



## TenStep Supplemental Paper

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### **Evaluating Total Quality Management Using Inventory Performance**

Over the years, the increasingly competitive and customer-driven market has caused many manufacturers to pursue Total Quality Management (TQM). Consequently, numerous methods of evaluating the success of TQM have also been applied. Often, companies themselves conduct evaluations to gauge the success of their quality initiatives. Most of these methods revolve around questionnaires, surveys and other subjective methods that evaluate customer satisfaction.

Other quality criteria, like quality awards or quality standards certification, have produced mixed results because some companies use the awards as stepping-stones to higher levels, while others face problems soon after winning the awards. Since all these methods are subjective, erroneous perceptions regarding the presence of quality have been prevalent. Therefore, a study was conducted to identify quantifiable and system-wide factors.

#### **Inventory as Indicator of Total Quality**

The study involved the design, development and testing of a non-subjective and quantitative model that could be utilized to indicate the presence and evaluate the effectiveness of a TQM program in manufacturing facilities. The model aims to use inventory performance as a measure of Total Quality (TQ). This approach is based on the fact that production is a dynamic system that requires the collaboration, integration and dedication of suppliers, customers, employees and management.

Any TQ organization must have quality embedded in all facets of its philosophy, which in turn must be reflected in the production process. For a flawless system, quality must be prevalent all the way from the design process to post-purchase satisfaction. The initial infusion of quality into any product calls for high-quality incoming raw materials. The entry of defective incoming raw material negates the effects of all the quality inputs. Therefore, mere inspection of incoming raw material to assure quality is insufficient. The manufacturer must also establish and promote long-term relationships with the suppliers. Companies with sterling reputations for TQ have further added to these relationships by encouraging suppliers and customers to participate in the design process. They also provide inputs into the technology and production process to be used. This ensures 100% quality and customer satisfaction.

Current trends in the global market indicate rapidly changing customer requirements. To ensure customer satisfaction, manufacturers must first minimize finished goods inventories. Providing superior quality products is not the only criteria; ensuring timely delivery is also very crucial. Just in Time (JIT) facilitates TQ as it involves flexible manufacturing and allows for little or no finished goods inventory. Furthermore, JIT entails the use of reliable equipment and superior technology, along with a dedicated workforce and expeditious processes, to convert raw materials to finished goods. All these technological factors are vital for successful total quality. Superior inventory



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performance in terms of low inventory is manifested through JIT or lean manufacturing only when there is:

- High quality design
- Supplier participation leading to defect-free incoming supplies
- Best-practice production processes
- 100% reliable equipment
- Rapid and responsive manufacturing
- Flexibility
- Technological superiority
- Employee integration

These criteria for superior inventory performance also represent the fundamentals of TQ. In order to gain competitive edge, a company has to anticipate customer requirements while holding a minimum inventory. Thus, for an effective TQM, there must be superior inventory performance.

TQM and JIT go hand-in-hand since they both aim to deliver the right product to the customer at the right time and the right place. The unique affiliation between TQM and JIT helps to create the competitive advantage for the organization. With low or zero finished goods inventory levels in JIT manufacturing, manufacturers can focus on designing products based on customer requests.

Inventory performance was selected as a measurement gauge for the study because it affects all phases of production, from raw materials to end-user delivery. Furthermore, to maintain zero inventory levels, it is essential to have quality suppliers who are educated in the principles of JIT. Inventory can be differentiated as Raw Materials (RM), Work-In-Progress (WIP) and Finished Goods (FG). Many JIT companies consider WIP to be their raw materials and termed them non-finished goods. The study emphasized the fact that low levels of finished goods inventories indicate higher TQ than any other types of inventory. Companies with higher finished goods inventory tend to sell what they have rather than what the customer wants.

### **The Inventory Model**

Ten companies with excellent reputations for TQ were selected to form a benchmark group. Another ten companies with no particular reputation for TQ formed the control group. A check was conducted on the benchmark group to verify that inventory had been differentiated into RM, WIP and FG. Three rating methods were developed based on priority levels assigned to finished goods inventory. To portray the inventory levels accurately, it was decided to divide every firm's value of inventory by the corresponding Cost of Goods Sold (COGS).

### **Three Rating Methods**



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*Rating method 1:* This was based on the principle that all inventories (RM, WIP and FG) should be given equal importance.

*Rating Method 2:* This method attached greater importance to finished goods by doubling the weight placed on finished goods inventory rather than on other inventory.

*Rating Method 3:* Assigned three times the weight on finished goods inventory

Since the model aimed to evaluate TQ and non-TQ organizations, emphasis was placed on the role of finished goods inventories. Hence, rating method 2 was selected for evaluation because it placed intermediate importance to finished goods inventory. The inventory ratings for each of the four years were consolidated into one rating per company. In order to evaluate the inventory performance of the companies from each of the groups relative to one another, the consolidated ratings for all the companies from both the groups were tabulated.

### **Analysis of Results**

It was observed that 50% of the entire control group had high inventory ratings and nearly 80% of the benchmark companies had low inventory scores. Cross-checking revealed that companies with lower inventory ratings were TQ organizations and those having high ratings were the non-TQ companies. However, a few companies scored in the intermediate range.

### **Need for more analysis**

The status of the companies in the intermediate range was undetermined and consisted of two benchmark and three control group companies. Further analysis is required to confirm if companies having a good inventory rating are indeed TQ companies. It is also vital to better classify companies in the intermediate range. A multi-factor model has to be developed to confirm the validity of the inventory performance tool presented above. Although the inventory-rating model will serve as a basis for a comprehensive and reliable tool for evaluating the presence of TQ in companies, an in-depth trend analysis is also required. Only then can superior inventory performance be considered a valid indicator of TQ in an organization.