
Review on the Principles of Scientific Management

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ABSTRACT

Many of the Indian authors in the field of Management studies proposes for four principles of scientific management and fourteen principles of general management. Even the university questions and the answer keys for evaluation show the confusion in this area. But there are few authors who opine that Taylor has contributed more to principles of management. This paper attempts to give an outlook into the contributions of Fredrick Winslow Taylor as far as management principles are concerned. The study is based on his two classic books written in 1990s. This article also aims to make certain suggestions for the avoidance of such confusions on the part of students of management studies.

INTRODUCTION:

Most of the Indian authors are of the opinion that Taylor has suggested four principles of scientific management and Fayol has suggested fourteen principles of management. Few authors differ in their views that even fourteen principles can be attributed to the Scientific Management also. Some opined that Taylor has suggested few more elements to the scientific management. The study is mainly based on the two classic books of Taylor:

- (1) The Principles of Scientific Management by Fredrick Winslow Taylor, written in 1911, Transcribed by Charles E. Nichols
- (2) Shop Management written in 1911(basically in 1903), transcribed by Charles E. Nicholas. This book is referred only for inferring clarifications for the elements given in his 'Principles of Scientific management'.

Objectives of the Study

The study has mainly three objectives:

- (1) One is to state the principles and elements of scientific management with authenticity based on the classic books written by F.W. Taylor.
- (2) Second objective is to find out the reason for difference of opinion among the authors regarding the principles/elements of scientific management. And
- (3) Third objective is to make some suggestions for eliminating the confusion of students of management in such differences among authors.

Principles of Scientific Management

The Book

FW Taylor's book 'Principles of Scientific Management has two chapters: Fundamentals of Scientific Management and The Principles of Scientific Management. The

first chapter starts with the sentence “The principal object of management should be to secure the maximum prosperity for the employer, coupled with the maximum prosperity for each employee.” This book adopts many things from his previous book ‘shop management’. For getting a full idea of scientific management, ‘shop management’ is also worth reading.

Maximum prosperity to management and maximum prosperity to employee had been the two leading established organizational objectives of that time. But there were always a ‘war (not peace)’ like situation existed among the employees and management of most industries in this established objective of management. Neither of them believed that maximum prosperity to management and employees could be established at the same time.

In this environment of mistrust among employees and management, Fredrick Winslow Taylor proposed that “prosperity for the employer cannot exist through a long term of years unless it is accompanied by prosperity for the employee, and vice versa.” His scientific management is founded on the conviction of ‘True interests of the two (Management and Employees) are one and the same.’ He claimed that payment of high wages (prosperity of employee) is possible through a reduction in the labour cost (prosperity of management). Development of every branch of the business to the highest state of excellence is necessary for the sustainability of the prosperity.

Experiments

He experimented the philosophy of scientific management at Bethlehem Steel Company and at Midvale Steel Company in 1870s. Those experiments had been made largely upon men who were lifting loads, shoveling (pig iron), brick layers, metal cutting, and supervision girls. He modified his scientific principles through the help of the experiments done by his followers and assistants from different areas. They include Mr. Carl G. Barth, a mathematician (the law of heavy laboring), Mr. Frank B. Gilbreth (brick laying system, time and motion study), Mr. Sanford E. Thompson, Mr. H. L. Gantt, and Mr. Carl G. Barth.

Back ground of soldiering

Deliberately working slowly so as to avoid doing a full day's work was a common practice among the industrial world all over. He explained this phenomenon with the popular colloquial words in the industries; ‘soldiering’ (US), ‘hanging it out’ (England), ‘ca canae’ (Scotland). He pointed that elimination of ‘soldiering’ and several other causes of slow working would lower the cost of production to a great extent. Taylor observed that the relationship between the management and workers, and the rule of thumb methods had been regarded as one of the major reasons for the soldiering.

Taylor reasons that generally people have great sports man spirit. But they deliberately plan to do little at work place. He observed three reasons for this condition:

- (1) Increased output ultimately resulted in the loss of job.
- (2) Defective system of management and
- (3) Inefficient rule of thumb methods.

Taylor suggested principles of scientific management as a solution to the third reason. Scientific management fundamentally consists of certain broad general principles, a certain philosophy, which can be applied in many ways. It was a systematic modification of the then existing system of management. Premium work, piece work and many other

ordinary plans of management had been there in common practice. The attitude of the then management was that of putting the work up to the workmen. Scientific Management's new philosophy placed a great part of it upon the management.

According to Taylor; no system of management, no single expedient within the control of any man can insure continuous prosperity to either workmen or employers. He claimed that under scientific management the intermediate periods will be far more prosperous, far happier, and free from discord and dissension. It is more than the then modern management of 'initiative and incentive' (workmen give their best initiative and in return receive some special incentive from their employers). Under scientific management, initiative of worker is obtained with absolute uniformity and to a greater extent.

Four great underlying principles of management

FW Taylor clearly summarises his studies with the following four principles of scientific management. He calls it as the "Four great underlying principles of management."

1. The development of a true science
2. The scientific selection of the workman.
3. His scientific education and development.
4. Intimate friendly cooperation between the management and the men.

Four elements which constitute the essence of scientific management

1. The development of the science by the management.
2. The scientific selection and subsequent training with constant help.
3. Setting of Task and payment of daily bonus.
4. Almost equal division of the work and responsibility between the workman and the management.

Elements of the mechanism of scientific Management

1. Time study- with the implements and methods for properly making it.
2. Functional or divided foremanship- and its superiority to the old-fashioned single foreman.
3. The standardization of all tools and implements used in the trades, and also of the acts or movements of workmen for each class of work.
4. The desirability of a planning room or department.
5. The "exception principle" in management.
6. The use of slide-rules and similar timesaving implements.
7. Instruction cards for the workman.
8. The task idea in management, accompanied by a large bonus for the successful performance of the task.
9. The "differential rate."
10. Mnemonic (memory aid) systems for classifying manufactured products as well as implements used in manufacturing.
11. A routing system.
12. Modern cost system, etc., etc.

Summary of Elements of Scientific Management

Taylor reminded that it is not a single element, but rather this whole combination, that constitutes scientific management. He summarised it as:

- 1) Science, not rule of thumb.
- 2) Harmony, not discord.
- 3) Cooperation, not individualism.
- 4) Maximum output, in place of restricted output.
- 5) The development of each man to his greatest efficiency and prosperity.

Duties of Managers under scientific Management

Taylor proposed that fully one-half of the problems were up to the management. Managers assume new burdens, new duties, and responsibilities under scientific management. They are: -

- (a) **Developing a science** for each element of a man's work: Taylor says that this is the most important of the four great elements of the new management. Developing of science is the duty of the management. In order to replace the rule of thumb method the manager should take the burden of:
 - (i) Gathering together all of the traditional knowledge possessed by the workmen.
 - (ii) Classifying, tabulating, and reducing this knowledge to rules, laws, and formulae which are immensely helpful to the workmen in doing their daily work.
- (b) **Scientific selection of the workman:** In order to replace the system of choosing his own work by the worker, the management should select, train, teach, and develop the workman according to the scientific method.
- (c) **Harmonious cooperation between the workmen and the management:** Heartily cooperate with the work-men so as to insure all of the work being done in accordance with the principles of the science.
- (d) **Almost equal division of the work and the responsibility** between the management and the worker.

Other Elements of Scientific Management

One can trace out the following additional elements of scientific management, suggested by FW Taylor in his book of 'Principles of scientific Management. These are suggestions made by him occasionally.

1. Selection of best method of work
2. Special incentives
3. Subdivision of the labor
4. working conditions
5. scientific cooperation:
6. Analysis of personal coefficient
7. Days of rest with pay
8. Maximum prosperity

- 6) **Maximum output:** There was a cut-off for the maximum wage to the worker, in every industry. Hence the output was also restricted. Taylor proposed that all employees must be allowed to for maximum output and they should be paid in maximum. He promoted maximum output with best quality of work as a means to low labor cost.
- 7) **Modern cost system:** Taylor suggests for a modern cost system, but he has not explained it directly. But he makes it clear that under scientific management reduction in labor cost is possible with a high wage to the worker, due to increased output. For this he suggests for a modern cost system.
- 8) **Planning department:** This separate department is necessary for planning ahead. They plans the best way of doing a work, preparation of instructions, division of work, etc. Taylor clarifies the functions of planning department as; The complete analysis of all orders for machines or work taken by the company, Analysis of enquiries in the sales department, Analysis of balance of work and balance of all materials, Rush Order Department, Time study of men and machine, Cost analysis, Pay department, Maintenance system, Messenger System of Post offices, Information bureau and employment bureau, A mutual accident insurance association, etc.

II. SELECTION AND TRAINING OF WORKERS.

Scientific selection and subsequent training followed by constant help are necessary for the workmen.

- 9) **The scientific selection:** It coincides with the principle of 'scientific selection of the workman'. Accordingly, the management should select, train, teach, and develop the workman according to the scientific method.
- 10) **Personal Qualities:** Taylor traces out ten required qualities of workmen in his book 'shop management'. They are Brains, Education, Special or Technical knowledge, Manual dexterity or strength, Tact, Energy, Grit (Determination), Honesty, Judgment or common sense and Good health. He observed that plenty of men possess only three of the above qualities can be hired at any time for laborers' wages. Add four of these qualities together and you get a higher priced man. The man combining five of these qualities begins to be hard to find, and those with six, seven, and eight are almost impossible to get.
- 11) **Personal coefficient:** Men of quick perception are said to have a low "personal coefficient," while those of slow perception and slow action have a high "personal coefficient." There is a great difference in the "personal coefficient" of different men. Some individuals are born with unusually quick powers of perception accompanied by quick responsive action. This idea was developed through his follower Sanford E. Thompson, a psychologist.
- 12) **Training with constant help:** It coincides with the principle of 'scientific education and development'. Taylor suggests that the constant help and watchfulness of the management along with scientific selection of the workman counts for more than anything else.
- 13) **Functional or divided foremanship*:** Foreman may be divided as per the functions to be performed. This functional foremanship is superior to the old-fashioned single foreman. There are three types of teachers under this system; Inspector, Gang boss, and

speed boss. In addition to the three main teachers there are repair boss, time clerk, route clerk, and disciplinarian.

III. ACTUAL WORK PLACE

The management must consider certain pre-requisites for the conducting of actual work. In other words, scientific management calls for the implementation of certain elements in the actual workplace.

- 14) **The task idea (Setting of Task):** This is the most prominent single element in modern scientific management. Work of every workman is fully planned out by the management at least one day in advance. Each work man should receive complete clear-cut written instructions, describing the task to accomplish in detail. He should also receive the means to be used in doing the work. Task specifies what is to be done, how it is to be done and the exact time allowed for doing it.
- 15) **Subdivision of the labour:** Taylor finds that the work can be done better and more economically by a subdivision of the labor. Under the traditional subdivision of labour each man specializes upon some comparatively small class of work. But in scientific management, subdivision of labour means that each act of each mechanic should be preceded by various preparatory acts done by other men.
- 16) **Standardization of all tools and implements (tools kits):** used in the trades, and also of the acts or movements of workmen for each class of work.
- 17) **Use of slide-rules** and similar timesaving implements (kits): Slide-rules are an aid to guide him in obtaining proper speeds. They are made for the purpose of determining the all-round capacity of metal-cutting machines.
- 18) **Instruction cards** for the workman: Instruction card should contain clear-cut instructions to the entire workman regarding the works to be done, how it is to be done, time allotted for doing it, and the means to do the work. All directions the workmen are written on a single instruction card, or sheet.

IV. PAYMENT OF REMUNERATION

Maximum prosperity to the worker is assessed on the basis of the remuneration paid to him. The worker should feel the prosperity clearly. So, the payment of remuneration should also be scientific.

- 19) **Payment of daily bonus:** Large daily bonus for working fast and doing what he is told to do. The task idea must be accompanied by a large bonus for the successful performance of the task. The average workman must be able to measure what he has accomplished and clearly see his reward at the end of each day if he is to do his best. Personal ambition always has been a more powerful incentive to exertion than a desire for the general welfare. Workers are always ready to share the profits, but they are neither able nor willing to share the losses.
- 20) **Task and the bonus** constitute two of the most important elements of the mechanism of scientific management. He also proposed that when the worker fails, he should be sure that sooner or later he would be the loser by it.
- 21) **The differential rate:** Under this system the pay of each worker was increased in proportion to the quantity of his output and also more in proportion to the accuracy of his work.

22) **Special incentives:** Hope of rapid promotion or advancement, higher wages, shorter hours of labor, better surroundings, working conditions, personal considerations, and friendly contact with his workmen, are special incentives that can be provided. Higher wages can be either in the form of generous piece-work prices or of a premium or bonus of some kind for good and rapid work.

V. BETTER WORK ENVIRONMENT

Taylor suggests for the importance of hormonal relationship between the worker and the employer for the success of scientific management. Hence he suggests for certain elements for ensuring the cooperation and harmony.

- 23) **Harmony, not discord:** It coincides with the principle of 'intimate friendly cooperation between the management and the men'. This harmony was not possible under the then existing system of 'initiative and incentive.'
- 24) **Scientific cooperation (Cooperation, not individualism):** Taylor suggests that a close, intimate, and personal cooperation between the management and the men is of the essence of modern scientific or task management.
- 25) **Almost equal division of the work and responsibility:** There should be equal division of the work and responsibility between the workman and the management. He introduces this element as a means to achieve the fourth principle of harmony.
- 26) **Standard (Improved) working conditions:** Imperfections in working conditions must be improved with benefit to all concerned. He also suggests shortening the working hours. Working hours must be planned in such a manner so that the workers can really "work while they work" and "play while they play," and not mix the two. Introduction of recreation periods will help this.
- 27) **Days of rest with pay:** Taylor also proposes for days of rest with pay. But he said that he is not sure about this.
- 28) **Maximum Prosperity:** Maximum prosperity for the employer (large dividends), coupled with maximum prosperity for the employee (higher wages) are the two leading objects of management. Development of every branch of the business to its highest state of excellence is necessary that the prosperity may be permanent. In the same way maximum prosperity for each employee also means the development of each man to his state of maximum efficiency, so that he may be able to do the highest grade of work for which his natural abilities fit him.

*Functional Foremen:

This element is explained very clearly in the book of 'shop management'. Functional foremen are the part of planning department. They are teachers who are necessary to ensure that the workmen understand and carry out these written instructions. These expert teachers, who are at all times in the shop, will be helping, and directing the workmen. There are three types of teachers; Inspector, Gang boss, and speed boss. In addition to the three main teachers there are repair boss, time clerk, route clerk, and disciplinarian.

1. **Inspector:** Inspector is one of these teachers who teaches the workers how to do work of the right quality; how to make it fine and exact where it should be fine, and rough and quick where accuracy is not required,

2. **Gang Boss:** He is the second teacher who shows him how to set up the job in his machine, and teaches him to make all of his personal motions in the quickest and best way.
3. **Speed Boss:** The third teacher sees that the machine is run at the best speed and that the proper tool is used in the particular way which will enable the machine to finish its product in the shortest possible time.
4. **Repair Boss:** He provides orders and help to the workmen about adjustment, cleanliness, and general care of his machine, belting, etc.;
5. **Time Clerk:** He provides orders and help to the workmen about as to everything relating to his pay and to proper written reports and returns;
6. **Route Clerk:** He provides orders and help to the workmen about as to the order in which he does his work and as to the movement of the work from one part of the shop to another. He lays out the exact route which each piece of work is to travel through the shop from machine to machine in order that it may be finished at the best time.
7. **Disciplinarian:** He interviews the worker, in case he gets into any trouble with any of his various bosses. In case of insubordination or impudence, repeated failure to do their duty, lateness or unexcused absence, the shop disciplinarian takes the workman or bosses in hand and applies the proper remedy.

Suggestions:

1. Many of the elements of scientific management are principle in essence. Hence one cannot say that it is wrong if a student trace out fourteen or more principles of scientific management.
2. In India most of the text books does-not show any bibliography. It seems that many authors also limits by referring to unauthorized non-standard internet publications as there major area of references. Hence there should be a culture of proper bibliography in every book which is prescribed for the students reading.
3. Even universities failed to provide the classic books as reference books in the syllabus. College libraries should also ensure that books of famous classic authors are available in the library for references.
4. In many colleges, across India, students are in the habit of text book reading for exam orientation. Hence there is a lobby of local as well as national publishers, who makes syllabus based capsule books, which limits the depth of the students. There is also a habit of single book dependence in a college.

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