**THE SCIENTIFIC MANAGEMENT THEORY**

Scientific Management is defined as the use of the scientific method to define the "one best way" for a job to be done. Frederick Winslow Taylor is popularly identified as the father of Scientific Management among other contributors. In 1878, an intense young man who had been forced to drop out of college because of illness (bad eye sight) went to work for the Midvale Steel works in Philadelphia as a common labourer. This was how Frederick W. Taylor launched his fascinating career as pioneer in the development of scientific management. Advancing from labourer through a series of jobs at the factory, Taylor became the chief engineer of Midvale by 1889.

**The Evolution of Scientific Management**

In his various jobs at Midvale Steel Works, Frederick Winslow Taylor observed what he considered to be shortcomings of factory operations. He saw, for example, that management had no clear concept of worker management responsibilities; that virtually no effective work standards were applied; that no incentive was used to improve labourers‘ performance; that systematic soldering existed on every hand; that managerial decisions were based on guess, intuition, past experience, or rule of thumb evaluation; that virtually no overall studies were made to incorporate a total flow concept of work among departments; that workers were incompetently placed at tasks for which they had little or no ability or aptitude, and finally that management apparently disregarded the obvious truth that excellence in performance and operation would mean a reward to both management and labour.

Taylor has been portrayed as a cold, calculating individual whose only interest in workers was to obtain more production from them through various clever schemes. It is true that he was interested in increasing production and efficiency, but he also displayed remarkable insight into the behaviour of workers.

For example, Taylor observed that workers at Midvale engaged in systematic soldering that is, pretending to work or loafing. He pointed out a reason for this behaviour in the principles of scientific management that workers who soldered often were not acting out of innate laziness. Rather they were reacting to management actions. If management for example cut a piece rate when management felt that the workers were beginning to make too much money, the workers would react by vowing never to overextendthemselves again. Hence there would be soldering for there was no motivation for hard labour**.**

Taylor‘s work with a gang of shovelers at the Bethlehem Steel workers illustrates his approach. He observed that the men worked hard and that there was no loafing. He also observed that they shoveled different kinds of materials throughout the day, from very light to very heavy materials such as iron ore. And they used the same kind of shovel all the time, even though their shovel loads varied from four pounds to thirty eight pounds.

Taylor hypothesized that there must be an ideal load for a shovel that would maximize production and minimize fatigue. He began to experiment by selecting two of the best workers and varying the loads on their shovel as they worked away at various intervals. He kept track of many possibly significant items relating to the work, but his most important finding was that the greatest productivity occurred when the shovel load was 21 ½ pounds. To implement this finding, shovels of various sizes were provided for different materials, larger shovels for light material and smaller shovels for heavy materials.

In this and other experiments, Taylor demonstrated the importance of standard methods of working, output quotas, wage incentives regulated rest periods, and of the proper selection and training of workers for each type of job. His success is indicated by the fact that the shoveling experiment findings, when implemented resulted in an increase in product of over 300 percent, and increase in pay for the workers, and a reduction in unit costs of over 50 percents.

All through his work, Taylor advocated the substitution of scientific methods for rule of thumb methods. The scientific method as he practiced it, focused on careful observation, experimentation, and measurement all intended to find the best way of doing a task. He modified this prescription in his writings by warning that scientific management in itself was not any efficiency devices, not a device of any kind of securing efficiency nor is it any bunch or group of efficiency device.

**The Fundamental Principles of Scientific Management**

Taylor believed that if the principles of scientific management were applied to the simplest individual acts as well as to the work of the great corporations, the results would be truly extending. The fundamental principles that he developed are as follows:

1. ***The development of a true science of work:*** By this he pointed out that since there is no definite knowledge or clear agreement of what constitutes a fair day‘s work, a boss has unlimited opportunities for complaining about his workers inadequacies. And a worker never really knows what is expected of him. This can be remedied by the establishment, after scientific investigation of a large daily task as the amount to be done by a suitable worker under optimum conditions. For this he would receive a high rate of pay much higher than the average worker would receive in unscientific factories. He would also suffer a loss of income if he failed to achieve this performance.

2. ***The scientific selection and progressive development of the workman:*** to earn this high rate of pay a workman would have to be scientifically selected to ensure that he possesses the physical intellectual qualities to enable him to achieve the output. Then he must be systematically trained to be a first class man. Taylor believes that every worker could be a developed worker, offering opportunities for advancement which would finally work for which he could become first class man.

3. ***The Bringing together of the science of work and the scientifically selected and trained men:*** it is the processes that cause the mental revolution in management and Taylor maintains that almost invisibly the major resistance to scientific management comes from the side of management. The workers, he finds are very willing to cooperate in learning to do a good job for a high rate of pay. Thus management should ensure that the work is being done in accordance with the principles of the scientific method that has been developed.

4. ***The constant and intimate cooperation of management and men:*** There is an almost equal division of work and responsibility between management and workers. The management takes over all the work for which they are better fitted than the workmen, i.e. the specification and verification of the methods, time, place and quality standards of the job, and the continuous supervision and control of the worker doing it. There is hardly a single act done by any workman in the shop which is not preceded by and followed by some act on the part of the men in management. With this close personal cooperation the opportunities for conflict are almost eliminated, since the operation of this authority is not arbitrary.

Taylor had trouble getting his message across to management. Meanwhile labour criticized him for alleged speed up attempts. Taylor on the other hand, claimed that he was not opposed to labour unions but that there would be no need for labour to organize if management and labour both adopted the principles of scientific management.

Despite all the confusion and misunderstanding that plagued Taylors work before and after his death the fact remains that he made a great and solid contribution. He and others identified with the movement - Henry Gantt, Frank and Lillian Gilbrech, Henry R. Towne, and Harrington Emerson DC advocated and justified research and experimentation, planning, training the setting of standards and cooperation, controls for checking results against standard and cooperation between management and workers.

The contributions of F. W. Taylor were spelt out clearly in the following principles:-

* Time Study Principles: Human efforts and work done should be measured with standard time.
* Piece – Rate Principles: Reward should be according to effort put in
* Separation of Planning from performance principles: Management should decide on policies while work/task to be done by the workers.
* Management Control Principles: Need for development is necessary.
* Scientific method of work principle: Responsible and accountable leadership.
* Functional Management Principles: There should be flexibility in running of organization.

He gave the following principle to guide management.

1. Each worker should have a clear defined task.

2. Standard conditions are needed to ensure task is more easily accomplished.

3. High payment to be made for successful completion of task.

4. There should be loss in case of failure. That no one should fail in his tasks where nobody does such a failing worker must pay for it.

**The Contribution of Frank Gilbreth.**

Frank Gilbreth made immense contributions in the scientific management movement. In 1886, Frank Gilbreth took up a job as apprentice bricklayer. He later developed bricklaying techniques so that production increased from 120 to 360 bricks per man hour.

Within a few years he advanced to become general superintendent and in 1895 started his own construction company. Successful from the start Gilbreth eventually built factories, dams, canals and mills all over the world. He invented a new method for water proofing basements, a new type of concrete mixture, and new types of conveyors, and became the first manager ever to use a cost-plus-mixed sum contracts.

Gilbreth conducted some of his experiments with his wife. They were interested in studies of fatigue and training, so they started with that and even did studies, in their home of bathing, brushing teeth, and touch typing using their children as subjects, the whole family was the subject first of a book and the many years later of a movie – Cheaper by the Dozens. The Gilbrethes were interested in the employee as an individual whose productivity depended on attitude, opportunity and physical environment as much as on the use of correct methods and ideal equipments.

He also conducted ***Time and Motion Study:*** the purpose of time and motion studies is to help workers at every level to get the best out of themselves.

**Time and Motion Studies**

The purpose of time and motion studies was to help workers at every level to get the best out of themselves. It aims at removing (a) wasteful or ineffectual movement in doing the work, (b) fatigue cause by the accumulation of waste products in the body and (c) defects in the physical environment such as poor lighting, excessive humidity, inadequate heating etc.

**Time Study**

The time study seeks to arrive at the optimum time for each separate operation that goes to make up a job and by adding these together to arrive at a sound optimum time for the operation taken as a whole. It thus provides an objective for measuring the effectiveness of individual work.

**Motion Study**

The motion study, on the other hand, aims at finding the best way in which any given operation of related sequence of operations can be done. It analyses the whole sequence of movement needed for the job and eliminates lost or unproductive movements. The various steps needed in such a study are (i) the job is classified into basic steps and motions, (ii) the most efficient way of doing the job is evolved with proper allowances for equipment, work place and work floor (iii) precise time values are obtained from detailed time reading by stop watch or micro motion studies, and (iv) standard time-output ratio are computed by accumulating time reading for all job elements, arranging and synthesizing times and applying leveling and normalizing factors to compensate for unusual work conditions and for non productive time caused by fatigue, rest periods and flow delays.

The major contribution of Frank and Lillian Gilbreth was notably the time and motion studies in brick laying among others. This study is remembered for laying down the basis of pay incentive schemes. That apart**,** Gilbreth has to be remembered again for his three position plan of promotion which was designed to attract desirable applicants. Each worker, he said, should be considered to occupy three positions namely his past, present, and next higher positions. Part of his work, then would be teaching the man below him and learning from the man above him. In that way he would qualify for promotion, himself and help to provide a successor for his present job.

Although both Taylor and Gilbreth belong to the scientific management movement, Taylor‘s findings received a lot of criticisms from Gilbreth. The first criticism was on Taylor‘s time study which according to Frank and his wife Lillian Gilbreth was considered to be unethical, wasteful, and inaccurate, employing questionable methodology, thereby costly and finally developing useless data.

Gilbreth also disagreed with Taylor about labour unions. Although Taylor sympathized with unionization in campaigns which had not adopted scientific management, he felt that there would be no need for unions once scientific management was introduced. The Gilbreth, on the other hand wrote ―we do not agree with Taylor that the necessity of the labour union disappears under any consideration. In addition Gilbreth criticized Taylor‘s system for absolute lack of the human element which he believed his system supplied.

**Attributes of the Scientific Management**

According to Tayor and other scientific management theorists increase in productivity and efficiency could be achieved and improved whenever the organization absorbs and establishes the following measures:-

1. **Management Selection: -** A good management should make a careful and thorough study in order to select an able and committed employee (worker) in the organization. Management should apply a more scientific selection technique on employment and placement of resources to enhance increase in productivity and standardization.

2. **Training:** - Employees should be thoroughly trained in order to improve and develop their skills in performing the job. The management should make a careful study of the employees capability and advance them to training. Through the training, it is possible to advance the employees interest that is to fix him or place him on the position that fits him accordance to his natural ability.

3. **Management Research:** The management should have to intensify on scientific method of research and experiment on its production methods. Management should therefore gather and source all the previous traditional methods, (rules of thumbs) analyses and quantify them with a view to improve on them. This can give way to the development of high standard process of production and efficient means of realizing goals.

4. **Financial Incentives Plans:** The management should pay reward, compensation and salary with their low unit production cost. Wages and salaries should be commensurable to the work done. The higher the pay, the more of the employee’s willingness to under take hard work. Bonus should also be introduced to induce employees’ interest.

5. **Development of Friendly Co-operation**: - Management should ensure and encourage close hearty friendly relationship among the employees on one hand, and that between the management and the employees on the other hand. The cooperation would cement and encourage consistency in stability and continuity of the working environment.

6. **Development of Careful System of Control**: - Management should develop a careful system of control of the employees so as to ensure efficiency and discipline within the organization.

There should be a system of rules and regulations, which should be imposed on every individual employee. Workers have to be forced to work in the organization. This introduced the appointment of supervisors and foreman factories.