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Evolution of modern management through Taylorism: An adjustment of Scientific Management comprising behavioral science

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Abstract

From traditional approach to scientific approach and then Scientific Management to Modern phase; methodology, principles and approaches have reached its current stage. Taylor, the originator of scientific management brought a revolution in the twentieth century by introducing scientific aspects of formulating patterns and disciplines within project management. Scientific management emphasizes on profit maximization by utilizing the workers through controlled mechanism, training, monetary incentives under managers, however it has been scrutinized and criticized highly for its short term focus on profit, treating workers as a machine like forms which eventually argued to result negative performance in the long run. Therefore, a drift towards behavioral study emerged and social factors have been included to address the challenges which Taylor's method neglected. This paper through an extensive literature review showed that, the advancement of technology and globalization stimulated the modern management approach to adjust and complement the scientific management by supplementing the human factor and their contributions within an organization rather than substituting the traditional approach. Therefore together with productive activities and completion of defined tasks, a successful modern day project management model highly values employee contribution and feedbacks at all level.

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Keywords: Scientific Management; Management Phase; Taylorism; Behaviroal Science; Organization; Industrial revolution; Profit Maximization

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1. Introduction

Management is a set of activities and behavior in which a superior entity plans, organizes, directs, leads and controls[16] available sub-ordinate entities and other resources to achieve goals ensuring maximum efficiency and gain, through optimal usage of resources[23,27]. There has always been a trend towards finding the right approach of defining management. And with the changing nature of business and technology at the modern era to guide and execute task, management has become an important stream of study, whether defined as exploitation science, engineering techniques, or behavioral theory[25].

1.1. Ad-hoc Project Management

Prior to Industrial Revolution there has been an ad-hoc process of management which was successful throughout history when we study ancient engineering wonders. A typical manager was isolated from ground level work, the foreman would be given the production duties and workmen used tools of their own choice and adopted methods that suited their own style of work[20]. However, the Industrial Revolution threw the toughest and an absolute new set of challenges to owners and managers. Entry to the paradigm shift from small-craft to large-scale mechanized manufacturing at the end of the 18th century raised the necessity for managers to search for new techniques to manage their organizations' resources, productivity increase and workers skill improvement[20, 27].

The classical theory of management emerged while finding an approach of predicting workers behavior and controlling their behavior from the manager's perspective to achieve organizational goals. Under classical approach workers were strictly controlled to perform as the manager's accordance following a specific set of rules were given to them[15]. This model treated human power[8] as a mechanical resource based on a systematic method by contributing their maximum capacity in order to gain the optimal financial gain[20].

1.2. Taylorism and Scientific Management

F.W. Taylor who was an engineer and manager was one of the first to introduce the process of maximizing output through observing human behavior at work and formulating a specific set of rules to operate and utilize human skills[3]. Taylor published in his famous book, "Principles of Scientific Management", brought a revolution in shaping the early twentieth century factory system[6], both in America and in Europe[3]. Taylor formalized the rule of thumb[5, 13] and transformed those into the science of management principles by systematically analyzing worker behavior, sub-dividing tasks into smaller unit and scientifically investigating and finding right training format for workers maximum production output[5,13,20]. Taylor through his scientific analysis of finding inefficiency in traditional organized businesses established the point that, each motion of work should be executed under maximum capacity of workers with a predetermined method of work under specific training format, ensuring high profit and resulting good worker manager relationship[3]. Taylor thus introduced a clear vision for the division of labor depending on responsibilities and rank and introduced science in the labor selection process in organization management which according to Ratnayake & Ima[20] is ***"****a complete mental revolution on the part of the workingman****"***.

Despite Taylor's approach of profit maximization through utilization of human resources in a mechanical approach, he was criticized for introducing conflicts, boredom and negligence towards workers at the workplace[20].

1.3. Modern Management

Modern management evolved to solve the various problems of scientific management, addressing systematic utilization of human resources as mechanical objects[23]. In order to improve the problems imposed by scientific management, one of the best case studies and research had been conducted named as Hawthorne Studies (1923-1933), which showed that workers' productivity is likely to rather rise when they are observed, their contribution is considered and mental support was provided by ensuring job-security than giving them set of rules, regulations and instructions[20]. According to the study, transparent sharing of information among employees of different ranks, rewards, encouragement by senior management are more important to workers rather than classical approach of Scientific Management introduced by Taylor[17,20]. One of the best examples of Twenty First century modern

management is McDonald's which through its four dimensions: efficiency to ensure optimization, calculability to ensure profit maximization, predictability to assure standard services across all locations and control[21]. McDonaldized organizations practice higher control in their management approach by using technologies, together with managers and inspectors; who ensure that the workers are properly trained to do their assigned tasks in instructed ways only[21].

Mcnaughton[10], in his paper brought forward an important factor regarding the implementation procedure of the scientific approach in the management of people. He later argued for a new scientific principle and the need for awareness and research towards the integration of social sciences into scientific management would make management more suitable to tackle modern day challenges[10].

Wagner-Tsukamoto25 pointed us toward the contemporary relevance of scientific management and of institutional economics suggested strategies for "modern" interaction contexts mostly grouped by people of different skill sets and hierarchical position in their organization25. The movement which originated in "Taylorism" introduced by F. W. Taylor neglected the influence of "human factor" on labor. However, as the management science has grown more robust and entered its modern era it widened its field to emphasis on industrial psychology to overcome the limitations of Scientific Management19.

This paper conducted a literature review of management methodologies, theories and practices to illustrate the significance of F.W Taylor's scientific management which turned a disorganized ad-hoc project management process to into a modern project management system[25] empowering and recognizing employee contribution as high priority and eliminating rank and status wise discrimination in a controlled way[7]. We study different phases of management and the reason behind each phase evolvements. In particular our contributions are:

First, while rigorous previous studies have been conducted on Scientific Management, none of those had analyzed the pre and post phase of scientific management to understand its significance. Unlike others we have focused on analyzing each phases of management with its significance to its contemporary time period.

Second, we have discussed the role play of behavioral science to introduce modern management to the era of tremendous advancement of technology and science where new generation employees are more interested to work for a company where they will be treated as a part of the organization and will be evaluated for their contributions to it.

The rest of this paper organizes as follows. Section II discusses how Taylor was inspired and used his engineering skills and experience to introduce scientific management in the industry, Section III analyzes Taylor's model considering the omission of behavioral science in Taylor's management model, while Section IV illustrates the significance of scientific management by comparing and contrasting scientific management with modern management process and pointing out the fact that, modern management is a modified and amended version of systematic management with an addition of human factor and its significance within an organization. Finally, Section V provides concluding remarks.

2. From Slavery to Systematic Management

Capitalism and slavery has been interlinked by many historians. Cooke[4], in his paper identified this as a newer form of disciplined labor with intrinsic similarity to slavery. Management often operates under hierarchical structure based on ranks and positions of people depending on their status. Hence, depending on roles and position descriptions of manager and workers, classical management and Taylor's Scientific Management can demonstrate slavery[4].

2.1. The Origin of Scientific Management through Taylorism

Taylor's early life experience in industries as an engineer and manager[14] settled down the platform for him to compute operating times which evolved into time and motion study. An effort to convert the informal methods of industrial management into a systematic one[14] encouraged him to apply his technical knowledge and conduct experiments aiming to find the science in management.

2.2. Scientific Management in Industry

As scientific management gained popularity among managers between 1901 and 1915 scientific management was introduced in nearly 200 American businesses where the majorities were factories[14]. Production managers of Henry Ford adopted the principles of Scientific Management from 1908 to 1914, resulting to promote Ford and his modified methodology of Fordism internationally[27]. Alfred Marshall, in his book conducted a detailed analysis of Scientific Management, its implications and limits in 1919[3,14]. In the 1920s it gained popularity in the Soviet Union and well accepted by Lenin and Gastev[14]. Nelson[13,14] (1990, pp. 77) also said that, Taylor's theory was made as *'a notable feature of the university education curriculum'*.

'The public furor that followed the publication of The Principles of Scientific Management in 1911 underlined the appeal of Taylor's ideas and their applicability to nonindustrial settings, from social welfare agencies to public school systems. In the decade after Taylor's death, they made it a notable feature of the practical curriculum.'

Scientific Management principles evolved a new figure in American industry called Industrial Engineer, who used to focus on formulating standards for the managers aiming to gain efficiency in labor control[14,22]. Richard A. Feiss[5], Mary Gilson, Frank and Lillian Gilbreth, Mary Van Kleeck[1,14], executives at Link-Belt[2,14], during the 1950s and 1960s also adopted modified version of scientific management and utilized Taylor's ideas.

However, during the phase of technological advancement in the 1960s and 1970s, mass production and labor management introduced new challenges for the Taylorist model, questioning the lack of flexibility for worker management[3]. Marshall criticized scientific management for extreme partitioning of labor and standardizing the work process, which according to him would restrict individual skill growth for workers and eventually would throw him to boredom and a lack of creativity[3].

3. Scientific Management revised with Behavioral Science

According to Locke[9], Scientific Management which was 'based on proven fact (e.g., research and experimentation) rather than on tradition, rule of thumb, guesswork, precedent, personal opinion, or hearsay' is consisted of: Standardization of Tasks, Tools and Procedures, Incentives, Rewards, Training, Selection of skilled worker choices, working hour schedules, interactions and finding the optimal way of conducting a work[9,26].

3.1. Criticisms of Taylor

Taylor categorized his methods based on his scientific analysis and treated human power[8] as entities, which raised the question about automating and mechanizing the workers and limiting their ability towards individual initiative and reflection[19]. Taylor defined tasks as 'motions' and believed that, maximum output would be attained from a worker if a set goal is given to the entity. This ideology of 'Economic Man'[19] exposed the worker as exploited as machines[9,11,12] motivated by financial benefits. Wagner-Tsukamoto[26] asserted that, Taylor defined managers as naturally 'good, as not self-interested and as heartily cooperative' however, was reluctant to consider workers feedback.

Douglas McGregor proposed two sets of assumptions Theory X and Theory Y, where the former defined workers to perform well under instructions given and the latter defined workers as very cooperative[27]. Henry Ford aimed to introduce 'flexibility' in working condition but failed address 'psychology of the worker - foreman relationship'[19]. In the contrary, if we look at modern day successful electronic industry we find that, the managers at the Hewlett-Packard follow the Theory Y in their practice which is a methodology and a people-oriented approach to acknowledge the individual contribution with recognition and respect. Long-term employment & job security ensures low stress and encourages engineers to be innovative and creative with informal and transparent communication between employees and their work progress[27]. Apple co-founder Steve Jobs in his early days had been a controlled follower of Scientific Management, where even with a good strategy, he resulted conflicts, fierce competition and distrust among the team members. However, in his come-back he modified his development strategy and management skills and emphasised on delegating authorities to the teams with hard timeline and goals[17,27].

3.2. Behavioral Management Theory

Price[18] raised the necessity to include economic condition, hygiene, wages, living standards under scientific management in order to reduce mental pressure, stress, monotony and fatigue and enable him to enjoy his work and perform it as a '*normal function*' rather than a '*simple unintelligent motions and endlessly repeated movements*'.

3.3. The Hawthorne Studies and Human Relations

'George Elton Mayo, Professor of Industrial Research at the Harvard Graduate School of Economics and his associates' conducted 'controlled experiments' to find out the 'limitations of Taylorism' which on the other hand laid the foundation of future research in industrial psychology'[19]. According to Locke[9] Professor Mayo brought out the 'influence of human relations or social factors on worker motivation' whereas 'Taylor viewed soldiering as a problem caused by poor management and one that could and should be eliminated by scientific management'. Pfeffer & Veiga[17] (1999, pp.40), described 'Seven Practices of Successful Organizations' as –

- Employment Security
- Selective Hiring
- Self-Managed Teams and Decentralization as Basic Elements of Organizational Design
- Comparatively High Compensation Contingent on Organizational Performance
- Extensive Training
- Reduction of Status Differences
- Sharing Information

The modern management system rationalized the behavioural problem faced by scientific management by flexibility, informality between worker-manager relationship, high collaboration and engagement, employee reflection and creativity[27]. Taylor introduced science in management in order to increase 'industrial efficiency' and applied his methods to the 'human factor', hence Price[18] argued for 'democratization of industry' where workers should be given proper recognition of their work. Fig. 1 illustrates the fact that, modern management amalgamated the highly valuable constant, Behavioural Science which Taylor totally omitted in his scientific management.

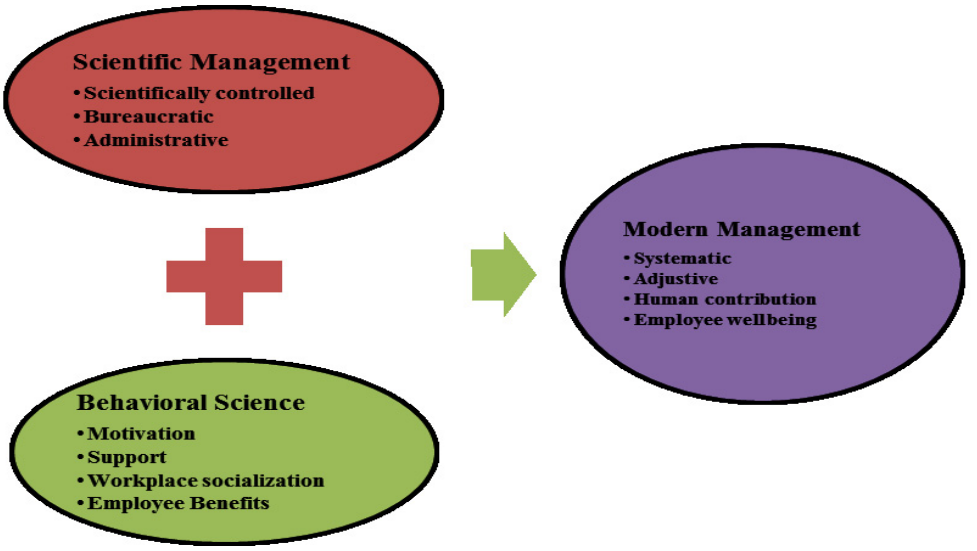

Fig. 1. Evolution of Modern Management.

4. Discussion

Locke[9] examined the ideas and techniques of Frederick W. Taylor with respect to their validity and acceptance in contemporary management, supporting Taylor's views as fundamentally correct and generally accepted. The most significant contribution of Scientific Management approach was that, it injected a performance model at industries where workers nature were defined by simplistic goals as sub-ordinates and managerial behaviour was illustrated as multi-dimensional specialized roles[26].

4.1. Study Implications

This article illustrated the significance of Scientific Management, to which the modern management has been a valuable addition. Taylor pioneered a systematic methodology based on his scientific findings which he conducted during his early engineering and management career to acquire the best of the workers. Further study together with technological advancement later found that, a balance between the exploitation of human factor and attention towards better conditions human factors such as labour, shorter hours, higher wages are required to reach the financial goal efficiently in the long run[18]. Through a reflective model by looking after the worker, trusting and treating them as critical asserts, an organization can perform a better management of people which in the long run increases profits, productivity, and innovation[17]. Table 1 below compares and contrasts between Scientific Management and Modern Management, which clearly shows that Modern Management emphasizes profit maximization through employee satisfaction and contribution.

Table 1. Comparison between Scientific Management and Modern Management approach.

Scientific Management	Modern Management
Introduced through scientific experiment	Evolved through scientific management with adjustment
Effective and formulated procedure followed in order to complete a project	Controlled way of process planning, organizing, monitoring, coordinating and commanding with additional steps of amendment when needed
Main focus is the accomplishment of task with fixed and pre-defined effort for maximum output	Main focus is the long term functional output together with employees productivity increase
Master and sub-ordinate relationship where managers set standard rules and objectives for employees	Conductive and monitored work environment within the organization where different levels of employee feedbacks are considered and analyzed as a part of product road map set up

4.2. Limitations

The arguments may incline more towards the location, culture and circumstances where proper and fair management practise is being exercised. An empirical study in perspective of different continents, cultures and economic conditions can provide us more precise understandings of Taylorism and recent management systems. A future research widening the scope to include both of the contributions of scientific management as well as its critics in the field of behavioural sciences, economic conditions and skill level of workers will present us more interesting answers[26].

5. Conclusion

The goal of this study was to illustrate the contribution of scientific management which eventually resulted to evolve modern management. Taylor introduced the science of a problem synthesis in productivity maximization and initiated systematic management approach. This paradigm shift Taylor introduced into an ancient, rigid and ad-hoc system has gradually been modified by including Industrial Psychology and Behavioural Science[19]. It prepared the way to evolve contemporary management and performance measurement research[13,14,20]. Modern productivity improvement techniques with all its critics partially accepted management-labour relations and individualized

work[9]. While retaining core concepts related to scientific management[20], the contemporary high performance management system reduces employee-owner relationship status distinctions and prioritises the employee initiatives, feedbacks to make them feel valuable and committed[17]. This study has provided new insights into modern day project management of the booming era of science and technology helping the individual within any organization and rank to realize that, the implication of human factor and its contribution together with systematic execution of process is inevitable for output maximization.

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