QUALITY PRODUCTIVITY CIRCLE IN MANUFACTURE

By

P. B. U. Achi
Industrial & Manufacturing Engineering
Federal University of 'Technology, Owerri

Abstract
A *brief history of quality control and productivity is hereby traced. The cultural implications of quality Circle management technique are discussed in its relationship with productivity. The paper emphasizes the role of total preventive maintenance in productivity and quality improvements. In all these the workforce holds the key, the only key, to success in the creation of wealth and so should be made sound in body (and spirit) through appropriate training and motivation.*

1. Introduction

The reconciliation of the demands of the consumer for quality but cheap products on the one hand and the producer for profits on the other hand, constitutes the history of industrial quality control and productivity improvement. The history of the industrial revolution itself in Europe is synonymous with the efforts of industry to reconcile good quality with high productivity. The highly skilled craftsman produces high quality goods and services but at high expense (and low production rates). The machine, depending on its condition, produces quality goods faster and less expensively. The level of demand for the products often is the determinant of what quality is acceptable and what profits accrue to the producer.

At the end of the 2nd world war in 1945-1950_s, people were hungry for industrial goods and so quality was thrown to the winds in the west and Japan. As jordan[1], the quality director at Bridgeport machines (UK) put it: "the Japanese may have got the message then but in the eyes of the west they had always produced shoddy goods anyway"! That was Japan's quality reputation around the world in those days. At this time in the west, what was in vogue in industry was quality "judgment" and not quality "management". The chief quality "inspector" in any industry was the "almighty" judge of what product would be rejected or accepted and his say was final. As a result it was usual for industries to feature a lot of scraps and reworks (rectification) giving continual knocks against productivity. However because of the quality reputation of Japanese goods, western goods remained competitive even at their higher prices.

Then followed the unusual development in Japan of factories without "inspectors" but with workers groups called "quality circles" and the involvement in this development of quality gurns like Americas juran and Deming in the 1960_s. By the late 1960_s Japanese goods have taken a revolutionary flight to the tops in quality and value for money following the introduction "quality circles" to Japanese industry. Today Japanese industry is demonstrating the complimentary (not contradictory) relationship between quality and productivity.

2. The Implication of "Quality Circle" (QC) In Productivity Management

In Japan the circles were formed mainly to consider ways to improve quality at a time when the quality of Japanese goods was principal "headache" to Japanese industry. The culture tendency of the Japanese people to operate efficiently in groups without hierarchies of leadership was conductive to the development of quality circles to include areas to industrial operation other than quality improvement, like productivity.

In quality circles the traditional clear-cut division between those who perform the more challenging and intellectual (and so more satisfying) task of innovations and finding solutions to problems and those who do the less satisfying routine and often risky jobs of operating and maintaining manufacturing or service plant is removed. Quality circles consists of a small number of workers of varying status grouped together in regular meeting to evolve solutions to production problems and to take production/design decisions.

During circle meetings "brainstorming "techniques are adopted to evolve solutions to problems presented before the meetings.

The leader of the circle provides his leadership only in convening circle meetings and recording the decisions of the meeting. Management does not have the right to overturn circle decisions unless those decisions adversely affect the fundamental policy direction of the company. Thus the circle suffers no constraints during its brainstorming sessions.

2.1 The Usual Procedure of Quality Circle Meetings

The procedure to be adopted by a circle does not follow any rigid patterns but generally the following sequence is followed;

i. Definition of the problem - The terminology used in describing the problem is carefully chosen otherwise the brainstorming session that will follow later may yield results which miss the mark. The idea is to define the problem as simply as possible and in a few words, the problem being observable.
ii. How does the problem affect the circle - the circle has to identify how the workforce are connected to the problem and how they can benefit by solving it! (e.g. Share from Profits).
iii. Causes of the problem - Usually confirmed with measurable or verifiable data.
iv. Detailed solutions and alternatives.
v. Estimation of the cost for implementing the solution.
vi. Estimation of the savings that may accrue to the company.

After the circle often takes the responsibility of implementing the solutions so that the problem is completely solved.

2.2 General Advantages of QC

Quality Circle harnesses the practical experience of the shop floor (the workforce) as well as those of the management staff to achieve the following:

i. Reduction of costs generally
ii. Improving quality of goods and services provided by the company
iii. Providing job satisfaction for both the workforce and. the management
iv. Improving the profitability (and productivity) of the enterprise
v. Providing job security to the workforce and creating new jobs

The positive effect of QC on productivity is the total effect of the reduction of errors on design manufacture and service functions, the reliability improvement on goods and services and reduction of costs. Therefore the merging of the components of the quality environment namely; design and development and the manufacture, introduced the modern concept of "Total Quality Management The integration of the "cost of quality" with the Total Quality Management therefore is the principal duty of the "Total Quality Productivity Circle" formed by the workforce, which is the main theme of this discuss.

3. Quality Management and Productivity

From the Japanese experience it is evident that the achievement of the reconciliation of the demands of high quality in the environment of high productivity can only be achieved by a highly motivated workforce, and not by management fiat. A will trained and 'motivated workforce, healthy in mind and body' are the, basic ingredients of improved quality and productivity.

By nature, man is insatiable because the more he has the more he desires! A. common phrase for motivating the worker is to let him know that "the sky is your limit" if he keeps improving his productivity. This promise becomes a farce or put more charitably, a figurative phrase unless when, viewed non-physically for the sky itself (even figuratively) is not attainable. However it becomes attainable when viewed within the context of the extra rewards await a conscientious worker in the kingdom of Jesus Christ; above the skies! A workforce that lays up its "treasures in heaven" through hard work for its company also heaps treasures on earth for itself and its employers. Therefore the mind of the worker should get as much training as his body in the acquisition and use' of skills for attaining high quality and productivity at work. For example, a Japanese can lay down his life for the Emperor!). The spirit de corps engendered among a workforce grouped in various "circles" all geared to improving quality and productivity is the greatest asset to an enterprise. The Japanese or Nigerians for that matter, can achieve even greater heights if they can consider all the necessary ingredients (including the mind) of productivity for national growth.

Using the concept of workforce - centered management (i.e., quality productivity Circles) the productivity achieved by Japanese motorcycle and hi-fi industries two· decades ago forced the British motorcycle and hi-fi industries to close down, since they are not productive enough to compete in the world market for these goods. The concept of quality circles removes "quality inspection" (judgment) with "quality management" by the world force. In Britain the social attitudes pose a problem for the successful application of QC because the cultural tendency there is that "the boss should be in command"[1].however U.K. industries are making spirited effort today to introduce "Total Quality Management" to replace "quality inspection" in their productivity efforts.

3.1 The Rationale Concept of Productivity

Many different ratios are used traditionally for measuring productivity. However the modern concept of "Quality Productivity Circle" suggests that the most appropriate measure for productivity

must also consider "quality" and posses a good degree of universal applicability. The "ratio of Added Value to labour input" therefore fits the requirements for a rationale measure of productivity. The use of Added -Value rather than gross output (in the Output/Input ratio) focuses on the productive efficiency of a particular activity in the company[2] Added Value has the advantage over financially - based indicators of productivity (like Rate of Return) because it enables fair comparisons to be made between industries and over time spans. Added Value (which is the determinant of quality and profitability) is also an effective measure of the gross domestic product which is the value of all home - produced goods and services per head of the workforce· population. A process cannot be controlled unless it can be measured in, its performance at every stage, not at the terminal result only and not just by intuition but by some rationale method which is repeatable. Therefore, since value added to a product, a service or system can be assessed (financially or in time or quality standards), the use of value added is the best rationale· measure for quality and productivity

4. **Materials Handling and Maintenance culture in quality/productivity managemen**t

Derek Gilson[3] in. his paper: "Materials, Handling a productivity opportunity"' recommends that the workforce should be aware of all the ramifications of handling from the very source of raw materials and component parts through the production process storage and transportation to the customer. The management philosophy in Japanese industry is to regard the handling of material as “WASTE” because it adds nothing to the value of the product and also degrades productivity instead of contribution to it! The strategy to remove this “waste” (which is predominant in Nigeria workshops) is to answer the question whether “that movement” is absolutely necessary or not for the manufacture process. Reduced handling and storage of materials or parts result in less damage and consequential scrap and rework. The issue of storage costs especially for work-in-progress which is excessive in Nigerian workshops is a nagging problem against productivity. A recent (1991) study of the effect of wok-in-progress on capital formation in metal good industries in Nigeria[4] reveals that a lot of savings can be made by reducing the excessive “wastes”. Nigerian goods cannot be cheap and of high quality unless these wasteful handling (and storage) cost are reduced considerable.

Another area of management that critically affects quality and productivity is maintenance. Even with the best motivated and trained workforce, faulty production equipment cannot produce quality goods and services and cannot achieve high productivity. To establish the maintenance culture in any· organisation the notion that maintenance work is the preserve of a maintenance department should be changed. Maintenance of the production system is best achieved as a continuous as process involving all the workforce so that preventive maintenance is done on-line. Emphasis in this regard is on training the workforce in the whole production process and also in the preventive maintenance process along the production line. This is the most effective method of increasing plant availability since the workforce on the shop floor usually collect the (Shop Floor Data Collection, SFDC) maintenance data before involving maintenance department; previous1y.The maintenance procedure that involves the line workers on an on-line basis is referred to as "Total Preventive Maintenance (TPM)" and it is carried out through the QC process. For example, when a problem of low productivity was identified in a small student batching shop (at Federal University of Technology, Owerri, Centre for Industrial Studies) the workforce formed QC to tackle the problem During the brainstorming sessions using the elimination process one Cause of low productivity lead to another with respect to the batching shop until the primary cause was reached;

thus:

- Cause of Low Productivity is "Delays"
- Cause of delays is Searching for Tools
- Cause of Searching for Tools is absence of proper Tool out Holed.
- Then THE TOOL HOLDER was built by the Quality productivity Circle. This gave rise in this particular. metal working shop to estimated 200% increase in turn-over .and is an example of "preventive” maintenance to this production system.

4.1 Conditions Monitoring and the Influence of Technology

The adoption of (unplanned) breakdown maintenance strategy is justified only for systems with no preventable maintenance or if monitoring of Present condition is not possible. This relates to equipment with randomly distributed failure rates. (in time, scale), e.g. Electronic Control equipment and static or low-stressed mechanical equipment[5]. With these systems replacement policies are difficult and the only available option is to respond to failures when they occur; i.e. the breakdown strategy.

Where the manufacturing plant is subject to

gradual degradation over a period of time the best maintenance is planned preventive: maintenance at fixed or variable intervals of time to remove "lost production" costs which lowers productivity. In this and other cases of preventable failure on-line sensors attached to the equipment can be used to monitor the condition of the plant and send signals for, replacement whenever necessary[6]. Today programmable controllers and computer systems (distributed, network of PC's) are adopted for conditions monitoring in industrial plant. The sensors are attached to parts -of the production plant most sensitive to qualify of' the goods and the workforce manning those plants take the responsibility to respond to preventive maintenance signal flagged by the controllers. This is referred to as "quality at the controls" e.g., the automatic monitoring of the condition of a position- control lead screw in machine tools helps to identify by how much machined components have gone out of tolerance.

5: Conclusions

Culturally Nigerians especially of Eastern States are republican in. nature and have traditionally solved their problems through collective ideas generation and endeavors. The secret to the development of this part of Nigeria is self-help. These traditional tendencies are conducive to the development of Quality Productivity Circle management in our enterprises. The areas where problems may arise will be during brainstorming sessions during circle meetings when dissensions may occur as Nigerians often insist on their views even when better ones arise from the other persons. The problem of ego-centrism may be overcome by better education, professionally and mentally. This is the area where Christian humility with professional competence will help tremendously.

In a world of rapidly developing technology, we have to be part of that development otherwise we cannot deeply penetrate even the ECOWAS market. The on-line quality and condition maintenance culture involving all the workforce is most essential. Therefore vigorous training of the workforce in every aspect of the, process is crucial. The secret for success in the quest for improved quality and productivity-should always centre around a well motivated workforce. Nigeria can repeat the Japanese miracle if we follow their quality improvement example carefully.

References

1. Jordan Philip; "Quality Culture".' An IprodE Silver Jubilee Paper." Manufacturing Engineering London. October 1990.

2. Achi, P: B. U, "Productivity in National Development". 1st NPC National Day' Symposium. Owerri, February 1991.

3. Gibson, D. W., "Materials Handling a productivity opportunity" *Production Engineer.* .July/August 19.88.

4. Achi, P. B. U. et al, "Effect of Work-in-Progress on Capital' Formation in Nigeria's-Metal Goods Industries". Project Report. Federal University of Technology, Owerri, 1991.

5. Watson I., "Economics of' Availability" Manufacturing Engineer. London, February1991.

6. Drake, P and Buck, A. A., "Quality at the Controls" *Manufacturing. Engineering.* London, April/May 1991.