

TITLE: BREAKTHROUGH TO WORLD CLASS MANUFACTURING -
A STRATEGY FOR THE TRANSFORMATION

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To be presented at the 5th International Conference on Manufacturing Strategy to be held in June 1990 and organised by the UK Operations Management Association.

THE STRATEGIC CHANGE BARRIER

During the last two decades, increased attention to strategic planning has been a prerequisite to determine how to fully exploit the market opportunities created by changes made to international trading agreements. The changes continue and a further major change will take place in 1992, i.e. the European single market.

These changes to trading agreements have increased the intensity of competition in most national and international markets but British manufacturing industry has not fared well against the aggressive competitive strategies adopted by their international competitors. There are many causes for the decline of the UK manufacturing industry but an explanation often given is the inability of many British companies to become world class manufacturers.

Because of the increasing ease of access to international markets for manufactured goods, world class manufacturing is an objective for most manufacturing businesses. However, very few UK companies seem to have made the changes required to become world class in manufacturing. Perhaps the reason for this is revealed by the definition of world class manufacturing contained in Professor Richard Schonberger's book.¹ He suggested that the term world class manufacturing "nicely captures the breadth and the essence of the fundamental changes taking place in industrial enterprises". Schonberger therefore seems to imply that to achieve world class status as a manufacturer, European and American companies must critically examine the competitiveness of both their marketing and manufacturing strategies.

The consequence of ignoring the new competitive strategies adopted by international competitors is the loss of that market share for which the holder invested so much to gain. The time during which these adverse changes can take place is often very small when compared with the life span of the firm. For example, how quickly the UK motorcycle manufacturing industry lost its dominance of its domestic market, which appeared to be impenetrable at the time.

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ABSTRACT

Reversing a decline in competitiveness may require radical changes to existing production methods and procedures. To implement such a change requires management vision, organisational flexibility and an integrated plan. It may also be necessary for senior management to review their expectations about the role of the manufacturing function and its part in establishing competitive advantage.

How to become a world class manufacturer is the principal topic of this paper. The paper includes definitions of the four dominant forms of manufacturing strategy which have been observed with an assessment of when it is advantageous to adopt each type. The paper also includes a description of a strategic plan to implement the radical changes needed to transform the traditional batch manufacturing system into one which is world class in its service to the customer.

The race for competitive advantage continues unabated and changes to international trading agreements continue to create new opportunities in markets for manufactured goods. However, although changes are being made to the way manufacturing is being managed in UK companies, e.g. the adoption of total quality management, these changes are actions required to "catch up" with the standards set by others and therefore do not appear to gain any competitive advantage. Steven Wheelwright² has proffered an explanation for this barrier to implementing radical changes to manufacturing strategy, i.e. "the single most important explanation for the worldwide decline in US manufacturing competitiveness is management's view of the manufacturing function, its role and how that ought to be carried out. Thus, restoring that competitive edge requires a basic change in philosophy, perspective and approach".

The aim of this paper is to present a generalised conceptual framework which will assist with the preparation of a plan for managing the breakthrough to world class manufacturing. The methodology described is intended for the management of manufacturing businesses that use the batch manufacturing method of production but do not produce at such high volumes so that continuous processing becomes economic.

World class manufacturing is defined, for the purpose of this paper, as the development of the role of manufacturing into one which fully supports the marketing strategy of the business and, at the same time, provides the capability to establish a competitive advantage from the manufacturing activity itself.

DEFINING THE MANUFACTURING STRATEGY OPTIONS

There is ample evidence^{3,4} to show that UK manufacturing companies are applying new technologies, techniques and methods of production to improve the performance of the manufacturing function. However, the inability of many UK manufacturing companies to outperform international competitors may be attributable to their senior management's judgement of the role of the manufacturing function and their expectations about its contribution to establishing competitive advantage.

A previous study⁵ of this issue has identified three dominant forms of management action in response to increased competition. This study has identified that another should be added to those previously identified.

THE QUICK FIX STRATEGY

Edmondson and Wheelwright⁵ describe the first mode of corporate response, to counteract the competitive challenges of the 1980s, as one which "seeks simply to provide quick relief from existing manufacturing pressures and problems. This relief can take several forms: milking the old (without substantial reinvestment), restructuring and cutting excesses (but continuing to operate under historical guidelines and principles), seeking government protection, or simply choosing to subcontract manufacturing to someone else".

This approach often exemplifies a management attitude which is introspective or a vision which may only be short term. Both of these characteristics combine to represent a corporate culture which views the manufacturing function as purely a cost centre. This is the "quick fix" approach to managing manufacturing strategy, see Appendix 1. Change should only be implemented following an examination of any alternative methods of organising the manufacturing activity and after considering the planned change's effect upon the capability of the manufacturing function to support the company's competitive strategy in the future. For example, the optimum solution now may be to use dedicated plant but the customer may already be demonstrating a desire for greater product choice. Such a development in the nature of market demand should be considered when selecting the appropriate manufacturing technology.

The nature of the change described is therefore one of correcting a short term operating problem. The quick fix approach is appropriate when all other strategic issues have been considered. Quick fix decisions made without considering the strategic implications of any planned changes are the most damaging form of manufacturing management decision making.

This strategy is appropriate when it is necessary to only improve current methods of production to satisfy the current set of critical success factors of the targeted market. It is the least complex strategy to adopt and, as its name suggests, can facilitate a quick corporate response to change.

THE CATCH UP STRATEGY

The second mode of corporate response is one which sanctions a change to the manufacturing process or infrastructure when corrective actions are required to

"catch up" with the standards of performance set by others. The stimulus for change in this case is the recognition that other manufacturers have demonstrated that competitive advantage has been gained from using a new method or technique for the production of their products.

The "catch up" strategy is the one that has been the most frequently observed in use during the last decade and its almost universal adoption has been induced by the phenomenal success of the Japanese manufacturing industry. Many organisations are employing a catch up strategy for their manufacturing operations in order to match the quality standards set by international competitors or to improve the quality of their customer service and reduce operating costs by installing material requirements planning systems³. However, fewer seem to have elected to install just-in-time manufacturing systems⁴.

The "catch up" manufacturing strategy, see Appendix 1, is characterised by focusing attention on changing the existing processes and/or the infrastructure to enhance the performance of the manufacturing system. The target performance improvements are usually limited to already established order winning criteria but current performance is below the standard achieved by the company's competitors.

The "catch up" strategy is appropriate when, as a leading manufacturer, a company's position is threatened by a development carried out in a follower. The leading manufacturer may outperform the follower in all other customer service criteria but that associated with the follower's innovation to its manufacturing system. Consequently, catching up on this innovation re-establishes leadership with the original leading manufacturer.

The limitation of the "catch up" strategy is when it is used to try to equal the performance of a leading manufacturer. Its aim is therefore limited and may be based upon an assumption that the targeted standards of performance will not be further improved upon by the leading manufacturer during the time changes are being made by the follower company.

THE STRETCH STRATEGY

The third form of corporate response, employed by organisations that are experiencing increased competition in their markets, is to enhance and extend the standards of customer service they offer. To achieve such an objective, the firms

may need to "stretch" the structure of their manufacturing systems to fulfil the additional needs of the market and deal with their consequential effects upon the manufacturing operation. The catalyst for change to this type of manufacturing strategy is the company's marketing function. Marketing led organisations may seek new opportunities to sell their products, which can result in an expansion of the company's product range, or the more frequent introduction of new products. The desire to differentiate products could result in product designs requiring an extension of the knowledge and/or skills needed by the workforce to manufacture the product. Warranty guarantees could impose higher standards of quality to be practiced by the production personnel. All of these changes to competitive strategy may impose new demands on the manufacturing system which will need to be effectively managed.

The "stretch" manufacturing strategy could be adopted to cope with these operating problems. As Appendix 1 shows, the stretch strategy implies that the existing manufacturing structure will require adaptation to support the new competitive strategy adopted by the company. The adaptations required are often mainly organisational, i.e. a redefinition of quality standards and increased quality control measures. Often no specific changes are made as a consequence of the change to the competitive strategy, e.g. the increase in the product range will be manufactured using the same manufacturing capacity and production control procedures.

The benefit of adopting the "stretch" strategy is that it causes the least disturbance to manufacturing operations and therefore, the capital costs of adaptation to the revised competitive strategy are minimised. However, organisational change often requires new forms of performance measurement and therefore, there may be infrastructural change costs such as additional training for the workforce or revisions to the production control information system used to report on manufacturing performance.

There is also another hidden cost which may be incurred when using the "stretch" manufacturing strategy. Imposing additional requirements upon the production system, which may be very different from those that the original manufacturing system was designed to meet, could reduce the competitiveness of the company in those market segments or niches where it was previously a market leader. There must be a consistency between the methods of manufacture to be used to support the new competitive strategy and those for which the original manufacturing process was designed.

This is the key limitation of the "stretch" strategy, change may increase complexity or result in an incompatible performance requirement, for example the need for greater flexibility from an inflexible process. The critical issue for senior management to consider, when a change in marketing strategy is to be made, is whether the company should adopt the low cost stretch strategy or fundamentally change the manufacturing process design.

THE BREAKTHROUGH STRATEGY

The final mode of response to increased competition is an aggressive and progressive one. Its aim is to outperform the competition in terms of both the nature of the product and the quality of service provided to the customer. To achieve this goal in the manufactured goods industry requires the highest standards of design engineering and manufacturing performance.

The breakthrough strategy is an approach to be used to achieve world class status in manufacturing, i.e. the development of manufacturing into one which fully supports the marketing strategy of the business and, at the same time, provides the capability to establish and maintain a competitive advantage from the manufacturing activity itself, see Appendix 1. Because of the pace of technological change, such a strategy may require quite fundamental changes to the manufacturing system design, i.e to process technology, infrastructure or both. It will certainly require the development of a set of distinctive competencies in manufacturing which customers will value highly.

To plan such an approach Edmondson and Wheelwright⁵ suggest the following methodology:

1. Identify what is likely to be distinctive and different about manufacturing - based competition in the 1990s from those typical of the 1980s.
2. Determine what capabilities will be required of the manufacturing function to achieve a significant manufacturing advantage in the coming decade.
3. Formulate a plan for the achievement of the distinctive competencies identified.

The remainder of this paper focuses on the management of the transformation to world class manufacturing. The benefit of applying the breakthrough strategy is that it forces a radical review of the future competitive strategies of the business and their fit with the company's current methods of manufacturing. However, to apply the breakthrough strategy also requires a management philosophy that regards the manufacturing function as an additional means of gaining competitive advantage.

The limitation of employing the breakthrough strategy may be that it is too great a change to make in the short term. It may be necessary to employ a catch up strategy first before further radical changes are possible. To develop a rigid manufacturing process into a more flexible one may be necessary before the company can compete on customer delivery lead time as its means of gaining competitive advantage.

A breakthrough strategy requires a general acceptance of the need for change which may sometimes be quite radical, e.g. flexible working practices. For companies where there is little organisational flexibility, it may be necessary to develop the corporate culture on the acceptance of the need for change before embarking on a breakthrough strategy for its manufacturing operations.

MANAGING THE TRANSFORMATION

To become a world class manufacturer will almost certainly require an acceptance, by senior management, that radical changes to existing manufacturing processes and procedures are necessary. This does not mean that such changes will necessarily require major investments in new technology, the costs of such transformations do not always exceed the annual reinvestment budget.⁶

Why is such a transformation necessary? The erosion of competitive advantage is often a very gradual process that can be corrected by incremental changes to competitive strategy. However, such approaches are no longer viable because of the different and very successful approach to managing manufacturing business adopted by the Japanese. The key strategic issue now for UK manufacturing companies is how can the business use its product design and manufacturing performance to regain competitiveness rather than what catch up action is required to counteract actions taken by competitors. Such an approach may require a new process, new procedures and working practices, that is the letting go of the established way of managing the manufacturing process which is familiar and has proved to be successful in the past.

Severance and Passino⁷ suggest that there are three essential elements to effect a change in manufacturing competitiveness, that is a clear management vision, organisational flexibility and an integrated plan.

These three essential elements for change constituted the objectives set for the design of a manufacturing strategy for a UK manufacturer. The aim of the manufacturing strategy design was to develop the business into a world class manufacturer. Appendices 2 to 6 show diagrammatically the approach followed, that is appendix 2 was used to define the desired competitive strategy and the other appendices show how the manufacturing strategy would be built to ensure consistency with the desired competitive strategy.

THE MANAGEMENT VISION

To create and communicate the vision, that is how the company's manufacturing system must be designed to regain competitiveness, the model shown on appendix 2 was used to review how organisations have competed over time. The evolution of competitive strategies employed by manufacturing organisations, which is examined in more detail in Sweeney⁸, provides a useful guide to the manufacturing performance required to equal the competition. To this must be added the forecast form of future competitive strategies.

Stalk⁹ has observed that the Japanese are now seeking a time-based competitive advantage. In his article he recommends that "today's new-generation companies compete with flexible manufacturing and rapid-response systems, expanding variety and increasing innovation. A company that builds its strategy on this cycle is a more powerful competitor than one with a traditional strategy based on low wages, scale or focus."

Therefore the vision for the UK company included a time-based objective for customer service which was considerably faster than the current performance of the company and its competitors. It is necessary to establish the customer delivery lead time target in order to design a production system which will allow the product manufacture and delivery within that target delivery lead time.

Appendix 3 shows the series of interrelated manufacturing system design issues which need to be examined to ensure consistency between the capabilities of the manufacturing process and the customer service standards defined by the competitive

strategy. The design decisions are not necessarily taken in sequence, as shown, some may be taken in parallel. The model of the approach to competitive business operations management does however illustrate the key strategic issues to be considered when determining the design of the manufacturing system. Once decisions on these issues are made, that is the appropriate competitive strategy and resulting manufacturing system design, the company will have established what needs to be done to regain competitive advantage. This is the vision of the future for the business.

In the model shown, throughput traceability has been shown as an issue isolated from designing the infrastructure of the manufacturing system. This is because shop floor data capture may be desired to trace build details for after sales service purposes and/or for tracking the quality of supplied materials. These monitoring objectives may be in addition to facilitating production planning and control.

ORGANISATIONAL FLEXIBILITY

This is essential for a world class manufacturer because competition in the 1990s is likely to be based upon change, that is changes to the product through innovation or expanding the range of products. It will also be based upon the ability of the manufacturer to cope with change. However, organisational flexibility cannot be confined to internal flexibility only, the flexibility of the suppliers is fundamental to achieving competitive customer delivery lead times.

Internal flexibility within the manufacturing system will require, in many UK organisations, significant changes to the traditional methods used to manage and measure the production process. In addition, the mindsets of both the management and the employees, on the role and the potential of the work force to problem solve, will need to be fundamentally changed and this attitudinal change can prove to be a major barrier to change. Its solution can only be achieved by education and training.⁶

Two series of operating system design decisions are shown on appendices 4 and 5, one associated with process management and the other people management. The goals of high throughput efficiency and continuous improvement are the targets for transforming the traditional manufacturing strategy, which focuses on low labour costs, volume and product focus, into one which is world class in manufacturing.

The first of these two objectives, high throughput efficiency, is defined as follows:

throughput efficiency = $\frac{\text{processing time required to manufacture the product}}{\text{the total elapsed time between the release of the works order into production and the completion of the product or batch of products}} \times 100$

The throughput efficiency for a continuous processing operation will often average close to 100%. However, in many engineering companies, which batch manufacture components prior to final assembly, the throughput efficiency may be as low as 10% to 15%. Setting a goal for throughput efficiency concentrates the mind of the organisation on reducing cost adding delays in the manufacture of the product, for example machine down time and set-up requirements. Such delays obviously also reduce the speed of the organisation's response to market demand. The aim therefore, in the first instance, is to design manufacturing systems for batch production operations which facilitate the achievement of a 50% throughput efficiency.

Rapid-response manufacturing systems require fast communication links with suppliers that are at some distance from the factory and recent developments in interfirm communications, such as facsimile transmission and electronic data interchange, make fast communications possible.

Appendix 4 therefore shows a route to high throughput efficiency and the process is one of continuous improvement through just in time manufacture.

Appendix 5 shows the series of stages through which a continuous improvement in quality may be achieved and, at the same time, reduce the cost of manufacture. A strategy of establishing continuous improvement teams to problem solve has already been tried and tested and therefore, now only requires companies to change the culture of the business into one that fosters work force involvement. However, the longer organisations wait before adopting this style of management, the greater the scale of the effort needed to catch up with the quality leaders.

These two models show how to approach the goal of organisational flexibility which is the second requirement for a change in manufacturing competitiveness.

AN INTEGRATED PLAN

Appendix 6 shows how the three key strategic elements of a world class manufacturing capability link together. The overlapping areas of the model indicate how the objectives of integration can be achieved. Labour flexibility and involvement cannot be developed without the workforce understanding the competitive pressures the business is experiencing, the competitive strategy to be employed to outperform the competitors and their role in helping to put into effect that competitive strategy. They must be much more informed about business plans and the management of the business finances.

Fast response to the changing needs of customers can only be achieved by producing products with a short manufacturing cycle time. Senior management must understand that this can only be achieved by changing the rules of traditional process management.

To achieve a faster response may require some excess manufacturing capacity to cope with the unpredictable nature of the demand for capacity that results from customers changing their preferences for products. The trade-off is maximising capital utilisation against speed of response.

Total quality management requires senior management involvement in the drive for the continuous improvement to quality. It can only be achieved using quality process technology and the involvement and commitment of the workforce.

The nucleus of the strategy for world class manufacturing is just-in-time production, that is choosing the technology-push approach by using a flexible manufacturing system or installing a Kanban or pull system of production control. This is because scientific management methods of piecework payment systems and narrow specialist skills were designed for a market environment when products were simpler to manufacture, the product life cycle was much longer and therefore, the customer's choice was much more restricted. For those manufacturing businesses in markets where competition from international competitors has intensified and they need to change their competitive strategy, to a form which is similar to that observed by Stalk⁹, a change to the way their products are produced is an imperative.

CONCLUSION

There is a choice of four types of manufacturing strategy, each appropriate to the particular set of circumstances briefly outlined in this paper. The breakthrough strategy is the most complex to implement but its purpose is to regain or maintain manufacturing competitiveness. The continuous decline of the UK manufacturing industry can only be reversed if radical changes are made to the traditional strategies used by many UK manufacturing businesses. The aim of this paper is to present a strategy to effect this needed transformation.

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Strategic Management in Manufacturing

**Customer Service
Criteria**

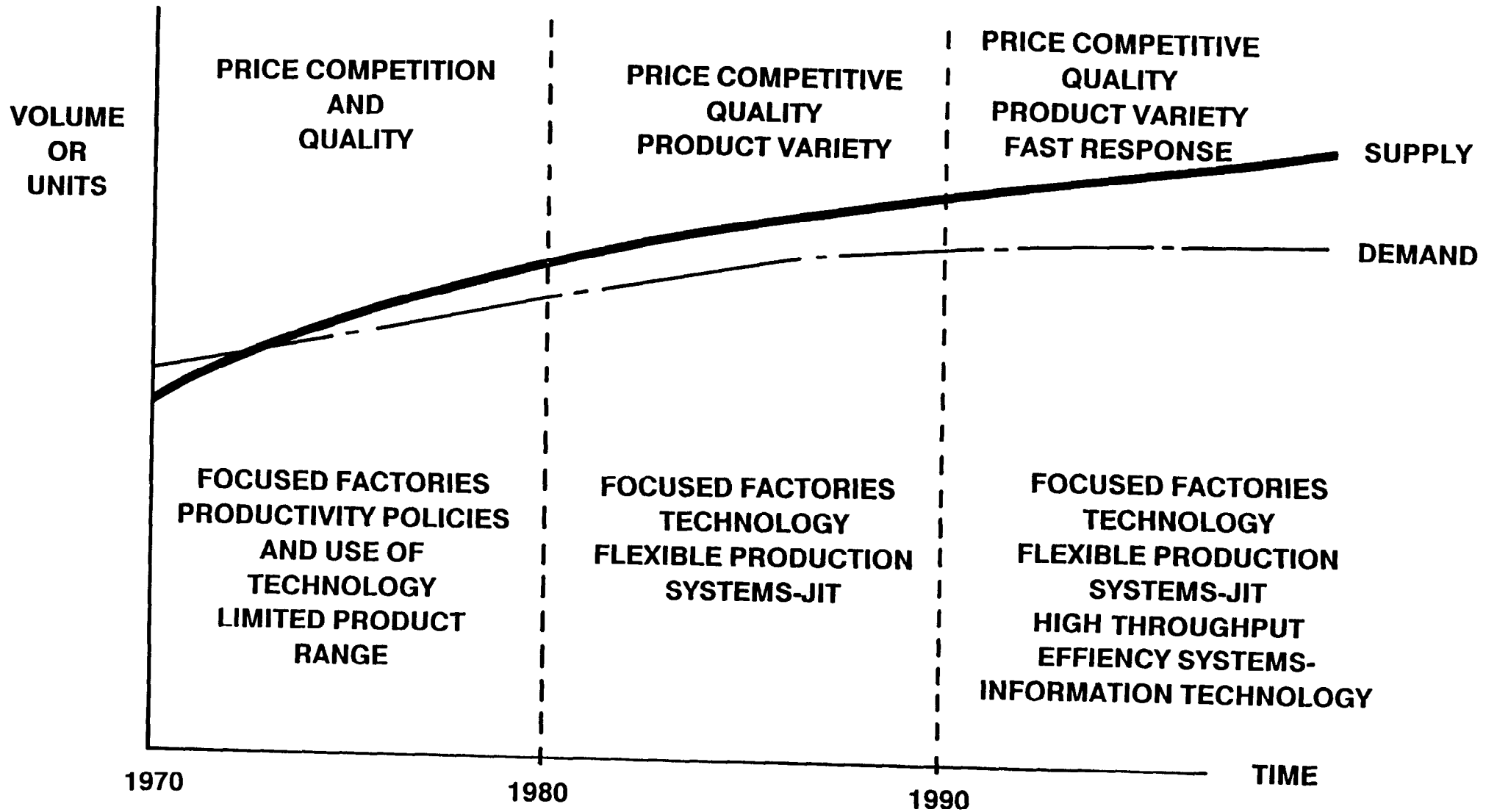
New	STRETCH	BREAKTHROUGH
Current	QUICK FIX	CATCH UP

CURRENT

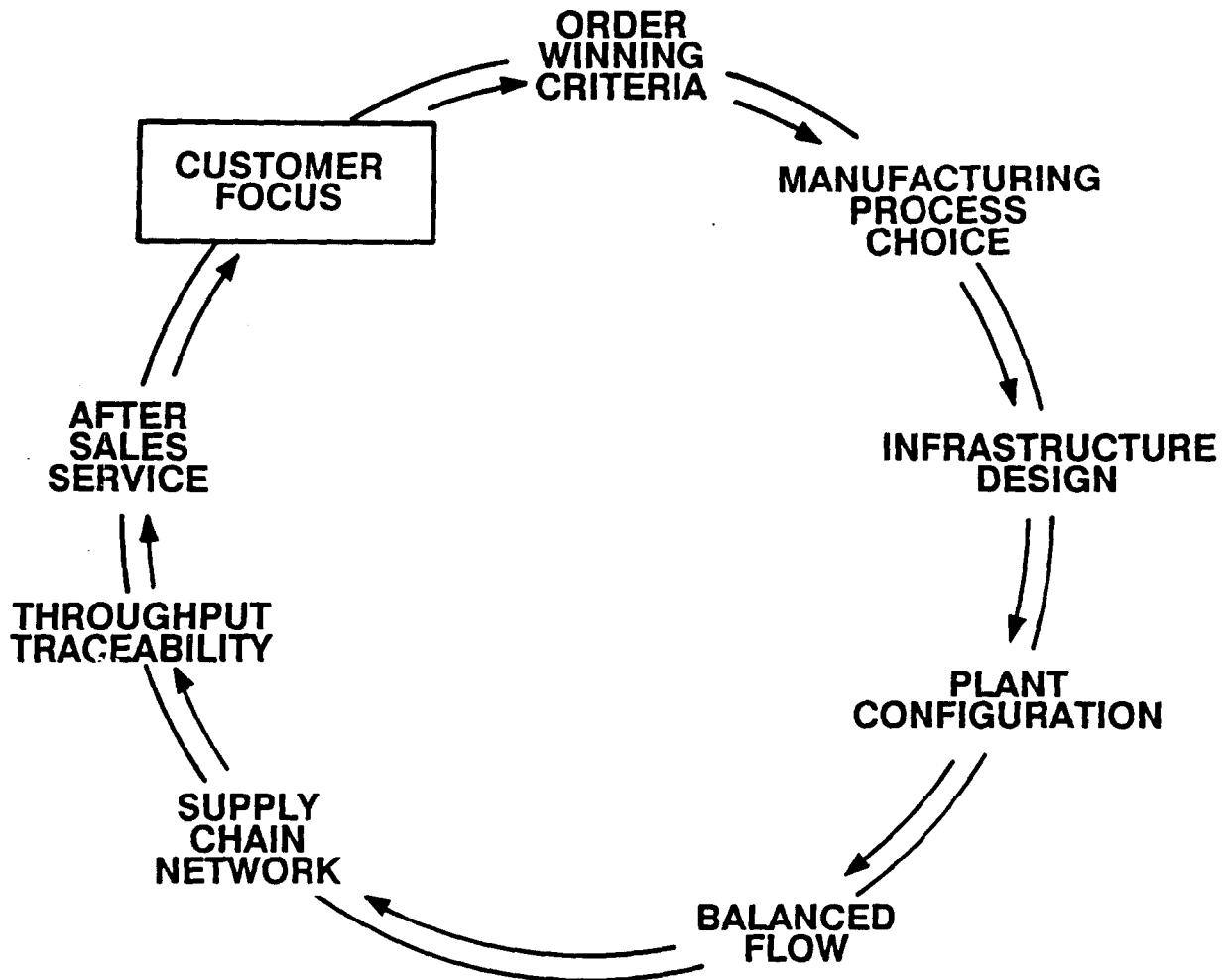
NEW

**Manufacturing
System Structure**

**COMPETITIVE STRATEGIES AND THE ADOPTED
MANUFACTURING STRATEGIES DURING
THE MARKET IN PERIOD**



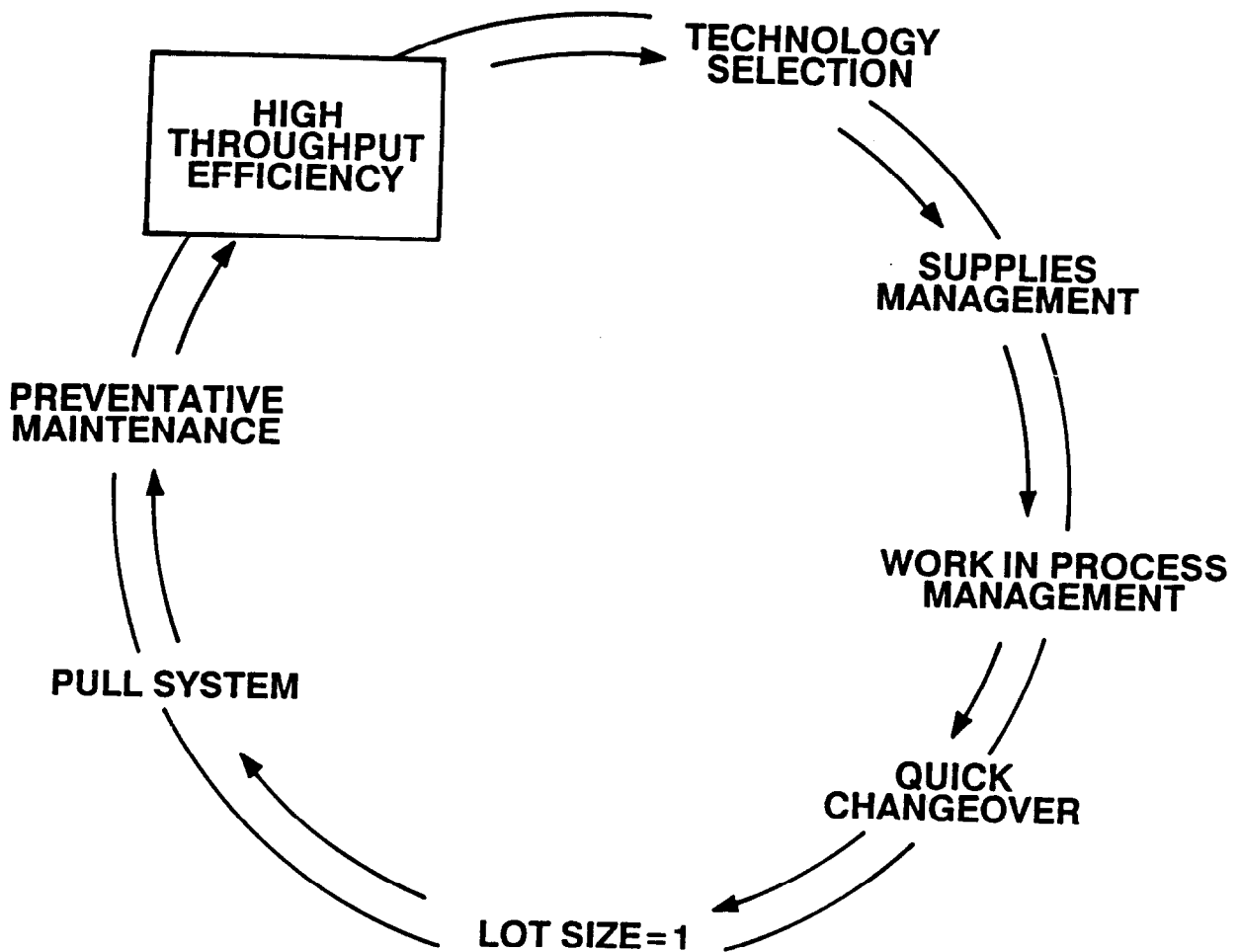
COMPETITIVE BUSINESS OPERATIONS
MANAGEMENT



OBJECTIVE:

TO MEET CUSTOMER
NEEDS AND MAINTAIN
COMPETITIVE ADVANTAGE
BY THE MOST EFFECTIVE
USE OF RESOURCES

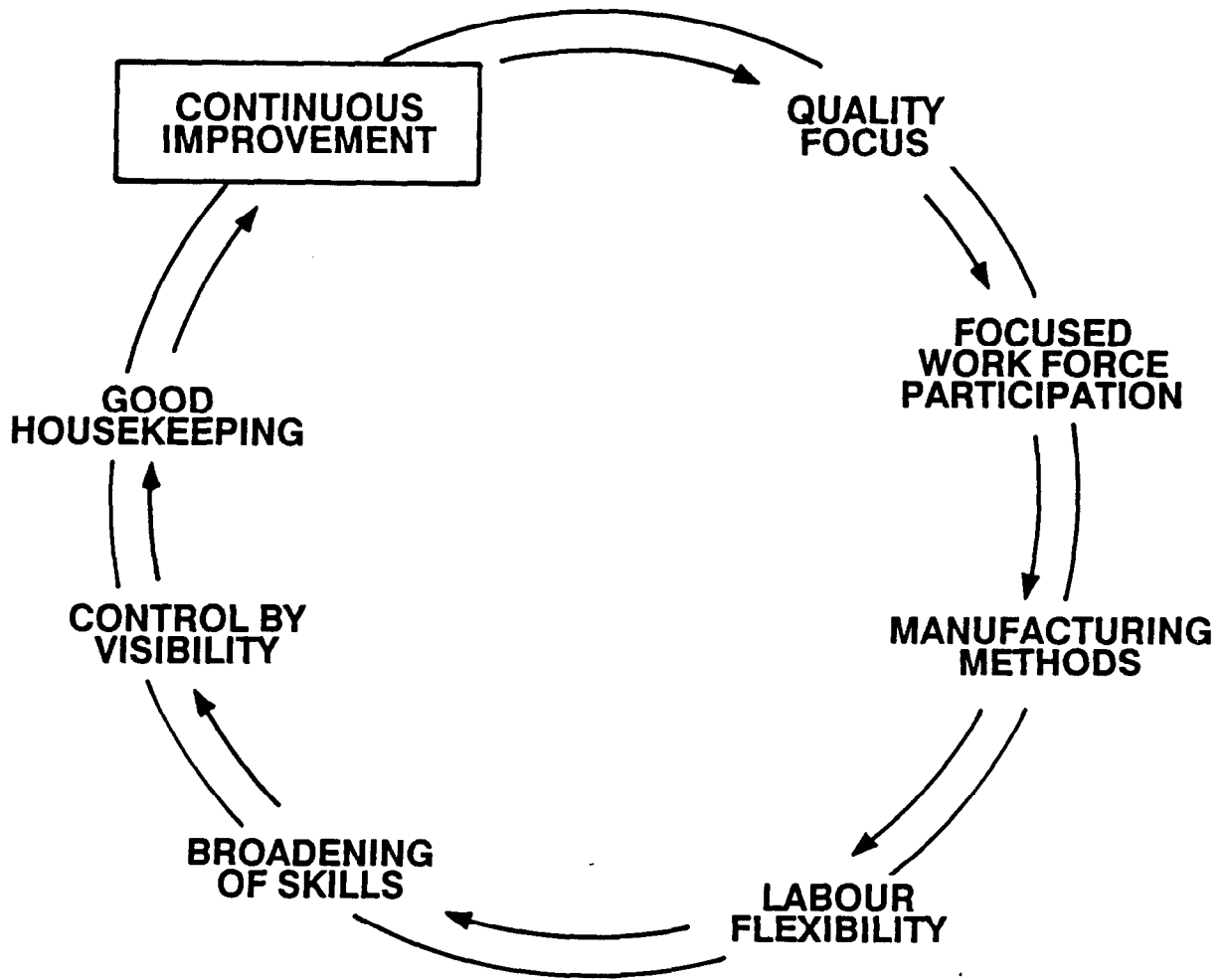
COMPETITIVE PROCESS MANAGEMENT



OBJECTIVE:

**A FLEXIBLE AND
FAST THROUGHPUT
PRODUCTION PROCESS**

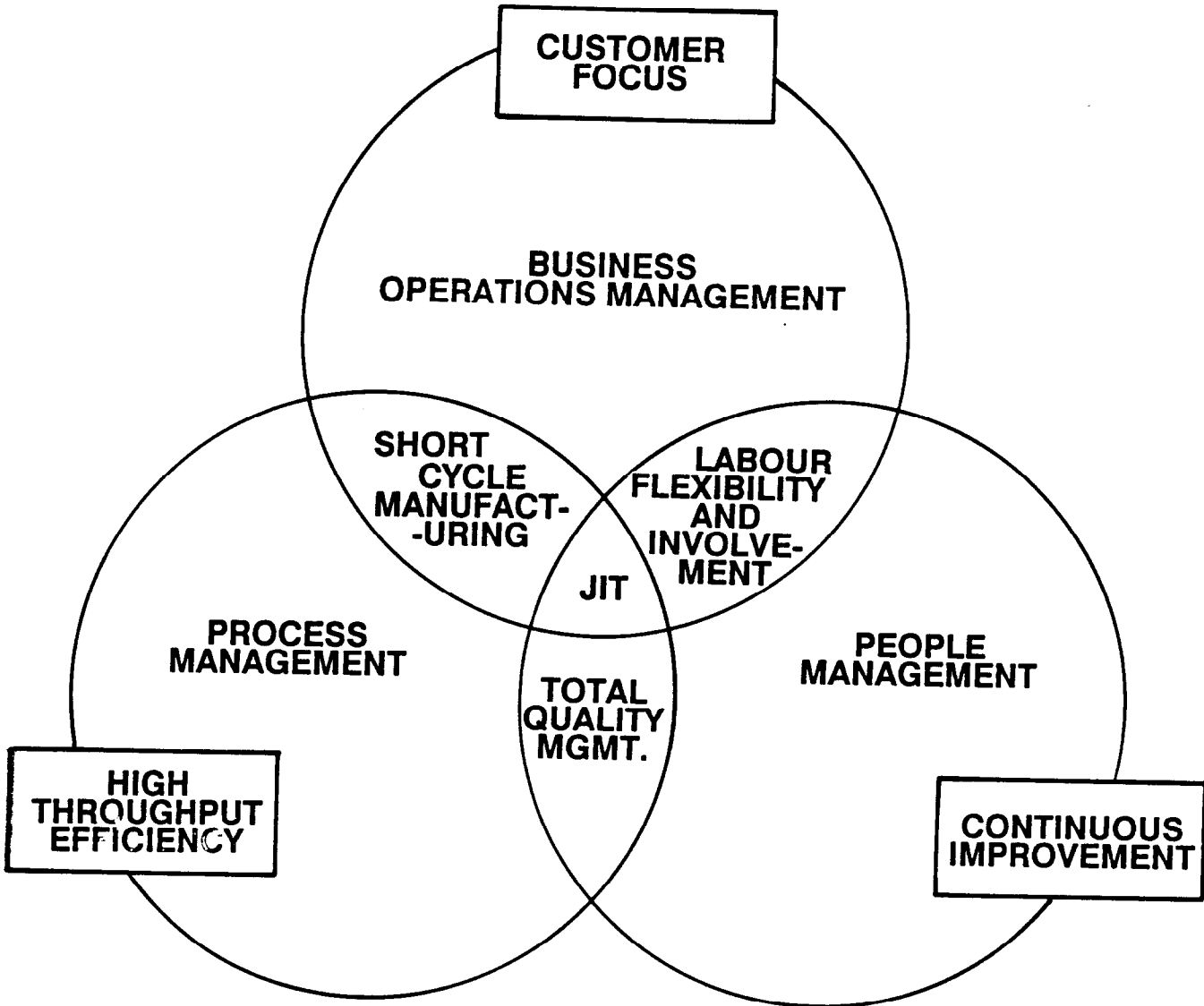
IMPROVED COMPETITIVENESS THROUGH
PEOPLE MANAGEMENT



OBJECTIVE:

CONTINUOUS IMPROVEMENT
IN QUALITY AND QUICK
RESPONSE TO CHANGE

WORLD CLASS MANUFACTURING
THE KEY STRATEGIC ELEMENTS



OBJECTIVE:

TO USE MANUFACTURING
AS A MEANS OF GAINING
AND MAINTAINING COMPETITIVE
ADVANTAGE