



Configurations of Manufacturing Strategy, Business Strategy, Environment and Structure

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By developing strategic configurations which describe commonly used paths to competitive advantage for manufacturers, this paper reconciles some basic concepts from competitive strategy and manufacturing strategy. Four basic strategic configurations are identified: niche differentiator, broad differentiator, cost leader, and lean competitor. The configurations are traced conceptually through competitive strategy, organizational structure, environment, and a strategic framework of manufacturing capabilities and decisions. Examples from the major home appliance industry are provided for each configuration.

Over the last two decades, the language and concepts of business-level competitive strategy have grown in both sophistication and acceptance by practitioners, as evidenced by the pervasive influence of schemes such as generic strategy (Porter, 1980) and core competence (Prahalad & Hamel, 1990). Over the same period, the acceptance and use of strategic approaches to managing manufacturing has enjoyed a similar growth, with the advent of concepts such as just-in-time production (Schonberger, 1982), lean manufacturing (Womack, Jones & Roos, 1990), flexible manufacturing (Goldhar & Jelinek, 1983; Meredith, 1987), and total quality management (Hall, 1987). Surprisingly, research in strategic manufacturing practices has been largely independent of research in competitive strategy despite a considerable literature proclaiming the need to regard manufacturing as a competitive weapon (Buffa, 1984; Cohen & Zysman, 1987; Hayes & Wheelwright, 1984). We seek to reconcile some basic concepts from competitive strategy and manufacturing strategy, and in so doing, present a framework for considering these two domains simultaneously. Joining competitive and manufac-

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turing strategy is important because the predominant resource-based view of strategy often requires understanding and exploiting the manufacturing capabilities possessed by the firm. In addition to the competitive and manufacturing strategy nexus, we suggest key linkages among manufacturing strategy, environment, and organizational structure.

Other researchers (e.g., Kotha & Orne, 1989; Nemetz & Fry, 1988; Parthasarthy & Sethi, 1992) have offered conceptual models which consider some of the linkages between and among manufacturing strategy, business strategy, structure, environment, and performance. Our contributions in this paper include a more detailed and less stylized consideration of manufacturing issues and a workable and fairly complete synthesis of current related research paradigms of organizational and manufacturing strategy researchers. We believe that the practical applicability of strategy research will be greatly increased if a common language is developed between organizational and manufacturing strategy researchers and this paper represents our effort to begin to develop such a common language.

A promising avenue for integrating business and manufacturing strategy research is the configuration approach (Miller & Mintzberg, 1988). In general, the configuration approach to the study of strategy involves identifying dominant *gestalts* of observable characteristics or behaviors which appear to lead to a particular performance outcome (such as success or failure). Configurations are "commonly occurring clusters of attributes or relationships . . . that are internally cohesive" (Miller & Friesen, 1984, p. 12).

Hambrick (1984) and Miller (1987, 1988) have studied the linkages among environment, organizational structure, and competitive strategy, but have not fully incorporated functional level strategies into their configurational models. Miller (1987, p. 56) left manufacturing strategy out of his configurations because "the research has not yet advanced sufficiently to generate interesting hypotheses about the structural and environmental correlates of these more specialized and refined dimensions." However, recent refinements in the literature identifying the dimensions of manufacturing strategy (Adam & Swamidass, 1989; Leong, Snyder & Ward, 1990) have provided the opportunity for hypothesis generation. This paper develops a model which accommodates the recent advances in theory concerning manufacturing and competitive strategies. Specifically, configurations are developed which envelop dominant patterns with respect to manufacturing strategy, competitive strategy, organizational structure, and environment linkages. Each configuration represents a hypothesis about patterns which are likely to lead to success.

Manufacturing Capabilities

It has frequently been suggested that sustainable competitive advantage for a business unit results from building core capabilities or competencies (e.g., Hayes, 1985; Prahalad & Hamel, 1990; Stalk, Evans & Shulman, 1992). Manufacturing strategy content embodies the choice of the most beneficial set of manufacturing capabilities for a business unit and the investments needed to build that set of capabilities. Manufacturing capabilities are best conceived as stocks of strategic assets which are accumulated through a pattern of investments over time and

cannot be easily imitated or acquired by trade, nor can good substitutes be found (Dierickx & Cool, 1989). Thus, the capabilities such as low cost, quality, flexibility, and delivery performance that a manufacturer possesses are stocks of strategic assets which have been accumulated through a flow of investments in capability building programs over time.

Various authors in operations literature have used different terms to describe such manufacturing capabilities, although they have most often been referred to as *competitive priorities* (e.g., Hayes & Wheelwright, 1984). Roth and van der Velde (1991) distinguish between intended and realized capabilities by referring to the former as *competitive priorities* and the latter as *competitive capabilities*. Hill (1994) classifies such capabilities as *order winners* and *qualifiers*, according to their importance in gaining customers.

Despite differences in terminology, general agreement exists in the manufacturing literature about the dimensions of competitive capabilities or priorities that are generic in manufacturing: cost, quality, delivery performance, and flexibility. This assertion is supported by a recent literature review (Leong et al., 1990) and contemporary empirical evidence (Cleveland, Schroeder & Anderson, 1989; Ferdows & DeMeyer, 1990). We refer to these dimensions as competitive manufacturing capabilities, as opposed to priorities, because this paper addresses realized as opposed to intended strategies, and thus adopt the term coined by Roth and van der Velde (1991) to make this distinction. The four generic competitive manufacturing capabilities are described in Table 1.

There is also general agreement about the strategic manufacturing decision areas in which capability-building program choices are made. Hayes and Wheelwright (1984) note that the manufacturing strategy of the business unit is made operational through a series of key choices consummated in a relatively few substantive areas. Ward, Miller and Vollmann (1988) find both empirical support and wide agreement in the literature for a circumscribed set of strategic choices in manufacturing which include: (1) process technology (2) capacity, facilities, and vertical integration (3) quality systems (4) production planning/inventory management systems (5) work force management, and (6) manufacturing organization. Figure 1 shows the generic content of manufacturing strategy including both manufacturing capabilities and strategic manufacturing decision areas.

Process technology is a decision area of particular strategic importance. The flexibility engendered by advanced manufacturing technologies (AMTs) challenges traditional wisdom about what is possible in manufacturing. For example, Goldhar and Jelinek (1983) point out that "economies of scope" are achieved when manufacturers are able to economically produce a number of different product designs appealing to different market segments. The essence of their argument is that the inherent flexibility of AMTs allows manufacturers to broaden their manufacturing scope with little sacrifice in production cost. Noori (1989) maintains that traditional job shop producers (e.g., machine shops) pursue economies of scope while traditional continuous process plants (e.g., paper mills) pursue economies of scale. According to Noori, firms adopting AMTs can pursue a third dimension, economies of integration. Such *computer integrated manufacturers* can simultaneously enjoy scope and scale economies. In other words, AMTs tend

Table 1. Descriptions of Competitive Manufacturing Capabilities

| | |
|--------------------------------|--|
| A. <i>Cost</i> | <ul style="list-style-type: none"> • All manufacturers are concerned to some degree with cost, but most do not compete solely or even primarily on this basis. • Manufacturers' choices about how they pursue marginal decreases in cost are generally technological in that they involve tradeoffs among capital, overhead, labor, and/or materials. • Advanced manufacturing technologies, including hardware, software, and management techniques, have changed the nature of tradeoffs for manufacturers. These changes have occurred primarily through "set up" efficiencies, which reduce the cost penalty of manufacturing short runs of customized products relative to long runs of standardized products. • New manufacturing technologies have made the pursuit of scale economies through production of standard products less attractive by reducing the manufacturing cost premium associated with less standardized products. |
| B. <i>Quality</i> | <ul style="list-style-type: none"> • Garvin (1987) suggests an eight-dimensional framework for quality to overcome the conflicting definitions of quality portrayed by organizational functions such as engineering, marketing, and manufacturing: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. • Manufacturing traditionally focuses on the conformance dimension of quality. • Each of the other dimensions of quality also represent possible bases of competition, but these other dimensions require more interfunctional coordination among manufacturing, marketing, research and development, and engineering than does achieving conformance quality. • The most essential capability possessed by a manufacturer is producing at a high level of conformance quality. In general, a manufacturer must achieve a high level conformance quality capability before it can pursue cost or delivery advantages. Low cost manufacturing requires the elimination of wasted time and material associated with excessive inspection, scrap, and rework attributable to nonconforming products. Similarly, neither delivery speed nor reliability is possible if long production delays caused by failed inspections resulting from poor conformance are tolerated. |
| C. <i>Delivery Performance</i> | <ul style="list-style-type: none"> • The two main dimensions of delivery performance are reliability and speed. • Delivery reliability is the ability to deliver according to a promised schedule. Here the business unit may not have the least costly nor the highest quality product but is able to compete on the basis of reliably delivering products when promised, even if the promise date is far in the future. • For some customers, delivery reliability is not enough, delivery speed is also necessary to win the order. • Although the two dimensions are separable, long run success requires that promises of speedy delivery be kept with a high degree of reliability. |
| D. <i>Flexibility</i> | <ul style="list-style-type: none"> • The dimensions of flexibility most commonly pursued by manufacturers are related to product mix, volume, and changeover. • The essential ingredient in each of the dimensions of manufacturing flexibility is reducing the time and effort involved in "setting up" for production of a different product. • Manufacturing flexibility has traditionally been achieved at a high cost by using general purpose machinery instead of more efficient special purpose machinery and by deploying more highly skilled workers than would otherwise be needed. When properly implemented, advanced manufacturing technologies have reduced the cost of achieving flexibility, thus enabling more competitors to pursue advantage through manufacturing flexibility. |

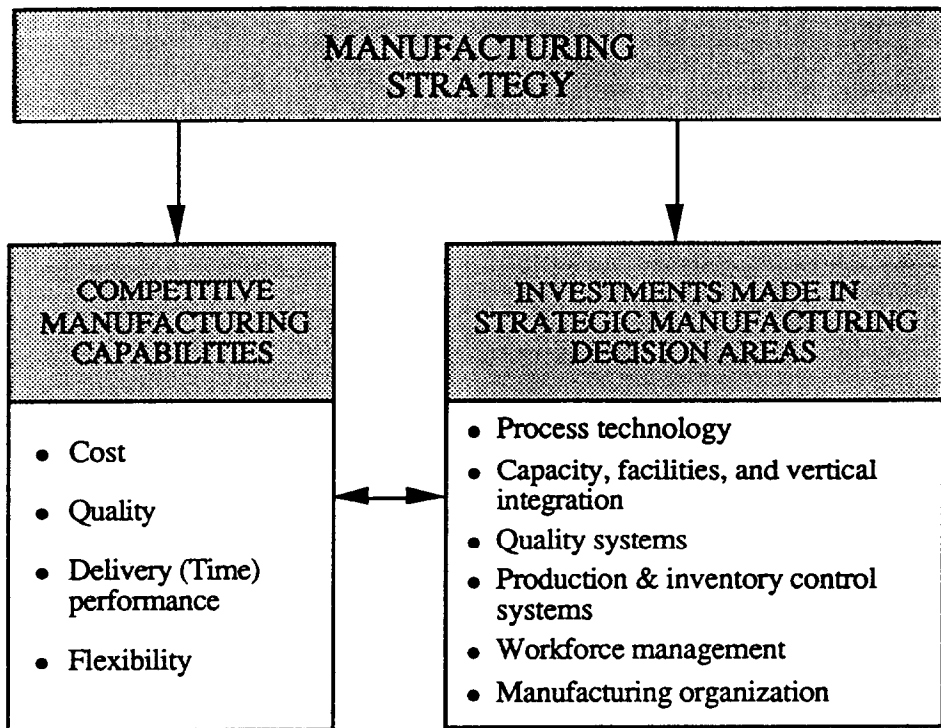


Figure 1. A Content Model of Manufacturing Strategy

to allow even manufacturers of customized products to achieve scale economies, and high volume producers to pursue niches formerly occupied by custom shops.

AMTs free manufacturers from some of the technological constraints that existed before the computer age in manufacturing and, thus, present strategic opportunities. However, AMTs do not represent a panacea that will allow manufacturers to make any product in any lot size at a very low cost. Hill (1994) describes the dangers of using flexibility as a "strategic cop-out" in instances where firms adopt flexible production technology instead of resolving basic uncertainties. Rather than altering the basic tradeoff between flexibility and cost, these technologies tend to expand the range of batch sizes which can be produced within cost and quality parameters in a particular plant. It is also evident that different competitive situations suggest different alignments of AMTs. Swamidass (1988) proposes a manufacturing flexibility typology based largely on volume-variety contingencies. Each contingency in Swamidass' model requires an emphasis on a different set of AMTs. For example, Swamidass suggests that low cost, high volume manufacturers tend to emphasize robotics and automatic storage and retrieval systems while low volume, high variety manufacturers tend to emphasize CAD/CAM technologies and flexible manufacturing systems.

Consistent with Swamidass' (1988) research, we suggest the types of process technology choices that are typically most important in each configuration.

Although process technology is often a critical choice, it is only one of several related strategic decisions depicted in Figure 1. Linking manufacturing strategy to its broader context of competitive strategy, structure, and environment suggests a road map for a program of capability building for manufacturers. The model proposed in this paper identifies the particular manufacturing capabilities which are the most critical complements for the strategy-structure-environment gestalts which are commonly observed.

Configurations of Manufacturing Strategy, Business Strategy, Environment and Structure

The configurational approach was chosen because it yields a systematic, detailed, and holistic image of reality, without attributing causation to any of the individual parts of the model. Thus, we join others in arguing that there is an underlying theme or consistency among environmental, structural, and strategic dimensions (Hambrick, 1984; Miller & Friesen, 1977, 1984; Mintzberg, 1979), without implying that it is always, for example, environment which determines the appropriate structure and strategy for a business unit. The configurations are composed of "tight constellations of mutually supportive elements" (Miller, 1986, p. 236).

It is our thesis that manufacturing strategy, competitive strategy, environment, and structure are configured or interlinked such that there are natural congruences between these elements. Figure 2 illustrates the connections between these forces. Direct links are proposed to exist between all elements except the link between structure and environment.

There is a primary link between competitive and manufacturing strategy. Functional strategies "add detail to business strategy" (Thompson & Strickland, 1990, p. 40), and their primary role is to *support* the overall business strategy. However, mutual causality applies because manufacturing strategy is often advanced as a source of competitive advantage (Buffa, 1984; Hayes, 1985; Hayes & Wheelwright, 1984; Hayes, Wheelwright & Clark, 1988; Skinner, 1978, 1985), suggesting that manufacturing strategy can have a significant effect on competitive strategy.

Competitive strategy has strong relationships with environment. Traditional contingency literature suggests that environment influences strategy (Burns & Stalker, 1961; Dess & Beard, 1984; Hambrick, 1983, 1985; Miller & Friesen, 1984). Competitive strategy can also influence environment (Lenz, 1981); again, mutual causality is the rule. Manufacturing strategy is also hypothesized to have a strong, bi-directional link with environment. This hypothesis is supported by Swamidass and Newell's (1987) empirical findings reporting a strong relationship between perceived environmental uncertainty and manufacturing strategies. In contrast, structure and environment are shown to have a weak link in Figure 2. This is supported by Miller's (1986, 1988) findings that strategic choice may reduce the relationships between environment and structure to insignificance.

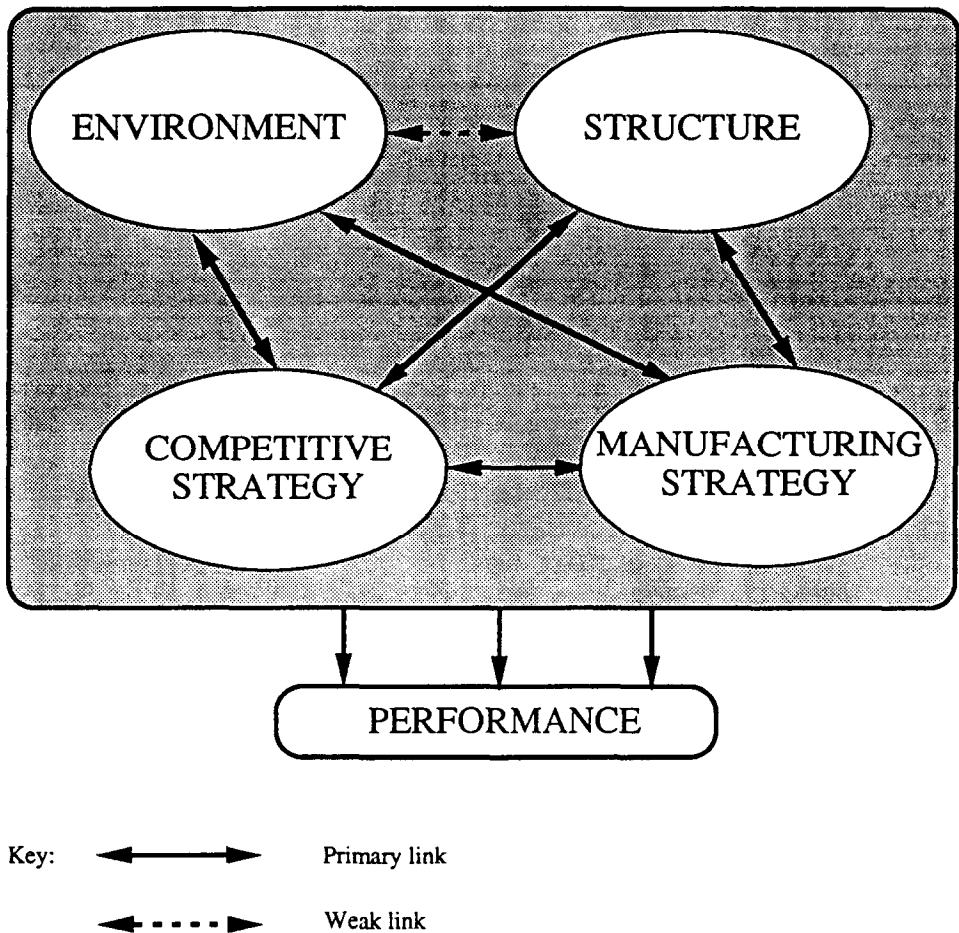


Figure 2. Interdependencies among Manufacturing Strategy, Competitive Strategy, Structure and Environment

Mutual causality also exists between strategy (whether competitive or manufacturing) and structure. Porter (1980) illustrates that business strategies have an influence on structure. Conversely, structure can influence competitive strategy (Miller, 1986). The existence of an important link between manufacturing strategy and structure is suggested by Nemetz and Fry (1988) and Parthasarthy and Sethi (1992) in conceptual papers on manufacturing flexibility.

Selection of Strategic Configuration Dimensions

The concepts of environment, structure, competitive strategy, and manufacturing strategy are each multidimensional and broad. Since the purpose of this

research is to incorporate manufacturing strategy into the emerging holistic view of competitive strategy, structure, and environment, our first task is to identify a set of reasonable and representative configurations of the dimensions of competitive strategy, structure, and environment. Once this is accomplished, we can embark on the task of integrating these within the basic framework of competitive strategy, structure, and environment.

Table 2 shows predominant linkages among competitive strategies, environments, structures, and manufacturing capabilities. With the exception of manufacturing capabilities, the dimensions identified in Table 2 are based largely on Miller's (1986) synthesis. Miller's (1986) dimensions of business-level strategy (an extension of Porter, 1980) and structure (an extension of Mintzberg, 1979) are well supported in the literature, and are utilized here without alteration. We have adopted the environmental dimensions (munificence, complexity, and dynamism) developed by Dess and Beard (1984). These are held to be the most critical dimensions of environment with respect to strategy (Keats & Hitt, 1988; Lawless & Finch, 1989).

A greater level of specificity is required when manufacturing considerations are added to the configurations because "differentiation" is too broad a term to have meaning in a manufacturing context; the manufacturer must also know the basis of that differentiation. Each of the strategic manufacturing capabilities implies a position with regard to differentiation. A strong emphasis on cost, for example, implies that the manufacturer competes on the basis of cost leadership which, in turn, imputes a standardized product with little emphasis on differentiation.

Product differentiation through manufacturing can be achieved through emphasizing one of two manufacturing capabilities, quality (primarily conformance) or delivery performance. We concede that other modes of differentiation exist (e.g., advertising, superior product engineering, marketing channels, etc.), but we argue that quality and delivery performance are the modes that originate largely in manufacturing. Flexibility, the fourth strategic manufacturing capability, is unlikely to be the cornerstone of product differentiation since it is most often of direct benefit to the producer rather than the customer. For this reason, flexibility is generally a manufacturing capability which *enhances or enables* a product differentiation strategy rather than serving as the basis of differentiation.

It is also possible to emphasize other combinations of capabilities simultaneously, such as both quality and delivery or both cost and quality. Although differentiation on several manufacturing bases is difficult to achieve and sustain, such competitors are formidable rivals. The lean competitor configuration, introduced below, competes on the basis of cost and differentiation.

The signs for the first three configurations appearing in Table 2 enumerate expected relationships and are based on Miller (1986, 1988) and also Lawless and Finch (1989). The fourth configuration, which we have named "lean competitor," is based primarily on a major study of the world auto industry reported by Womack, Jones and Roos (1990) and also on Bourgeois and Eisenhardt (1988), Hill (1994), and Schonberger (1986). Each configuration, which can be identified by reading down a particular column, has been named by its favored competitive strategy. The proposed configurations do not represent the entire realm of strate-

Table 2. Predominant Linkages among Competitive Strategies, Environments, Organizational Structures and Manufacturing Capabilities

| | <i>Configurations</i> | | | |
|--|---------------------------------------|---------------------------------|------------------------|-------------------------------|
| | Niche differentiator | Broad market differentiator | Cost leader | Lean competitor |
| | <i>Favored competitive strategies</i> | | | |
| <i>Competitive strategy dimensions</i> | Niche differentiation | Broad market differentiation | Cost leadership | Lean competitiveness |
| <i>Competitive emphasis on:</i> | | | | |
| <i>quality/service</i> | + | + | - | + |
| <i>low price</i> | - | - | + | + |
| <i>Asset parsimony</i> | + | + | - | + |
| <i>Innovation and R&D</i> | - | + | 0 | + |
| <i>Narrow product-market scope</i> | + | - | 0 | - |
| | <i>Environmental types</i> | | | |
| | High velocity | Heterogeneous | Stable | High velocity & complexity |
| | | | | |
| <i>Dynamism</i> | + | + | - | + |
| <i>Complexity (Heterogeneity)</i> | + | + | | + |
| <i>Munificence</i> | - | | - | + |
| | <i>Structural types</i> | | | |
| | Simple structure | Adhocracy (Organic) | Machine bureaucracy | Adaptive |
| | | | | |
| <i>Centralization</i> | + | - | + | -/+ |
| <i>Bureaucratization</i> | - | - | + | - |
| <i>Specialization</i> | - | + | - | - |
| <i>Liaison devices</i> | - | + | - | + |
| | <i>Manufacturing strategy</i> | | | |
| | Niche Quality Delivery | Broad Quality Delivery | Low Cost | Lean Production |
| | | | | |
| <i>Cost</i> | - | - | + | + |
| <i>Quality</i> | + | + | + | + |
| <i>Delivery performance</i> | | + | | + |
| <i>Flexibility</i> | + | 0 | - | + |

Notes: + Indicates an expected positive and significant relationship.

- Indicates an expected significant negative relationship.

0 Indicates an expected insignificant relationship.

A blank indicates no hypothesized relationship (indeterminate).

gic possibilities; thus, they are representative, not exhaustive. It is suggested that following one of these configurations, assuming it is implemented appropriately, increases the odds of long run success (Miller, 1987).

Citations of literature which provide specific support for each configuration are provided in summary form in Table 3. This literature, as it relates to each of

Table 3. Citations Supporting Configurations of Competitive Strategy, Environment and Organizational Structure

| A. Competitive strategy dimensions | Niche differentiation | Broad differentiation | Cost leadership | Lean competitiveness |
|------------------------------------|---|---|--|--|
| Quality/service | Miller (1986), Porter (1980) | Miller (1986), Porter (1980), Wright (1987) | Porter (1980), Wright (1987) | Gilbert & Strebrel (1988), Hill (1988), Jones & Butler (1988), Wright (1987) |
| Low price | Cooper, Willard & Woo (1986); Miller (1986) | Miller (1986), Wright (1987) | Hambrick (1983), Porter (1980), Wright (1987) | Gilbert & Strebrel (1988), Hill (1988), Jones & Butler (1988), Wright (1987) |
| Asset parsimony | MacMillan & Hambrick (1983), Miller (1986), Porter (1980) | MacMillan & Hambrick (1983), Miller (1986), Porter (1980) | MacMillan & Hambrick (1983) | Womack et al. (1990) |
| Innovation and R&D | Miller (1988) | Miller (1986), Miller & Friesen (1977) | Abernathy & Utterback (1975), Miller (1986), Porter (1980) | Clark & Fujimoto (1991), Wheelwright & Clark (1992), Womack et al. (1990) |
| Narrow product-market scope | Murray (1988), Porter (1980) | Miller (1986), Murray (1988), Porter (1980) | Miller (1986), Porter (1980) | Womack et al. (1990) |

| B. | Environmental Dimensions | High velocity | Heterogeneous | Stable | High velocity & complexity |
|----|----------------------------|--|---|---|---|
| | Dynamism | Bourgeois & Eisenhardt (1987, 1988), Miller (1988) | Miller (1986, 1988) | Gilbert & Strebel (1988), Miller (1986, 1988) | Gilbert & Strebel (1988), Hill (1988) |
| | Complexity (heterogeneity) | Murray (1988) | Miller (1988) | | Murray (1988), Womack et al. (1990) |
| | Munificence | Lawless & Finch (1988) | | Hambrick (1983), Lawless & Finch (1988) | Jones & Butler (1988) |
| C. | Structural Dimensions | Simple structure | Adhocracy (Organic) | Machine bureaucracy | Adaptive |
| | Centralization | Miller (1986), Mintzberg (1979) | Burns & Stalker (1961), Miller (1986), Mintzberg (1979) | Lawrence & Lorsch (1967), Miller (1986), Mintzberg (1979) | Bahrami & Evans (1987), Bourgeois & Eisenhardt (1987, 1988), Hayes et al. (1988), Nemetz & Fry (1988), Quinn (1978), Schonberger (1986), Womack et al. (1990) |
| | Bureaucratization | Covin & Slevin (1989), Miller (1986), Mintzberg (1979) | Burns & Stalker (1961), Miller (1986), Mintzberg (1979) | Miller (1986), Mintzberg (1979) | Hayes et al. (1988), Schonberger (1986), Womack et al. (1990) |
| | Specialization | Covin & Slevin (1989), Miller (1986), Mintzberg (1979) | Burns & Stalker (1961), Miller (1986), Mintzberg (1979) | Lawrence & Lorsch (1967), Miller (1986), Mintzberg (1979) | Hayes et al. (1988), Schonberger (1986), Womack et al. (1990) |
| | Liaison devices | Miller (1986), Mintzberg (1979) | Miller (1986, 1988) | Miller (1986, 1988) | Hayes et al. (1988), Schonberger (1986), Womack et al. (1990) |

the configurations, is developed more fully in the discussion which follows. This discussion links the important elements of each configuration to its manufacturing capabilities and presents the key manufacturing choices which face businesses pursuing each configuration. Finally, we illustrate the discussion of each configuration with an example taken from a single industry, major home appliances.

Configuration #1—Niche Differentiators

Competitive Strategy

Niche differentiators offer a specialized product/service bundle to a market segment which is not well served by larger firms in the industry (Miller, 1986; Porter, 1980). The niche differentiator has a wide set of possibilities for differentiating its product/service bundle which include, but are not limited to product attributes such as customization to provide special performance or reliability characteristics, added-service which appeals to certain segments, and geographic coverage not provided by larger competitors. Although avoiding direct competition with large competitors is the norm, in some instances niche differentiators are successful in directly confronting larger competitors in its niche (Cooper, Willard & Woo, 1986).

In addition to product differentiation, the typical competitive strategy of niche differentiators includes high degrees of asset parsimony (MacMillan & Hambrick, 1983) and product-market focus (Murray, 1988; Porter, 1980). Asset parsimony can be equated with relatively small capital investment levels and relatively frugal positions in assets such as inventory and receivables. The essence of this logic is that niche differentiators avoid unnecessary investments so that they can remain nimble and lean in accommodating the market segments they serve. Focus requires that the niche differentiator pursue a narrow segment defined by customer, product, technology, or locale.

Environment

The niche differentiator typically occupies a high velocity environment (Bourgeois & Eisenhardt, 1988), in which firms face change from customers, competitors, and society at large which is both rapid and relatively unpredictable. Niche differentiators can thrive in high velocity environments because their relatively small size and simple organization promotes the agility needed to adapt quickly to the changes in customer demand and business conditions (Miller, 1988). If the environment were not volatile, larger, more efficient firms would move in to satisfy customer demands and the niche would disappear. There must be variation in customer needs to create opportunities for segmentation, and thus, a viable niche position (Murray, 1988). Such variation suggests environmental complexity. In addition, the niche differentiator's growth opportunities are constrained by the size of its niche; a more munificent environment would attract larger firms (Lawless & Finch, 1989).

Structure

The small size and the relatively small investments in tangible assets of the niche differentiator suggests a predominant organizational form, the simple struc-

ture (Mintzberg, 1979). A simple structure dictates a powerful central authority making most of the important decisions (Miller, 1986; Mintzberg, 1979). Because the niche differentiator is small and does not require many specialists (e.g., scientists, public relations professionals), the need for bureaucratic controls, liaison devices, and management layers are kept to a minimum (Covin & Slevin, 1989; Miller, 1986; Mintzberg, 1979). The strong, unencumbered CEO implied by the simple structure is well suited to provide quick responses to environmental change (Mintzberg, 1979).

Manufacturing Strategy

Niche differentiators generally require that manufacturing processes maintain flexibility to accommodate environmental changes in customer demand and competitor behavior (Goldhar & Jelinek, 1983; Nemetz & Fry, 1988; and Swamidass & Newell, 1987). Many niche differentiators also need flexibility to accomplish customized product/service strategies (Abernathy & Utterback, 1975; Hayes & Wheelwright, 1984; and Hill, 1994). In addition, Kotha and Orne's (1989) paper on generic manufacturing strategies provides general support for the importance of flexibility to niche differentiators.

Such flexibility is most often achieved by using general purpose equipment and employing people with sufficient training and experience to adapt quickly to product changes. This very flexible production arrangement is generally referred to as a job shop or small batch manufacturing. Job shop/small batch manufacturing is consistent with simple organizational structure since skilled workers and general purpose equipment obviate the need for high levels of process engineering and other specializations which add complexity to the organization. Because it implies lower capital costs than other production processes, job shop production is also consistent with the need for asset parsimony engendered by a niche differentiation strategy.

When manufacturing capabilities play a key role in product differentiation, the niche differentiators are hypothesized to compete primarily by either concentrating on quality or delivery performance along with flexibility. Delivery and quality differentiation each require different key choices by manufacturers, as outlined below. Concern with low production costs, while always important, typically is not a strategic emphasis for niche differentiators, regardless of the basis of differentiation.

Key Manufacturing Choices

The content of manufacturing strategy summarized in Figure 1 consists of a set of capabilities resulting from a set of choices and programs spanning several strategic manufacturing decision areas. We hypothesize that successful niche differentiators make key, capability-building choices across the decision areas which are consistent with its configuration of competitive strategy, structure, and environment. The set of choices that are often most critical for niche differentiators, those involving process technology, facilities, inventory, and workforce policies, are discussed below.

Process technology. The most basic strategic choices in manufacturing concern process technology because these choices influence and constrain the other choices available to a manufacturer (Hill, 1994). We have already noted that the niche differentiator is expected to choose a job shop or small batch process which embodies its need for organizational simplicity and relatively low capital requirements. A more difficult technological choice facing niche differentiators concerns the adoption of flexible, advanced manufacturing technologies (AMTs).

In the U.S., these technologies have been adopted mainly by large firms (i.e., broad differentiators) primarily because of their high cost and exacting requirements for engineering and programming support. However, Jaikumar (1986) describes a different pattern occurring in the machine tool industry in Japan, where small business units are primary adopters of AMTs. Production workers are largely replaced by engineers who continually experiment and learn about the technology, thus enabling a stream of incremental process improvements. As a result, Japanese machine tool producers are able to achieve high levels of product differentiation at low costs compared to global competitors. Japanese experience suggests that AMTs may very well define the future for niche differentiators. However, firms that choose to pursue advantage through AMTs must be cautious *not* to try to achieve greater efficiencies by buying technology and appending specialists (and bureaucracy) to the organization. Japanese experience suggests that a simple organizational structure can be maintained, albeit with engineering personnel largely supplanting production workers.

Capacity, facilities, and vertical integration. Facilities focus refers to maintaining a relatively narrow set of product/process demands on a production facility. Research has shown that a narrow manufacturing focus is related to good performance (Hayes & Wheelwright, 1984; Skinner, 1974; Venkatesan, 1990). Erosion of facilities focus is a classic problem to which niche differentiators are particularly vulnerable as they expand product offerings to increase revenue. Niche differentiators must make choices with respect to product offerings which reflect their manufacturing capabilities. For example, to accept an order for long runs of relatively low priced items may satisfy a desire to use excess capacity but results in diminished delivery performance which annoys established customers who value prompt delivery (Hill, 1994).

Production and inventory control systems. Consistent with its strategy of asset parsimony, niche differentiators desire to maintain small inventories. The typical niche differentiator's ideal choice would be to minimize raw material inventories by purchasing components as close to the point of manufacture as possible and to ship products immediately after manufacture to avoid finished goods inventory. Such ideal policies are particularly difficult to realize for niche delivery firms, however. The small size and consequent modest purchasing leverage of the typical niche differentiator may force it to maintain higher than desired levels of components and raw materials in order to avoid long vendor lead times that could be ruinous to its own reputation. Such a policy is particularly risky in a high velocity environment because of the potential for obsolescence and dramatic swings in demand.

The *just-in-time* movement intensifies the difficulty of developing coherent inventory management policies for the typically small niche differentiator that often serves larger customers. Large firm customers of niche differentiators often enforce their own just-in-time goals with their less powerful suppliers by extracting penalties for either early or late deliveries. Thus, the just-in time movement provides expanded opportunities for niche delivery firms but also raises the importance of developing just-in-time relationships with its own suppliers.

Workforce management. The niche differentiator often requires a more highly skilled workforce than others in its industry. This is particularly true of the niche quality differentiator, which often counts on production people to have the know-how to build a high quality product in the absence of formal process controls used in high volume settings. Although various mechanisms are available to achieve quality, total quality management (TQM) programs are currently favored by a wide spectrum of firms, including niche manufacturers.

Employee empowerment is a central tenet of the TQM movement, and niche differentiators are well positioned to benefit from such programs because of the high quality workforce employed. The danger in adopting formal programs, however, is that formalization often results in a loss of organizational flexibility which is the major advantage that niche differentiators have over larger competitors. In short, niche differentiators must avoid programs which impinge on the flexibility engendered by their simple structure. TQM programs used by niche differentiators should be designed to maintain nimbleness.

Illustration of Niche Differentiator

Sub-Zero Freezer Company, Inc., a producer of built-in home refrigerators, is an example of a niche differentiator. The company is privately held with 1992 sales of \$90 million. Sub-Zeros are often found in gourmet kitchens in expensive homes because they combine commercial refrigerator capacity, durability, and engineering details in a broad range of style choices. Sub-Zero is focused exclusively on the built-in home refrigerator market and does not make or market commercial products or other lines of home appliances.

Consistent with its configuration, Sub-Zero occupies a high velocity environment. It faces the cyclical vagaries encountered by all consumer durable manufacturers as well as the less predictable phases of consumer fashion trends. In addition, Sub Zero faces a large and threatening new competitor in General Electric, which has introduced a line of high quality built-in refrigerators after observing Sub Zero's success in this market.

Sub-Zero's organization fits the description of simple structure which is typical of niche differentiators. Sub-Zero is directed by a strong CEO supported by a small cadre of top functional managers. Sub-Zero's policy of hiring highly skilled production workers obviates the need for a large staff of technical specialists. The simplicity of Sub-Zero's organizational chart and the proximity enabled by a small headquarters and production facilities preclude the need for elaborate liaison devices to foster communication.

Sub-Zero's manufacturing strategy is aligned with the rest of its niche differentiator configuration and is characterized by judicious use of production technol-

ogy with primary reliance on attracting and keeping good people. In sharp contrast with industry norms, it employs small batch fabrication and assembly methods. It uses advanced, programmable technology for stamping metal and cutting plastic parts, mainly to facilitate faster design-to-manufacture cycles. Otherwise, Sub-Zero depends largely on the competence of its workers to turn out high-performance products. To the extent possible, Sub-Zero hires experienced workers and pays a premium wage. It has two production facilities (Madison, WI and Phoenix, AZ) which are focused geographically; each plant produces the full product line, thus keeping plant size manageable and maintaining product mix flexibility. Currently, Sub-Zero is investing in an ongoing program which embodies the deployment of work teams to achieve TQM and inventory reduction goals. Interestingly, it benchmarks its success to the experience of excellent small batch manufacturers in other industries because the larger scale of most firms in the appliance industry decreases their relevance as a comparison group.

Configuration #2—Broad Differentiators

Competitive Strategy

Broad differentiators seek to be better than their competitors at providing a wide range of products to a variety of markets, while striving to develop and maintain a large share in each market on the basis of quality or service as opposed to price (Miller, 1986; Murray, 1988; Porter, 1980; Wright, 1987). In general, broad differentiators use new product development as a means for expanding market share and preempting competitors (Miller, 1986; Miller & Friesen, 1977). Broad differentiators are relatively large compared to niche differentiators and, like niche differentiators, maintain asset parsimony and strategic flexibility by attempting to keep investments in fixed plant and equipment as small as possible (MacMillan & Hambrick, 1983). In general, total investment per dollar of output is somewhat higher than would be expected for niche differentiators and smaller than would be expected for cost leaders in the same industry.

Environment

Because broad differentiators often serve a variety of markets within a single industry, they are likely to find it difficult to characterize some dimensions of their environment because of the variety in customer and competitor behavior between markets. Broad differentiators have been shown to face unpredictable, dynamic environments (Miller, 1986, 1988). In addition, broad differentiators must confront environmental complexity because the many customer types and markets served by broad differentiators define a heterogeneous environment (Miller, 1988).

Structure

Broad differentiators' structure is best characterized as adhocracy (Mintzberg, 1979) or organic structure (Burns & Stalker, 1961). Decentralized, nonbureaucratic control in the adhocracy supports the broad differentiators' need to remain close to a variety of customers and aware of competitors' actions in

different market segments (Miller, 1986). A relatively high degree of specialization and differentiation is needed to maintain the product development, manufacturing, and marketing skill base needed to serve diverse markets well and to respond quickly to new information (Burns & Stalker, 1961; Miller, 1986; Mintzberg, 1979). A variety of devices such as cross functional teams and task forces are used to coordinate actions in the absence of strong central control (Miller, 1986, 1988). Recent history provides abundant examples of broad differentiators whose extreme difficulties are partly explained by their organizational structure becoming increasingly bureaucratic and, hence, less responsive than their competitors'. General Motors and IBM are two of the more prominent cases in point.

Manufacturing Strategy

The wide product range and variety of segments pursued by broad differentiators circumscribe their manufacturing strategy to an extent. Broad differentiators must simultaneously maintain flexibility and output predictability in order to satisfy both variety and volume dictates. These goals are often achieved through multiple plants which serve particular market segments, which can be defined from a manufacturing perspective on the basis of volume, product or service characteristics, or, as suggested by Hill (1994), customer order winning criteria.

Broad differentiators generally manufacture products in intermittent batches and thus can accommodate both changes in product mix and new product introductions fairly economically. Certain relatively mature product lines of a broad differentiator may have sufficient stability and demand volume to sustain a dedicated line flow production system, while other "younger" product lines of the same manufacturer may require only small batch production of relatively nonstandard products. Thus, managing product lines through the product-process life cycle is a strategic manufacturing challenge for the broad differentiator.

Key Manufacturing Choices

Because broad differentiators attempt to serve a variety of customers, they are faced with fighting their war for market share on at least two fronts. Competition from a variety of niche differentiators may lure away customers whose specific needs are better served by one or another of the niche players, especially for lower volume, more specialized products. At the same time, the broad differentiator's more mature products are particularly vulnerable to competition from cost leaders whose standard products may provide adequate functionality at a lower price. Thus, broad differentiators are faced with constantly negotiating the tradeoff between the advantages of customization achieved through increasing manufacturing flexibility and the advantages of cost reduction achieved through more focused manufacturing and avoidance of product proliferation. These tradeoffs are usually quite subtle and technical and, therefore, the strategic implications of manufacturing choices often escape scrutiny.

Process technology. The batch operations characteristically used by broad differentiators often present ambiguous process equipment choices because of shifting product volume and mix across shared equipment. The complexity of such processes often blurs the dynamics of capacity and estimates of run-time

versus set-up efficiencies. Because of the difficulty in understanding product mix effects at the machine level, incremental equipment choices are often based on machine utilization and capacity needs with current product mix, even when substantial shifts in mix are expected. A series of such incremental decisions may leave the broad differentiator with insufficient capacity, and poor delivery performance for critical products, even though sales forecasts for these products may be accurate. Although difficult, mastering capacity dynamics in such operations, and reflecting that understanding in incremental equipment decisions can be sources of competitive advantage.

When used appropriately, advanced manufacturing technologies can reduce the cost of flexibility, allowing broad differentiators to pursue narrower market segments than they otherwise might. The typical broad differentiator's environmental position, organizational structure, and competitive strategy are well suited to successful implementation of AMTs. The broad differentiator's heterogeneous environment and competitive strategy requires flexibility with respect to product mix and volume while maintaining reasonable costs, thus matching the capabilities AMTs provide. Less obviously, there is also a fit between the broad differentiator's typical organizational structure and AMT implementation. Broad differentiators are decentralized and possess high levels of technical skills and market savvy at the product line level, attributes which fit well with successful AMT application (Jaikumar, 1986).

Capacity, facilities, and vertical integration. Broad differentiators are faced with manufacturing a variety of differentiated products, with different performance attributes, production volumes, and margins, all of which can be at odds with the notion of facilities focus. Broad differentiators often use multiple plants to resolve the largest differences in mission implied by various product lines. However, focus thus achieved can quickly erode because of shifting patterns of relative mix, volume, and margins among product lines. Therefore, broad differentiators must regularly review facilities assignments with an eye toward achieving and maintaining sufficient focus, and bearing the cost of reassigning manufacturing responsibility for product lines fairly often.

Manufacturing organization. Overhead costs are a constant source of concern to broad differentiators because these costs account for an increasing share of total product cost. Special concern about overhead costs among broad differentiators is appropriate because the different life cycle stages of their product lines require different levels of overhead support in areas such as engineering, purchasing, inventory, and materials management, etc. It requires discipline and regular attention to pare down support staff as products mature and reallocate those resources to new products which need more attention and different skills than more mature products.

Another reason for concern about manufacturing overhead among broad differentiators is related to diseconomies of scale that accrue as plants grow larger through incremental expansion (Hayes & Wheelwright, 1984). In particular, large facilities using batch production are subject to diseconomies of confusion and communication. Accordingly, these large plants tend to employ more nonproduc-

tion workers to compensate for confusing material flows (Ward, Berger, Miller & Rosenthal, 1992).

Illustration of Broad Differentiator

Maytag Corporation has a U.S. market share of 14.8 percent, ranking fourth in U.S. sales behind G.E., Whirlpool, and AB Electrolux in the home appliance industry (Hunger, 1990a). We focus specifically on Maytag's home laundry appliances since their competitive strengths are in this segment of the home appliance industry. Maytag, with approximately 15 percent market share in this segment, ranks third behind Whirlpool and General Electric.

Maytag differentiates its washers and dryers on the basis of quality (specifically the performance, durability, and reliability dimensions of quality), as evidenced by consistently high ratings by *Consumer Reports* and a company policy of rejecting cost reductions that reduced product quality. Their successful differentiation strategy allows Maytag to claim the highest profit margins in the industry (Hunger, 1990b). Maytag's broad market and multiple channels implies that its environment is necessarily complex. Its environment is also relatively dynamic because demand for washers and dryers are subject to the cyclical fluctuations that prevail in home construction and consumer durable markets. Maytag's organizational structure also conforms to the configuration favored by broad differentiators. It minimizes corporate staff and stresses an open, participative management style. Its lack of centralization is accented by its organization chart, which reveals corporate vice presidents for finance and human resources but not for other functional areas (Hunger, 1990b).

In terms of manufacturing strategy, Maytag strives to achieve quality by developing a well-trained and committed workforce using appropriate production technologies. Unlike niche differentiator Sub-zero, Maytag prefers to hire and train production workers without previous related experience. Maytag has expanded both capacity and focus in its washers and dryers facilities by moving dishwasher manufacturing out of its Newton, Iowa complex, thus enabling the extensive manufacturing renovations needed to meet anticipated demand in the 1990s.

Configuration #3—Cost Leaders

Competitive Strategy

Cost leadership implies that the final product/service bundle is offered at a lower price than comparable offerings by competitors (Hambrick, 1983; Porter, 1980; Wright, 1987). Thus, successful cost leaders have to develop effective, well refined systems for purchasing, logistics, and manufacturing, as well as efficient marketing channels. Cost leaders typically focus on a range of high-volume, stable, usually mature products and often stress scale economies and product, rather than service, attributes (Hambrick, 1983). Following product-process life cycle arguments (Abernathy & Utterback, 1975), process rather than product innovations tend to be pursued by cost leaders (Miller, 1986; Porter, 1980). Heavy investments in fixed assets such as plant and equipment generally preclude a strategy of asset parsimony (MacMillan & Hambrick, 1983).

Environment

A cost leadership strategy works best under conditions of environmental stability in which neither customers nor competitors substantively alter their aggregate behavior (Gilbert & Strebel, 1988; Miller, 1986, 1988). Such environmental stability serves to ameliorate the risk associated with large fixed investments in process and plant needed to sustain low unit costs with mature products. Mature industries, in which cost leaders tend to dominate, are also likely to provide only limited opportunities for growth in sales and profits (Hambrick, 1983; Lawless & Finch, 1989). Requisite large investments in plant and equipment serve as both entry and exit barriers for cost leaders (Porter, 1980).

Structure

The characteristic organizational structure of cost leaders is a highly centralized machine bureaucracy, with a key role played by the technical specialists who design the manufacturing and logistic systems (Mintzberg, 1979; Miller, 1986, 1988). Important structural decisions regarding capacity and technology are made centrally. Relatively few substantive decisions are made by lower or middle management, who are charged with following plans, maintaining the large investment in plant and equipment and running facilities to take full advantage of scale economies (Lawrence & Lorsch, 1967).

Manufacturing Strategy

Cost leaders achieve advantage in manufacturing primarily through careful management of potential scale economies, cumulative experience (learning), technological achievement, and extensive investments in processes. The typical cost leader's production process is best characterized as a highly mechanized flow process, with minimum work-in-process inventory (Hayes & Wheelwright, 1984). The capital intensive nature of the typical cost leader's manufacturing process dictates relatively few direct production workers, while the centralized management structure and the technical complexity of mechanized processes often require greater numbers of various technical and clerical specialists than other competitive types (Ward et al., 1992).

Manufacturing capabilities are particularly important to cost leaders and manufacturing management plays an important role in business governance. In contrast with differentiators, low unit cost is of primary concern and flexibility and delivery performance are of less importance. Quality, especially in terms of conformance and yield, is extremely important to the cost leader because scrap and rework resulting from nonconformance add costs.

Key Manufacturing Choices

Because of the capital intensive nature of their operations, the typical cost leader's key strategic choices in manufacturing involve both structural decisions concerning investments in tangible, "bricks and mortar" assets and infrastructural choices concerning systems which assure efficient utilization of capital investments.

Capacity, facilities, and vertical integration. Expansion of capital intensive processes often involves adding large chunks of capacity rather than increments (Hayes & Wheelwright, 1984). Thus, cost leaders are particularly concerned about maintaining sufficient capacity to achieve market share goals, while avoiding excessive overcapacity over an investment horizon that is relatively long because of the stable environment. In addition to projected demand, cost leaders must consider technological advances and the behavior of industry rivals (Lieberman, 1987).

In the mature industries in which cost/price competition dominates, industry overcapacity is a constant concern. Leaders are often able to preempt expansion by rivals by moving first to add capacity, or, in oligopolistic situations, to coordinate expansion in the industry via signals (Lieberman, 1987).

Historically, cost leaders have often used backward and forward integration to reduce total production costs; minimize transaction costs; assure high quality, dependable sources of supply; and protect proprietary technologies. However, these benefits can be more than offset by disadvantages related to cost and flexibility (Harrigan, 1985). The heart of the integration problem for cost leaders is that advantages gained from integration can quickly erode as environmental conditions change, but fixed assets can be difficult to dispose of, especially under adverse environmental conditions. In recent years, cost leaders have often gained many of the advantages of integration but retained more flexibility by pursuing strategic alliances (Harrigan, 1985).

Manufacturing organization. Because cost leaders often make large investments in manufacturing plant and equipment, these manufacturers are very concerned with using capacity efficiently and, thus, exploiting their investment. Maximum utilization requires long runs and, consequently, few equipment set-ups. In multiple plant operations, this often means centralized process design, technology choice, product planning, and production scheduling. The price of such centralization is generally paid by giving up a degree of responsiveness, a compromise which can be tolerated in the stable environments which favor cost leaders.

In addition to the tradeoffs incumbent in centralization decisions, multiple plant cost leaders are faced with choosing the appropriate focus for the manufacturing organization. Hayes and Schmenner (1978) characterize this choice as between two extremes: plants which are dedicated to particular markets and plants which are dedicated to a particular manufacturing process. According to Hayes and Schmenner, dedicating plants by process type works best with complex, divisible processes in which balancing capacity among several plants and process levels, logistics, and technological change are key issues. Thus, centralized organizations favored by many cost leaders are well suited to managing manufacturing organizations in which plants are dedicated to particular technical processes rather than markets or segments.

Illustration of Cost Leader

Magic Chef Company, a division of Maytag Corporation since 1986, distributes a full line of medium- to low-priced appliances for both retail and contract

(construction) markets. Because of its low price (cost leader) strategy, Magic Chef has been particularly successful in selling to builders. Ranges, the traditional area of strength for Magic Chef, continue to account for the bulk of its manufacturing activity. The conventional range market in the U.S. is stable, with few product innovations and, because virtually all American homes are equipped with a stove, much of the demand results from replacement and new construction needs. After significant consolidation in the major appliance industry, competition is most fierce in the higher-end of the market (Hunger, 1990a). Thus, the relative environmental stability sought by cost leaders prevails in Magic Chef's segment, as does the relative lack of significant growth opportunities which accompanies market saturation.

Magic Chef's range of manufacturing strategy is consistent with its configuration. Manufacturing is concentrated in two focused plants in Cleveland, Tennessee, with one plant producing 30-inch ranges and the second producing other types of ranges. The company summarizes its manufacturing strategy: "...invest capital to redesign the product, take cost out, put quality in" (Hunger, 1990b). Magic Chef achieves low cost production through careful design for manufacturability, high unit volume production, and capital investment in processes. Magic Chef pursues long-term supplier relationships in lieu of major efforts toward vertical integration.

Configuration #4—Lean Competitor

Competitive Strategy

If poorly conceived or badly implemented, the simultaneous pursuit of cost leadership and differentiation can lead to abject failure in the marketplace with products that are neither cheaper nor more valuable than those of their competitors. This outcome is described by Porter (1980) as "stuck in the middle." Since Porter's seminal work, numerous researchers have noted that some businesses compete successfully on both cost and differentiation (e.g., Gilbert & Strebel, 1988; Hill, 1988; Jones & Butler, 1988; Wright, 1987).

One way to accomplish this feat is to manufacture at the lowest possible cost and to achieve product differentiation in a broad market through marketing or service value-added. More interesting from a manufacturing strategy perspective, however, are those relatively few manufacturers who achieve and sustain both differentiation and cost leadership, in a broad market segment, through manufacturing capability. These manufacturers present a formidable challenge to their competitors since manufacturing capabilities are especially difficult to emulate (Hayes, 1985).

One illustration of how companies can achieve differentiation and cost leadership simultaneously is provided by Womack et al. (1990), who carefully document how a new management paradigm, which they term lean production, has effectively supplanted mass production in the world automotive industry. The enterprise model of the lean competitor depicted by Womack et al. extends beyond the factory to include the entire organization and its associated value chain.

The lean competitor pursues asset parsimony through low inventory levels achieved through just-in-time production and high utilization of manufacturing processes achieved through continuous improvements (Womack et al., 1990). Companies that adhere to the lean production paradigm are also capable of designing, manufacturing, and introducing new products with rapidity because of simultaneous engineering and their ability to exploit both cross-functional relationships and alliances with vendors (Clark & Fujimoto, 1991; Wheelwright & Clark, 1992). The lean competitor depicted by Womack et al. (1990) pursues a broad product-market scope because of its abilities as a global competitor and because of its capacity for producing a relatively wide array of products efficiently.

Environment

The environment of the lean competitor is relatively dynamic, complex, and munificent. It must be dynamic because stability would support competitors finding the "right" product formula and then pursuing a pure cost strategy, consequently obviating the advantages of differentiation (Gilbert & Stebel, 1988; Hill, 1988). The environment must be complex because the breadth of the markets pursued by the lean competitor imply heterogeneity in customers and channels (Murray, 1988; Womack et al., 1990). Environmental munificence is required for businesses to risk the investments in capability building needed to become a successful lean producer (Jones & Butler, 1988).

Structure

Womack et al. characterize the lean producer as decentralized with a high reliance on relatively autonomous teams of employees who possess a breadth training and experience (1990, p. 99). The findings of Womack et al. are consistent with both Hayes et al. (1988) and Schonberger (1986), who stress innovativeness, learning, and continuous improvement as requisites for world-class manufacturing. Organizational flexibility and adaptability are also cited as increasingly important ingredients for excellent manufacturers (De Meyer, Nakane, Miller & Ferdows, 1989; Goldhar & Jelinek, 1983). All of these attributes are best supported by a decentralized, organic organizational structure (Burns & Stalker, 1961; Nemetz & Fry, 1988). Hayes (1985) observes that capability building in manufacturing firms is augmented by incremental, bottom-up decision making processes in stable environments. However, in periods of sharp, discontinuous environmental change, such firms may be served best by a combination of centralized and decentralized actions (Bahrami & Evans, 1987; Bourgeois & Eisenhardt, 1988; Quinn, 1978). Bourgeois and Eisenhardt (1987) find that effective firms in high velocity environments have a powerful, decisive chief executive who makes the initial choice, but then empowers the top management team to establish and carry out the implementation, thus, a hybrid combining aspects of centralization and decentralization. All of this suggests that the best lean manufacturers possess the organizational flexibility and management talent to utilize an organic structure to enhance innovation and learning during periods of relative environmental stability and to adopt a hybrid structure during periods of severe environmental volatility.

Manufacturing Strategy

From a manufacturing perspective, it is difficult to simultaneously achieve both cost leadership and differentiation. However, some business units *are* able to compete on the basis of both cost and differentiation simultaneously, despite the seemingly schizophrenic set of manufacturing capabilities required. The lean producers in the automotive industry described by Womack et al. (1990) provide one well-documented example of manufacturers who are able to accomplish and sustain both cost leadership and differentiation. This competitive strategy is enabled by a manufacturing function that has accumulated stocks of capabilities incrementally in the areas of quality, cost, delivery performance, and flexibility, thus, a high level of performance for each manufacturing capability. These capabilities result from long term programs of continuous improvement, which are often cross-functional in scope. Top management understands and supports the strong position of the manufacturing function and exploits that strength strategically.

Key Manufacturing Choices

The basis of the lean producer's advantage is the ability to deliver a variety of high quality products as needed with greater asset parsimony than most of its competitors. Therefore, the entire range of competitive manufacturing capabilities, cost, quality, delivery performance, and flexibility, are required at relatively high levels. Such capabilities are necessarily built over a period of time through a range of coordinated programs of continuous improvement. Critical decisions must be made with respect to process technology and organization to enable these improvement programs.

Process technology. Decisions related to process technology are absolutely critical because the process must provide the efficiencies required to be the lowest cost producer in the market and the flexibility needed to respond quickly to changes in customer preference. This is particularly difficult because both cost advantage and the flexibility needed to differentiate are subject to rapid erosion in the high velocity environment occupied by the typical lean producer. Flexible automation through adoption of advanced manufacturing technologies can provide a partial solution, but experience shows that such investments are neither sufficient nor absolutely necessary. For example, Lincoln Electric, a manufacturer of a full line of welders has maintained a successful differentiation/cost leadership position for many years with little investment in advanced manufacturing technologies. Instead, Lincoln has made continuous, incremental improvements in their processes which have had the cumulative effect of preventing serious erosion of their positions as cost leader or as a quality differentiator. Achieving and maintaining world-class manufacturing status through lean production requires relentless, continuous improvement of production processes, regardless of technologies chosen. In contrast, occasional, single-shot improvements through major investment programs are likely to inhibit flexibility and therefore leave the firm vulnerable when change is required.

Manufacturing organization. Because the lean producer often possesses relative competitive advantage in their broad market segment, they are faced with organizing manufacturing for growth. Although this task is pleasant when

compared to alternatives, it presents daunting challenges. The problem is that control systems that formerly worked well can be overtaxed during periods of rapid growth. The normal managerial response to this condition is to add "checkers," people who make sure systems are working correctly. These checkers come in the form of additional production supervisors, inspectors, inventory specialists, planners, production control specialists, expeditors, etc.; and all will have to be fit into the organization. The result of these incremental steps is that the formerly lean, agile manufacturing function now has to overcome bureaucratic control mechanisms before it can respond.

Illustration of Lean Competitor

The lean competitor paradigm outlined by Womack et al. (1990) is based in the world automotive industry. General Electric's GE Appliances division is an example of lean production in the world major appliance industry. GE Appliances division, with sales that rank first in the U.S. and second (to Whirlpool) worldwide, has been successful in increasing profitability and market share in a mature industry (Malnight, 1990). This illustration focuses on the GE dishwasher unit, a particularly strong business within GE's appliances segment. GE dishwasher sales represent a dominant 40 percent share of U.S. sales, an increase from 22 percent in 1983. The dishwasher business strategy of pursuing both cost and differentiation emerged in the 1980s from a product innovation (plastic tub and door assemblies) that resulted in superior product performance but higher costs than rivals. Through major improvement programs, including a \$38 million investment in plant and equipment, GE was able to achieve low cost along with superior product performance (Hayes & Wheelwright, 1984). The environment in the dishwasher industry is munificent and dynamic compared to that of other major appliance segments because penetration rates in the U.S. and globally are still relatively small, thus allowing more growth opportunities than more mature appliance segments (Hunger, 1990a). In recent years, GE's organization has been simplified to conform to the adaptive form needed for leaner factories and offices. Centralization, bureaucracy, and required planning structures have been reduced while a strong chief executive remains at the helm for intervention when needed (Malnight, 1990).

The dishwasher business unit was targeted as an opportune area for major investment by top corporate management, and manufacturing improvement programs were implemented at GE's Louisville, Kentucky, dishwasher facility. Early results from these programs are documented by Schonberger (1986): lead times were cut from 6 days to 18 hours while inventories, scrap, rework, and field service calls were all cut by more than half. These results indicate significant achievements with respect to reduced cost, increased responsiveness, and improved quality. These achievements resulted from programs which focused on improving both the manufacturing technologies and the skills of the manufacturing workforce (Hayes & Wheelwright, 1984). The overall payoff has been that GE dishwashers moved from a distant second place to a dominant position in their industry during the 1980s; GE has continued to sustain the advantage.

Consequences of Misalignment

The previous sections have sketched the basic form of strategic configurations with a particular emphasis on the alignment of manufacturing strategy with environment, competitive strategy, and structure. Although not all manufacturers conform to these configurations, we argue that these are the predominant avenues to success. It is interesting to consider the consequences of a business unit misaligning its manufacturing strategy relative to the rest of its configuration.

Although many possibilities for misalignment exist, of particular interest is the business unit whose manufacturing strategy does not fit appropriately with the other elements of a configuration which are otherwise aligned. This situation, or more precisely, the mismatch between competitive and manufacturing strategy, has been discussed frequently in the manufacturing literature (Skinner, 1969; Wheelwright, 1984). The most common manifestation of the mismatch is weighting cost heavily as a strategic manufacturing capability, regardless of the competitive strategy being pursued (Skinner, 1985). In some business units, manufacturing managers are rewarded only for lowering cost, even when the competitive strategy is based on differentiation.

The cause of this situation has been attributed to the cost accounting basis of most manufacturing performance measurement systems (Cooper & Kaplan, 1988), as well as to the top management neglect of manufacturing. Almost inevitably, the result of such misalignment is poor overall business unit performance. Rewarding manufacturing management on the basis of efficiency and cost minimization criteria creates pressures to seek high levels of utilization, economies of scale, specialized equipment, etc. It would be more appropriate for differentiators, regardless of the basis of product differentiation, to forego economies of scale and utilize relatively small plants, and general purpose equipment.

Failing to perceive and correct the mismatch can lead to long-term poor business unit performance; but correcting the mismatch requires more than an adjustment of strategies. Realignment requires building an appropriate set of manufacturing capabilities which can be used to the strategic advantage of the business unit. Such capability building requires time and investment. Many authors have suggested ways to transform manufacturing from this "underachiever" status into a source of strategic advantage (e.g., Hayes & Wheelwright, 1984; Hill, 1994). Each of these suggested transformations involves changing the posture of manufacturing from a reactive state in which demands are passively accepted to a more assertive posture in which manufacturing plays a strategic role by bringing to bear a set of capabilities which contribute to the competitive strength of the business unit.

Conclusion

This paper uses the emerging approach of strategic configurations as a vehicle for synthesizing manufacturing strategy with widely accepted views of competitive strategy, environment, and structure. The configurations introduced in this paper suggest the predominant modes in which manufacturing capabilities can be marshaled to strengthen the strategic position of the business unit. The

major propositions are fairly clear: (1) manufacturing and competitive strategy, environment, and structure are related as indicated by Figure 2, (2) the predominant configurations of these elements and their relationships are as depicted in Table 2, and (3) the patterns of strategic manufacturing decisions are as described and illustrated in the discussion in each of the configurations and in Figure 1.

At this point the synthesis is incomplete; each of the configurations represents a hypothesis which can be tested empirically. Simply stated, the hypothesis corresponding to each configuration is that a large proportion of successful business units pursuing a particular competitive strategy will adhere to the other aspects of the configuration as predicted. The overarching hypothesis is that business units which conform to one of the configurations will be more likely to perform well than those which are not so aligned with regard to competitive strategy, structure, environment, and manufacturing strategy. These hypotheses will be tested empirically in future research.

Beyond their research ramifications, the configurations provide insights for practicing managers. We have contended that the result of misaligning manufacturing strategy relative to the rest of the configuration is poor business unit performance in the long run, regardless of the merits of the competitive strategy and despite an otherwise viable configuration of strategy, structure, and environment. This contention implies the need for particular caution on the part of firms that are rationalizing and integrating systems following an acquisition or major reorganization. Specifically, imposing systems and policies inconsistent with a business unit's configuration increases the likelihood of failure of the merger or reorganization. Such failures, otherwise attributed solely to a "clash of cultures," may have their roots in a misalignment of the very tangible elements suggested in the configurations.

Further, the configurations point out the difficulty inherent in major changes in strategy or structure; such changes must be consistent with the entire gestalt. When manufacturing strategy is added to the mix, the expense and difficulty of accomplishing a strategic shift expands greatly because of the large, long-term investments required to achieve necessary manufacturing capabilities.

Our intentions in this paper are to contribute to a common language and understanding of manufacturing strategy for organizational researchers from various management disciplines and to present configurations which can serve as hypotheses for empirical testing. Both of these thrusts help to clarify the need to attend to the fit between a company's manufacturing strategy and its constellation of competitive strategy, structure, and environment. Regardless of strategy, successful manufacturers must achieve this fit.

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