CHAPTER 1

The Drive to Economic Performance

GLOBALIZATION — WHAT IT TAKES TO SURVIVE

Throughout the 1970s and 1980s business management forums were dominated by discussions about the increasing globalization of industry. But it was not until the 1990s that the full impact of globalization was actually realized: a very tough business environment in which only the best-prepared and best-managed companies survive. In many cases, the surviving companies have thrived to an unprecedented degree by growing both organically and through acquisitions.

In some respects, the decade of the 1990s was a buy-or-be-bought decade. The fiscally strong companies have consumed the weaker ones and often become quite large. But size alone has not been enough to prevent acquisition. Some of the larger companies in the world, even in traditionally untouchable industry segments, have been acquired in the past decade or so, sometimes even by smaller firms with fiscal strength and tough management.

Globalization has created a difficult environment marked by an incredible degree of organizational downsizing or perhaps, to be more politically correct, rightsizing. Some organizations are now doing an increased level of business with half of their original workforce. Some of the downsizing has been the result of technological advances, but most of it is motivated by a desire to reduce labor costs as much as possible without hampering productivity. The impact on the people working in these environments has been harsh. Longevity and loyalty seem to have lost their value in many organizations, and many employees feel they are regarded as mere piece-parts and numbers rather than valued contributors.

Globalization has led to several other trends that businesses must respond effectively to if they want to survive. Inconsistency and instability in the global resource base for raw materials and human resources have put new pressures on manufacturers. Those that have traditionally focussed successfully on one geographic market segment now face new competitors from different parts of the world entering their traditional market. Often for these competitors raw materials are easier and less costly to access and of higher quality, giving them favorable competitive advantage. Human resources often follow a similar pattern. Twenty years ago, developing areas of the world tended to have an abundance of human resources who were low cost but typically also lower skilled and less educated. Manufacturers in the industrialized regions had no choice but to pay higher wages for the higher skills and better education of their local workforce. But this education and skill gap is rapidly closing, presenting manufacturers in developed regions with a very challenging competitive environment. They cannot survive unless they change their traditional practices.

Another key driver created by globalization is the shift in the criteria used to select automation solutions from technical considerations to economic considerations. A decade ago almost all decisions about automation purchases depended on the preference by the technical community within the manufacturing operation of a state-of-the-art technology or feature. This resulted in a significant level of capital spending for automation technology that we now see provided little or no economic return.

Ten years ago, the phrase *shareholder value* was seldom, if ever, heard. Today, this phrase can be heard in almost every business discussion, even among the technical communities of manufacturing operations. The concern with shareholder value is introducing a new and extremely beneficial perspective into the process of selecting and using automation assets in manufacturing operations. This concern has been intensified by reductions in capital spending and capital budgets. In the 1980s, companies expected returns on capital in the range of 15 to 18 percent. Today, the focus on shareholder value has often resulted in expectations for returns on capital in the 50 percent or greater range. This drive has presented manufacturers with significant challenges in obtaining the capital they need to enhance and upgrade their technology base.

The driving economic forces that have resulted from globalization are all a great cause for concern among manufacturers. Business managers of these firms realize that to survive and thrive within this tough competitive environment they have to be better than their competitors. In the past, they could surpass competitors through superior sales and marketing strategies. In the future, they know they will have to win through more effective manufacturing strategies and better execution of those strategies.

Manufacturers have experimented with dozens of different programs, such as Total Quality Management, to set themselves apart, but most have enjoyed little success. Unfortunately, the path to survival is neither clearly defined nor without obstacles.

But the path does exist. It leads to the realization of new levels of plant performance through more effective use of all plant resources. The objective of this book is to take you down this path. Manufacturers who start along it today will likely be the world-class manufacturers of the future, the ones who survive to tell of their success.

PATHWAY TO PERFORMANCE

Manufacturers have been struggling to use technology to optimize manufacturing strategies ever since the computer was introduced as a tool for automation. From the beginning, it seemed obvious that this new digital technology offered a tremendous potential to improve on the manufacturing process. However, no matter how much effort was applied, the results never seemed to meet the expectations.

The growth in technology, especially computer technology, has resulted in some peculiar human behaviors. Technologies are typically invented to address sets of problems that humans have encountered. But the newer and more complex the technology, the more people seem to focus on the technology itself rather than the problems to be solved.

This is exactly what has happened in the manufacturing industries. Computers are ideal tools for addressing many manufacturing issues, but after they were introduced they became the object of focus rather than the problems facing manufacturers. As a result, computer technology has never reached its full problem-solving potential in manufacturing.

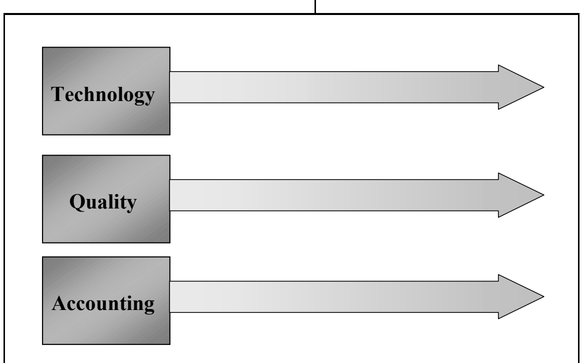

Figure 1.1 Trends for Surviving in a Global Economy

Today, much of the hype surrounding computer-based technology is behind us. Users are increasingly focused not on the tool, but on its use. This is an exciting and encouraging change, one that is vitally necessary if manufacturers are to move to a new paradigm for the management of plant or mill performance. This new paradigm is "bottom-line automation," a discipline that has the potential to significantly improve the performance of plant operations by emphasizing a complementary relationship between people and technology. If that potential is realized the result will be that ever-elusive ideal—world-class manufacturing.

One of the most startling aspects of bottom-line automation is that there is nothing terribly revolutionary about it. As Peter Drucker said in his book *Innovation and Entrepreneurship*, "the greatest praise an innovation can receive is for people to say: 'This is obvious, why didn't I think of it?'"[1] Bottom-line automation is in many respects a natural evolutionary step in manufacturing systems. It is based on three seemingly unrelated or independent trends that can actually be made to converge into a single comprehensive pathway leading to enhanced manufacturing performance.

The concept of the convergence of seemingly independent trends into a knowledge-based innovation is not new. As Drucker also pointed out, a "characteristic of knowledge-based innovations … is that they are almost never based on one factor, but on the convergence of several different kinds of knowledge, not all of them scientific or technological."[2] In the case of bottom-line automation there are three trends (see figure 1.1). One is purely technological but the other two, "quality improvement" and "performance measurement," are not. All of three have been independently viewed by manufacturing management as part of the solution to the difficult economic driving forces we discussed earlier. Let's briefly discuss each of these trends.

THE TECHNOLOGY TREND

For about the past thirty years, industrial manufacturers have looked longingly to computer-based automation to solve their manufacturing problems. They often focused on the computer system replacing automation functions that had traditionally been accomplished with non-computer-based automation equipment such as electronic relays and/or analog controllers. In practice, however, the payback for the functional replacement of older technologies by computer-based technology never fully occurred. Doing the exact same job with a newer technology seldom provides significant returns on the investment.

Computers were introduced into the actual automation of process manufacturing plants in the 1960s. When Digital Equipment Corporation (DEC) proved that a computer could be manufactured for a reasonably low price, computer technology was seen as a viable candidate for many applications that it had traditionally not been considered for. One of the most intriguing areas of application was the manufacturing process itself.

Once installed, a primary problem faced by industry was that to be used effectively this new machine required specialists in computer technology, and these specialists were few and far between. Also, most of the people who had a reasonable knowledge of computers knew little or nothing about manufacturing. The result was that the same companies that were vendors of the traditional automation equipment performed the initial applications of computers to manufacturing plants, typically on a customized basis. Computers showed promise, but the custom application costs were very high, and just getting the computer-based systems to the same level as the previous automation systems required a great expenditure of resources.

The emphasis on computer technology in manufacturing started to evolve significantly in the 1970s. The availability of standard applications software made the computer as a tool for manufacturing automation much more viable. It allowed the computers to be *configured* to solve many of the repetitive applications found in manufacturing rather than *programmed* from scratch each time. Although the computer was becoming easier and more economical to apply, it was used, for the most part, only to replace automation functions that had previously been accomplished with older technology. Many of the manufacturing computers included software packages such as linear and nonlinear programming, but these advanced techniques were implemented sparingly. The result was that the computer was becoming an increasingly common tool for automating manufacturing facilities, but using this new technology led to few functional automation enhancements. It was simply a case of a new technology replacing an older technology.

Toward the end of the 1970s a new trend in manufacturing came into vogue, a movement to tie all of the plant's computers together. It was assumed that if all the various computers in a plant were linked together the plant would operate as an integrated facility. In manufacturing, this trend became known as "computer integrated manufacturing" (CIM). Computer integrated manufacturing became a goal unto itself in that every manufacturer, or at least every technologist in a manufacturing facility, tried to achieve some degree of "interconnectivity," and each was absolutely convinced that good things would result from interconnecting computers. Nobody seemed quite sure what these "good things" would be, but there was general agreement that, whatever they were, interconnectivity would make them happen.

Predictably, the CIM movement did not meet the high expectations of industry. In 1988, I talked to a member of a mill-wide automation team for a large pulp and paper company. He related to me that over the previous five years his company had spent over $50 million on CIM, with not one additional dollar of profit to show for the investment.

This is a prime example of the focus on the *technology* rather than the true problems in the plant. Connecting computers together into a plantwide network overcomes some of the *barriers* to implementing solutions, but it does not solve manufacturing problems. Because of its high expense, however, the CIM trend was exactly what the manufacturing world needed to drive some reality back into automation strategies and planning. Computer integrated manufacturing should have been helping plants accomplish automation, and automation should be implemented to solve plant problems. If a new development solves an automation technology problem, however, it is only of value if it results in true functional enhancements in the end application of the technology. In other words, connecting the various computers together, in and of itself, did not make the manufacturing operation perform any better.

However, it is incorrect to believe that the CIM movement had no value; it resulted in some significant advancement. Communications, operating system, and database management standards were developed during this period, and these tools helped to break down some traditional technological barriers. But the most significant positive accomplishment of this period was that it refocused manufacturers back on the functional issues of manufacturing and away from the automation technology issues.

This decade-by-decade technology drive created a tremendously fertile environment for manufacturing improvement into the 1990s. The focus on technology for its own sake is, for the most part, behind us. Technological tool sets, especially in the area of application software, are now abundant. The reduced cost of the technology now enables creative new forms of physical and functional distribution. And the emerging new automation systems have begun to take on many of the characteristics of higher-level information systems. These new tool sets provide a technology framework that is ideally suited to addressing the current opportunities facing manufacturing. Today's challenge is to take advantage of these powerful new tool sets. The time has come to apply them directly to the problems manufacturers face.

THE QUALITY TREND

The preoccupation with technology for its own sake doesn't only take place in the computer arena. It often happens when any new development emerges and seems to offer a magic cure for pressing problems. One such movement is *statistical quality control* (SQC).

Back in the early 1930s, Walter A. Shewhart, a researcher with Bell Laboratories, published a groundbreaking book on the application of statistics to the control of manufacturing processes. His book, *Economic Control of Quality of Manufactured Product* (1931), provided the foundation for a movement that would take shape some twenty to thirty years later.

Shewhart, who W. Edwards Deming referred to as “the master” of SQC, recognized that no matter how precise a manufacturing process was, in the real world it could never produce exactly the same output each time a product was made. There are variations that occur in nature that man-made manufacturing processes cannot overcome. Shewhart recognized that statistics provided an excellent platform for dealing with this natural variability. His