American Competitiveness Study

Characteristics of Success

ERNST & YOUNG LLP

Foreword

The competitiveness of America's manufacturers, in both domestic and international markets, is of paramount importance to continuing the nation's status as the leader of the free world and to maintaining its standard of living.

Ernst & Young, as part of our long-standing commitment to a robust U.S. manufacturing industry, undertook a survey of manufacturers in America's industrial heartland—the Great Lakes area. We were interested in assessing the state of manufacturing renewal and, importantly, what can be done to accelerate this process.

The findings indicate that successful renewal is much more complex than merely adopting manufacturing technologies to improve factory productivity. Winning businesses were different from losing businesses in the way they planned, the market strategies they pursued, the way they organized people, the performance measures they took on their businesses, and finally, the level of investment emphasis they gave to people versus technology. Overall, it was this softer side of the business that made the difference in financial performance, marketplace position and even the success of technology deployment itself.

Many of these winning characteristics are still points of "uncommon sense," practiced by a few but omitted by, and thus inhibiting, many others in their renewal efforts. The level and consequence of this uncommon sense is reflected in our measure of competitive change. We estimate that more companies are actually losing competitive ground than are gaining competitive ground at this moment.

What can be done to accelerate renewal? This study provides a diagnostic checklist for evaluating many factors found to be associated with successful renewal, as well as a general prescription for making these uncommon-sense characteristics of success the common sense necessary for winning efforts. But research efforts always leave questions unanswered and raise new questions. This forms the basis for future research by Ernst & Young and other organizations committed to searching for better answers to improved competitiveness.

For us, one of the most important questions raised and left unanswered by this study deals with the influence of organization and culture on the application of world class quality management practices. Research in this area is already underway. The International Quality Study, a joint project of the American Quality Foundation and Ernst & Young, will examine and contrast quality management practices across industries, countries and cultures. A model of best practices for quality improvement is an overriding objective of this study.

Synopsis of the American Competitiveness Study

U.S. manufacturing is in a period of competitive transition. How well companies manage the renewal of operations will strongly influence the outcome.

American Competitiveness

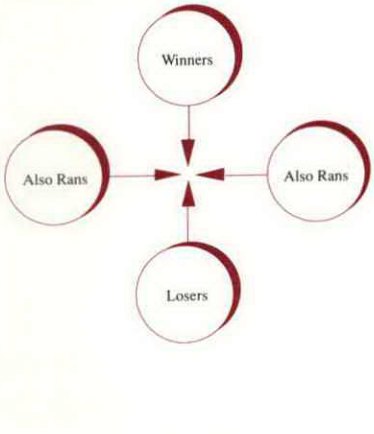
The renewal of U.S. manufacturing has been an issue of growing national attention since the late 1970s. This need has come about because the pace of improvement by foreign manufacturers has been greater than our own. More importantly, the forces driving these improvements continue to operate. In many cases positions of advantage have already eroded to the point of disadvantage. As a result, the renewal of our manufacturing industry is not just about absolute improvement, but rather the rate of improvement necessary to overtake a moving target and reestablish competitive advantage.

Much of the basis for these shifting fortunes is no longer the subject of wide debate. The ability to achieve unprecedented levels of quality and productivity and the power of doing so have been clearly demonstrated by both foreign and domestic manufacturers. Now, a decade later, it is rare to find a company that is not pursuing these objectives as a stated part of its overall strategy. As a result, the consequences of manufacturing renewal are no longer confined to just those companies facing foreign competition.

Remaining very much in debate, however, is the best approach for accomplishing better quality and higher productivity. A groundswell of prescriptions are presently being administered with varying degrees of emphasis and levels of investment. These improvement initiatives, involving changes in technology, systems, people and the way a company is organized, are producing a multitude of approaches with a wide range of outcomes. Some manufacturing renewal efforts have been unqualified successes, producing rapid rates of improvement, while others have failed miserably.

The fact that so many companies are aggressively pursuing manufacturing renewal with such widely varying outcomes creates a period of competitive transition. During this period, the potential for fundamental shifts in market leadership among competitors is very high.

U.S. industrial competitiveness is not an abstraction. It is a series of conflicts among direct competitors and the people they employ.



Across the country today, individual companies are locked in very personal contests with their direct competitors. In many cases the outcomes are being decided by how well the manufacturing renewal opportunity is being managed. Winning positions will belong to those companies who are the first to master the intricacies of operations improvement. Conversely, losing positions will belong to those slower to adopt, and most assuredly, by those aggressively pursuing incorrect approaches.

Manufacturing renewal to achieve better quality, higher productivity, faster throughput and quicker market response has become a competitive mandate for every U.S. manufacturer. As such, how to organize successful efforts and the pace of execution necessary to preempt competition are now critical questions facing most manufacturing executives.

Purpose of Study

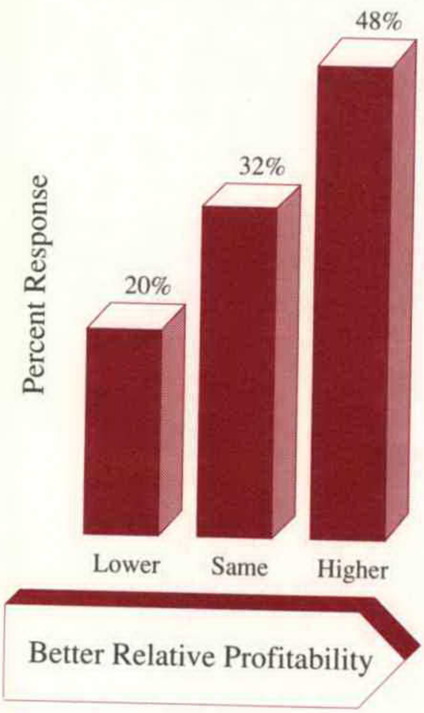
To examine the evidence about the content, construction and impact of successful manufacturing renewal efforts.

The American Competitiveness Study, which polled the top executives at 277 manufacturing companies, was conducted to learn more about the current status and competitive impact of manufacturing renewal. The objectives of the study were to search for answers to three questions:

- What factors explain why some manufacturers are more successful than others?
- How much of a shift in competitive standing is likely to occur as a result of present renewal efforts?
- What principles exist to guide manufacturers in actually improving competitive standing through the renewal of their operations?

Given the diversity of opinion about the best approach to manufacturing renewal, the identification of statistical evidence linking different actions with different outcomes was an overriding consideration in analyzing the survey data. The findings of the American Competitiveness Study have passed this test. While these results do not represent the whole picture by any means, they are important pieces of the puzzle.

A Measure of Success—Current Relative Profitability



One measure of competitiveness is a company's relative profitability—that is, its profitability relative to that of its actual competitors. While absolute profitability is essential, relative profitability separates the "winners" from the "losers" in a given marketplace. Each could be making handsome profits or none at all in an absolute sense. But regardless of the level of absolute profitability, companies possessing real competitive advantage have the *ability* to consistently outperform their rivals financially over the long haul.

The present relative profit positions of the businesses participating in this study provided a sample of overall competitive success. Nearly half (48%) of the companies were outperforming their principal competitors financially. On the other hand, only 20% of the participants were financially underperforming their direct competitors, and a third (32%) of the companies found themselves in dead heats.

Having this range of relative profit positions was important to the study. Very little insight can be gained from looking only at winning businesses because it is difficult to tell what really makes them different from less successful businesses. Within the scope of the survey, the analysis looked for those factors that were characteristic of better performance *and* uncharacteristic of weaker performance.

Characteristics of Success

There are no "silver bullets!"

Behind the successful outcomes was a story of common and uncommon sense that began in the marketplace and cut a wide swath across the manufacturers' operations and business practices. No one thing was found to dominate the outcomes of the businesses studied. Rather, a number of interdependent things have to be done well to produce competitively superior financial results.

Marketplace Position

A Strong "Balance Sheet" of Marketplace Assets

Immediately beneath the surface of relative profitability were four comparative measures of business performance versus direct competitors that provided a good deal of explanation regarding the current level of profitability being achieved. The more profitable businesses were those that had achieved positions of: 1) better relative quality and 2) lower relative cost. But these advantages alone were not enough. These positions had to be converted to financial advantage through: 3) higher relative price and/or 4) larger relative market share. It was here that many companies appeared to be squandering their current quality advantage.

Marketplace Position Factors	Relative Profitability	
	—	+
Relative Quality	Worse	Better
Relative Cost	Higher	Lower
Relative Price	Lower	Higher
Relative Market Share	Smaller	Larger

These were more than nonfinancial measures of past accomplishment. Companies that had developed positions of advantage on these measures possessed a greater ability to exercise market leadership in a number of ways not available to their competitors. As such, these advantages were true assets of the business even though they do not appear on conventional financial balance sheets. Conversely, positions of disadvantage were competitive liabilities handicapping the very starting point of many renewal efforts.

For this reason, business practices associated with planning, products and markets, organization, performance measurement, and finally, actual operations improvement initiatives were all put to two tests. Could they be positively linked either to better financial performance or better marketplace position? Factors that passed either test were the business practices characteristic of success found in this study.

Winning businesses were more likely to address matters of internal organization and external competition than were their counterparts. Second, these broader planning agendas were aimed at achieving the more demanding ambition of market leadership rather than just self-improvement. Here, winning businesses were more likely to be pursuing product and service quality superiority, which helped form the necessary foundation for pricing leadership.

Products and Markets

Scope of Business—as Broad as Manageable

For the majority of companies, the planning agenda most often included product and market considerations, and a number of choices related to product and market strategy were found to influence overall competitive standing.

Improvement Factors	Relative Profitability	
	—	+
Product Line Scope	Narrower	Broader
Product Innovation	Infrequent	Frequent
Quality Criteria	Product	Reputation
Vertical Integration	Less	More
International Scope	Less	More
Competitive Pressure	Customers	Competitors

More successful businesses offered broader product lines than their competitors and were more active in upgrading these product lines through innovation. But these companies also believed that their customers' criteria for quality extended well beyond today's physical product quality to include their general reputation for better products and services. More successful companies were also more vertically integrated, more likely to have some involvement in international markets and were less likely to find themselves in market situations where customer bargaining power was the principal catalyst for increased competitive pressure. In summary, companies were rewarded for their ability and willingness to manage complexity and drive innovation.

Organization

Close Proximity to Customers

While organizational issues were the ones most likely omitted from a company's planning agenda, the way businesses were organized impacted their performance.

Organizational Factors	Relative Profitability	
	—	+
Organization Structure	Centralized	Decentralized
Factory Focus	Unfocused	Focused
Decision Making	Executive Level	Operating Level
Management Focus	Control	Culture
Executive Compensation Measures	Skewed to Short or Long Term	Balanced Short and Long Term

The more successful companies were more likely to have decentralized organization structures, focused factories, more decision-making authority residing at the operating level of the business, a management focus on establishing a proper culture versus tighter control, and finally, executive compensation systems based on a balance of short- and long-term performance measures. Collectively, these organizational differences underscored the value of getting the organization "closer" to its marketplace.

Performance Measurement

More Prescriptive Than Traditional Approaches

As more companies intensify their manufacturing renewal efforts, it is increasingly apparent that traditional cost accounting and performance measurement approaches can be roadblocks to success and the results of the study support this contention.

Performance Measurement Factors	Relative Profitability	
	—	+
Operating Measures	Traditional	Prescriptive
Cost of Quality	Unknown	Known/Low
Capacity Utilization	Low	High
Capital Justification	Ineffective	Effective
Information Systems	Ineffective	Effective

Better business performance was linked to operating measures that extended beyond traditional views of manufacturing. An increased emphasis on lead time management, work flow balance and resource utilization were characteristics of the operating measures of the more successful businesses. Cost of quality was known and low, overall capacity utilization was high, and better performing businesses were much more likely to judge their capital benefits tracking and general information systems as effective tools for managing the business.

Improvement Initiatives

Point of Focus—Total Quality

Method of Attack—Employee Training

Increasingly, when the competitiveness of a manufacturing business is considered, attention is centered on the improvement of the production process itself, and here a wide latitude of thought exists for exactly what needs to be improved and how to go about it.

Improvement Factors	Relative Profitability	
	—	+
Performance Objective	Lower Cost	Better Quality
Investment Focus	People Last	People First
Technology Constraints	Many	Few
Process Drivers	Better Equipment	Customer Needs

In this study, the more successful businesses placed quality improvement ahead of cost reduction. Quality advocates seemed to get both better quality and lower costs, while cost advocates often got neither. With respect to approach, the more successful businesses placed a greater emphasis on people-related investments, the principal constraint to successful technology adoption. But the successful deployment of technology, the number one area of investment by companies participating in this study, required more than the elimination of constraints. Companies that viewed technology as a "solution in search of a problem" did not do nearly as well as those that put technology to work, as appropriate, in the course of finding ways to better satisfy customer needs.

Shift in Competitiveness

Twenty-eight percent of the companies appear to be undergoing significant change and there are likely to be more losers than winners.

How much of a shift in relative profitability and competitive standing appears to be taking place? We examined 277 businesses in this study. Some were currently achieving better relative financial performance while others were not. But clearly current profitability is not necessarily a predictor of future profitability.

A business may currently be paying the price for upgrading its operations for the future; this business may well have inferior current earnings—at least earnings as they are normally reported in accounting statements—but strong expectations for the future. On the other hand, a business may be being "harvested" today, and show high apparent current profitability at the cost of destroying the foundation for future success. How can we tell what is really occurring today and therefore in prospect for tomorrow?

- Eroding from a higher level (17%)

  Profitable now as result of past actions but not now taking the actions that normally are required to maintain future success at the current level.

- Sustaining less profitable positions (13%)

  Not as profitable now, as result of not having taken the required steps in the past, and not now taking them either, thereby virtually assuring lower levels of relative profitability in the future.

The Message in the Results

Business results are a product of organizational habits; bad habits are easily formed and difficult to break.

Seventy-two percent of the companies appeared to be maintaining their current competitive position. Evidently business results are very much a matter of organizational habit. Some companies have good strategic habits, others bad strategic habits, and both kinds of habit tend to persist for long periods of time. This fact underscores the enormous importance of developing good strategic habits in the first place by installing good organizational procedures and training people in their effective use.

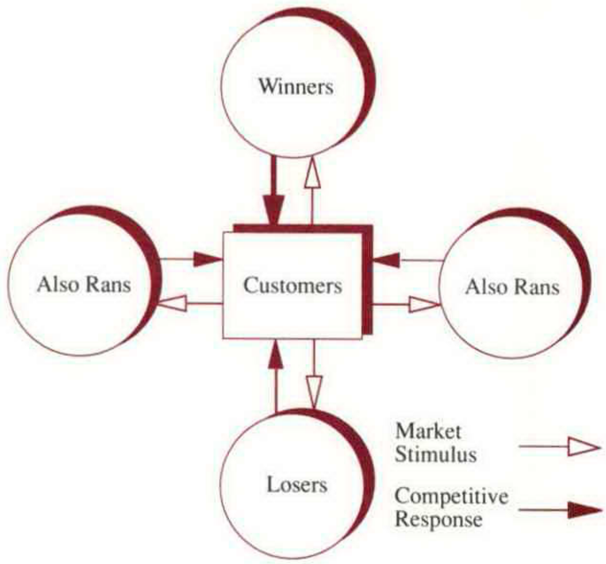
Of the companies who did appear to be undergoing significant change in their present positions, more seemed to be slipping from higher ground than were climbing to higher ground (17% versus 11%). While habits tend to persist, when change does occur, a change for the worse is apparently more easily accomplished than a change for the better. Why should that be? Possibly because a poor strategic position is very much a trap. Not only does it produce weaker current results, it also deprives the organization of the means of change for the better.

There are two messages here. First, poor business positioning should be avoided at almost all costs, because it puts a company into a trap from which escape is difficult and therefore rare. Second, good positioning is profitable but not always secure, and therefore even well-positioned businesses need to constantly renew themselves to stay that way.

Competitiveness is about marketplace leadership and is a never-ending battle of actions stimulating reactions among direct competitors. Each year uncomon-sense characteristics of success are observed to make a difference and become more widely adopted. A decade ago a focus on quality improvement was an uncommon-sense belief providing an opportunity for repositioning. Today, quality has become more a common-sense characteristic of success that must be pursued to avoid disadvantage.

Winning businesses, and particularly those that are likely to stay that way, do the "right thing" in most of the major action areas and lead their competitors in doing so. Losing businesses, and particularly those that are likely to stay that way, tend to be poor in many of the action areas, and moreover lag their competitors in making changes. Intermediate and/or mixed behavior patterns tend to produce intermediate results.

Winning businesses lead their competitors in doing the right things.



Winning renewal agendas begin and end with the marketplace. The scope and pace of the effort required for a given company is a function of its starting point and the aggressiveness of its competitors in attempting to serve more customers better. Along the way a number of things must be brought into alignment within the organization to produce the good strategic habits that lead to better competitive position.

Principles of Prescription

Winning renewal agendas depend on doing the right things well, in the right order, at the right time and at the right pace.

What needs to be done?

Will the huge investments of time and money being made to improve operations be offensive initiatives that actually improve the competitiveness of the business or merely defensive moves that help avoid decline? While there is a wide variation in precisely what has to be done, this study confirmed a number of general principles that are essential for establishing and executing winning renewal strategies.

- Market Research

  Manufacturing has been properly described as the missing link in business strategy. In turn, market research is too often the missing link in defining the specific performance objectives of manufacturing operations. Since what can be done to better satisfy the needs of the market is always more varied than an organization's capacity for accomplishment, priorities need to be established. Therefore, a fact-based understanding of the power of individual attributes governing the purchase decision is essential if relative value is to be assigned to doing various things well.

How well does it need to be done?

■ Competitive Benchmarking

However, merely understanding what the market desires most is not enough. Current and potential competitive standing based on the ability to satisfy market needs, together with current market share holdings of each competitor, help complete the market-driven objectives of the manufacturing strategy. Knowing the value of what needs to be done and the pace required for accomplishment are essential elements of successful strategies.

What needs to be improved?

■ Extended-Process Recognition

The processes and functions surrounding manufacturing (e.g., product engineering, sales and marketing) have a tremendous influence on the effectiveness of manufacturing operations (and vice versa). Successful efforts require that the extended process, connecting the business with its customers, be the focus of improvement rather than just the subprocesses of manufacturing operations or any other functional view of the business. Manufacturing renewal is about integrating the entire enterprise with its marketplace.

Who will do it?

■ Investment in Employees

Investment in talent, education, training and motivating people precedes most everything else. This provides the foundation for moving the decision-making authority of the organization "closer" to the customer so that process improvements are made in accordance with market needs. People must be empowered to improve, not just administer, the processes of the business.

How will it be done?

■ Sequence of Process Improvement Initiatives

The sequence of actions providing the most expeditious and economical path to process improvement is: 1) process stabilization, 2) process simplification, 3) extended-process integration, and 4) automation. Taking the automation "bypass" and not laying the necessary foundation actually slows progress and, at a minimum, raises the cost of process improvement. There do not appear to be any shortcuts to sound manufacturing renewal. The competitive edge lies in how quickly and sure-footedly these initiatives are accomplished.

How will progress be measured?

■ Performance Measurement

Performance measurement systems need to be realigned to identify what activities are adding value and driving costs. Traditional cost accounting systems do an inadequate job of distinguishing muscle from fat throughout the extended process of the business. These systems are worse than incomplete; they are misleading and disruptive.

When is the job finished?

■ A Philosophy of Continuous Total Improvement

Markets change and competitors improve. This creates a natural turbulence in the marketplace and makes competitiveness a test of adaptability. Anything that improves the *ability* of the business to respond to the market with better products, of higher quality, at lower costs, in a more timely manner, improves adaptability. In this regard, two blind spots in philosophy can knock renewal efforts off their courses. First, the value of pursuing generic strategies that have just lower cost or higher conformance quality as their ultimate goal will eventually play out as more companies learn how to do both; total improvement in delivering value to the market is required. Second, large, infrequent efforts to rejuvenate competitiveness allow leadership to ebb and flow, and undermine the organization's ability to handle change. The improvement process must be continuous. Longer term, the most competitive businesses may actually strive for turbulence in their markets because they manage it best.

How is business performance judged?

■ Management Performance

When it comes to manufacturing renewal, the short-term profit motivation of the financial community is often viewed as an obstacle to accomplishment. In some respects, this is an unfair portrayal. Businesses that have gone sour on Wall Street have first gone sour on Main Street. As the competitive gap widens in the marketplace, the cost of recovery grows noticeably larger and the value of the business declines. Management compensation and reward systems based on long- *and* short-term performance help maintain a sense of urgency for profitably satisfying Main Street.

Synopsis of the American Competitiveness Study

The results of the American Competitiveness Study provide a message of both encouragement and concern. Finding so many of the characteristics of successful renewal to be minority traits of companies in this study suggests that the overall pace of improvement is slower than what is needed for the U.S. to regain its industrial edge. However, for many individual companies this also means that the window of opportunity is still open for establishing competitive leadership on the strength of a truly integrated organization focused on getting the job done in its marketplace.

Respondents and Research Approach

Survey and Respondents

The study included a survey of top executives from 277 midwestern manufacturing companies in the tristate area of Ohio, Michigan and Pennsylvania. Fifty-six percent of the respondents were CEOs and ninety-five percent of all respondents were at or above the level of director. The companies represented a cross section of smaller private and larger public companies, including twenty-six *Fortune 500* industrial corporations.

The survey described each company along a number of dimensions: 1) marketplace and operating characteristics of the business, 2) manufacturing strategies being pursued, 3) planning, management and control factors surrounding these strategies, and 4) competitive standing, including relative financial results.

The number of responses indicated a very high level of top management interest in the subject of manufacturing strategy. It also provided a sizeable and diverse sample of approaches and outcomes for analysis.

Approach to Analysis

Identifying the characteristics of success. What explained better relative profitability and marketplace position?

Survey findings are useful in many ways. Perhaps the most common use is in measuring trends and priorities. There is a certain amount of comfort in understanding what is "normal," and other surveys have been completed that provide information on the popularity of various manufacturing improvement programs. However, being normal is not synonymous with competitive leadership.

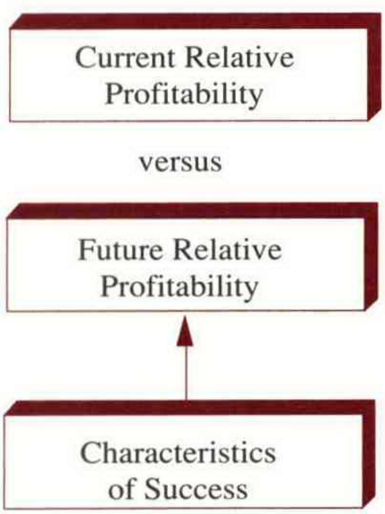
The objective in analyzing the American Competitiveness Survey data was to convert information into intelligence about which programs and conditions are positively linked with better business results. The approach taken to analyze the data was "cross-sectional," that is we looked comparatively at the more successful and less successful businesses represented in the survey to determine what made the difference in relative profitability.

Respondents and Research Approach

Relative profitability is one bottom line measure of how well a business is doing today in the contest with its immediate competitors. But relative profitability certainly isn't the only measure of competitive standing. Some of the most powerful variables explaining differences in relative profitability in this study are marketplace measures of competitiveness such as relative cost, relative quality, relative market share and relative price. Advantages here are developed over time and support the ability to continue achieving higher levels of relative profitability in the future.

Therefore, in addition to relative profitability, the impact of manufacturing strategies on marketplace position was also examined. This helped identify a number of additional relationships, also indicative of successful renewal efforts, that were not quite strong enough or mature enough to link directly to relative profitability.

Estimating the present shift in competitive standing.



The data clearly signaled several important "determinants" that were significantly related to better performance. Statistically, each of the factors identified in this study was significant at the 95% level or better and a majority were significant at the 99% level. When all of these factors were combined into a multiple regression equation with relative profitability as the dependent variable, the R-square (the degree of explanation of the variance across all responding businesses) was near .60, meaning that 60% of the difference in profit positions could be explained by differences of position on underlying factors. This indicated that the characteristics of success discussed in this report, while not the whole story by any means, have indeed been important to successful manufacturing renewal efforts.

The multiple regression equation provided a model of relative profitability representing the collective experience of all respondents. This enabled an estimated future relative profitability value to be calculated for each business participating in the survey based on the presence or absence of factors which seemed to explain better performance.

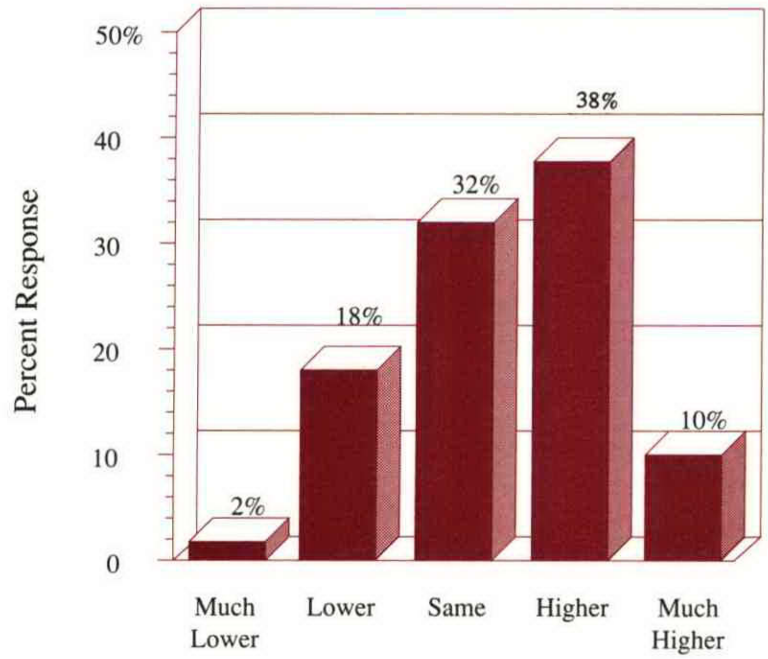
When the future relative profitability value was higher than the reported level of current relative profitability would indicate, the business was evaluated to be laying the foundation for improvement and likely to receive the reward of a better profit position in the future. Conversely, if the future profit position of a company was much lower than its current position, the business was evaluated to be in store for a potential fall.

Characteristics of Success: Competitive Position

Relative Profitability

How do businesses compare with competitors on relative profitability? Based on current profitability, nearly half (48%) of the companies believed they were outperforming their primary competitors. Only 20% of the companies believed they were less profitable than their competitors.

Relative Profitability



The fact that there were so many more winners than losers was somewhat of a surprise. This indicated that there was some bias in the sample. The most likely explanation for the bias was that businesses that were doing well were more likely to share their story than those that were not. Another explanation was that there was a tendency to give a business the benefit of doubt when actual profitability of competitors wasn't known.

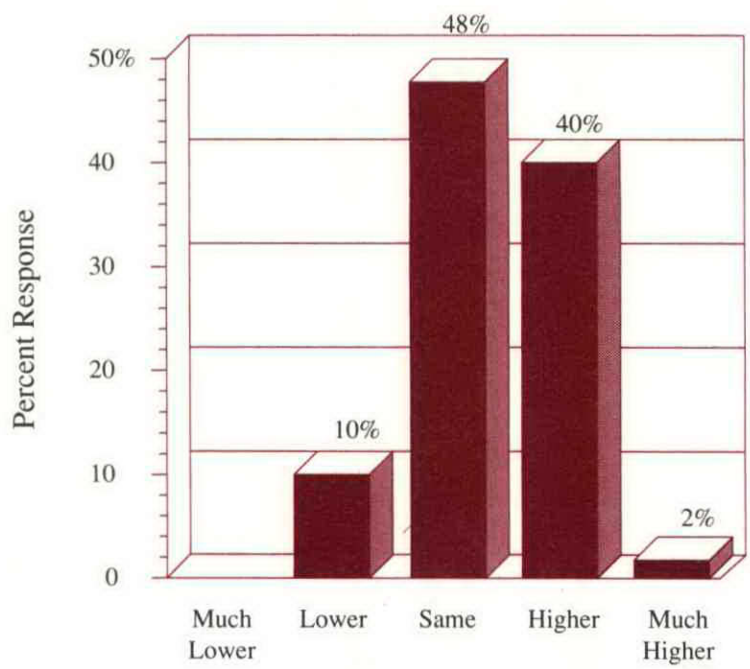
While both explanations are probably true, neither had an appreciable affect on the results of the study. The purpose of the study was to look for significant differences that distinguished the more successful from the less successful outcomes. The survey provided an ample number of businesses across a range of relative profit positions to make this analysis. The high degree of explanation that was found as to why businesses were located at different positions across this profit range indicates that the bias was not strong enough to disguise many of the important differences.

Relative Price

Throughout this report each factor identified as characteristic of success was found to be linked to either relative profitability and/or one or more of the factors of marketplace position. The direction of the relationship is shown by (+) or (-) for factors at the 95% level of significance and (++) or (--) for factors at the 99% level or higher.

How do businesses compare with their competitors on selling price? The survey shows that most companies (48%) are pricing to meet the competition. However, the tendency to charge a slight premium (40%) was reported to be much more common than underpricing (10%) the competition. Extreme pricing positions in either direction versus direct competitors are normally rare, and the results of this survey are no exception.

Relative Price



- When pricing was compared with relative profitability, positions of higher relative price were found to support better profit performance.

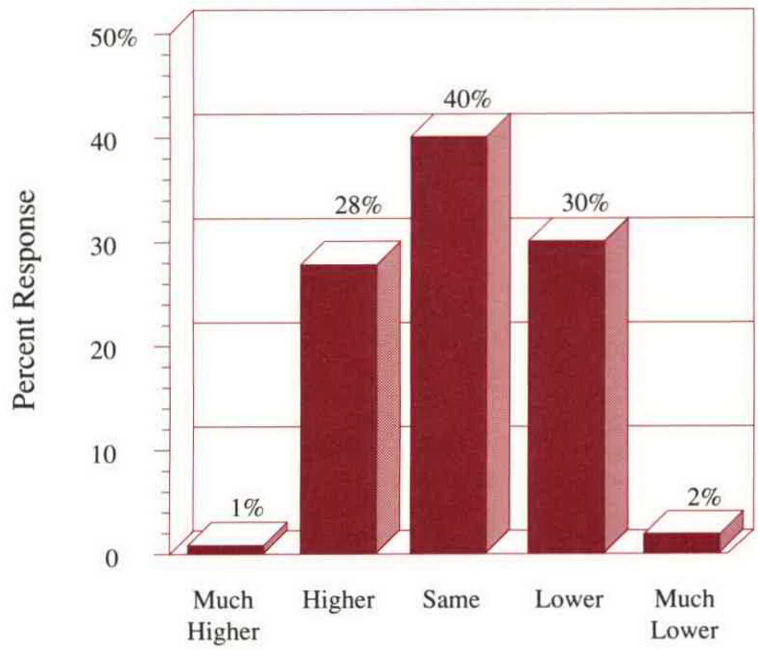
However, premium price positions were not achieved by a mere willingness to exercise price leadership. The ability to do so had to first be present. Other factors associated with marketplace position and breadth of operations were closely correlated with the ability to premium price. When these factors were present, exercising upward price leadership enhanced profit performance. On the other hand, premium pricing in the absence of these factors depressed profitability.

One important implication of these findings is that some of the potential advantages associated with successful renewal efforts may be squandered through unaggressive pricing practices.

Relative Cost

How do business compare with competitors on the cost of goods sold? Like relative price, most companies reported a parity position on relative cost (40%) versus their primary competitors. But cost-disadvantaged companies (29%) were nearly as frequent as cost-advantaged companies (32%).

Relative Cost

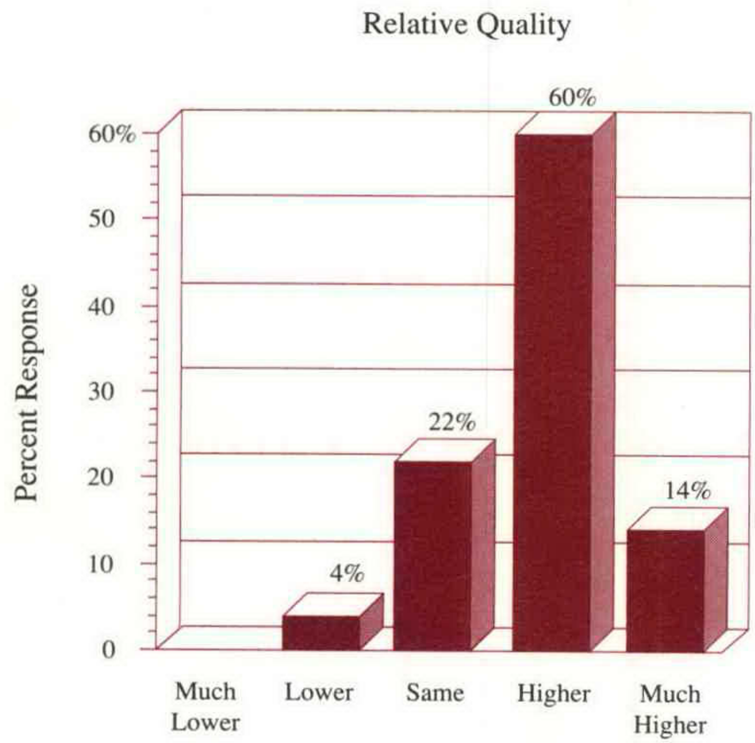


- A strong correlation was found to exist between relative cost position and relative profitability. Unsurprisingly, better relative cost supported better relative profitability.

A number of factors were found to be closely correlated with better relative cost. As a rule, the factors were more circuitous and counter-intuitive than mere cost reduction programs. Two of the most important were accumulated strengths on the remaining marketplace factors: relative market share *and* relative quality.

Relative Quality

How do businesses compare with competitors on quality? Higher quality is an "average" position. Sixty percent of the companies believed customers regarded the quality of their products and services to be higher than that of direct competitors and 14% rated their quality to be significantly better. Only a quarter (26%) of the respondents considered their quality to be equal to or lower than that of competitors.



Can so many companies actually be better than their competitors on quality? Probably not. Experience has shown that, in the absence of hard market research evidence, there is a natural tendency to overestimate one's own quality position (a bias of higher relative price also exists, although not as severe). This may be a "blind spot" preventing many companies from establishing effective renewal efforts.

- Despite this bias, better quality correlated directly with better relative profit performance and indirectly through higher relative price and better relative cost.

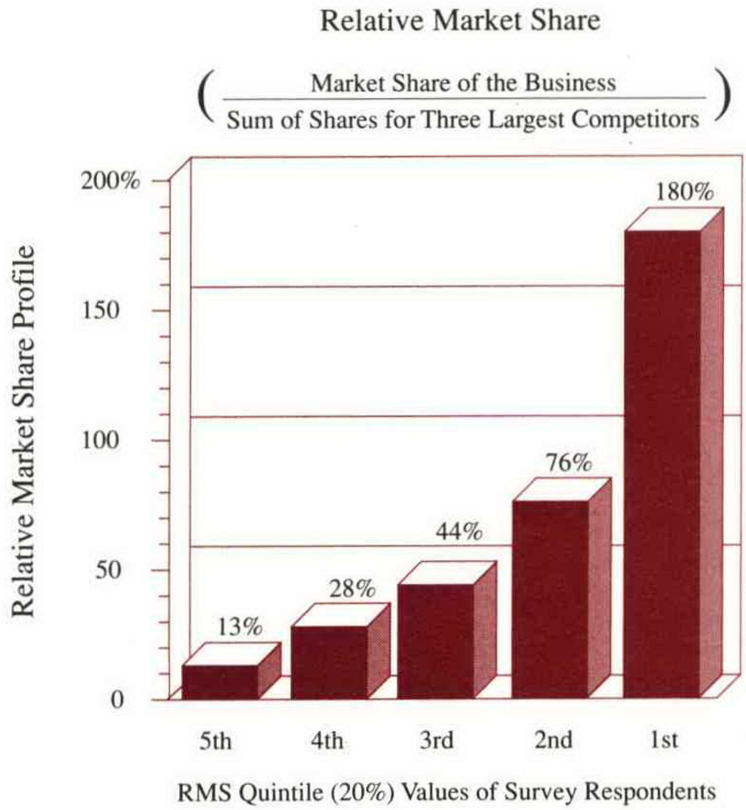
Demonstrable differences of "much higher" or "lower" relative quality seemed to matter the most. An important implication for successful manufacturing renewal is that better quality had at least two favorable by-products: higher prices and lower costs.

Relative Market Share

How do businesses compare with competitors on market share position? The market share that a company held in relation to its primary competitors also helped to explain the relative profit position of survey participants.

The average share of the markets being served by participating companies was 26% and ranged from a low of 1% to a high of 90%. The relative market share (market share divided by the sum of shares held by the three largest competitors) of the average company in the study was 68%.

Characteristics of Success: Competitive Position



- Higher relative market share position correlated directly with better relative profit performance. Better relative market share also supported higher relative price and better relative cost. The ability to exercise market leadership and hold economy-of-scale advantages over competitors accrued with market share gain.

Of the four marketplace measures of competitiveness, relative market share may be the most difficult to *profitably* acquire and the most enduring once acquired. Relative quality advantage and relative margin advantage (higher relative price and/or lower relative cost; lower prices can be traded for higher share opportunistically) were found to be associated with better market share positions. The implications are that most of the other fundamentals of competitiveness must be in place first and then sustained in order to make steady, incremental gains in share.

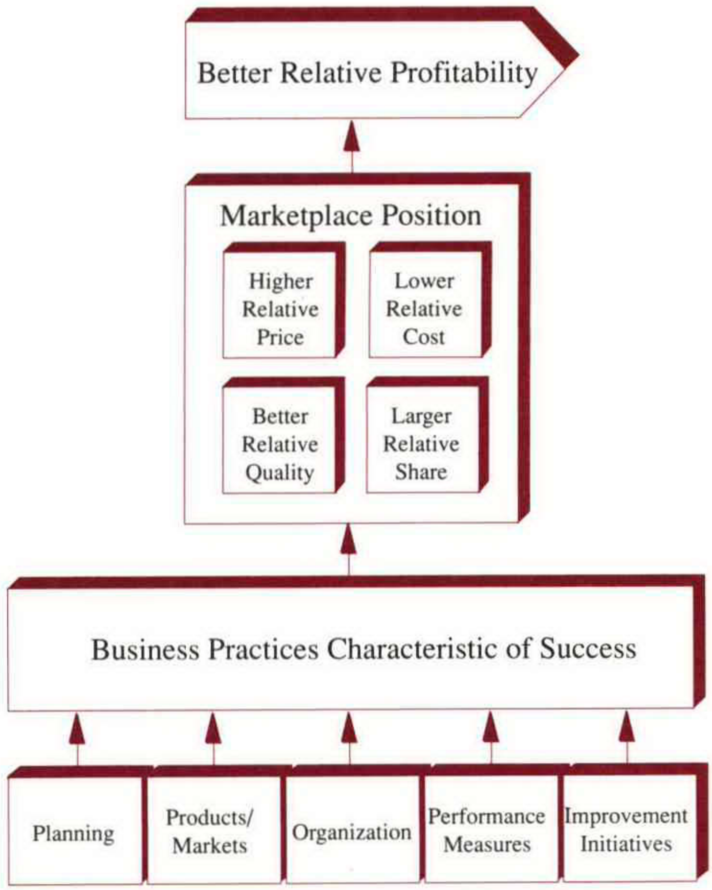
The attainment and continuation of better relative financial performance is an ultimate goal of competitive renewal. But this objective alone fails to provide the focus necessary to construct successful renewal strategies. Better financial performance is the "end." The factors of marketplace position are the means to this end:

- Better Relative Quality
- Higher Relative Price

Characteristics of Success: Business Practices

Competitive Success

What factors about a company and its renewal efforts are characteristic of successful business practices? The criterion for success was improved competitiveness. The metric used to make the judgement was a favorable impact of a factor on at least one of the four underlying fundamentals of marketplace position, without eroding any of the remaining marketplace factors or relative profitability itself. In some instances, factors were discovered to have a negative influence on the competitiveness of a business and were labeled "uncharacteristic of success."

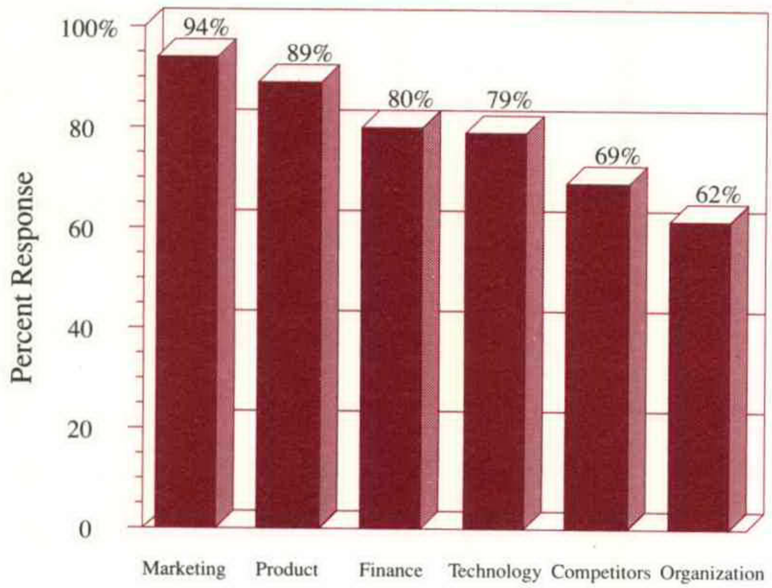


Within the scope of the survey, characteristics of success were found to be associated with: 1) business planning, 2) products produced and markets served, 3) organization and management, 4) performance measurement, and 5) improvement initiatives. No single dimension was found to dominate the outcomes of the businesses studied. Instead, a number of interdependent things had to be done well for manufacturing and overall business renewal to actually occur.

Scope of the Business Planning Process

What dimensions of the business are considered in setting the renewal strategy? Respondents were asked to indicate which of six categories of consideration were formally addressed in their strategic planning processes. The survey results indicate that marketing is almost always addressed, followed by product, financial and technological considerations. Competitor strategies and organizational factors were least likely to be included as a formal part of the process.

Scope of the Planning Agenda



When these responses were compared with the level of performance being achieved, two findings emerged:

- The broader the scope of the business planning agenda, the better the level of relative profitability.
- While all of these factors were important, the omission of competitor strategies and organizational considerations from the planning agenda were the most critical, as they weakened the correlation with better relative profitability the most.

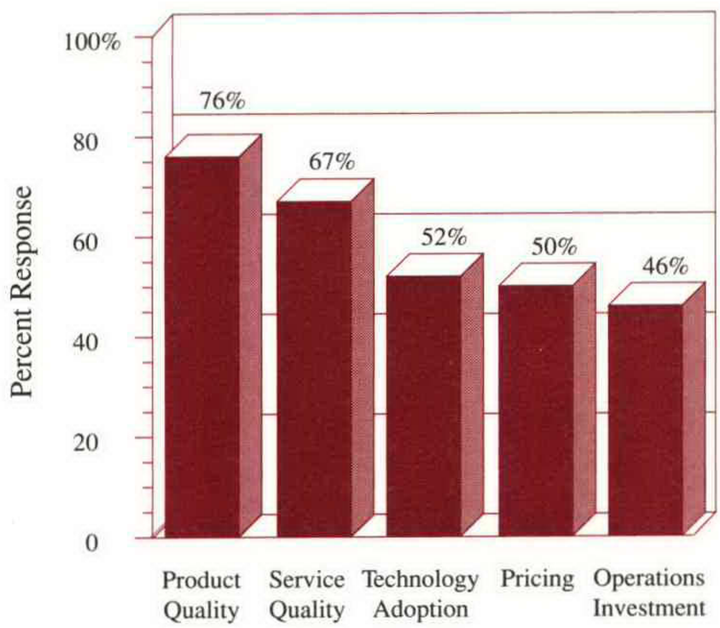
The implication of these relationships is that successful manufacturing renewal requires the integration of the *entire* enterprise with its marketplace, and the progress of competitors is as important as the needs of customers in charting the course of successful efforts.

Leadership Intent

How aggressively has marketplace leadership been pursued? To a large degree, competitiveness is about leadership. Respondents were asked to indicate whether their businesses exercised leadership (i.e., were the first to make a move) in five categories of activity.

The survey results show that the majority of businesses believe they are leading their competitors in taking actions to improve the business and control the marketplace. The improvement of product and service quality were the most frequently cited areas of leadership. By contrast, leadership in the use of technology, pricing and willingness to invest in operations were less prevalent characteristics.

Leadership Intent



While the question was intended to measure actual leadership, the overall frequency of response suggests that the proclivity to lead competitors was captured instead. Nonetheless, the willingness to exercise leadership correlated with business performance in several areas:

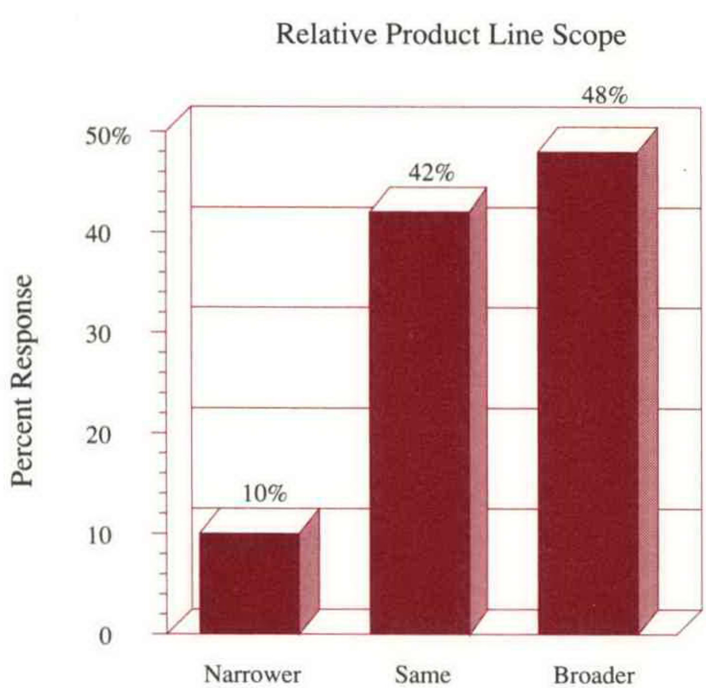
- Companies that were price leaders had higher relative price positions than non-price leaders, indicating that the tendency was to lead up rather than down.
- Price leaders also had higher relative profit positions than non-price leaders, indicating that companies were generally being rewarded for their aggressiveness.

- Price leadership correlated with high relative quality and market share positions, indicating that an underlying ability to lead also had to be present.
- Companies without a proclivity for product/service quality leadership tended to hold lower relative quality positions.
- A high degree of overall leadership, including the willingness to take the lead in adopting new technologies and investing in operations, strongly correlated with higher relative market share positions.

The planning process must plan for leadership and it appears there is a prescribed order of attack for achieving "profitable leadership." The evidence suggests that this begins with establishing *actual* quality advantage. That so many companies wish to lead on quality is certainly encouraging, but the growing list of contenders makes it more difficult to gain and sustain real advantage.

Relative Product Line Scope

What position are businesses taking on the breadth of their product lines? Respondents were asked to compare their number of products and degree of customization with competitor offerings.



Companies participating in the survey indicated a strong tendency toward broader, more customized product lines, with nearly half

(48%) of the companies already offering more choices to their markets than competitors.

Two relationships associated with product line breadth were found:

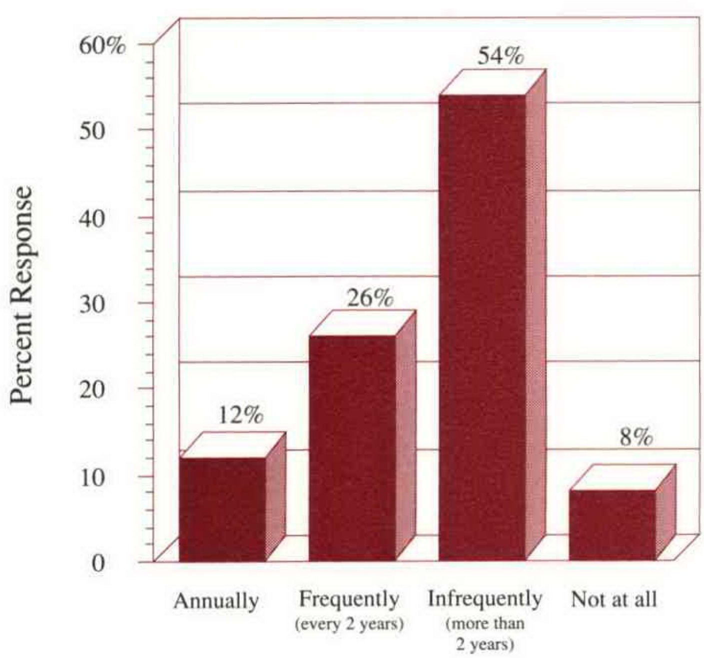
- The broader the product line, the higher the relative price position of the business.
- The broader the product line, the higher the market share position of the business.

A part of the general prescription for manufacturing improvement deals with process simplification. This helps pave the way toward process improvement and effective automation. The implications of these findings are that product line simplification should not be an automatic extension of these activities—the marketplace consequences first need to be examined. While higher market share positions help relieve some of these tensions by providing more acceptable levels of volume across the product line, a challenge for most renewal efforts will be how to manage complexity better.

Product Innovation

How often do products change? This also influences the inherent complexity of operations. Participants were asked to indicate how often changes were made to all or part of their product lines. Product changes included product improvements, style changes, and the introduction of new products.

Frequency of Product Change



While broader product lines were a common trait for participating companies, frequent product changes were not. A substantial majority of companies (62%) faced product design changes infrequently if at all. By contrast, 38% of the respondents managed product change on a regular basis.

The study shows the level of product change had the following relationships with business performance:

- The more active a company was in the area of product innovation, the higher the relative price position of the business tended to be.
- However, relative profitability was heavily dependent on a strong relative cost position when higher levels of product change were present.
- In turn, good relative cost positions for these businesses were strongly influenced by capacity utilization.

For many companies, product change is a condition of the marketplace that increases the fixed cost of doing business. In these instances, manufacturing renewal efforts that serve to lower the cost and time of getting worthwhile innovations to the market are vital to business success.

At the same time, the market worthiness and volume potential of a product change are equally important, and this is principally a marketing/product planning responsibility. That capacity utilization plays so heavily in the success of these companies suggests that a more rigorous screening of proposed product changes is also vital to better business performance.

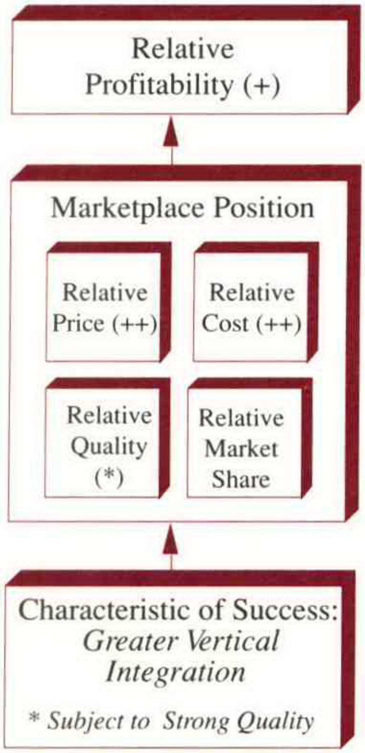
Vertical Integration

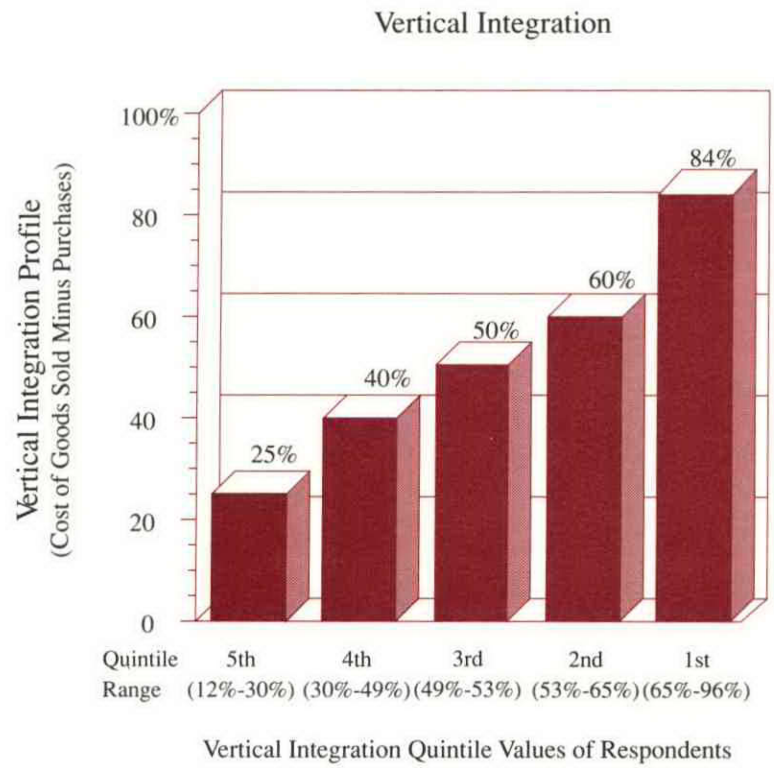
How much of the product is being manufactured in-house, as compared to being purchased from suppliers? As a measure of vertical integration or value-added, companies participating in the study provided the percentage of purchased materials contained in the cost of goods sold.

The average vertical integration (cost of goods sold less purchased materials) of participating companies was 54% and ranged from 12%, representing companies doing very little of their own manufacturing, to 96% for companies doing nearly all of their own manufacturing.

- The degree of vertical integration influenced business performance. The more vertically integrated a business the better its relative profit, price and cost positions if a strong relative quality position was also present.

The implication of this finding is that, if the added production complexity of doing more of the processing in-house can be managed well, there is a reward for doing so. The trend toward reducing the





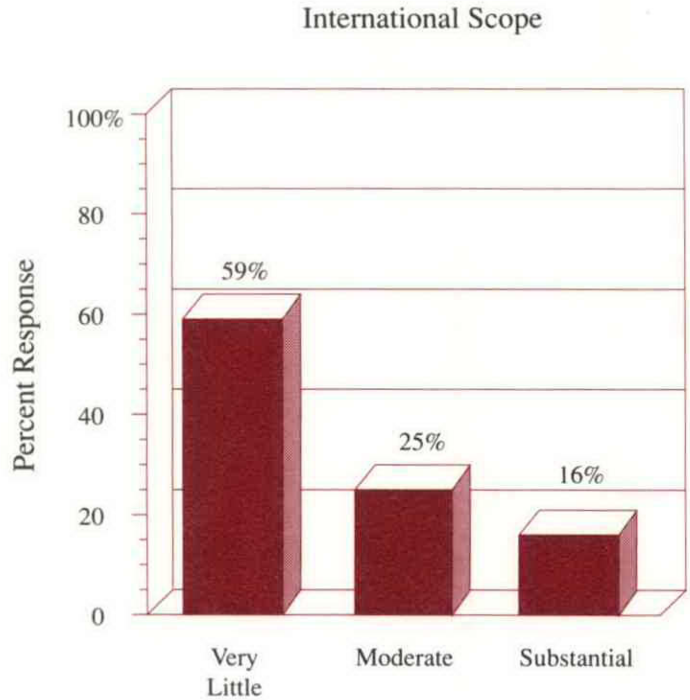
number of suppliers and eventual sole-source relationships that is being pushed by many vendor quality programs may have impacts similar to vertical integration.

International Scope

How globalized are the operations of the business? Respondents were asked to indicate the level of international operations within their businesses. The survey results show that the majority of companies are not involved with globalized operations.

- International presence supported better relative profit performance through higher relative price.

The relationship between globalization and competitiveness is not a surprise (although higher relative price as the mechanism is somewhat of a surprise). Driven by events such as the U.S.-Canada Free Trade Agreement and 1992 in Europe, most observers believe that more and more companies will be affected by globalization, including those choosing not to operate globally. The concept of achieving world class capability is more than a lofty ambition relevant to only the largest companies.



Market Criteria for Quality

How do customers judge quality? Respondents were asked to rank the importance they believed *customers* assigned to three dimensions of quality in evaluating the relative quality position of their companies versus competitors.

The survey results indicate that most companies (62%) believe the number one criterion is the design and conformance quality of the product. The scope and conformance quality of the services augmenting the product were a distant second (25%). The overall reputation and image of the company was judged to be least important in the customer's mind.

These evaluations were closely associated with business performance:

- The more emphasis given by the customer to reputation, the better the profit, price and cost positions of the companies serving those customers tended to be.
- The more emphasis given to product the weaker overall performance tended to be.

These findings do not suggest something as shallow as that the secret to better quality hinges on the strength of a company's advertising and communication with its market. But there are a number of implications associated with these findings, including market communications:

Market Criteria for Quality

(Percent Response)

	Most Important		Least Important
Product	62%	26%	12%
Service	25%	61%	14%
Reputation	13%	13%	74%

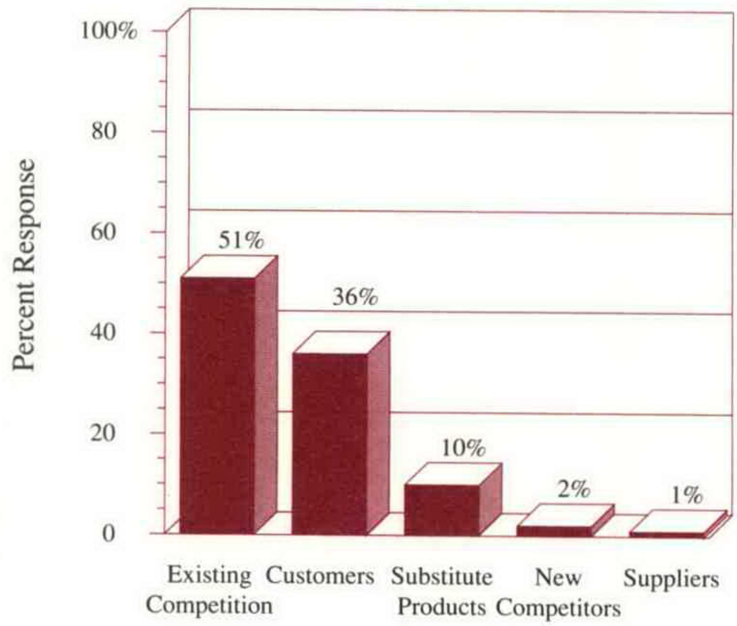
- Most companies are pursuing quality improvement at about the same pace, using the same general script which usually begins with the product. As such, while quality has improved, very little real competitive difference has yet been accumulated and sustained to the point that customers perceive the difference.
- When the quality advantages are known to be real, advertising can help establish this difference in the market. (Other research has shown that "real" quality advantage actually improves the effectiveness of sales and marketing expenditures while poor quality undermines these efforts.)
- Good reputation and image are the result of a company consistently outperforming its competitors on product and service quality long enough for them to become generally recognized traits of the company in the eyes of its marketplace.

The overall findings suggests that there is a hierarchy of quality accomplishment. Product quality is fundamental to overall quality and this is much more than tighter conformance to current design specifications. Companies that have achieved better product quality are moving on to establish service quality superiority on the strength of design innovation and conformance. Reputation and image are simply a higher stage of accomplishment where quality leadership has been sustained for a number of years as a result of continuous improvement on both product and service.

Competitive Pressure

What drives competition? Survey respondents were asked to rank the importance of five sources of competitive pressure influencing the direction of their businesses.

Primary Source of Competitive Pressure

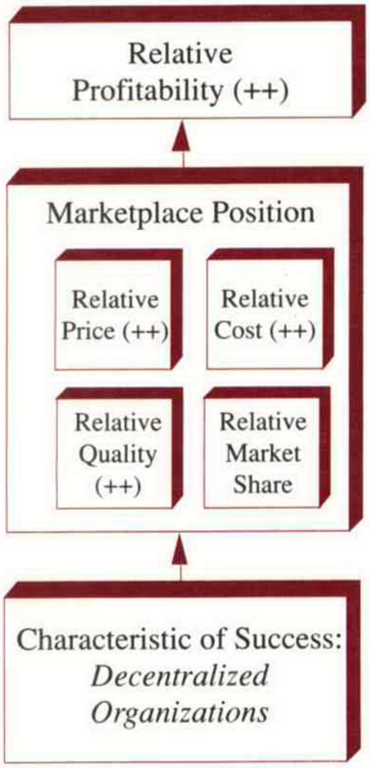


The leading source of competitive pressure for most companies was the activities of existing competitors (51%). However, more than a third of the companies (36%) indicated that the customers themselves were the driving force behind competitive intensity. For a number of companies (10%) substitute products and technologies were the major force affecting competition. Very few businesses were principally affected by the threat of new competitors or supplier bargaining power.

- Those companies citing customer bargaining power as the number one source of competitive pressure were unique in a number of respects. The most notable was that these businesses were more likely to have a profit position similar to their competitors and less likely to achieve positions of "much higher" relative profitability.

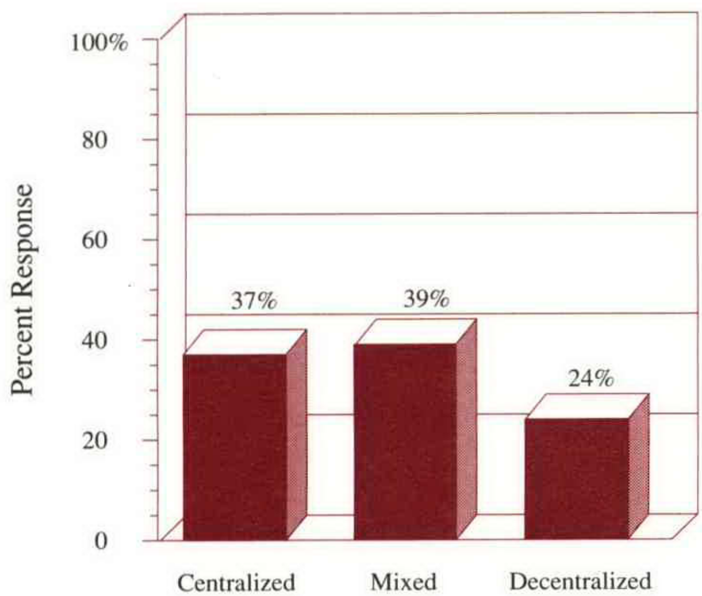
Automotive suppliers and defense contractors are examples of industry situations where customer bargaining power has heightened competitive intensity. Here, the customers are exercising a strong influence over the renewal activities of their suppliers and the rewards for winning may be less while falling behind can be fatal.

Organization Structure



What basic organization structure characterizes the business? The survey results show a tendency toward centralized organizations. Only 24% of participating companies described themselves as being almost entirely decentralized, while 37% were almost entirely centralized. Mixed organization structures, where some functions are specific to the business unit and others are consolidated, were just slightly more common than pure centralization.

Organization Structure

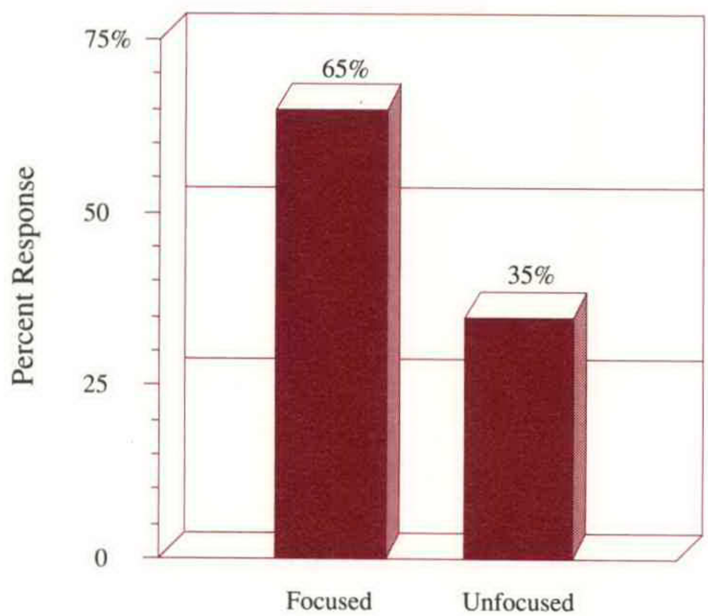


- When these responses were compared with business performance, better relative profit positions were characterized by higher degrees of decentralization. On the other hand, very little relationship was found between centralization and better relative cost position, which is often a driving force behind centralization.

The implication of these findings is that decentralization provides the business with an ability to focus all functional activities on its marketplace, and that often outweighs the more easily quantifiable cost advantages of centralized organizations. Even in smaller manufacturing companies, different products are sold into different market segments competing against different competitors. The effect is to have different businesses with different marketplace requirements. Centralization can compromise the clarity of focus required to win.

Factory Focus

Is the factory itself centralized or decentralized? The survey asked respondents if production operations were organized around a focused factory concept where activities are dedicated to producing specific products and/or serving specific markets.



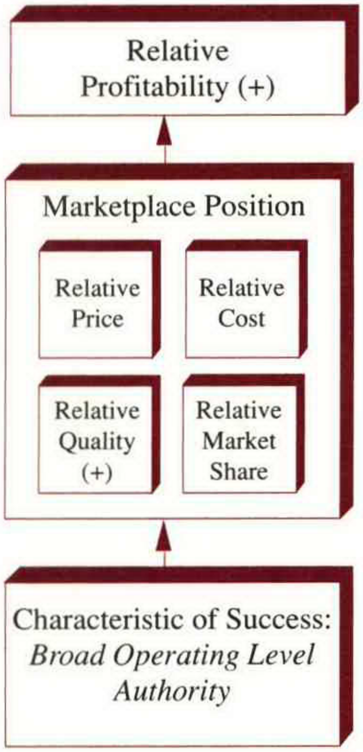
- The survey results show that only 35% of the companies believe their manufacturing operations are not focused. When the results of this group were compared with focused-factory companies, the "unfocused" group had higher relative cost and lower relative profit positions.

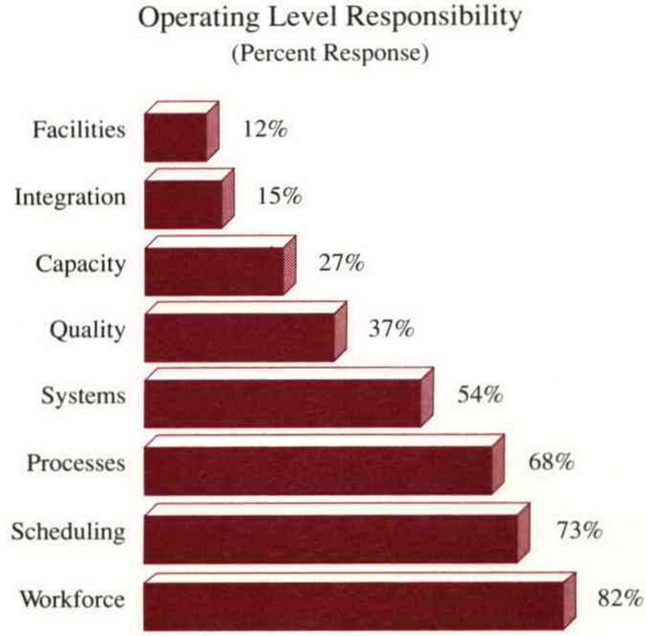
Like decentralized organizations, the findings suggest that the more operations are tailored to the marketplace the better the results.

Decision-Making Responsibility

Who makes the decisions on various aspects of operations? For a range of manufacturing subjects, respondents were asked to indicate whether decisions were made at the operating or executive level.

The survey results show that decisions dealing with workforce, production planning, process engineering and information systems are most frequently made at the operating level. Issues related to facilities, vertical integration, capacity and quality are most frequently executive level matters.





- The findings show that the more decision-making authority resided at the operating level of a company the higher the company's profit and quality positions tended to be.

Management Focus

What must be managed well? Participants were asked to rank the importance of management controls, personnel factors and cultural factors in achieving the overall objectives of manufacturing renewal.

The survey results show that management commitment and involvement in the process were considered to be most important by a majority (51%) of companies. Personnel factors dealing with competencies and labor relations were judged most important by 29% of the respondents. Cultural factors dealing with a shared sense of purpose across functions was considered least important.

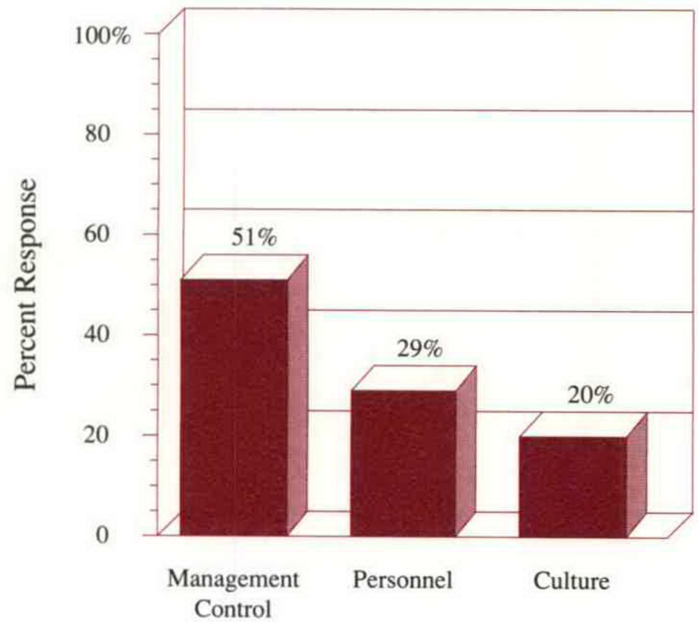
The degree of emphasis given to these factors correlated with business performance:

- The more emphasis given to cultural factors the higher the relative profit position of the business.
- The more emphasis given to management control the lower the relative profit position.

The implication of these findings is that successful renewal depends more on managing the culture than managing the people. Businesses that are "close" to their markets in terms of physical organization and whose people are properly trained and given the responsibility to

make operating decisions commensurate with the needs of the market are more likely to excel.

Management Focus



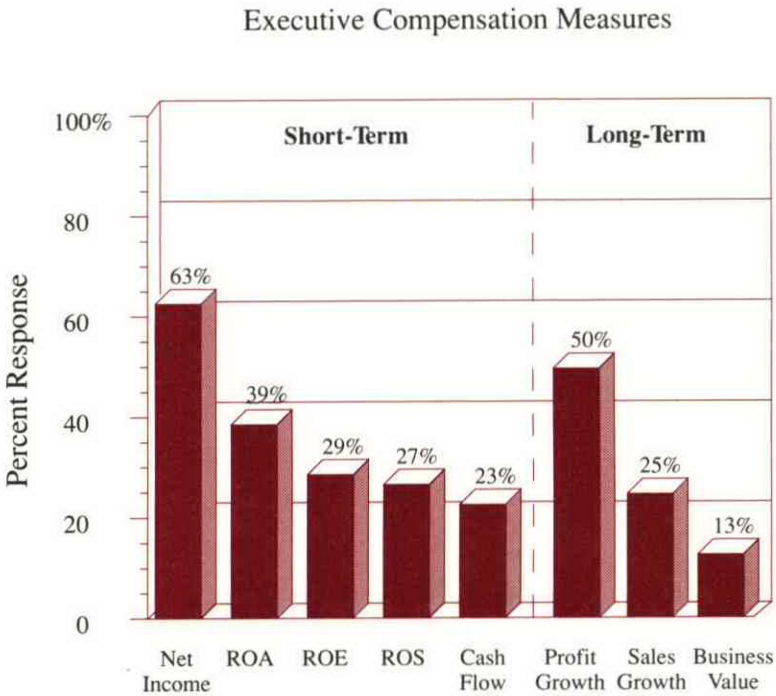
Executive Compensation

What is the financial performance orientation of the business being reinforced through execution compensation and reward systems? The survey asked respondents to indicate what measures were dominant criteria for rewarding their top managements. The choices represented a selection of short- and longer-term criteria.

The survey results show that shorter-term performance measures, capturing the financial results of the current period, are generally more popular than longer-term measures dealing with growth and overall business value.

When these responses were compared with business performance, no single measure correlated with the results achieved. However:

- Companies emphasizing only short-term measures were found to have weaker relative cost and relative price positions.
- Companies emphasizing only longer-term measures were also found to have weaker relative cost and relative price positions.
- Companies with executive compensation systems incorporating both short-and longer-term measures produced the best results.



When the subjects of manufacturing strategy and competitive renewal are discussed, a plea for a longer-term perspective is usually made. The implication of these findings is that the short-term view of the business cannot be ignored in the process. Moving the organization closer to the customer must also be accompanied by a sense of urgency for profitably serving its marketplace.

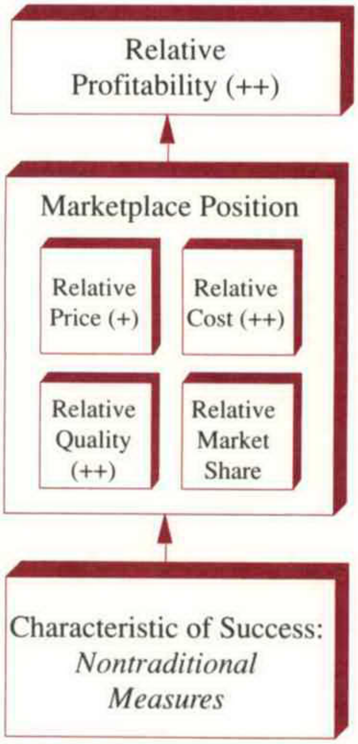
Operating Performance Measures

What gets measured? The selection of operating performance measures helps to shape the organization's focus of attention and thereby the results achieved. From a list of typical performance measures, respondents were asked to indicate which were given significant emphasis within their operations.

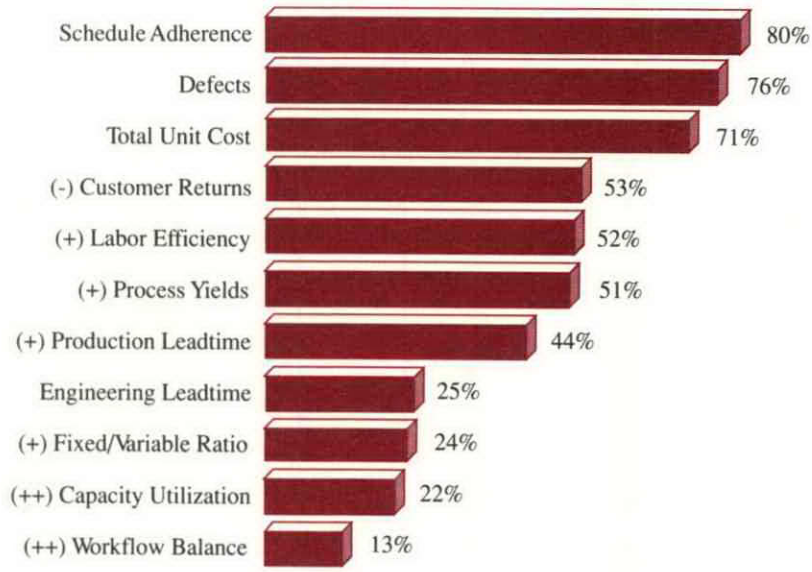
The survey results show that adherence to production schedules, defects, and total unit costs were the most widely emphasized. Customer returns, labor efficiency, and process yields were also majority measures of manufacturing performance. Production lead time was also a frequently emphasized area. On the other hand, only a minority of respondents were giving significant emphasis to design and engineering lead time, fixed/variable cost ratios, capacity utilization, and maintaining balanced work flows across production operations.

A number of relationships were found to exist between performance measurement selection and actual business performance:

Characteristics of Success: Business Practices



Significant Performance Measures
(Percent Response)



- The two least popular measures, work flow balance and capacity utilization, were the most characteristic of success. Businesses giving significant emphasis to these dimensions of operating performance were most likely to have better relative profit positions.
- Businesses giving significant emphasis to process yields, production lead time, ratio of fixed to variable cost and labor productivity were also more likely to have better relative profit positions.
- Schedule adherence was found to be closely associated with better relative quality and higher relative price.
- A significant emphasis on customer returns was found to be uncharacteristic of success. These businesses were more likely to hold positions of disadvantage on quality, price and profitability. Why might this be? This finding may indicate that many companies are emphasizing customer returns after quality problems have surfaced in the marketplace.

There are several implications to be drawn from these findings:

- That the selection and emphasis given to various performance measures could be tied to business performance indicates that they are indeed statements of priority to which an organization responds.
- Performance measures that aid the immediate detection and correction of causal factors driving performance are more important than

after-the-fact knowledge of performance itself. Month-end cost information is, by definition, untimely and often lacks prescriptive value as a result. Customer return information can be disastrously after the fact.

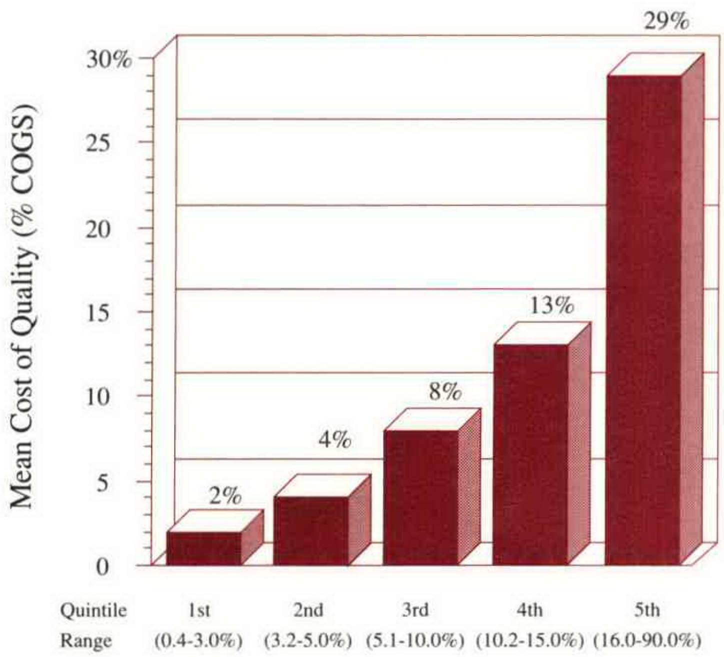
- The mechanization of manufacturing is driving a fundamental change in the cost structure. The importance of purchased materials and fixed costs (overhead and depreciation) increase as this occurs. In turn, resource utilization measures such as capacity utilization and process yield become more important.
- An important dimension of resource utilization involves how quickly relevant information and high-quality output pass through operations on the way from suppliers to customers (Just-In-Time). Work flow balance and lead time measures help increase velocity and "effective" capacity.

Cost of Quality

How much does quality cost? Almost from the beginning of the manufacturing renewal era, a non traditional performance measure, "cost of quality," came into fashion. The term refers to the amount spent to control quality plus the cost of failure which occurs throughout all operations, beginning with suppliers and ending in the marketplace, despite the efforts to control quality.

Survey participants were asked to estimate the cost of quality for their businesses. Only 60% of the respondents provided an estimate of this category of cost.

Cost of Quality



The average cost of quality as a percent of cost of goods was 11% and ranged from a low of .4% to a high of 90%. By way of comparison, firsthand measurement of this cost category typically ranges between 8% and 35%. When these results were compared with business performance, no relationship was found.

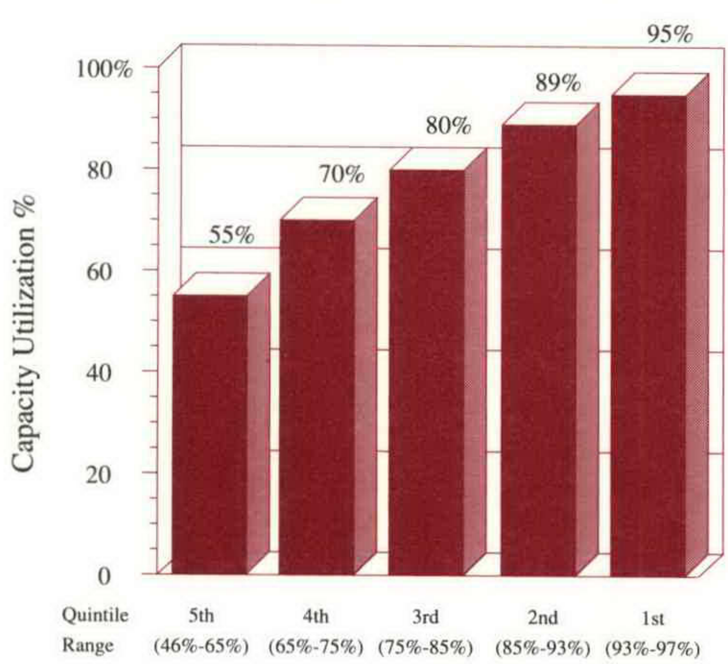
- However, when only those responses that fell within the more realistic range of 8% to 35% were analyzed, lower cost of quality was closely tied to better relative cost position and, to a lesser degree, higher relative price and profitability.

The implication of this finding is that perhaps no more than a third of the respondents really knew how much off-quality output was costing their businesses. For the majority of companies the magnitude of this improvement opportunity represented a blind spot undermining effective renewal efforts.

Capacity Utilization

What is the utilization of current manufacturing capacity? Participants were asked to provide the capacity utilization percentage for their businesses. The average capacity utilization for participating companies was 78% and ranged from a low of 46% to a high of 97%. More than 40% of the companies were utilizing production capacity at a rate equal to or greater than 85%.

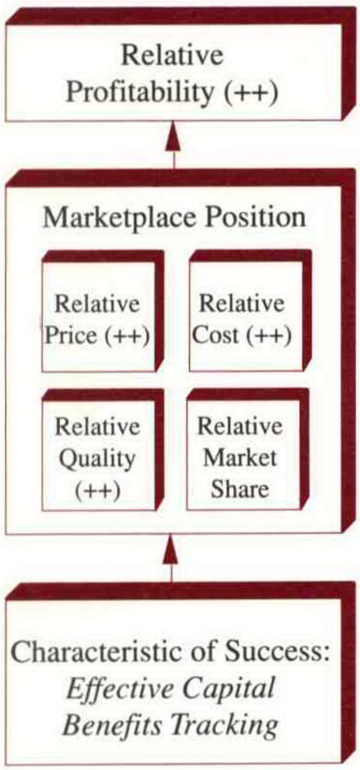
Capacity Utilization



■ Despite the fact that only 22% of respondents placed a significant emphasis on capacity utilization, it was one of the most telling measures of better performance. Unsurprisingly, the higher the level of capacity utilization the better relative cost and relative profit performance were likely to be.

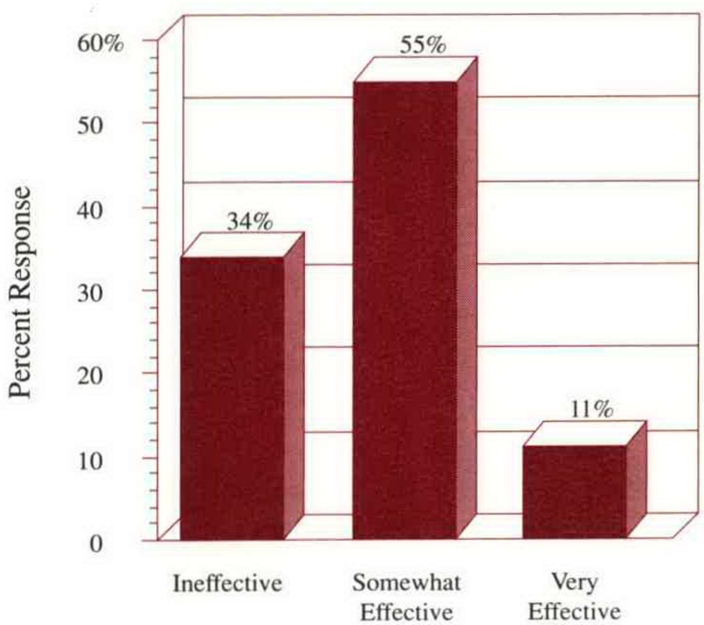
Capacity utilization, always a vital sign measurement for process industries, may be underemphasized in more discrete production environments where "bottleneck" work centers determine the effective capacities of the overall operations. As the capital intensity and fixed-to-variable cost ratios of businesses increase with mechanization so does the importance of this cost driver.

Capital Benefits Tracking Effectiveness



How well are companies able to measure the performance of capital investments? Survey participants were asked to assess their ability to tie capital investments to bottom line results.

Capital Benefits Tracking Effectiveness



Only a small percentage of companies (11%) were completely satisfied with the ability to track capital investment performance. On the other hand over one-third of the companies were dissatisfied with their ability to do so.

■ The ability to tie capital investment to bottom line results was a characteristic of success. The more effective this capability was judged to be the more likely higher levels of quality, cost, price and profit performance were also present.

The deficiencies associated with capital justification and benefits tracking are often regarded as a major roadblock to widespread use of manufacturing technologies. At least three problems are typically associated with this ineffectiveness:

- The justification process fails to tie revenue (price/volume) increases to the proposed initiative because the importance customers attach to various attributes is not known.
- While most justification approaches have a strong cost improvement orientation, not all cost and working capital benefits are identified because real cost drivers are not totally understood.
- A satisfactory mechanism usually does not exist to recognize the competitive consequences of making the investment versus not doing so because relative marketplace position and competitors' actions to improve their positions are not always known.

The fact that better relative quality, price and profitability correlated favorably with the effectiveness of capital performance evaluation provides further validation for this argument.

The issue of ineffective capital justification procedures is not that it prevents companies from investing in manufacturing technologies. Rather, it prevents the intelligent assessment of all resource allocation alternatives necessary for successful manufacturing renewal.

Information Systems Effectiveness

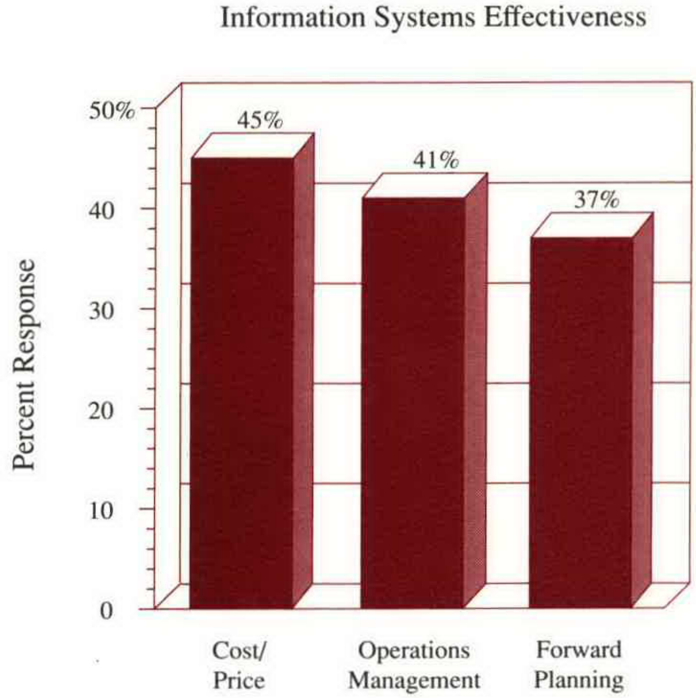
How effective are information systems? Each participant was asked to assess the effectiveness of information for decision making in three areas: cost and pricing, operations management, and forward planning.

The majority of respondents were not totally satisfied with the ability of their information systems to support their decision-making responsibilities in any of the three areas.

- When these responses were compared to the reported level of business performance, the higher the overall level of satisfaction with information system, the better relative cost and relative profitability tended to be.

There was also a very strong correlation between information systems effectiveness and capital benefits tracking effectiveness, indicating that ineffective capital justification procedures may be symptomatic of a larger weakness concerning many business systems.

Ineffective information systems fail to fully delineate the extended-process relationships existing within the operations of the business and, as a result, fail to provide the necessary insights about cause and effect relationships leading to better performance. While these systems are used to form judgements about operating performance, they offer very little prescriptive value to the organization.



Performance Objectives

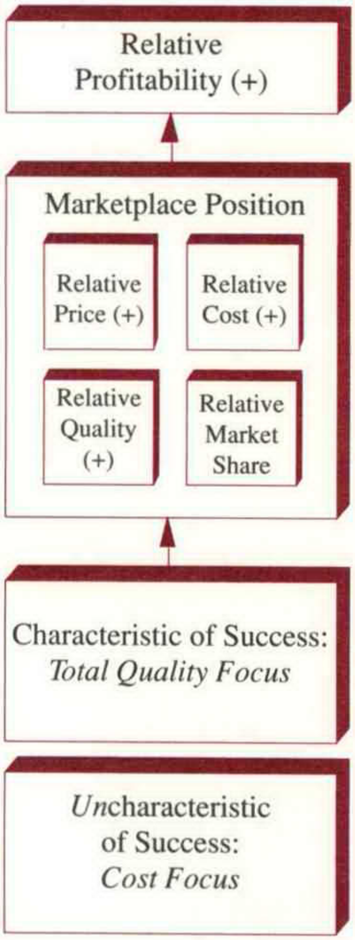
What aspects of operations are being targeted for improvements? Manufacturing renewal can be directed at a number of areas of performance improvement. The focus of these efforts appear to have an influence on the competitiveness of the business. Survey participants were asked to rank the importance of five performance drivers in their operations.

The improvement of conformance quality (existing products and processes) was most often the primary focus. Cost reduction and product improvement were distant seconds by a wide margin. Even fewer companies had a primary focus on lead time reduction and only a handful of respondents were most concerned with capacity utilization and expansion.

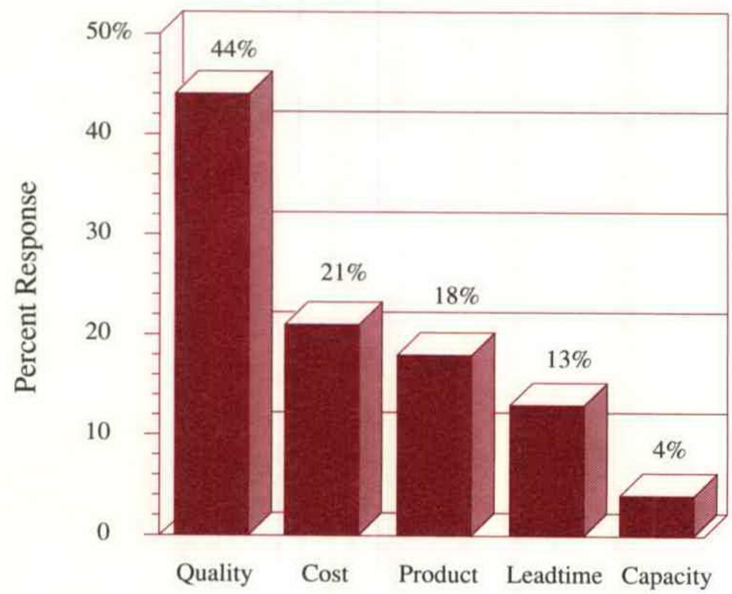
When these responses were compared with the competitive standing of the businesses three general relationships were identified:

- As the emphasis on cost increased, relative quality, relative price, relative cost and relative profitability positions of the business decreased.
- On the other hand, as the emphasis on quality increased, so did the relative quality and relative cost positions of the business.

Characteristics of Success: Business Practices



Primary Performance Objective



- When quality, product and lead time were the top three points of focus, relative quality increased the most.

The implication of these findings is that the best mindset for successful renewal is maximizing value added rather than minimizing cost.

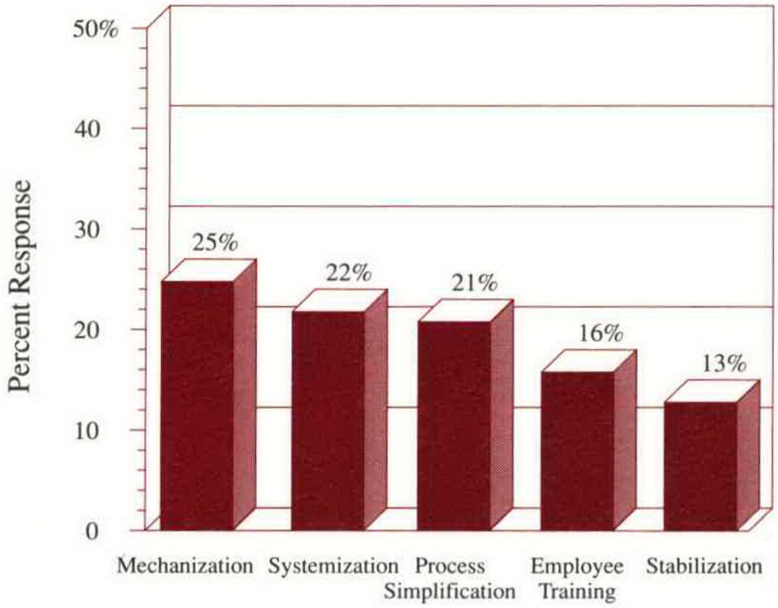
Investment Focus

How are companies addressing the renewal of their operations? The general approach taken to achieve the performance objectives of the operations was measured by where companies were spending time and money. Respondents were asked to rank the importance of six categories of improvement according to the level of effort and expenditure which had been made over the past five years.

The leading area of investment for nearly half (47%) of the companies centered on the automation of production processes and information systems. Process simplification was also a frequent area of investment focus. Employee training and process stabilization received the least amount of investment attention.

- The relationship between competitive standing and the way improvement dollars were spent showed that the more emphasis given to employee training the better the results. This supported competitiveness directly through better relative cost and indirectly as one of several underpinnings to effective mechanization and systemization.

Investment Focus of Renewal Efforts
(Leading Investment Area Over Past Five Years)



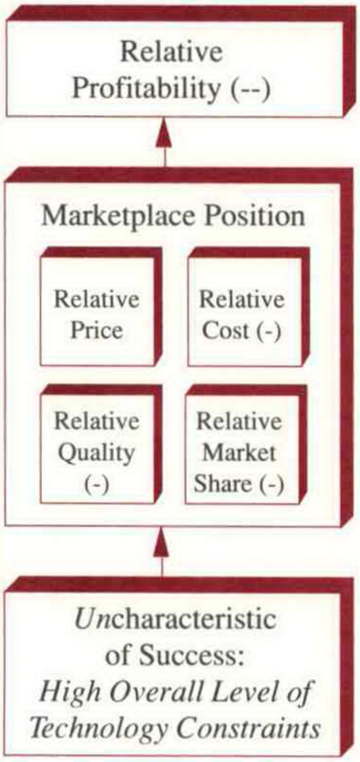
- By a wide margin, the companies most likely to have emphasized employee training were those pursuing quality as the principal performance objective.

The other areas of investment emphasis, including technology, could not be unequivocally linked to good or bad performance. The mere willingness to invest in these areas did not assure success. The evidence suggests that the effectiveness of these efforts depended on a number of other factors.

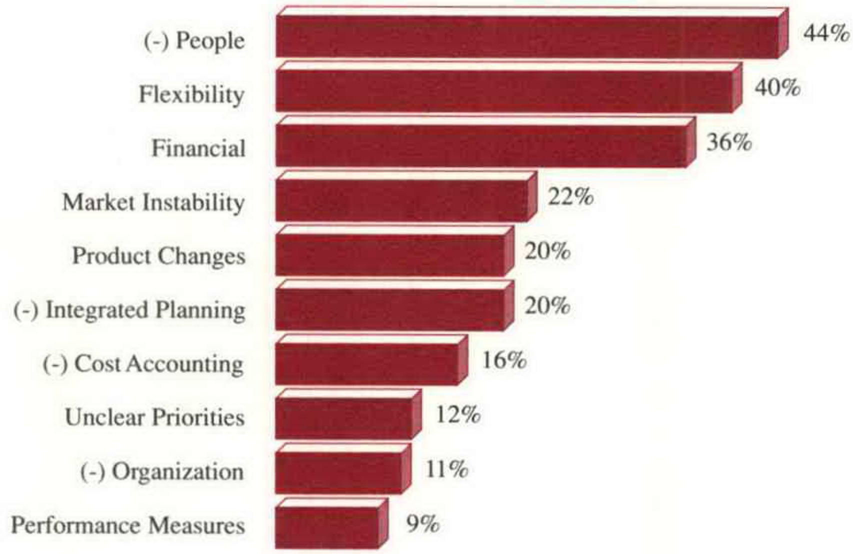
Technology Constraints

What are the obstacles to technology adoption? From a list of commonly mentioned problems associated with the inability to use new technology, participants were asked to indicate which factors were significant for their companies.

The survey results show that people-related issues (44%), the fear of lost flexibility (40%) and the cost of manufacturing technologies were the three most significant constraints. Market demand instability (22%), product changes (20%) and the difficulty of integrating technology planning with overall business planning (20%) were also significant to a number of the companies. Accounting, performance measures, organization and uncertain business priorities were regarded as least significant in constraining the use of technology.



Significant Technology Constraints
(Percent Response)



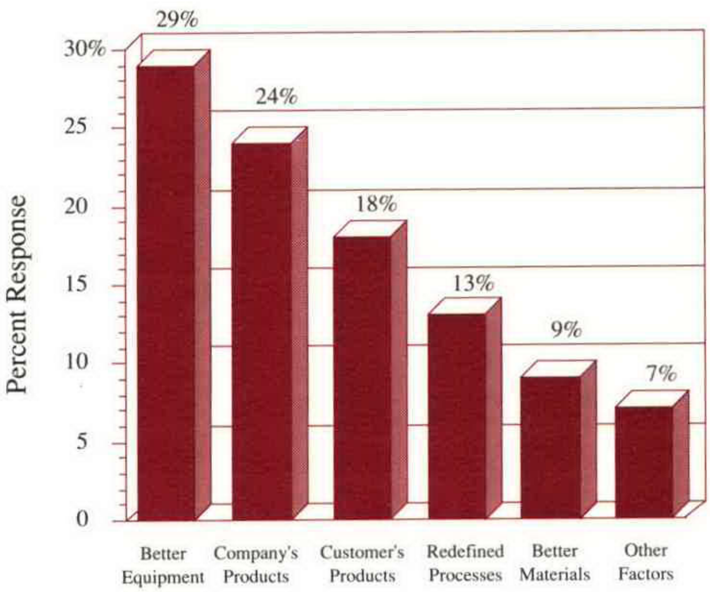
These constraints correlated with business performance and technology in the following ways:

- The fewer factors identified as significant constraints to the use of technology, the better relative cost, relative quality and relative market share performance of the business were likely to be. This finding held for all companies, not just those who had invested heavily in technology.
- For the group of companies that had made either mechanization or systemization the top investment priority, the most successful companies exhibited an even lower level of overall constraint. The absence of constraints associated with people, organization, business planning and cost accounting systems were most significant.
- Between the two forms of technology, the success of business systems automation was found to be the most dependent on the elimination of these constraints.

An important implication of these findings is that the success of technology is very dependent on a solid foundation of nontechnical characteristics concerning the business. Encouragingly, achieving technical readiness also improves business performance as the foundation is laid.

Process Change Drivers

What are the forces driving changes in the manufacturing processes? A number of influences represent potential stimuli for major changes in production processes and the use of advanced manufacturing technologies. Survey participants were asked to select the one most important source of change from a list of internal and external categories operating on their business.



For 42% of the companies, product-related changes were considered to be most likely to result in major changes to production processes—24% considered their own or competitors' product changes most important and 18% considered changes in customer products and service requirements most important. Vendor-related improvements of better equipment (29%) or better material (9%) were considered most important by 38% of the companies. For 13% of the companies, fundamental redefinition of the manufacturing process flow was considered most important. A miscellaneous collection of other factors was considered to be important by the balance of companies, with labor-related changes most frequently mentioned (2%).

These responses correlated with the reported level of business performance and mechanization in the following ways:

- Companies with production processes most heavily influenced by customer-related product needs were found to have the highest level of relative profitability. However, process change may or may not include technology adoption.

- For the group of companies that had made technology its number one area of investment, redefining process flow was found to strongly support better relative profitability.

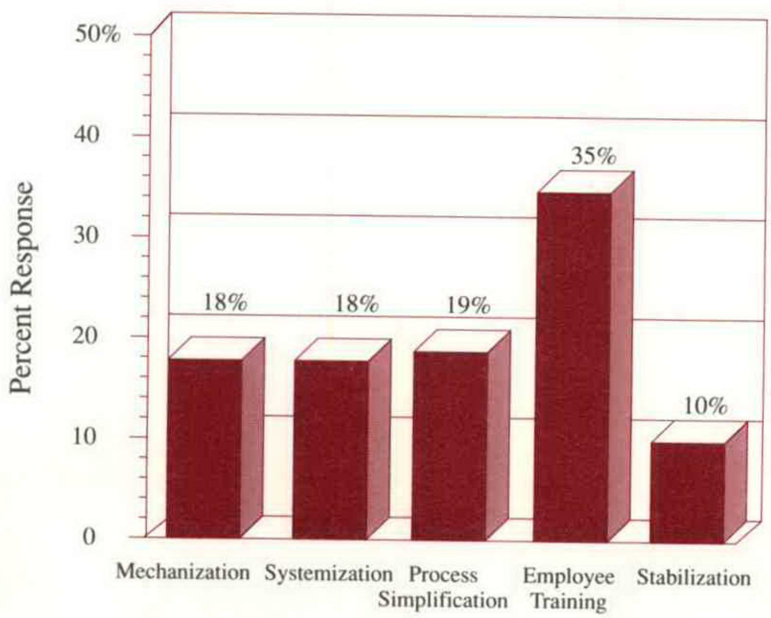
With respect to the forces driving process change there are several implications for successful mechanization. There is a preemptive appeal for automating production processes. However, a certain risk appears to exist if mechanization of current processes occurs without first examining the effectiveness of the overall process flow among all operations. The effectiveness and permanency of these process flows cannot be adequately evaluated without linking them to the dynamics of the marketplace.

Future Investment Focus

A shifting investment emphasis toward employee training.

Where are companies planning to place their investment emphasis in the future? Respondents were also asked to rank the importance they intended to give to the same six categories of improvement programs over the *next* five years.

Planned Investment Focus
(Leading Investment Area Over Next Five Years)



Over the next five years companies plan to invest more in employee training than any other single area. In many ways this survey result seems to validate the findings suggesting that technological readiness is an underpinning to the successful deployment of technology and that the first step toward improved competitiveness begins with the most important asset of any business—its people.