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## **Section 1. Overview**

### **Overview**

*This publication is intended for students, supervisors and front-line managers. The publication aims to stress the importance of the contribution employees at all levels of an organization can make to improving organizational productivity. It provides both a theoretical and practical framework to the problem of constantly advancing productivity.*

*Furthermore, it gives an overview of the key dynamics mitigating for and against enabling greater employee productivity, with suggestions into how these can be incorporated into a productivity enabling organizational environment.*



# Introduction

the need to constantly improve productivity

Economic forecasters have predicted that the rate of growth over the next ten years will not be greater than 2 per cent per annum and that unemployment will rise. Many are less optimistic and there are even doubts about the availability of nonrenewable resources (e.g. fossil fuels and metals) that would be required to sustain growth, bringing into question the desirability of this as an objective for the long term (the Second Report to the Club of Rome (1975)).

Consumer spending has cushioned us from the true impact of the current recession. Property prices are at an all time high. They have now reached a plateau; they will decline eventually. A spate of record losses incurred by large corporations, notably in the telecommunications sector, financial malfeasances, a general mistrust of corporate reporting, unsuccessful large mergers and takeovers and the gaps in corporate pension funds etc. do not bode well for the future.

In addition, many jobs in the service sector are being lost in the Western economies. Employers in the service sector are now seeking to relocate some or all of their operations to the East and the Indian subcontinent. Crucially, and self evidently, we in the West will be reliant on manufacturing industry and exports and to continue to improve our national prosperity.

Britain led the first industrial revolution, but other countries are now leading the second. What does not augur well is that UK has allowed its industrial base to erode more quickly than other industrial nations, and, in comparison, for example with France, Germany and Japan, there is a far lower proportion of people employed in the manufacturing wealth-creating sector of the economy, so vital to recovery in the short and medium term.

The paucity of investment in industry, both at a firm and a national level, has certainly contributed to this condition. Not only has the volume of investment been less (i.e. fixed capital formation per head, half that of West Germany, France and Sweden, and a third of that of the United States), but the productivity of the new plant (i.e. increase in net output per unit of investment), which represents the *quality* of the investment, has been lower.

In relation to this most important problem we should consider our attitudes to work and management. There has been inefficiency, overstaffing, poor industrial relations (e.g. slow progress to participate) and we have contributed to our problems by paying ourselves too much for too little. In times of plenty this may have been easy to overlook, accept even, but in the recessionary periods it is vital that total and specific resource productivity be reviewed and revised. These are some of the reasons why we enter into difficult economic situations; but how do we get ourselves out?

It is now recognized that if we are to take advantage of the opportunities offered by new technology, we must first live through still more changes, both in our society and industry, whilst at the same time creating the GDP to make our escape to a post-industrialized future possible. As Lord Ezra said at the Manchester Management Lecture on Industrial Policy (1983):

“If we were a business we would immediately start reassessing the situation – we would say in two years’ time our profit is going to disappear – if we were a household and we were facing that situation in two years’ time we would not just sit back and hope something would turn up – we would do something about it.”

The various management services professions, supervisors and indeed front line employees cannot change the situation on their own, but they have parts to play in ensuring that our industries are effective, profitable and as competitive as possible.

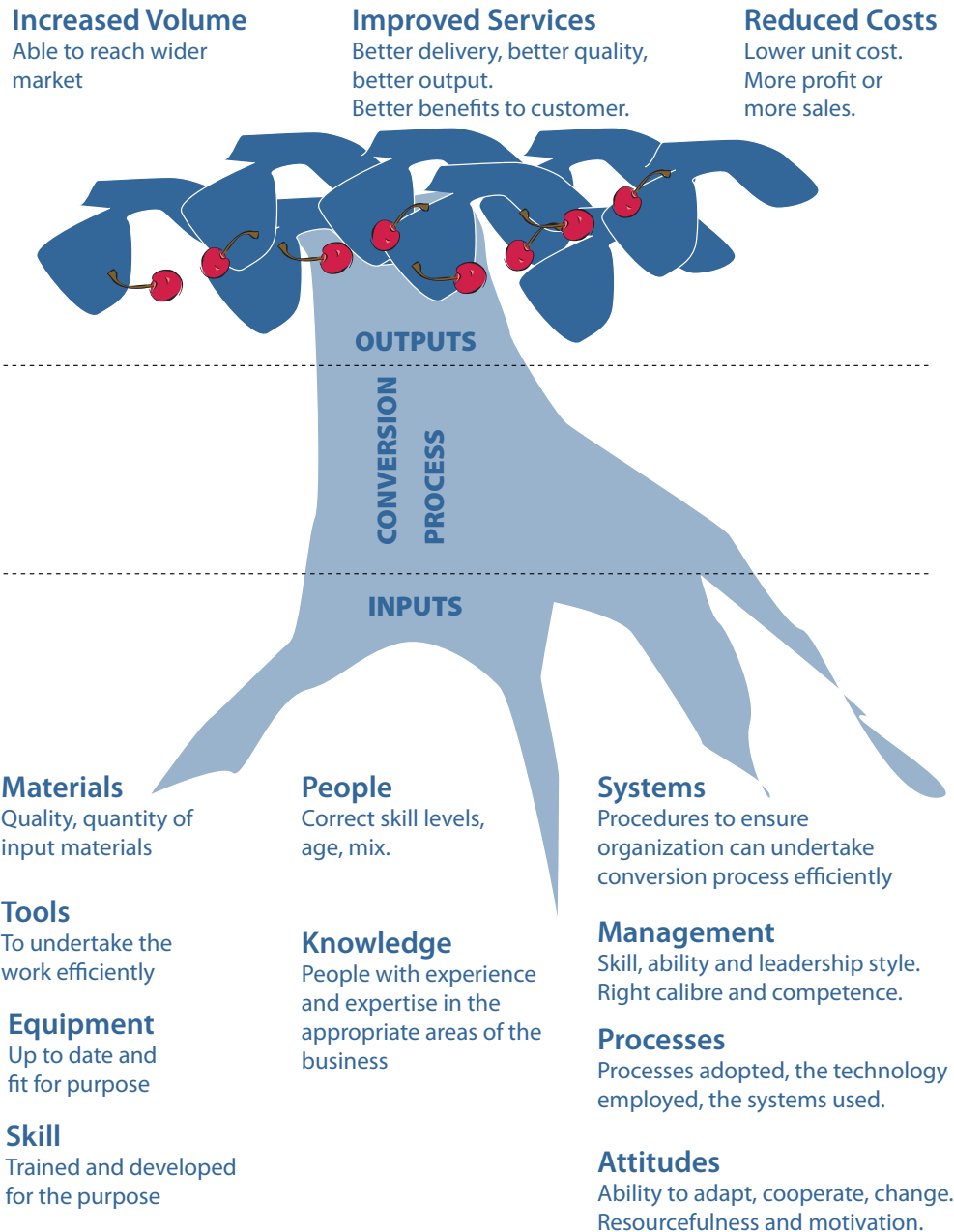
Section 1. aims to point the way forward, by reference to our past. It recognizes that management/ supervision and worker practices and relationships have evolved from the development of large industries at a time of growth and stability. In doing so, there has been a tendency to overlook the broader background and neglect the lessons that could be learned from other professions, disciplines and cultures.

## What is Productivity?

A simple way of looking at productivity in a business organization is to think of it in terms of the productivity model below. Essentially, productivity is a ratio to measure how well an

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## Productivity Conceptual Model



organization (or individual, industry, country) converts input resources (labor, materials, machines etc.) into goods and services. This is usually expressed in ratios of inputs to outputs. That is (input) cost per (output) good / service. It is not on its own a measure of how efficient the conversion process is.

The Productivity Conceptual Model, takes the form of a 'productivity tree'. The roots denote the inputs to the system, the trunk the conversion process and the foliage and fruits the systems outputs.

The successful management of this process, is ultimately the key to survival of any organization. It should be the concern of, and a development goal for, all organizational members, irrespective of their position.

### Who is responsible for productivity?

It is generally regarded that productivity management and engineering, is the responsibility of management specialists, industrial engineers, work study engineers, consultants and senior management to develop improved methods. Middle management and supervisors being

responsible for the maintenance. We would argue that productivity is the responsibility of all within an organization. It makes good business management sense after all, to have everyone pulling in the same direction.

#### How productivity is improved

Using our productivity model, improvements can be realized by:

- achieving more output for the same input
- achieving the same output from less input
- achieving much more output for slightly more input
- getting slightly less output for much less input

There are six lines of attack to improve the productivity ratio of an organization, namely:

- Improve basic process by research and development (long term)
- Improve and provide new plant, equipment, and machinery (long term)
- Simplify product and reduce variety (medium term)
- Improve existing methods and procedures (short term)
- Improve the planning of work and the use of manpower (short term)
- Increase the overall effectiveness of employees (short term)

The focus of this publication are the short term lines of attack. The areas that most, if not all, employees can contribute to, in a measurable way. That is, if employees are properly motivated, coached, receive the right information at the right time, use simple productivity improvement tools and techniques and are rewarded in an appropriate way.

#### What's productivity got to do with me and my job?

Work for a profit or nonprofit organization in the public or private sector? Own your company that employs people? Then you cannot afford to ignore the concept of productivity. If you have worked for any length of time, productivity, or the lack of it, will have affected you in some way at some time. Lost your job or seen valued colleagues, friends and family members join the ranks of the unemployed?

All these are symptomatic of poor productivity at one level or another. It's a safe bet to assume that the majority of downsized / restructured organizations could have been (in hindsight) avoided, or the devastating effects of those affected been minimized, if a culture of productivity improvement had been installed, at an earlier time.

This paper is aimed at those who wish to use foresight and improve their own security and that of their organization. The productivity improving resources made available here and being developed, will contribute to improving productivity in any organization.



# Historical Perspectives

on the development of management, work, attitudes, motivation and the search for productivity improvement

## Developments from Ancient History

It can be deduced, that from earliest recorded times groups of people have been organized to work together towards planned goals. Their efforts coordinated and controlled to achieve such outcomes. Though the term scientific management did not come into being well into the Industrial Revolution (the latter half of the 19th century,) it's history is, on reflection, much longer than the term itself.

Consider the management skills required, by the ancient Egyptians to build their pyramids, by the ancient Chinese to build the Great Wall of China, the management skills of the Mesopotamians to irrigate their land and wall their cities, of the Romans when building their roads, aqueducts and Hadrian's Wall.

All these man-made constructions required large amounts of human effort and therefore organization i.e. planning, control and coordination.

The Great Pyramid for example is 75600 square feet at it's base, 480 feet high, and contains over 2 million blocks of stone, each weighing 2.5 tons. The base of the structure is only 7 inches from being a perfect square. All this with no computer, electronic calculator, modern materials handling equipment or advanced mathematical techniques/ models.

### Earlier contributors to management thinking

The Chinese philosopher Mencius (372–289BC) dealt with conceptual models and systems familiar now under the term of production management techniques. He indicated the advantages of the division of labor.

Records indicate that the ancient Greeks understood the advantages of, and practiced, uniform work methods. Their soldiers were instructed as to how their weapons and equipment should be laid out in case of a surprise attack. They also employed work songs to develop a rhythm, in order to achieve a smooth less fatiguing tempo, to improve productivity.

The division of labor was recognized by Plato (427–347BC). He wrote in *The Republic*, 'A man whose work is confined to such limited task must necessarily excel at it'

### Early attitudes to work

However, work itself was viewed by certainly the ancient Greeks and the Romans, as demeaning. Something to be avoided as it got in the way of more ideal pursuits, such as the arts, philosophy and military adventure. Therefore those who could afford to do so employed slaves.

### After the Fall of the Roman Empire

With the fall of the Roman Empire, development was curtailed; slavery being replaced by feudalism. In pre-Reformation Christian Europe work was also seen as a burden. A punishment for the sins of Adam and Eve, for which reward would be found in the hereafter.

In this period, the mechanical clock, invented by Heinrich von Wych in Paris in 1370, and Guttenberg's printing press were key to all future developments in scientific management.

The former permitted accurate work measurement the latter the ability to communicate by the printed word. Indeed Guttenberg's inspired creative thinking can be viewed as an early example of method study.

The story goes that Guttenberg, whilst at a wine festival, realized he could apply the technique of using dies for coin-punching with the mechanics of a wine press, to produce a printed page, made up of individual letters instead of from a single engraved block.

In 1436 a Spanish visitor to the Arsenal of Venice reported:

*"And as one enters the gate there is a great street on either hand with the sea in the middle, and on one side are windows opening out of the house of the arsenal, and the same on the other side, and out came a galley towed by a boat, and from the windows they handed out to them, from one the cardage, from another the ballistics and mortars, and so from all sides everything which was required, and when the galley had reached the end of the street all the men required were on board, together with the complement of oars, and she was equipped from end to end. In this manner there came out ten galleys, fully armed, between the hours of three and nine."*

The Spanish visitor had witnessed a production line, around 500 years before Henry Ford. The

Arsenal of Venice also used standardized parts. The bows of the warships had to accommodate all types of arrows, stern parts to accommodate all types of rudders and rigging. The deck parts had to be interchangeable. This was also an earlier form of *waste control*. Wrecked vessels could be cannibalized.

This productivity improving method of manufacturing of galleys presupposes some sort of work measurement and method study prior to the establishment of the facility. Plus, the desire to improve productivity in line with a real need to do so i.e. reduce costs, competition, protect, maintain or improve competitiveness etc.

Fifteenth century monks recorded the overall times for the construction of monastery stonework. Such records suggest an attempt, even in those early times, to establish standards of quality, time and output.

#### Glorification of Work

With the Reformation the Protestant 'work ethic' emerged based on Luther's glorification of work theory. Calvinism brought further consolidation to this principle and with it the virtues of thrift, frugality and the honorable acquisition of wealth. Work was viewed in society as respectable and idleness as deplorable.

From the forgoing it can be deduced though the term scientific management has been coined fairly recently, the search for and the application of scientific management principles has been around a lot longer.

## Developments during the Industrial Revolution

The impetus for the industrial revolution developed by the seventeenth century. Agricultural methods had improved in Europe to the extent that surpluses were generated. These surpluses were used for trade. Trade routes were by this time expanding, on a global scale, including those to the East and the Americas to the West.

Technical advances were being made, most importantly in textile manufacturing, notably in the eighteenth century, Hargreaves's spinning jenny, Arkwright's water frame and Compton's mule. The steam engine first developed in 1698 by Thomas Savory, was harnessed by James Watt. Improved hygiene and diet led increased life expectancy and thus expanding populations.

These factors, technological developments, expanding trade/ markets, growing populations created opportunities for merchants and entre-

preneurs to invest in new factories. This was the beginning of the Industrial Revolution. With it came the need to improve *work methods, quality, and productivity*.

#### The Factory System

Adam Smith, in the eighteenth century advocated making work efficient by means of *specialization*. He advocated breaking the work down into simple tasks. He saw three advantages of the division of labor;

- the development of skills
- the saving of time
- the possibility of using specialized tools.

Following on rapidly from Smith changes in the process of manufacturing developed.

In the USA, after the War of Independence, there was a shortage of musket parts in the United States. Eli Whitney proposed the manufacturing of muskets by means of using interchangeable parts. Though the idea was viewed with initial skepticism, his process was successful in producing large quantities of interchangeable parts. Thus was born the process of tooling up for production. At this time Whitney developed and used techniques such as cost accounting and quality control.

Records from the Soho Bell Foundry in Chelsea, around the same time as Whitney, reveal evidence of the use of production standards, cost control, work study and incentives.

In 1832, Charles Babbage, an engineer, philosopher and researcher, examined the division of labor in his book *On the Economy of Machinery and Manufacturers*. His work raised important questions about production, organizations and economics.

#### Division of Labor

One factor, crucial in the latter development of incentives, Babbage proposed, as an advantage of the division of labor, that the amount of skill needed to undertake a specialized task was only the skill necessary to complete that task. He illustrated this concept by breaking down the manufacture of a pin, into seven elements.

The important implication for employers was that they need only pay for the amount of skill necessary to complete each individual task. He advocated breaking down jobs into elements and costing each element. In this way, potential savings from investments in training, process and methods could be quantified.

Thus these developments presaged the machine age, replacing traditional manual labor and improving productivity.

- Machines were located near sources of power, first water later coal for steam.

### Summary of the key innovations.

Date	Innovation	Originator	Purpose
1370	Mechanical clock	Heinrich von Wych	Exact measurement of time
1430	Standardised parts and assembly line techniques	The arsenal of Venice	Interchangeability and speed of outfitting
1760	Time and motion economy (study of pin manufacture)	J. R. Perronet	To establish standard times for operations
1776	The economic advantages of the division of labor	Adam Smith	Breaking down jobs into smaller units to improve efficiency
1698	Steam engine	Thomas Savery	Draining mines
1764	The spinning jenny	Hargreaves	Mechanised spinning
1769	The water frame	Arkwright	Mechanised spinning
1779	Mule	Crompton	Mechanised spinning
1779	Steam engine	James Watt	Harnessing steam power
1785	The powered loom	Cartwright	The combination of steam with machinery
1798	Interchangeable parts	Eli Whitney	To speed up manufacture (of muskets)
1832	Time study, division of labor and their implication on payment	C. Babbage	To reduce the labour cost element in manufacture
1911	Work design, time study and incentives	F. W. Taylor	To bring scientific principles to the management and organization of work
1911	Motion economy and the use of the camera	Frank and Lillian Gilbreth	Systematic analysis of methods and their improvement
1913	The assembly line	Henry Ford	Automation of car manufacture
1914	The Gantt chart	H. Gantt	A visual display chart based on time used for scheduling
1920	Rating concept	Charles Bedaux	Enabled basic time data to be 'normalized'.
1917	Introduction of mathematics into stock control	F. W. Harris	Enabled graphical description of stock control models to be put into mathematical models
1920s	Study of human motivation and fatigue in Britain	British Industrial Fatigue Research Board	Highlighted human problems at work
1930s	Study of human motivation in the USA and the beginning of the 'Human Relations Movement'	Elton Mayo	Recognition of the importance of formal and informal groups at work
1931	Introduction of mathematics into quality control	W. A. Shewhart	Statistical quality control
1940	Operational Research	P.M.S. Blackett	To bring together multi-disciplinary teams to solve complex problems
1947	Linear programming	G. B. Dantzig	Resource optimization in problems allocation and scheduling
1947	The first electronic computer ENIAC	University of Pennsylvania	To help solve complex problems
1950s	Introduction of behavioral psychology and sociology to the understanding of behavior at work	Various	The application of industrial science into management
1950s through to date	New developments in technology and their application into business		

- Large concentrations of machines were gathered in one place under one roof in the factories.
- Large numbers of people came together to work these machines and in the distribution of the outputs from the factories.

*“The old fashioned dictator does not exist under Scientific Management. The man at the head of the business under Scientific Management is governed by rules and laws which have been developed through hundreds of experiments just as much as the workman is, and the standards devel-*

Thus the management functions of *control, planning* and *coordination* were required to be studied in order to further improve productivity.

Probably the first attempt at formally timing work was in 1760 when a Frenchman, Jean Radolphe Perronet, studied the manufacture of pins and attempted to establish *standard times* for various operations.

Documents have been found relating to the Old Derby China works for the year 1792 in which a Mr. Thomas Mason pledged himself to undertake *time studies* in the factory and to undertake his work conscientiously and diligently.

At the turn of the century the problems of *layout* and *method* were studied by Robert Owen. Owen’s work at the New Lanark Mills was revolutionary at the time. Through experimentation, he succeeded in raising the living conditions of his workers whilst reorganizing his mills on commercial principles. Robert Owen is credited with being the first to recognize *fatigue* and the work *environment* as factors affecting the performance of factory workers.

## Scientific Management

### Frederick Winslow Taylor

By far the most influential person of the time and someone who has had an impact on management service practice as well as on management thought up to the present day, was F. W. Taylor. Taylor formalized the principles of scientific management, and the fact-finding approach put forward and largely adopted was a replacement for what had been the old rule of thumb.

He also developed a theory of organizations which altered the personalized autocracy which had only been tempered by varying degrees of benevolence, such as in the Quaker family businesses of Cadbury’s and Clark’s.

Taylor was not the originator of many of his ideas, but was a pragmatist with the ability to synthesize the work of others and promote them effectively to a ready and eager audience of industrial managers who were striving to find new or improved ways to increase performance.

At the time of Taylor’s work, a typical manager would have very little contact with the

activities of the factory. Generally, a foreman would be given the total responsibility for producing goods demanded by the salesman. Under these conditions workmen used what tools they had or could get and adopted methods that suited their own style of work.

### F.W. Taylor’s contributions to scientific management

By 1881 Taylor had published a paper that turned the cutting of metal into a science. Later he turned his attention to shoveling coal. By experimenting with different designs of shovel for use with different material (from ‘rice’ coal to ore) he was able to design shovels that would permit the worker to shovel for the whole day.

In so doing, he reduced the number of people shoveling at the Bethlehem Steel Works from 500 to 140. This work, and his studies on the handling of pig iron, greatly contributed to the analysis of work design and gave rise to *method study*.

To follow, in 1895, were papers on incentive schemes. A piece rate system on production management in shop management, and later, in 1909, he published the book for which he is best known, *Principles of Scientific Management*.

A feature of Taylor’s work was stopwatch timing as the basis of observations. However, unlike the early activities of Perronet and others, he started to break the timings down into elements and it was he who coined the term ‘time study’.

Taylor’s uncompromising attitude in developing and installing his ideas caused him much criticism. Scientific method, he advocated, could be applied to all problems and applied just as much to managers as workers. In his own words he explained:

“The old fashioned dictator does not exist under Scientific Management. The man at the head of the business under Scientific Management is governed by rules and laws which have been developed through hundreds of experiments just as much as the workman is, and the standards developed are equitable.”

### Objectives of Scientific Management

The four objectives of management under scientific management were as follows:

- The development of a science for each element of a man’s work to replace the old rule-of-thumb methods.
- The scientific selection, training and development of workers instead of allowing them to choose their own tasks and train themselves as best they could.
- The development of a spirit of hearty coop-

eration between workers and management to ensure that work would be carried out in accordance with scientifically devised procedures.

- The division of work between workers and the management in almost equal shares, each group taking over the work for which it is best fitted instead of the former condition in which responsibility largely rested with the workers. Self-evident in this philosophy are organizations arranged in a hierarchy, systems of abstract rules and impersonal relationships between staff.

#### F.W. Taylor's contribution to organizational theory

This required an organization theory similar for all practical purposes to that advocated by those organizational theorists who followed. These theorists developed principles of management that included much of Taylor's philosophy

His framework for organization was:

- clear delineation of authority
- responsibility
- separation of planning from operations
- incentive schemes for workers
- management by exception
- task specialization

#### Some problems

However, there were problems—Taylor's papers were not always well received, as many of his ideas were associated with bad practice, such as rate-cutting by unscrupulous managers.

In 1911 and 1912 a special committee of the US House of Representatives questioned Taylor at length. As a result laws were passed banning the use of stopwatches by civil servants and it was only in 1949 that this restriction was lifted.

Taylor's view of the motivations of workers has had a profound influence throughout the century until the present day. His belief that man was rational and would make economic choices based on the degree of monetary reward led him to devise payment systems that closely related the kind of effort he sought with the level of reward offered. Not surprisingly, there was strong criticism of this theory that treats human beings like machines and assumes that workers are satisfied by money alone.

#### Underlying assumptions

His views on motivation, management and organization all presupposed certain conditions to be constant, which we now know, they are not. The assumptions underlying his work were:

- the presence of a capitalist system and a money economy, where companies in a free market have as their main objective the improvement of efficiency and the maxi-

mization of profit;

- the Protestant work ethic, that assumes people will work hard and behave rationally to maximize their own income, putting the perceived requirements of their organization before their own personal objectives and goals.
- that an increased size is desirable in order to obtain the advantages of the division of labor and specialization of tasks.

Taylor's impact has been so great because he developed a concept of work design, work measurement, production control and other functions, that completely changed the nature of industry. Before scientific management, such departments as work study, personnel, maintenance and quality control did not exist. What was more his methods proved to be very successful.

#### Frank and Lillian Gilbreth

Frank and Lillian Gilbreth were associates of Frederick Winslow Taylor. The Gilbreths, unlike Taylor, had experience in unionized industry that presumably limited their enthusiasm for timing jobs.

In Frank Gilbreth's early career he was interested in standardization and method study. Noticing, in the bricklaying, at construction sites where he worked, that no two bricklayers used exactly the same method or even the same set of motions when working fast as opposed to slow, he set about trying to find an improved method. The result was that he was able to raise output from 1000 to 2700 bricks per day. From their various studies the Gilbreths developed the laws of *human motion* from which evolved the principles of *motion economy*.

It was they who coined the term 'motion study' to cover their field of research and as a way of distinguishing it from those involved in 'time study'; it is a technique which they believed should always precede method study. This still holds true today.

The use of the camera in motion study stems from this time and the Gilbreths used micro-motion study in order to record and examine detailed short-cycled movements as well as inventing cyclographs and chronocycle graphs to observe rhythm and movement.

#### 'Cheaper by the Dozen'

Frank and Lillian Gilbreth carried their work to extremes and their family of twelve exemplifies their treatise 'Cheaper by the Dozen'. This was also made into a Hollywood movie. This incorporation of their work into family life is now legendary.

*'Factory managers are going to someday realize that workers are not governed primarily by economic motives'. –Elton Mayo)*

*The mistake that was made by managers was the replacement of the traditional theory with that of the human relations school as if one was a perfect substitute for the other, when in fact they were part of the same continuum.*

### Henry Gantt

The third well-known pioneer in the early days of scientific management was Henry Gantt. Gantt worked for Frederick Winslow Taylor in the USA and is to be remembered for his humanizing influence on management, emphasizing the conditions that have favorable psychological effects on the worker.

### Gantt Chart

The Gantt chart for which he will also be remembered, is a visual display chart used for scheduling that is based on time, rather than quantity, volume or weight.

From the doctrines of Taylor and the Gilbreths, there followed rapid developments in machinery and technology and with the improvement of materials came the moving assembly line.

### The Production Assembly Line

Towards the end of the nineteenth century the internal combustion engine was invented, leading to the development of the motor car. There was a move towards streamlining production, and the first assembly line method of manufacture can probably be attributed to the mail order factory of Sears and Roebuck of America.

More famous was, of course, Henry Ford. His car factory in the United States is the best example of the change to modern assembly-line techniques. Before the 'line' was set up, one man, taking a time of about twelve and a half hours, assembled each car chassis.

Eight months later with standardization and division of labor the total labor time had been reduced to just ninety-three minutes per car. (It is interesting to note that the idea of assembly line came to him when he was watching a moving conveyor of carcasses in a Chicago slaughterhouse. A similar creative innovation to Gutenberg's conception of the printing press.)

### Charles Bedaux

Another pioneering contributor to the field of scientific management was Charles Bedaux. Although not embarking on his career until after Taylor's death, he was to have widespread influence, firstly in the USA and later in Europe. Many major European companies were his clients, although many who experienced his work had unscrupulous managers who brought his name into disrepute.

Bedaux introduced the concept of rating assessment in timing work. He adhered to Gilbreth's introduction of a rest allowance to allow recovery from fatigue. Although crude and poorly received at first, his system has been of great consequence to the subsequent devel-

opment of work study. He is also known for extending the range of techniques employed in work study which included value analysis.

## Development of scientific management since the Second World War

The Second World War, like the first, played a large part in speeding up the rate of output, for which work study principles were particularly useful, as well as in rapid development of new technologies, such as electronics and nuclear physics.

During the period before the wars, development had been much slower. Unfortunately for the practitioners and advocates of scientific managements, its introduction coincided with the depression, which led workers to believe that there was a causal link between productivity improvement and further unemployment. Also at this time technical knowledge was lacking and tools and materials were not always readily available, thus impeding progress.

Output per man or machine was calculated in terms of direct relationships and this led to problems in forecasting production variables. It was not until statistical methods were developed that concepts such as probability were applied to forecasting, which in consequence became more reliable.

The introduction of mathematics to business did much to simplify the analysis of problems. Mathematics was applied successfully to project control, strategic planning and decision analysis. F. W. Harris converted graphical descriptions of stock control models into mathematical models. In the same year, 1931, books were written on inventory control (F. E. Raymond) and statistical quality control (W. A. Shewhart of Bell Telephone Laboratories).

Once the initial hostility that had impeded the progress of scientific management had dissipated, a number of texts appeared which tidied up and reinforced much of the work of the early pioneers. In 1934 Tippett who also set standards for operational delays introduced work-sampling theory. From these beginnings statistical quality control concepts developed rapidly.

The Second World War, with its complex problems of logistics, control and weapons system design, created the climate for the development of an interdisciplinary concept now called 'operational research'. During the war OR was started by Professor P.M.S. Blackett of

Manchester University. As director of Naval Operational Research, his first task was to study the problems of the detection of ships and submarines by airborne radar.

Operational research groups were attached to all three armed services and quickly became involved in a range of assignments, from establishing the correct explosion depth for RAF Coastal Command's depth charges to considering the relative merits of large versus small convoys. The rationale was to bring together in a group or team, specialists from mathematics, psychology, business and economics, to tackle particular problems, thus removing some responsibility in complex decisions from the existing management at the time. After the war this work became incorporated into the portfolio of management services and development continued.

In 1947 the introduction by G. B. Dantzig of linear programming for practical application provided management with a basic tool capable of handling many of the large-scale and often complex problems of scheduling and allocating limited resources to a production system. The development of the computer has enabled larger models to be handled than would have been possible manually. In some organizations the work of systems analysis and design, especially since the advent of the microcomputer, has been incorporated into or done in conjunction with more general management services work.

As organizations become larger and more complex, there is a realization that opportunities for productivity improvements come as much from management and clerical workers as from the direct workers who traditionally enjoyed the focus of attention when productivity improvements were to be made. Work study in this area is described as organization and methods.

The computer has now become an invaluable tool, not simply to deal with the tedious repetitive calculations, but also to simulate systems, forecast changes and predict results.

Today, management services has become a multi-disciplined concept, which reflects development and economic growth of Western nations. The departments and functions encompassed include:

- (a) work study / organization & methods / industrial engineering;
- (b) operational research;
- (c) materials handling
- (d) production planning and control;
- (e) personnel / HRM;
- (f) training;

- (g) quality;
- (h) cost accounting and finance;
- (i) wages and salaries;
- (j) safety;
- (k) technical and design;
- (l) industrial relations.

## *The impact of the social sciences on scientific management approaches*

So far mention has been made only of developments relating to production, management, organization technology and science. No mention has been made of the impact of these developments on people and the way in which they react and are likely to react in the future.

The social sciences can now offer explanations in the behavioral field that could be valuable but have so far been largely ignored by management services practitioners. In some countries, for example, Sweden, job design has been approached taking into account the human attitude and there has been no loss of performance.

As long ago as the 1920s there was opposition to the scientific management principles and discretion was removed from individuals as a way of centralizing control and authority into specialized functions. On occasions this was clearly in the best interests of the workforce but often it was not. Benefits went disproportionately to the company and the individuals' experience of work was dehumanizing as they were treated as extensions to the machines.

It was soon realized that there were many things which scientific management had not taken into account, for example, the importance and influence of formal and informal groups at work. Many internal divisions exist in organizations as they grow and these militate against the attainment of a goal or objective.

Prior to 1940 the predominant theory about employee motivation was the classical management approach. Until this time the focus of attention had been almost exclusively on the jobs which individuals performed and how they could be improved. Incentive schemes were advocated and devised that related reward closely with the kind of effort required. Failure to achieve expected results was deemed to be a fault of the method or the training of the individual.

In the 1920s the British Industrial Fatigue

*The mistake that was made by managers was the replacement of the traditional theory with that of the human relations school as if one was a perfect substitute for the other, when in fact they were part of the same continuum.*

*When faced with the evidence, it becomes clear that no single panacea exists for problems relating to productivity improvement and the answers, as advocated by the contingency theorists, are situational and dependent on the unique circumstances*

*‘not only does much of the reputed “best practice” rest on “special case” models and, hence, may be inappropriate to those organizational circumstances that do not directly correspond to them, but “best practice” tends to ignore the constraints arising from the political realities of organizational behavior that circumscribe any manager’s freedom and ability to pursue a given course of action.’*

Research Board studied the complex issues involved in considering productivity and motivation that were just not being recognized or understood. Later in America, Mayo and his Harvard colleagues examined fatigue in their search for a rational explanation to differences in performance at a Philadelphia textile mill. These studies showed that motivation was outside the boundaries of the systematic and logical and rational model of Taylor.

What was found and has been substantiated many times since, is that people have;

- multiple needs,
  - feelings and
  - personal goals
- that are not always consistent with the
- good job design,
  - exact standards and
  - performance measures obtained from traditional techniques and approach.

During the course of Mayo’s studies, which were to last ten years, he managed to switch the focus of attention away from the individual and physical considerations to the importance of groups at work requiring sociological and psychological consideration. Much of Mayo’s research is often forgotten as the fact that performance increased under observation is popularized but still of significance to management are his findings that:

- (a) workers thought and acted not as individuals but as a group;
- (b) workers would sacrifice their self-interest in the face of group pressure;
- (c) money is not the sole motivator. (This prompted Mayo to comment: ‘Factory managers are going to someday realize that workers are not governed primarily by economic motives.’)
- (d) supervisors have significant influence on output.

His recommendations reflected these findings and were that:

- (a) managers must not ignore the informal organization but ensure its norms are in harmony with organizational goals;
- (b) man is basically motivated by social needs, not economic ones;
- (c) work is rationalized by employees and meanings are sought in social relationships at work;
- (d) in order to influence the behavior of individuals managers must focus on the work group rather than individuals;
- (e) effective supervisors are those who satisfy subordinates’ social needs.

Mayo’s work is now part of management folklore and it has made some managers reject the views of the traditionalists and turn instead to ‘human relations’ management as the answer to ‘How do I motivate employees to work hard?’ Which theory management chose was largely dependent upon beliefs about human nature, later categorized by Douglas McGregor into theories X and Y.

The mistake that was made by managers was the replacement of the traditional theory with that of the human relations school as if one was a perfect substitute for the other, when in fact they were part of the same continuum.

Modern concepts, of which human relations was one, are not completely unrelated to scientific management and classical organization theory, but are evolved from earlier views and represent modifications based on research and experience.

It was not long before the human relations school, recognizing the importance of individual motives and the interaction of groups in organizations, highlighted areas neglected by traditional managers. They rapidly developed into a movement, and like the scientific managers before them, fell into the trap of being descriptive and prescriptive. Their three main areas of managerial activity were:

1. To encourage employees to be more participative.
2. To implement job enlargement and job enrichment in order to give wider discretion to employees.
3. To improve communications between employees and their managers.

However, it was soon considered that the movement’s analysis lacked rigor and considerably oversimplified the complexity of human behavior. The assumptions about individual motives were simple and sterile, with money remaining as an important work-related incentive for employees and conflict treated as an evil to be removed in all circumstances.

It was to counter these weaknesses that the behavioral science approach was adopted. Although at first reaching similar conclusions to the human relations movement, findings were based on research by industrial psychologists who concentrated on motivation of individuals and industrial sociologists who looked at the behavior of formal and informal groups at work.

The period between 1951 and 1971 was the era of rapid growth in management. Managerial employment grew seven times and professional

*‘so much of excellence in performance has to do with people being motivated by compelling, simple – even beautiful values.’*

appointments increased eleven times as fast as overall employment. Some managers moderated their 'logical' approach to such things as job design and considered such alternatives as participation, job-redesign, job enlargement and job enrichment. At the same time management theorists and social scientists expanded the work of Taylor and others in the scientific management school or developed, researched and published work based on social science findings. Precious little cross-fertilization appeared between the same covers.

Legendary in the field of behavioral research that utilizes applied psychology to explore motivation are Maslow, Herzberg, Vroom and Lawler, whilst in the areas of leadership that combines the behavioral science approaches of psychology and sociology are writers such as Blake and Likert.

By the mid-1960s and 70s in Britain there was much confusion as to which theory to follow and much conflicting evidence from researchers. Where motivation was concerned, Goldthorpe (1969), for example, was to find that some employees, although they disliked the work which involved repetitive tasks in their Coventry car assembly plant, would put up with them for the money rather than move to more interesting jobs and lower wages in plants nearby.

Experiments at Philips at Eindhoven showed that although output initially rose after enlarging the jobs in radio assembly, workers were unhappy with their new jobs and responsibilities and many left. White (1973) also found that the motivation of managers to work depended very much on two factors – the type of job that was being performed and the age of the jobholder.

These findings show the limitations of approaches such as those proposed by Herzberg and others that advocate a single 'best way' and draw attention to the danger of viewing behavioral science as a provider of packaged solutions.

Proponents of each approach can blame the ineptness of the application for the failures encountered in implementation. This is a standpoint that many managers still hold today, and it is a difficult claim to refute, especially when talking to people who have built their careers on their respective approaches to management problems and become specialists.

When faced with the evidence, it becomes clear that no single panacea exists for problems relating to productivity improvement and the

answers, as advocated by the contingency theorists, are situational and dependent on the unique circumstances existing at the time.

Much recent work has gone into diagnosing work situations in order to determine what 'contingent variables' there might be in order to make predictions on 'best fit' or solutions that will have a better chance of success. Considerable work has now taken place along these lines in the fields of management style, leadership, job design, organizational structure, payment systems, industrial relations and motivation.

### *The present role of management services and the wider perspective*

The economic situation today is one of increasing uncertainty and ambiguity. The rapid growth in national prosperity, that took place during the 1990s is now firmly behind us. The ground rules, that may have applied then, no longer apply. Foreign competition has grown and technological change has changed our social fabric in ways that will require a quite different response from that which has gone before. The working environment is changing and will continue to do so; there are many different prognoses for how these effects of post-industrialization will affect our working lives and society generally.

Organizations often seek quick results and this has led in the past to an overreliance on work measurement, especially as a means of raising labor performance through incentive schemes, rather than by a concentration of effort on method improvements. Not only has this practice antagonized workers, leading them to believe that work measurement is meant to control earnings, but it shows a misdirection of resources and a fundamental error of emphasis.

Management findings, highlighting the degree to which worker participation can improve performance, have been glossed over and much evidence points to the fact that incentive schemes do not always lead to higher productivity in quantifiable terms (Bowey et al. (1982)).

Work measurement is essentially about keeping things going in a steady state in contrast to method study, which is applicable, when circumstances are more fluid. Method study is about innovation and change, where the quantifiable payback is uncertain, but the attraction of work measurement is that it provides relatively quick, measurable results often preferred by managers to the less tangible results of method study.

Further, it has been argued by Parris (1979)

that the credibility of practitioners to undertake methods investigations suffers when all they do is work measurement. Method study requires an innovative problem-solving approach which contrasts the mechanical procedures associated with work measurement.

Past failure to respond to the challenge has been the focus of much criticism of the profession. Criticism of professional institutions is not confined to the management services profession. For instance Karen Legge (1978) writing about personnel management may have come close to problems experienced in other branches of management services. She explains how in personnel management, 'not only does much of the reputed "best practice" rest on "special case" models and, hence, may be inappropriate to those organizational circumstances that do not directly correspond to them, but "best practice" tends to ignore the constraints arising from the political realities of organizational behavior that circumscribe any manager's freedom and ability to pursue a given course of action.'

She goes further by concluding that not only may personnel managers' traditional lack of power and influence in this area hinder the establishment of even such recognized "best practice" as would suit organizational circumstances and requirements, but that this lack of authority may be further exacerbated by attempts to implement irrelevant or inappropriate "best practice".

One argument advanced for the decline of manufacturing industry is that we are currently training managers and practitioners to tackle immediate problems without insisting that at the same time they should take a longer view. In so doing, opportunities are neglected.

Peters and Waterman (1982) conclude that there is now a widely held view that the MBA degree and the way we train managers in the West, might be part of the current problem. Minzberg (1982) is critical of the emphasis on efficiency in business education. He states that 'because it is the costs that are more easily measured than the benefits, efficiency all too often reduces the economy'.

Tom Glyn-Jones, training manager of BP, would like to see the training of managers as part of the responsibility of the companies to which they belong. Peters and Waterman (1982) note that 'business students lack arts literacy ... need broader vision, a sense of history, perspectives from literature and art'. Robert Pirsig (1974) laments that 'so much of excel-

lence in performance has to do with people being motivated by compelling, simple – even beautiful values'.

What would all this give a manager? One answer might be that it is from this knowledge that creativity stems. Austin (1978) in Chase, Chance and Creativity identified four factors that assist creativity, –Factor 1 is a chance occurrence and cannot be prepared for, but factors 2, 3 and 4 show how a broad education and wide outlook help to develop a creative mind and stimulate innovations.

1. It just happens (blindness).
2. Favors those in motion (curiosity).
3. Favors the prepared mind (personality).
4. Favors the individualized action (the unique intellectual history of the individual).

What is required is an increased willingness for practitioners to question assumptions and take initiatives that will lead to change and improvement based on as broad a knowledge base as possible.

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