Using Product Profiling to Illustrate Manufacturing-Marketing Misalignment

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As companies choose among process alternatives, they need a clear understanding of the changing alignment between manufacturing and the needs of their markets. Assessing how well existing processes fit these market requirements and making choices to meet future needs are critical strategic responsibilities for manufacturing. Product profiling can be used to examine the degree of alignment between the needs of a company's markets and the characteristics of its existing manufacturing process and infrastructure investments. We compare product profiling with another tool, the product-process matrix, and examine the applicability of both in a typical mismatch situation. In-depth analysis in one firm indicates that product profiling is a valuable tool to uncover the origins of misalignments that occur over time and to illustrate the phenomenon to executives.

Markets are inherently dynamic and often change for reasons out of a company's direct control. On the other hand, manufacturing is inherently fixed and only changes as a result of the conscious efforts of its managers. Furthermore, investments in manufacturing plant, equipment, and infrastructure are characterized by their large size and lengthy time scales [Skinner 1969]. In contrast, marketing investments are typically shorter term in nature and, while still siza-

0092-2102/98/2804/0047/$5.00
This paper was refereed.

INDUSTRIES—PHARMACEUTICAL
MANUFACTURING—STRATEGY

INTERFACES **28:** 4 July–August 1998 (pp. 47–63)

ble, are more adaptable than those in manufacturing. One result of this inherent disparity is that, without strategic direction and review, the essential link between markets and manufacturing may over time become blurred and eventually drift out of alignment.

Can companies detect growing problems of misalignment between manufacturing and their agreed markets? If so, can they determine the origins of the problem and hence change the factors involved so as to realign the interface between the market and manufacturing within the overall strategic direction of a business?

These are the questions we address in this paper.

Manufacturing Strategy

The role of functional strategies is to support a company's agreed markets. Given the large and fixed nature of its investments, it is essential that manufacturing play a proactive role in developing corporate strategies. As Skinner cautioned as long ago as 1969, "few top managers are aware that what appear to be routine manufacturing decisions frequently come to limit the corporation's strategic options, binding it with facilities, equipment, personnel and basic controls and policies to a non-competitive posture which may take years to turn around" [Skinner 1969].

However, in many companies this warning seems to have gone unheeded. Manufacturing continues to take a reactive stance partly because corporate managers expect manufacturing to be "under control" and partly because manufacturing perceives its strategic role as requiring it to respond to all that is asked of the production system [Hill 1994]. Even where conditions are favorable and corporate encouragement and support are high, few manufacturing executives seem to know how to align their functional strategies with the firm's markets. Many companies either lack formal, coherent manufacturing strategies [McGrath and Hoole 1992] or they learn how to adjust their plans to the marketing function's objectives in a reactive manner. This has led to poor input by manufacturing to the corporate strategy debate and correspondingly poor output in terms of deliverables [Skinner 1996]. Academics, on the other hand, frequently report two reasons for the apparent lack of progress in manufacturing strategy. One is the dearth of adequately developed concepts, approaches, and theories within the production-and-operations management (POM) field [McCutcheon and Meredith 1993]. The other is the failure of POM researchers to produce relevant results partly because many academics hesitate to use plant-based research methods when the outcomes are difficult to publish in current POM journals [Hill, Nicholson, and Westbrook 1995; Meredith et al. 1989; Westbrook 1995].

How Markets and Manufacturing Become Misaligned

A company needs a comprehensive understanding of how manufacturing can support its business. Assessing how well existing processes fit an organization's current market requirements and making appropriate choices of process to meet future needs are critical manufacturing responsibilities and core themes in corporate strategy debate.

Manufacturing can become increasingly out of alignment with the company's mar-

kets for various reasons:
—The company may invest in a process that embodies trade-offs that are inconsistent with part or all of its markets.
—The firm may apply one manufacturing strategy in two or more markets.
—The company may decide to downsize its total manufacturing capacity by reallocating products from one plant to another, thereby enabling one plant to downsize or close while improving the other's utilization levels. The receiving plant, although technically capable of producing the relocated products, often finds itself unable to meet the new market demands.
—The least-cost plant within a group of plants in the corporation that make the same product may attract business from sister companies. The new businesses often require support for different market requirements, leading to a deterioration of performance at this "best" plant.
—The company may fail to notice gradual changes in market needs because it uses analyses that compare the current year only with the previous year.

Existing literature lacks plant-based empirical research investigating these types of alignment issues. The in-depth case review in this paper examines the last type described.

Tools to Illustrate Market/Manufacturing Misalignment

There are two principal approaches in the literature that deal with the issues of alignment and relationships between products and processes, the product-process matrix and product profiling.

The product-process matrix approach suggests that the way process technologies evolve in manufacturing companies (process life cycle) and the major stages their products pass through (product life cycle) are interrelated [Hayes and Wheelwright 1979, 1984]. A firm's products with a good match between their process technologies and their product or market characteristics occupy regions of the matrix along the upper-left-to-lower-right diagonal (Figure 1). As a firm's products grow in volume, they pass through the typical stages of their life cycles and, according to the logic of the matrix, the manufacturing-process technology used in the company should be altered accordingly to match this progression. This is not to say that firms cannot operate in the zones that are off-diagonal; indeed, some do so. However, the farther off the diagonal, the greater the mismatch between product characteristics and process capabilities.

Few studies in the literature directly test the applicability of this framework. Fine and Hax [1985], in their test of a manufacturing-strategy-design methodology, used the matrix to detect the degree of match between product and process structures of the three product lines at Packard Electric's wire and cable unit. Their intention was not to test the validity of the matrix but to use it as one of the instruments in their strategy design.

Safizadeh et al. [1996], in their cross-sectional study using a mail survey, reported a correlation between process choice and product plans (as represented by degree of product customization). They see this correlation and the differences they found among the competitive priorities of firms with different process choices as evidence of the validity of the product-process matrix. However, they recognize

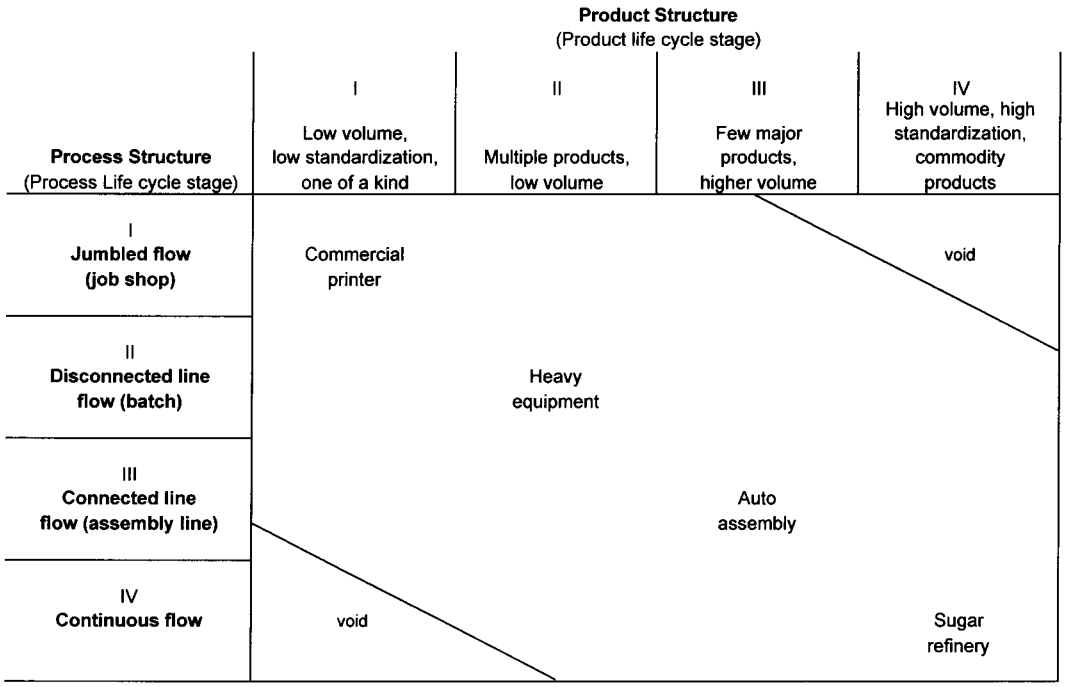

Figure 1: The product-process matrix [Hayes and Wheelwright 1979] shows how companies' product life cycles (product structure) are related to the stages of their process life cycles (process structure). According to this matrix, firms with a good match between their product and process structures should fall on the upper-left to lower-right diagonal.

that their study did not address the dynamics of plants with products advancing through their life cycles—an aspect that we believe was the original focus of the matrix. The other characteristic of their study is its unit of analysis: "primary product line" produced in a particular plant. We, too, applied the product-process matrix framework at the plant level; however, we used all product lines produced in a particular plant because this is the reality most manufacturers face. We believe it is the existing diversity and the changes in the market characteristics of the products over time that typically cause misalignment.

To examine the extent of the match between the characteristics of a firm's markets and the characteristics of its existing process and infrastructure investments one must understand the evolution of those factors over time. Hill [1994] proposes product profiling as a practical tool to lead practitioners in a systematic examination of those elements of fit and as a way to help them explain those interdependencies to managers in marketing, manufacturing, and other areas within a company. Practitioners can compare two profiles drawn on a set of continuums that illustrate typical choices based on several relevant aspects of markets, process, and infrastructure. One profile represents the characteristics of a company's current products, markets, and manufacturing strategy, while the second depicts these

characteristics at the time of the company's original investment.

We illustrate and explain the use of both approaches using the same company case so that we can draw comparisons and reach conclusions about their usefulness.

Data Collection

We employed a methodology used in action research. One of us (Menda) was a member of the plant-management team at the time of the study and undertook the in-depth analyses and reviews that underpin the outcomes. We conducted our study as a real-time investigation based on data obtained from company records and from in-depth discussions with operations managers, supervisors, planners, and engineers over several weeks. We discussed the data, the analyses, and the results with the participants in group meetings, from which we identified the need for further analyses, leading to another cycle of discussions and investigations. We checked the conclusions against available data for consistency and reached agreement by consensus. The core group of operations managers made the final recommendations. The activities in this phase took over three months. Following approval by the company's upper management, the operations managers implemented the action plan during the following six months.

The Case of Rumack Pharmaceuticals

Rumack Pharmaceuticals (a pseudonym to disguise an actual company) is one of a number of operating units of a large multinational corporation based in the United States. Each unit is set up as a separate business and operates with considerable autonomy.

In the mid-1980s, Rumack Pharmaceuticals built a new plant in Bakersfield, California, to meet the increasing demand for its successful Restolvic brand-name products. In addition to a wide range of derivatives under the Restolvic name the plant also manufactures its Hedanol and Ladirine products. Recently the company transferred the manufacture of the prescription version of the Restolvic preparation to Bakersfield after shutting down one of the plants of an affiliated business unit.

Although Rumack's products are pharmaceuticals, they are marketed and sold in the highly competitive consumer market as over-the-counter (OTC) products. Moreover, the segments of the market in which Rumack competes are somewhat fragmented. Several multinational firms sell their brand-name preparations in those markets as do many smaller companies that manufacture generic or private-label versions of those drugs. Even though the generics sell at much lower prices, brand-name products still dominate Rumack's markets with a combined share of 65 percent.

Restolvic is one of the most successful products Rumack has developed since the 1960s. To exploit its sales potential the company brought out a number of variants. Initially, the firm explored additional dosage forms and package sizes of the basic product (Restolvic-A). Recognizing the product's wide acceptance, Rumack also tried to capitalize on the growing strength of the brand name. It achieved this by developing additional OTC products (Restolvic-B and C) with slightly varied but related indications to relieve an even wider range of symptoms. The strategy

has been very successful and since the mid-80s Rumack's market share has doubled.

Rumack competes in five OTC market segments (Table 1). All its products are the premium brands in their markets and retail at a 50 to 70 percent price premium over their generic or store-brand competitors. They are positioned as "high-quality brand-name products the users can trust." The Bakersfield plant also manufactures two additional product groups (Restolvic-BTC and Rx), which are marketed and sold by another operating unit of Rumack's parent corporation.

In general, processes in the plant are highly capital intensive. Products are standard and are manufactured to exacting specifications. Processing or run times typically vary between two and 20 hours per batch, and setups are from four to 16 hours, depending on the type of product and type of equipment. The plant runs three shifts, five days a week. The manufacture of pharmaceutical dosage forms is divided into two major groups of activities: processing and packaging.

In processing, powdered ingredients are converted into bulk tablets or liquid preparations. Each piece of equipment is dedicated to a single operation, such as dispensing, granulation, blending, compression, coating, or liquid mixing, with lot sizes dictated by the capacity of the particular processing equipment.

In packaging, containers (plastic bottles) are filled with the bulk tablets or liquids produced in the previous processing stages, and these containers are capped, labeled, safety-sealed, put in cartons, and packed in cases by automated equipment. A packaging line is arranged as a sequential set of processes with the containers moving from one process stage to the next on conveyors that link the machines. Typically these lines are dedicated to running a narrow range of similarly designed container sizes.

All equipment used in the processing and packaging operations is cleaned and

Market segment	Product group	Percentage of total company sales	Number of end products
1	Restolvic-A	60	22
2	Restolvic-B	16	8
3	Restolvic-C	16	16
4	Hedanol	3	6
5	Ladirine	5	4
6	Restolvic-BTC	—	5
7	Restolvic-Rx	—	7

Table 1: Rumack markets and sells products in five market segments (1 through 5), however, the Bakersfield plant manufactures 12 additional products for an affiliate company (sold in markets 6 and 7). Restolvic-A and B are market leaders in their own categories, holding approximately 30-percent and 60-percent shares of their own markets. Restolvic-BTC and Rx are marketed and sold by the affiliate company, the sales of which are not included in this table. Behind-the-counter (BTC) drugs do not require a doctor's prescription but can be obtained only through the pharmacist; prescription (Rx) drugs, on the other hand, can be obtained only from a pharmacist on presentation of a prescription.

set up between product runs to meet the strict requirements stated in the Food and Drug Administration regulations. Currently the plant has four packaging lines, each handling a specific group of products.

Line 1 fills and packs all (except non-OTC Restolvic) solid-dose products in small package sizes, ranging from 20 to 30 tablets per bottle. Because of the high demand for small packs, Rumack dedicates the entire packaging line to this package size (35cc), thus minimizing setup times. However, each product change still requires a four-hour changeover to strip down the filling machine and change labels, cartons, and cases.

Line 2 is tooled to accommodate three bottle sizes (70, 100, and 130cc) and handles all pack sizes from 50 to 130 tablets of various products per bottle. In terms of the physical configuration of equipment, this line is identical to Line 1.

Line 3 packs only liquid products in five bottle sizes. Changing sizes takes an average of eight hours.

Line 4 handles Restolvic-BTC and Rx products (behind-the-counter and prescription versions of Restolvic). It was installed more recently after an affiliate company closed its plant. The equipment from the plant was transferred to Bakersfield, modified, and retrofitted to bring Line 4 up to the same specification as Lines 1 to 3.

Rapid growth in demand for both existing and transferred-in products had absorbed the planned excess floor space. The company could not expand capacity further by adding new equipment without further construction, with attendant delays and costs.

The Problem

In recent months, the plant has not met its production schedules, and the backlog of customer orders has grown. The pressure to maintain schedules to reduce and then eliminate back-orders has intensified. Failure to deliver products reliably would jeopardize the company's short- and long-term sales growth and lead to loss of market share. The company was also concerned that it might not achieve its cost-leveraging targets (sales growth translating into lower product costs) this year for the first time since the plant started up.

On the surface, the problem appeared to be a lack of capacity. However, on paper, the plant had enough capacity to meet current and future sales levels. Still, manufacturing found it increasingly difficult to satisfy weekly demand even though it was well below theoretical capacity calculations.

Line 1 suffered most from this capacity problem. Demand for the most common package size, 35cc bottles, increased annually, as did the number of end products or SKUs (stock-keeping units) to be packed on this line.

Of the three packaging lines present since the plant start-up, Line 1 experienced the fastest SKU growth (Figure 2). Furthermore, the average annual volume per SKU for those products allocated to Line 1 has been fairly steady although overall volumes have increased (Figure 3).

Because of these changes, the company has downscaled its estimate of the projected maximum sales revenue that existing capacity can support. Consequently, operations management staff started evaluating alternate ways to meet the short- to

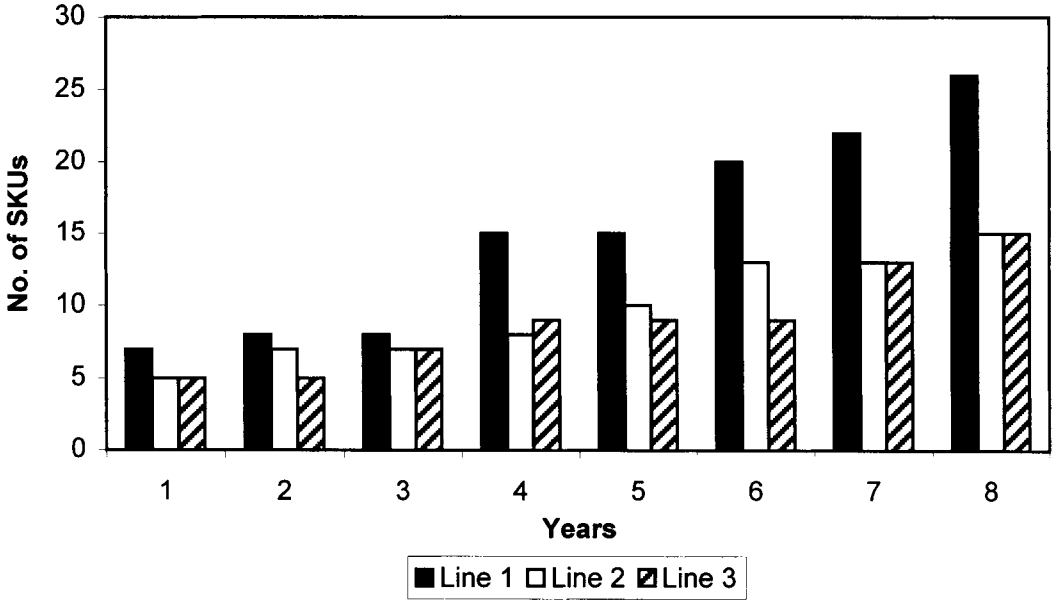

Figure 2: In the graph of SKU growth by packaging line, Line 1 has had the largest share of the increase in the number of end products as the sales of the small-size packages grew at rates higher than other sizes.

mid-term demand on the packaging lines (Table 2).

The operations managers thought that any of the alternative courses of action, while helping resolve the capacity issues, would have a negative impact on product costs. In fact, simply trying to find a cost-effective way of providing more capacity

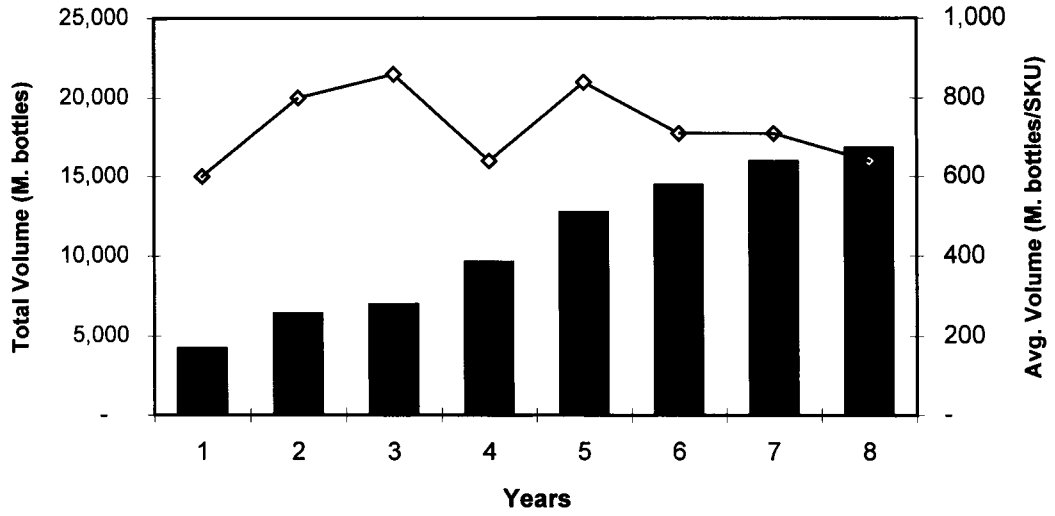

Figure 3: This shows the overall volume growth (bars; *y* axis) and average annual volume per SKU (line; second *y* axis) for Line 1. Although total production volume grew steadily, annual volume of an average end product remained virtually flat.

Alternatives considered, Their costs and lead times	Implications
1) Install a new packaging line, identical to Line 1. —Equipment cost: $3.5 million —Lead time: 12 months	—Space would have to be created by moving out another operation or by expanding the facility at a cost of $3.0 million. —Investment was considered high and lead times long.
2) Install a new packaging line that is less dedicated and more suitable for high-variety, low-volume production. —Equipment cost: $2.5 million. —Lead time: 10 months	—Same as for alternative 1, and —Such a line would have lower running speeds, resulting in higher product costs.
3) Work through weekends.	—Weekends were already utilized for demand fluctuations, seasonality, and unexpected machine breakdowns. This mode of operations was not considered sustainable on a permanent basis.
4) Transfer an appropriate number of products from Line 1 to the identically equipped Line 2 with lower utilization, thus freeing up capacity on Line 1. —Retooling cost: $300 million —Lead time: six months	—The retooling cost was unbudgeted. —The bottle-size changeovers on Line 2 would go from five to 16 hours per setup. —Longer setup times would reduce effective capacity. —Run efficiencies for all products on Line 2 would decrease due to ramp-up curves following each size change.

Table 2: Rumack's managers considered four options to deal with the capacity problem encountered on packaging Line 1. They decided that none of the alternatives was feasible.

for small packs would, they believed, be reactive and likely to treat the symptoms and not the cause. They recognized that the problem required analysis at a deeper level. This could lead to a feasible solution, and more important, it could explain the underlying causes and improve the managers' ability to avoid similar problems in the future. To perform this fundamental review, we used the two approaches advocated in the literature.

The Product-Process Matrix

To test the degree of match in Rumack's case, we placed the brands on a product life-cycle curve in line with marketing executives' views and based on the market data we had collected and evaluated. We then constructed a composite matrix by combining the life-cycle curve with the product-process matrix and placing Rumack's brands on this matrix (Figure 4).

Rumack's products have substantially different levels of volume, are at different points on their life cycles, and yet use the same process technology (high-volume batch). The processing steps in the manufacture of these products reflect a typical batch process. Similarly, the various stages within the packaging operation, although linked to each other with conveyors, still

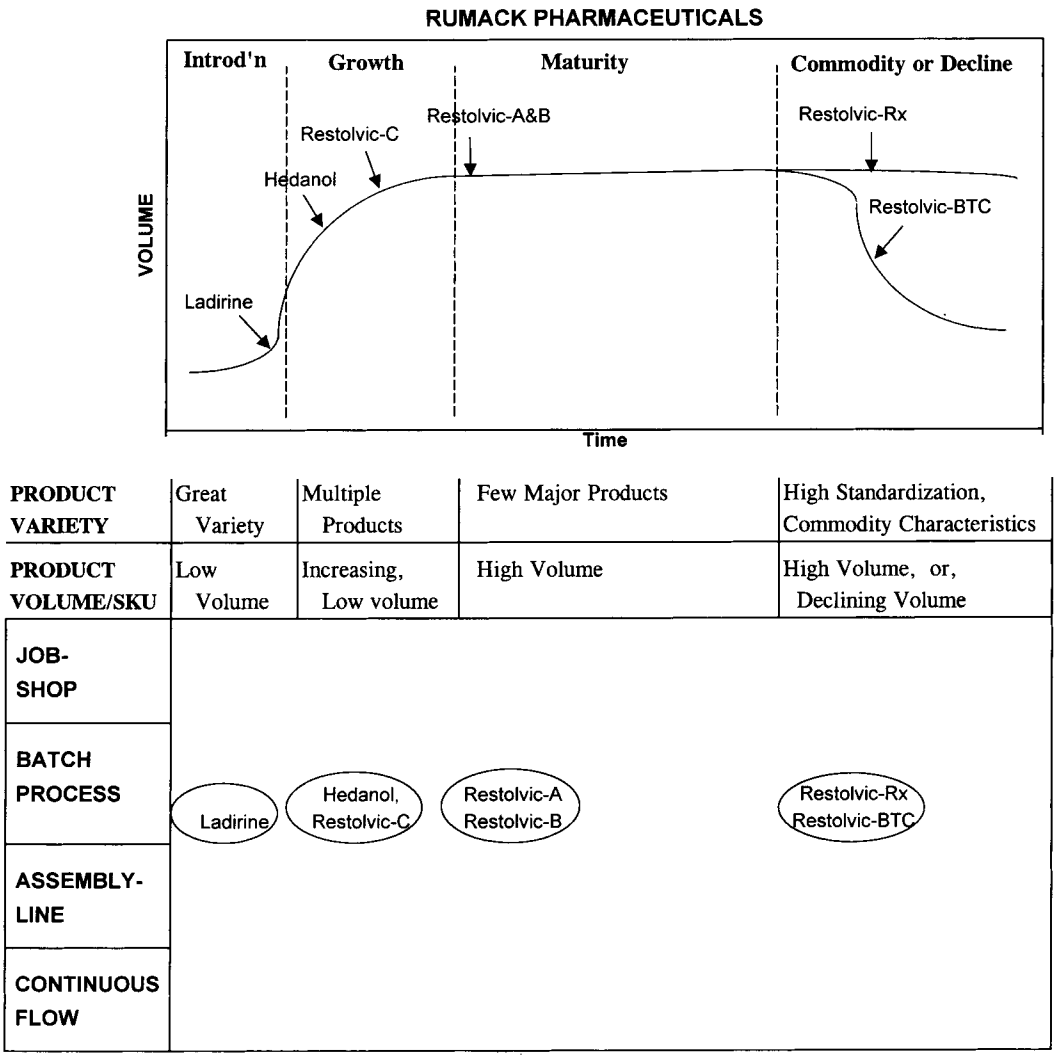

Figure 4: Rumack's products are positioned on the life-cycle curve and the product-process matrix. As the positions of the ellipses illustrate, although the firm's products are at different points in their life cycles, they use the same process stage (high-volume batch). According to the logic of the product-process matrix, this indicates a mismatch because they don't fall on the upper-left to lower-right diagonal. However, it does not explain the origins of the problem.

qualify as batch because the entire line is stopped and changed over between runs. We refer to this hybrid process technology as linked batch.

A superficial analysis using the product-process matrix indicates that the company has not chosen the appropriate process technologies for the variety of products it now sells. The products do not fall around the upper-left to lower-right diagonal, which is an indication of a mismatch. We first attempted to use this mismatch as the starting point in finding the origins of Rumack's current difficulty. We saw two pos-

sible causes for this situation:
—Rumack should have invested in different process technologies in-line with the changing product mix and market characteristics.
—As the company expanded its product lines through a steady stream of new product introductions, its position on the product dimension shifted to the left. Therefore, it should have maintained its initial region in the middle of the matrix by increasing sales of Restolvic-A and B only without adding new variants.

After considering these possibilities, Rumack's managers came up with the following responses. Investing in the wide range of technologies from jobbing to assembly line would have been prohibitively expensive and would have driven up product costs unacceptably. On the other hand, concentrating on only the main product lines (Restolvic-A and B) would have limited the sales growth, reduced market share, and lowered overall profit levels.

The product-process matrix showed the various brands' positions as they related to their life cycles and process-technology choices as a snapshot in time. Although this indicated a mismatch, it did not explain its origins nor did it aid in its resolution.

Product Profiling

As an alternative way of exploring the origins of Rumack's dilemma, we developed a product profile. First we selected several aspects of products and markets, manufacturing, and infrastructure that are relevant to the problem (Figure 5). We used two criteria to select those aspects from a long list of dimensions [Hill 1994]: (1) they must relate to the issues on hand and reflect the strategic dimensions of relevant markets, products, and manufacturing; and (2) the number of aspects selected must be kept small so that the resulting picture is uncomplicated and clearly illustrates the issues. For example, under "products and markets," the "product range" and "rate of new product introductions" dimensions are relevant because Rumack's marketing group has pursued a deliberate product-proliferation strategy. "Frequency of schedule changes" is an obvious dimension to explore because products in the early stages of their life cycles, of which Rumack has three, typically have unpredictable demand, which increases the number of changes in schedules. "Typical order-winners/qualifiers" is a key dimension of markets that affects manufacturing; therefore, it would be included in most situations (qualifiers are those criteria that enable a company to be considered as a potential supplier; order-winning criteria actually win the order against others that have qualified in that market). We chose the other dimensions under the manufacturing and infrastructure headings for similar reasons.

Next, for each dimension chosen, we displayed the two typical extreme positions on the continuum that result from the choice of process. For example, take the product-range dimension. In a jobbing environment, companies would typically handle a wide range of products using general purpose machines and highly skilled workers. At the other extreme, firms that use a line process would normally manufacture a single product or a narrow range of products in high volumes

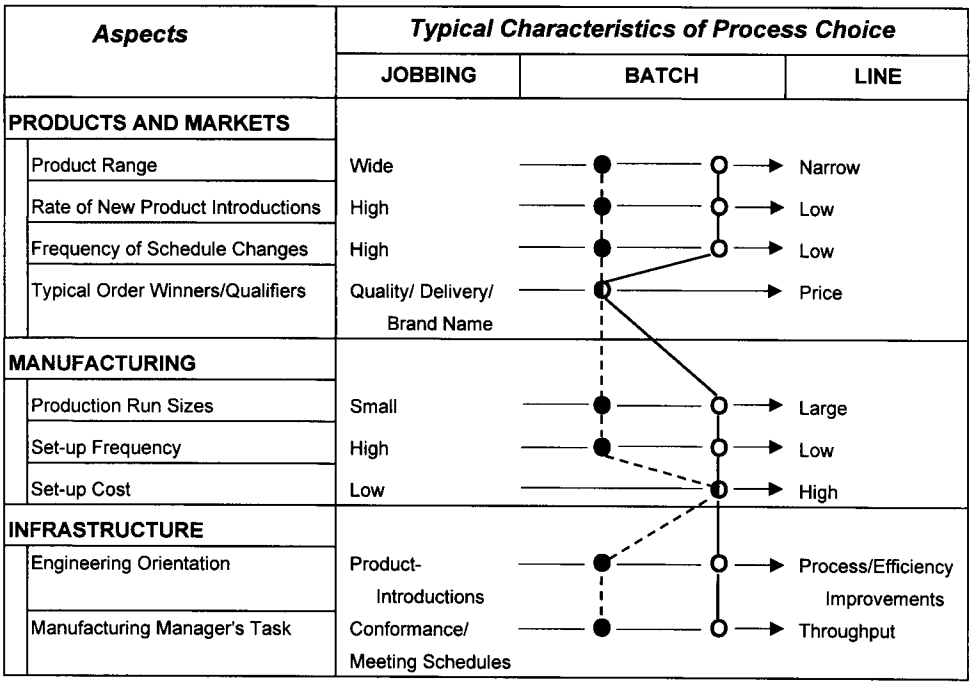

Figure 5: The product profile we constructed for Rumack shows how certain aspects of the company's markets have changed over eight years, leading to a shift (to the left) in the demands placed on manufacturing (solid circles). This invariably resulted in a misalignment with the characteristics of the processes put in place eight years ago (hollow circles). We displayed the current profile using an intermittent line and the profile of the company's position eight years earlier using a solid line.

using dedicated machines. The arrow leading from left to right signifies the continuum between the two extremes and characterizes the gradual change in product range as the process choice moves from jobbing, through batch, to line. Once we had placed the related choices for each dimension at the ends of each continuum, we had a template against which to profile products.

In profiling the products and processes, our first step was to position Rumack's products on the continuum for each characteristic as they related to the company's original choice of process on packaging Line 1 when it made the investment eight years earlier. The reason we used the period when Rumack first made the investment is that those investments reflected the company's assessment of its markets and the appropriate manufacturing capabilities it needed at the time. The characteristics of the company's products and markets and the characteristics that its processes and infrastructure can deliver are closely aligned with one exception. In most high-volume markets, price would typically function as an order winner; here brand name supplants price because high profit margins typify Rumack's market sectors.

Since the primary purpose of product

profiling is to reveal shifts in position over time, we then characterized the current situation of Rumack's products and processes on the same template.

Products and Markets

—In the eight years profiled, the number of SKUs assigned to Line 1 grew from seven to 26 (Figure 2).

—During the last four years, the company has added new products more rapidly (an average of 3.7 new SKUs per year) than in the first four years (an average of 2.7 SKUs per year).

—Production schedulers and manufacturing staff reported that the number of weekly changes had increased in recent years with more products competing for scheduling priority.

—Rumack's products win orders on brand name. Even though some are high volume, they are not price-sensitive and are able to command premium prices in their market categories. Manufacturing's strategic task is to meet the stringent quality requirements of these products, to deliver them on time, to meet the short-lead-time demand that often characterizes this market, and to ramp up production in response to seasonal or abnormal demand. While the first two characteristics are qualifiers, the latter two will be order winning and are essential in the firm's drive for market share.

Manufacturing Processes

—Given the corporate inventory targets, the plant scheduled the runs to keep within these levels. With the new variants, average run sizes had progressively become smaller (Figure 6). Currently, runs average 14 hours on Line 1 compared to a minimum setup time of four hours. The result has been lower efficiency, lower productive time, and an ever increasing erosion of available capacity. Manufacturing wanted to keep the average production runs as long as possible while it was expected to respond to unplanned changes and short lead times on the one hand and tight inventory constraints on the other.

—Because runs are shorter and the number of SKUs is greater, setups are more frequent than eight years ago.

—However, since Rumack had designed Lines 1 and 2 to handle high-volume production runs with fast processing speeds, even with recent efforts to reduce setup times, their cost relative to the size of the runs remains high.

Manufacturing Infrastructure

—In the early years, engineering, in support of manufacturing, concentrated on improving process-throughput speeds. This was to help the company achieve its targeted gains in economies of scale and to help it take advantage of the experience-curve opportunities inherent in the growth in volumes. However, with a marketing strategy designed to capitalize on sales opportunities through the introduction of product variants, the engineering function's focus changed throughout the years to supporting product launches at regular times.

—Similarly, manufacturing had to change its emphasis from machine throughput (typically associated with low-variety, high-volume production) to meeting unpredictable production schedules and product launches.

The profiles (Figure 5) show the aligned nature of markets and manufacturing in the earlier years (except for brand name

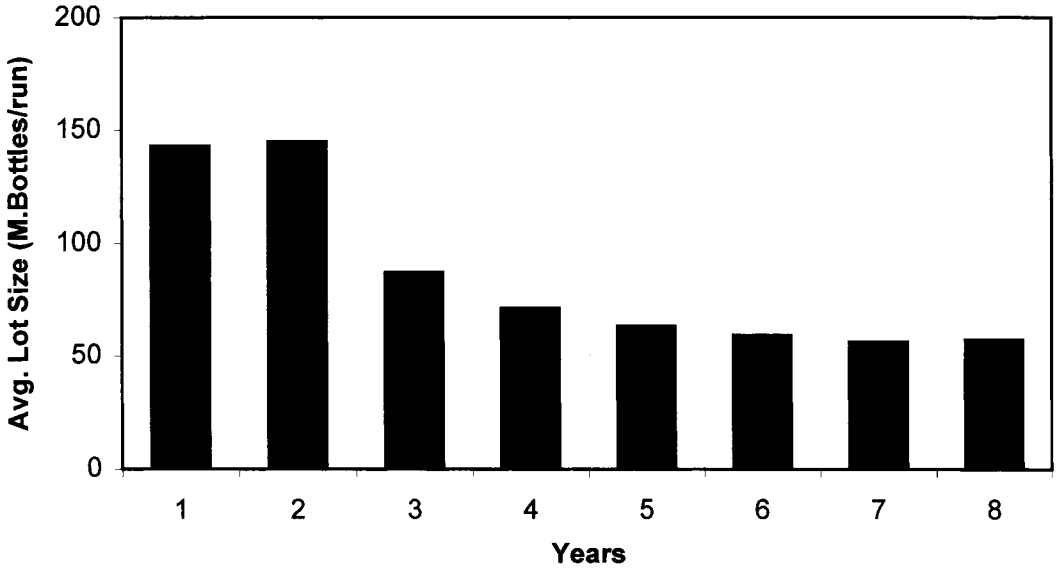

Figure 6: The production-planning and inventory-control department reduced average lot sizes on Line 1 over time to meet the inventory targets set by corporate headquarters.

replacing price as an order winner) and the lack of alignment between current market characteristics and the process capabilities established eight years earlier.

Discussion

In the Rumack case, we used two approaches to identify, analyze, and illustrate the origins of a typical problem faced by manufacturing companies. Both approaches focus on the match between a company's markets and its manufacturing.

As the product-process matrix shows, Rumack markets a wide of range of products, each at a different stage in its life cycle. Initially, when Rumack invested in the Bakersfield plant, Restolvic-A and B were nearing the ends of their growth stages. The chosen process technology (linked batch) was consistent with Rumack managers' views of the markets at the time and their anticipation of future growth for those products. Rumack made a large investment in the plant and, in terms of automation and throughput speeds, it was state of the art at the time. It also built in capacity to accommodate future growth.

During the years following the plant start-up, as the company extended its product lines and introduced new products to capitalize on the Restolvic brand name, the plant easily accommodated the growth in sales by increasing its utilization of existing equipment. The cost leveraging achieved through better overhead absorption made the marginal costs for the new products very attractive, encouraging the marketing function to add even more products. Although overall production volumes grew, this growth was spread over an ever-increasing number of products, and the company reduced individual lot sizes to meet inventory targets. This, coupled with the changing positions of products in their life cycles, placed differ-

ent demands on the manufacturing function. However, the deterioration in the fit between the orientation of manufacturing and the characteristics of the markets is difficult to explain using the concepts underpinning the product-process matrix. Furthermore, companies would find it difficult to justify repeated investments in new process technologies to match their existing products' progression on their life cycles. Companies expect to invest once rather than investing and re-investing as products move through their life cycles.

Market shifts of this nature and their impact on manufacturing are core strategic issues. Operations managers need to recognize gradual changes in markets and communicate them to other functions in a convincing manner. Product profiling, by capturing the cumulative effects of such changes in a presentable way, proved to be a powerful tool for Rumack's managers.

The Aftermath: How to Realign Markets and Manufacturing

Once companies identify the elements of misalignment and understand their origins, they can then seek ways to realign individual factors, while recognizing that they cannot change all of them. Managers need to discuss and agree on the trade-offs (for example, how well various aspects of manufacturing can support the needs of markets or how the range of products or the balance of product mix would affect overall sales revenue and profits). Market-oriented companies, such as Rumack, as a first step can change some of their manufacturing decisions to bring them more in line with the capabilities of their existing investments. These changes relate to the manufacturing-processes and manufacturing-infrastructure sections of the profile (Figure 5) and would require direct intervention by operations managers. Naturally, managers must carefully assess the impact of the proposed changes on other parts of the business (the trade-offs).

Other companies may choose to change certain elements of their products and markets. For example, discontinuing some product variants (SKUs) would move related aspects of the profile toward the right-hand side. Again, managers must carefully analyze the consequences of such decisions in terms of market share and sales volume.

Yet other companies may decide not to make changes and to live with the mismatch, recognizing the consequences to expect in the short and long term. Deciding on a course of action and considering its strategic implications must form part of the debate on corporate strategy at the highest levels of the firm, with full participation of functional heads.

Rumack's Response

The action Rumack's operations managers took would be seen as unwise or contrary to accepted practice in many of today's manufacturing organizations. Rumack decided to increase production lot sizes by an average of 100 percent. Careful analysis of the proposed change identified direct and indirect benefits and a number of trade-offs. The direct benefits were a 50-percent reduction in the number of setups and improved overall run efficiencies resulting from larger lot sizes (steady-state speeds sustained for a longer time reducing the negative effects of production line ramp-ups and wind-downs). The manage-

ment team calculated that the change would free up sufficient capacity on packaging Line 1 to postpone the need to add new capacity in the short term.

The indirect benefits were similar, although smaller in scale. They included shorter cleanups and less documentation at preceding work centers (various stages of bulk processing). These changes reduced the risk of mix-ups and errors which, although rare, occurred most often during changeovers.

On the downside, the most notable (and high-profile) disadvantage was increased inventory levels. Initial projections showed that the direct financial benefits of the proposed change would pay the company back for the carrying cost of higher inventory in only nine months. This alone was considered to be sufficient to justify the change. However, the management team also used the indirect benefits (not quantified) as intangibles in its proposal. Given this set of trade-offs, the company's management board approved the proposal after a short debate.

Now, nearly three years after the implementation, the projected benefit-cost elements have proved to be correct. The packaging line continues to operate with the same staffing levels, at lower machine-utilization rates, despite a three-percent annual increase in volume each year. The company does not expect to need new capacity for another three to four years.

After implementation, an additional benefit surfaced that had not received much attention initially: reduced quality-assurance costs. Based on Food and Drug Administration regulations, the company tests each production lot, regardless of size, prior to releasing the product for sale. When the number of lots went down, so did the amount of testing required.

Conclusion

When companies invest in manufacturing processes and infrastructure, they often fail to appreciate the business trade-offs inherent in those investments. In today's dynamic and fragmented markets, incremental volumes invariably bring with them a shift in demands. These changes in demands often stem, not from the technical specifications of the additional volume, but from the business specifications—for example, new variants of existing products, lower individual volumes, increased setups, and changes in delivery speed and reliability.

Product profiling, in our case, enabled Rumack to test the current level of fit between the needs of its markets and the characteristics of its existing process and infrastructure investments. The format and style of our presentation enhanced the clarity of the picture, highlighted the origins of the problem, pointed the way forward, and allowed executives from all functions to discuss the business and arrive at a course of action that best met the overall needs of the company. This assessment achieved two results. First, it provided managers with a way to evaluate and improve the degree of fit between the way the company wins orders in its markets and manufacturing's ability to support these criteria. This forms manufacturing's strategic response. Second, it helped managers move toward a more integrated approach, and away from classic strategy building characterized by individually developed functional perspectives that typi-

cally fail to assess what is best for the entire business.

From a research perspective, this study underlines a further important issue. We must devote more effort and emphasis to undertaking plant-based research focusing on the application of manufacturing-strategy concepts. The need for relevance in the field of operations management has too often been diluted by the emphasis placed on activities that are neither grounded in business-based analysis nor adequately oriented toward helping companies address and solve essential problems. Only by providing practicing managers with usable tools to solve real-life problems will academic work contribute to the improvement of business performance.

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A letter from the vice president of operations of the subject company, who wishes to remain anonymous, reads in part, "The implementation has been successful. The reduction in number of changeovers and the increased run efficiencies enabled us to maintain the line utilization at levels below the threshold we set ourselves, and helped to improve schedule attainment. As a result, we have been able to absorb an average of three percent annual volume increase in the past three years without requiring additional capacity on that line.

"We continue to monitor run sizes for all of our products; and any proposal to change the agreed quantities is discussed in a multifunctional setting."