materials governed by known physical laws, the techniques of management are applied to people and must rely on people ensure that. At this time also, alterations in design can be made to avoid having to remove too much material, and tests can be made in running the product to ensure that it meets the technical specifications demanded. The equivalent to the product development stage in the chemical and allied industries is the pilot industry. In transport, a non manufacturing industry, the equivalent is the experimental service or the proving flights which are carried out on airliners. The weakness can be conquer by the close together of design and production staffs from the beginning. If the product is to be produced in large quantities or is one of a range of similar products produced by the firm, improvement to make it easier to produce can be undertaken at the product development stage, when production staff can examine the components and assemblies and call for changes before money has been spent on production, tools and equipment. If the design of the product is such that it is not possible to use the most economical processes and methods of manufacture, this usually happens because are not familiar enough with workshop processes; it is especially liable to occur in the metal working industries. Specialisation and standardisation are the techniques by which the variety of products or components can be reduced and batch sizes increased so that use can be made of high production processes. The management must be sure of the requirements of the and of the customer, and of the technical requirements of the product itself. The first two may be established by market research and consumer research. Where the quality level is set by technical considerations product research may be necessary to establish what it should

be. Ensuring that quality requirements are met in the production shops is the concern of the quality control or inspection function. The men who perform this function must be properly informed of the quality level required and should be able to advise the designers which quality standards safely be altered to achieve higher productivity. If quality standards are higher than necessary for the efficient functioning of the product the time taken to manufacture it will generally be greater because of the care required; unnecessary rejects will also be caused. Customers sometimes make demands for dimensional tolerances or finishes of higher standards than necessary. On the other hand, neglecting quality, especially the quality of materials purchased, may prolong the time of manufacture because the materials may be difficult to work. A case of this kind was brought to light by a trainee of the Indian productivity centre while carrying out a work study investigation. He found that operatives had great difficulty in assembling black bolts and nuts because of variations in the dimensions of both, although they were supposed to be standard products and interchangeable. Inquiry showed that the buying office of the firm had purchased them from suppliers other than the usual ones because they were a little cheaper. If the quality of the product as a whole is too low, sales will be lost. Quality standards must be right.

In the chemical industries these conditions are usually laid down by the scientists in the research department. In all types of manufacturing industry it may be necessary to do process research in order to discover the best manufacturing techniques. Proper maintenance will ensure that plant and machinery is operating properly and will prolong its life, so reducing capital expenditure. Process planning combined with method study will ensure the selection of the most suitable tools for the operative. In industries which have developed their practice from engineering it is usual, today, for the process planning function to be responsible for specifying the machines on which the product and its components shall be made, the types of tools necessary and the speeds, feeds and other conditions under which they shall be run. If the proper steps are taken to remove features making unnecessary work in the product before production actually starts effort can be concentrated on reducing the work content of the process. The layout of the factory, shop or workplace and the working methods of the operative are the task of method study, one of the two branches of work study.

It will be seen that even where the work content of the product and process has been reduced as much as possible under the existing conditions, it is still possible for there to be a great deal of waste simply through failure to use time properly. Much of the responsibility for this rests with the management. If management stops working to endow with fine functioning conditions ineffective time will be augmented because workers will have to take more rest to overcome fatigue or the effects of heat, fumes, cold or bad lighting. If management fails to take the proper precautions for the safety of the workers ineffective time will be increased owing to loss of time through accidents. Machines and plant which break down cause idleness, reduce productivity and increase manufacturing costs. Breakdowns can be reduced by proper maintenance. Industry and machinery in bad condition will turn out bad work, some of which may have to be scrapped. This takes time which must be regarded as ineffective. Workers and machines may be made idle because materials or tools are ready for them when it is needed. Material control ensures that these

requirements are foreseen and fulfilled in time, and at the same time that materials are bought as economically as possible and that the stocks maintained are not in this way the cost of holding stocks of materials is kept down. The planning of proper programmes of work so that plant and workers are kept supplied with jobs without having to wait is known as production planning and the control of that programme to ensure its being carried out is production control. A proper programme can only be worked out and applied on the basis of sound standards of performance. Much ineffective time is caused by failing to ensure that the product is functioning correctly or meets the requirements of the customers before it is put into full production. This results in parts having to be redesigned or modified, and these modifications mean wasted time, material and money. Every time a batch of parts has to be remade there is ineffective time. Standardisation of components will also reduce ineffective time. It is often possible to standardise most of the components in a range of models of the same type of product; this gives longer runs and reduces the time spent in changing over machines. This decision must be taken with a full understanding of its effects. Unfortunately, in many companies, variety of product grows unnoticed through attempts to make sales by meeting every special demand for variations, most of which are generally unnecessary.

Specialisation is, therefore, an important step towards eliminating ineffective time. The reduction of ineffective time starts with the policy of the directors concerning the markets which the firm shall try to serve (marketing policy). Shall the firm specialise in a small number of products made in large quantities at the lowest possible price and sell them cheaply, or shall it try to meet the special requirements of every customer? The level of productivity achievable will depend on the answer to this question. To make many different types of product means that machines have to be stopped in order to change from one type to another; workers are unable to gain speed on work because they never have enough practice on any one job. The responsibility of the management for the achievement of high productivity is always great, especially in the reduction of ineffective time. Ineffective time can be a source of great loss even where working methods are very good.

Careless workmanship and the carelessness which leads to accidents are both the results of bad attitudes of mind on the part of workers which can only be overcome by a suitable personnel policy and proper training. It will be seen, therefore, that management has a very great responsibility for reducing the ineffective time due to the action or inaction of workers. A soundly based wage structure, including, where appropriate, incentive schemes based on accurate time standards usually set by work measurement which allows the worker to earn in some measure at the level of his output, will dampen any affinity to ravage time and hence will compose for high productivity. The willingness of the worker to get on with the job and reduce this ineffective time depends very much on the personnel policy of the management and its attitude to him. Personnel policy involves the whole relationship between the management and employees; if this relationship is not a good one it is very difficult to make any management techniques work satisfactorily. To create the right conditions for good relationships is part of the art of management. A sound personnel policy includes the training of managers and supervisors of all ranks in proper attitudes to and relations with the workers. In order to reduce this ineffective time, it must be

made to want to reduce it, and it is the business of management to create the conditions which will make him want to get on with his work. First, bad working conditions make it difficult to work for long stretches at a time without frequent periods of rest and produce an attitude of mind in the worker which makes him feel that he does not want to try. Second, if the worker feels that he is simply looked upon by management as tool of production without regard for his feelings as a human being he will not want to make a greater effort than he has to in order to keep his job. Third, if the worker does not know what he is doing or why he is doing it, if he knows nothing of the work of the firm as a whole, he can hardly be expected to give of his best. Fourth, if the worker feels that he does not receive justice from management the feeling of grievance will hinder him from doing his best. To create the right conditions for good relationships is part of the art of management. A sound personnel policy includes the training of managers and supervisors of all ranks in proper attitudes to and relations with the workers.

The willingness of the worker to get on with the job and reduce this ineffective time depends very much on the personnel policy of the management and its attitude to him. Personnel policy involves the whole relationship between the management and employees; if this relationship is not a good one it is very difficult to make any management techniques work satisfactorily. Any attempt to speed up the rate of working, except by proper training, will tend to the number of errors made. The worker can save time mainly by reducing the amount of time when he is not working, that is, when he is resting, talking to his fellow workers, having a smoke, waiting to clock off, late or absent. Whether the available time is fully used also depends on the workers. It is widely believed that someone doing a manual job can work faster or slower according to his choice. This is true only up to a certain point. Most people who have been doing a job for a long time have a certain pace at which they work best and at which they will normally work. Usually a worker trained at and accustomed to his job cannot actually work much faster, except for short periods, and equally feels uncomfortable if forced to work more slowly than his natural pace.

Each one has effects on others. It is impossible to plan programmes of work properly or to set up good incentive schemes without the standards provided by work measurement. Method study can be used to simplify the design of the product so that it is both easier to use and easier to produce. Production planning will be made easier if a sound personnel policy and a well applied incentive scheme encourage workers to perform reliably. Standardisation will make the job of material control easier by demanding less variety of materials to be bought and held in stock. Process research, by eliminating features of the industry likely to break down, should make easier the application of a proper system of maintenance.

### Conclusion

Productivity helps an association to not only in increasing economy at micro level benefiting at both financial as well as labor performance output standard. Increases in productivity also can influence society more broadly, by improving living standards, and creating income. They are central to the process generating economic growth and capital accumulation. But still in today's association, I feel that total factor productivity, by contrast, captures the contribution to output of everything

except labor and capital: innovation, managerial skill, association.

### REFERENCES

- Ban, NES, Ralph M. 1966. Motion and Time Study: Design and Measurement of Work. New York and London. John Wiley and Sons. Fifth Edition.
- Boyce, R. 1967. Integrated Managerial Controls. London. Longmans Green.
- Brech, E. F. L. 1963. The Principles and Practice of Management. London. Longmans Green. Second Edition.
- Buan Au DES Temps Elementaires: L'étude du travail: l'étude des temps. Fascicule IV. Paris. B, T. B. 1952.
- Carroll, P. 1954. Time Study for Cost Control. New York. McGraw-Hill. Third Edition.
- Carson, G. B. 1958. (Ed.): Production Handbook. New York. Ronald Press Company. Second Edition.
- Cemach, H. P. 1965. Work Study in the Office. Croydon, U.K. Maclaren and Sons for Current Affairs. Third Edition (Revised).
- Crossan, R. M. 1959. "Master Clerical Data. A New Approach to Clerical Work Measurement", in *ibid.*, Vol. 6, Nos. 2 and 3, May and Aug.
- Crossan, R. M. and Nance, H. W. 1962. Master Standard Data. New York. McGraw-Hill.
- CuIUUE, R. M. 1963. Work Study. London. Sir Isaac Pitman and Sons. Second Edition.
- Culue, R. M. 1963. Financial Incentives Based on Work Measurement. London. British Institute of Management.
- Currib, R. M. 1963. Simplified F.M.T.S. London. British Institute of Management.
- De Chantal, R. 1957. "Etude du travail et théorie des attentes", in *L'Etude du travail*, June, pp. 14-20.
- Drucker, P. F. 1955. The Practice of Management. London. Heinemann.
- Gomberg, W. 1955. A Trade Union Analysis of Time Study. Englewood Cliffs, N.J. Prentice Hall. Second Edition.
- Gillespie, J. J. 1951. Dynamic Motion and Time Study. New York. Chemical Publishing Company.
- GRACRE, 3. 3. 1949. A Fair Day's Pay. London. Management Publications.
- Hendry, J. W. 1950. A Manual of Time and Motion Study. London. Sir Isaac Pitman and Sons. Third Edition.
- Idein, 1955. "How Many Time Study Readings to Take", in *Factory Management and Maintenance*, Vol. 113, No. 2, Feb. pp. 132-133.
- Idem' The Measurement of Work. London. British Institute of Management. 1965.
- Idem, 1950. Work Methods Training Manual. Los Angeles. Campbell's Book Store. Third Edition.
- Idem, 1951. "Statistical Aids for Accurate Standard Data", in *Advanced Management*, Nov. pp. 11-15.
- Idem, 1951. *Time Study Fundamentals for Foremen*. New York. McGraw-Hill. Second Edition.
- Idem, 1953. *Materials Handling*. New York. McGraw-Hill.
- Idem, 1954. *Vocabulaire technique concernant l'étude du travail*. Paris. Les Editions d'Organisation.
- Idem, 1957. *Work Sampling*. New York. John Wiley and Sons. Second Edition.
- Idem, 1960. *How to Chart Data*. New York. McGraw-Hill.
- Idem, 1961. *Motion and Time Study Applications*. New York. John Wiley and Sons. Fourth Edition.
- Idem, 1966. *Job Evaluation*. Geneva. 1960. *Studies and Reports, New Series, No. 56*. Third Impression.

- Idem, 1969. The Enterprise and Factors Affecting Its Operation. Geneva. 1965. Second Impression.
- Idem, Training Guide: Principles and Application of Value Engineering. United States Department of Commerce. Industrial Management and Productivity
- Idem: 1964. Applications of O. and M. London. Macdonald and Evans for the O. and M. Training Council.
- Ideni, 1951. Work Measurement Manual. Los Angeles. Campbell's Book Store. Fourth Edition.
- Immer, J. R. 1950. Layout Planning Techniques. New York. McGraw-Hill.
- International Labour Office, 1967. Payment by Results. Geneva. 1951. Studies and Reports, New Series, No. 27. Ninth Impression.
- International Labour Office, 1967. Higher Productivity in Manufacturing Industries. Geneva. 1954. Studies and Reports, New Series, No. 38. Third Impression.
- LEHMANN, J. T. 1965. La mesure des temps alloués. Louvain. Librairie universitaire.
- Lowry, S. M., Maynard, H. B. and Stegemerten, G. J. 1940. Time and Motion Study. New York. McGraw-Hill. Third Edition.
- Maclaren, D. A. B. 1964. A Practical Guide to Office Efficiency. Sydney. *Rydge's Business Journal*.
- Mallick, R. W. and Gaudreau, A. T. 1951. Plant Layout Planning and Practice. New York. John Wiley and Sons.
- Maynard, H. B. 1963. (Ed.): Industrial Engineering Handbook. New York. McGraw-Hill. Second Edition.
- Maynard, H. B. and Stegemerten, G. J. 1955. "Universal Maintenance Standards", in *Factory Management and Maintenance*, Nov. 434
- Maynard, H. B., Stegemerten, G. J. and Schwn, 3. L. *Methods-Time Measurement*. New York. McGraw-Hill. 1948.
- MILLS, G. and Standingford, O. 1966. Office Administration. London. Sir Isaac Pitman and Sons.
- Moanow, R. L. 1957. Motion Economy and Work Measurement. New York. Ronald Press Company. Second Edition.
- Mundel, M. B. 1960. Motion and Time Study: Principles and Practice, Englewood Cliffs, NJ. Prentice Hall, Inc. Third Edition. 433
- Muwa1w, G. E. 1967. Organisation and Methods. London. St. Martins. Second Edition.
- Nadler, G. 1955. Motion and Time Study. New York. McGraw-Hill.
- NEALE, F. J. 1967. Primary Standard Data. London. McGraw-Hill.
- Neeraj Kumar Sharma, 2016. "Enhance Productivity Using Method Study in Sugar Industry", *International Journal of Mechanical and Industrial Technology*, Vol. 4, Issue 2, pp: (35-37), Month: October - March 2017.
- Predetermined Motion Time Systems Biel-Nisen, H. E. 1960-61. "Universal Maintenance Standards", in *Journal of Methods-Time Measurement*, Vol. 7, Nos. 4 and 5, Nov.-Feb.
- QuICK, J. H., DUNCAN, H. and Malcolm, 3. A. 1962. Work Factor Time Standards. Measurement of Manual and Mental Work. New York. McGraw-Hill. work study in the office
- Rose, T. G. 1963. Higher Control in Management. London. Sir Isaac Pitman and Sons. Seventh Edition. INCENTIVES
- SHAW, Airne G. 1960. The Purpose and Practice of Motion Study. London. Columbine Press. Second Edition.
- Smith, J. 1965. TEAR: Series of articles on interference published in *Work Study* (formerly *Time and Motion Study*). London. Sewell Publications. June/Oct. 1965. "The Use of Curves Produced by the Wool Industries Research Association", in *Journal of the Textile Institute* (London), Vol. 44, No. 12, Dec. 1963.
- Sylvestbr, L. A. 1950. The Handbook of Advanced Time Motion Study. New York. Funk and Wagnalls.
- The Use of Wright's Adaptation of Fry's Formula", in L. P. ALFORD and J. R. BANGS: *Production Handbook*. New York. Ronald Press. Second Edition, 1964. Section 12.85 to 12.87.
- United Kingdom Treasury, 1962. The Design of Forms in Government Departments. London. Her Majesty's Stationery Office.
- United States Department of Defense, 1963. Value Engineering (Handbook H 111). Superintendent of Documents. U.S. Government Printing Office.
- Valota, 1958. "L'interférence réciproque des machines", in *L'Industrie textile*, July, pp. 519-523.
- Value Analysis MILes, L. D. 1961. Techniques of Value Analysis and Engineering. New York. McGraw-Hill.

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