### Module Overview

Total Quality Management (TQM) is the organization-wide management of quality that includes facilities, equipment, labor, suppliers, customers, policies, and procedures. TQM promotes the view that quality improvement never ends, quality provides a strategic advantage to the organization, and zero defects is the quality goal that will minimize total quality costs. While this special topic on TQM is not a comprehensive discussion of all aspects of TQM, several key concepts will be discussed.

An important basis for justifying TQM practice is understanding its impact on total quality costs. TQM is rooted in the belief that preventing defects is cheaper than dealing with the costs of quality failures. In other words, total quality costs are minimized when managers strive to reach zero defects in the organization. The four major types of quality costs are prevention, appraisal, internal failure, and external failure.

**Prevention costs** are the costs created from the effort to reduce poor quality. Examples are designing the products so that they will be durable, training employees so they do a good job, certifying suppliers to ensure that suppliers provide quality in products and services, conducting preventive maintenance on equipment, and documenting quality procedures and improvements. In a traditional organization that does not practice TQM, prevention costs typically comprise the smallest percentage of total quality costs.

A good example of good product design occurs in all Honda products. Honda produces a wide variety of items, including automobiles, ATVs, engines, generators, motorcycles, outboard motors, snow blowers, lawn and garden equipment, etc. To say the least, Honda engines last a long time. For example, Honda Accords typically run for well over 200,000 miles.

Employee training is also a very important prevention cost. For instance, employees in a vegetable/fruit packaging warehouse need to know what a bad vegetable/fruit looks like, since customers will not want to find spoiled produce in the store. Lifeguards at a swimming pool must know proper procedures for keeping swimmers safe. In many circumstances in both manufacturing and service businesses, the training of employees can make an enormous difference in preventing defects.

Supplier selection and certification are critical prevention activities. A product or service is only as good as the suppliers who partner with an organization to provide the raw materials, parts and components, and supporting services that make up the final products and services that the end customers receive. For example, a home furnishings store might use an outside subcontractor to install carpeting, but if the subcontractor fails to show up on time, tracks mud into the customer’s home, or behaves in a rude manner, the store’s reputation will suffer. Similarly, a car manufacturer who purchases defective tires from a supplier risks incurring high costs of recalls and lawsuits when the defects are discovered.

Preventive maintenance is necessary for preventing equipment breakdowns. Many manufacturing companies use sophisticated software to track machine usage, and determine optimal schedules for regular machine maintenance, overhauls, and replacement.

Documenting quality is a necessary prevention cost because it helps the organization track quality performance, identify quality problems, collect data, and specify procedures that contribute to the pursuit of zero defects. Documentation is important to communicating good quality practice to all employees and suppliers.

**Appraisal costs** are a second major type of quality cost. Appraisal costs include the inspection and testing of raw materials, work-in-process, and finished goods. In addition, quality audits, sampling, and statistical process control also fall under the umbrella of appraisal costs.

Inspection and testing of raw materials is very important, since substandard raw materials lead to substandard products. Raw materials used for a bridge determine the strength of the bridge. For example, soft steel will erode away faster than hardened steel. Moreover, the concrete bridge decking needs to be solid, as concrete with air pockets will erode and crumble faster, creating an unsafe bridge.

Finished goods and work-in-process inventory also need inspecting and testing. For example, worker error is quite common in the home construction industry, and this is why inspections occur frequently on newly constructed homes during and after the construction process is complete. Building inspectors ensure that the house has the proper framing, electrical, plumbing, heating, and so forth.

Quality audits and sampling are also important appraisal costs. Quality audits are checks of quality procedures to ensure that employees and suppliers are following proper quality practices. With sampling, a company can ensure with confidence that a batch of products is fit for use. For example, a wooden baseball bat manufacturer may test 10 out of every 100 bats to check that they meet strength standards. One weak bat can signal that quality problems are present.

Statistical process control (SPC) is the final type of appraisal cost. SPC tracks on-going processes in manufacturing or service environments to make sure that they are producing the desired performance. For example, a restaurant might statistically track customer survey results to make sure that customer satisfaction is maintained over time. In manufacturing windshields for automobiles, SPC might be used to track the number of microscopic air bubbles in the glass to make sure the process is performing to standard.

**Internal failure costs**are the third category of quality costs. This cost occurs when quality defects are discovered before they reach the customer. Examples of internal failure costs include scrapping a product, reworking the product, and lost productivity due to machine breakdowns or labor errors. Internal failure costs are typically more expensive than both prevention and appraisal costs because a great deal of material and labor often has been invested prior to the discovery of the defect. If a book publisher prints 10,000 books, then discovers that one of the chapters is missing from every copy, the cost of reworking or scrapping the books represents a major loss to the company. It would have been much cheaper to have procedures in place to prevent such a mistake from happening in the first place.

In the case of internal failure cost due to machine failures, FedEx and other courier services cannot keep up with demand when a conveyor belt breaks down in the package distribution center. Major delays and costs occur when such incidents occur. Other examples include a road construction company having a road grader break down, a tool and die shop having a CNC machine break down, and a farmer having a combine break down during harvest time.

**External failure costs** are the fourth major cost of quality. External failure costs occurs when the defect is discovered after it has reached the customer. This is the most expensive category of quality costs. Examples include product returns, repairs, warranty claims, lost reputation, and lost business. One spectacular example of external failure cost was when the Hubbell telescope was launched into space with mirrors that were ground improperly. When the telescope was turned on, instead of a magnificent view of stars, planets, and galaxies, the scientists could see only blurred images. The price of correcting the problem was over USD 1 billion.

External failure costs also occur when the wrong meal is delivered to a restaurant customer, when a computer breaks down shortly after it was purchased, when the wrong kidney is removed from a patient, and when a poorly designed automobile causes the death of drivers and passengers. Because of the enormous costs of internal and external failures, all companies should strive for zero defects. Successful TQM practice dictates that pursuing zero defects will result in the minimization of total quality costs by spending more on prevention and appraisal activities in order to reduce the much higher costs of internal and external failure.

**References:**

Global Text Project (2017), Operations management: Special topic: Total Quality Management. OpenStax CNX. Retrieved from [*http://cnx.org/contents/2a279ebf-9d2b-4e95-8682-195a1afc2d4b@4*](http://cnx.org/contents/2a279ebf-9d2b-4e95-8682-195a1afc2d4b%404)