2.8 Environmental Management, Quality, Design for the Environment, and Other Important Buzzwords

Developing sound environmental management systems together with product design considerations may be an important key to competitive success for companies that think to the future. Concepts related to full cost accounting (FCA) and total cost assessment (TCA) are potentially applicable to any business. The concepts in this section are an extension of FCA and TCA that apply particularly to the manufacturing sector.

Emerging Environmental Management Systems

When the **ISO 9000** quality standards were put into place, many manufacturers in the United States felt pressure to seek ISO 9000 certification to improve their access to global markets. Certification implied that a company had a management system in place that promoted quality standards through continuous improvement. While it did not set a specific quality standard, the certification program identified companies that had management systems in place that fostered quality improvements.

Some expect that **environmental management systems** (EMS) will take on similar importance in the years ahead. Regulatory agencies like the U.S. EPA will offer some relief or preferential treatment to companies who voluntarily implement an EMS program, assuming that the program standards would assure regulatory compliance. Under the guidance of the International Organization for Standardization (ISO), the best known system being released for implementation is the **ISO 14000** series, which includes an EMS standard.

In case studies of seven companies that have implemented a form of EMS, it was found that companies think that international trade will require ISO 14000 certification to be competitive and to have market access. Those who already have ISO 9000 certification tend to be better positioned to implement an EMS system. Some smaller companies have a more difficult time quantifying the benefits of EMS. One hurdle is that programs such as ISO 14000 will result in management systems that "prevent" environment-related waste costs or liabilities.

Some companies are taking a wait and see approach, since the case for investing in ISO 14000 certification seems less justifiable than for ISO 9000. A distinction is made between **quality** and **environmental** standards by these two management systems. Quality is driven mainly by customer satisfaction with the quality of the product or service. Management systems are used which focus on understanding customer satisfaction and practices which support continuous improvement in quality.

Environmental standards are driven by more than the customer, and can include a variety of other stakeholders who may have an interest in the environmental impact of the processes used by the company. This becomes more of a community or regional interest, and includes the interests of regulatory agencies. Buyer acceptance of the product or service is increasingly impacted by

"green" characteristics which become part of the quality perception. For example, organically grown foods are finding greater acceptance, both because of the low environmental impact of farming practices, and because the food is seen as being of better quality than non-organically grown foods.

While some may view quality and environmental impacts as mutually exclusive, very often quality is linked to environmental impacts. When waste is generated from a process, it indicates that the process may be inefficient, and a waste may have several associated cost dimensions.

For example, a food packaging company has a packaged goods reject rate of about 2 percent. The company prides itself in providing a quality product. Most of the reject rate is not from off spec food product, but from packaging problems. The packaging line generated about 200,000 units or more per day, based on spot checks for leaks and continuous monitoring of weight and other factors. The company considered the reject rate acceptable and did not consider the quality of the packaging process to be an issue. However, the company employed two full-time inspectors and an operator to remove reject packets, rip them open, and recover the product. It also spent money buying and disposing of the waste packaging. In addition, it had machinery to shred the packets. No cost analysis had been done about improving the packaging line quality versus the operating costs to inspect and reject packets.

In another example, a company applying paint to its product prided itself in having a high quality, durable finish. However, it had to refinish 7 percent of its products before shipment. After finding an alternative paint product that eliminated its hazardous waste stream, it found that it also had virtually eliminated the need for rework. The management approach to improving environmental performance also produced a better quality product. The key point is that similar practices and procedures are used for both **quality and environmental improvement**. Rather than being mutually exclusive, the two are complementary.

Based on these examples, the step from "total quality management" to "total quality environmental management" may be a small, but beneficial step. Just as quality improvements may lead to less environmental impact, so might environmental improvement projects lead to quality improvement.

Life Cycle Assessment

In 1969 the Coca Cola Company began a study of the comparative environmental releases and the use of raw materials and energy in producing different types of beverage packaging. The methods introduced and then laid the foundation for Life Cycle Assessment of products being produced.

The process involves examining the impact of the product at various stages in its life, from procuring materials to final disposition at the end of its useful life. The stages of a product life cycle can be broken down as follows:

- **Raw Materials Acquisition**
- **Manufacturing**
  - **materials manufacture**
  - **product fabrication**
  - **packaging**
  - **distribution**
- **Use, Maintenance, and Reuse**
- **Recycling and Waste Management**

In addition to materials issues that are present throughout the life cycle, energy is consumed in almost every stage of making, using, and disposing of the product.

The information gathered from life cycle assessment may have a variety of applications. These applications could be: addressing environmental priorities, identifying data gaps, ranking the relative impact of each stage, supporting product certification (i.e. green labeling), or educational use.

Life Cycle Design/Design for the Environment

Modern manufacturing and design practices require a better understanding of product specifications for performance and customer satisfaction. The number of criteria that customers may use in judging a product's quality or acceptability can be very diverse. These criteria need to be accounted for in the design process. The product must be defined in terms of those criteria. In this way, all the attributes can be included.

This approach to design is known as **design for X** which allows the designer to quantify the range of pertinent criteria such as the following:

assembly	**manufacturability**	**reliability**
compliance	**materials**	**safety and liability**
environment	**orderability**	**serviceability**
		testability

From this perspective, it can be seen that environment is one of many design concerns. With the advent of computer-aided design and computer-aided manufacturing (CAD/CAM), it is feasible to design and test many of the attributes on the computer before a prototype is built.

The data gathered from life cycle assessments can be part of the foundation for **life cycle design** or **design for the environment** (DfE) initiatives. DfE is gathering interest from companies because it is a cost effective way to produce competitive products. It is defined as a design process for producing more ecologically and economically sustainable products.

In this system, environmental needs are balanced with performance, cost, cultural, and legal criteria. It provides the designer with an opportunity to factor these issues into each stage. The

designer can take advantage of what has been learned from life cycle assessments, and the product designers become more aware of the environmental and quality consequences of the designs. Companies like AT&T are investing more time and effort into DfE practices as they realize the potential for lowering costs. The companies are also realizing the environmental consequences of product chassis that are reusable and materials that are more easily claimed for recycling and reuse in the manufacturing process.

Sources:

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