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What is the definition of life process

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In our earlier article, we limited ourselves essentially to exploring issues related to corporate “positioning” on the matrix; that is, to choosing how a company prefers to compete (see Exhibit I): Exhibit I Matching Major Stages of Product and Process Life Cycles To the left or to the right of the matrix diagonal (implying, respectively, greater product diversity and more rapid product change, or fewer, more stable products). Above or below the matrix diagonal (implying either flexible, less capital-intensive processes or more mechanized, cost-efficient, and rigid processes). We next examined the familiar concept of distinctive competence—the notion that each company should identify and exploit those resources, skills, and organizational characteristics that give it a comparative advantage over its competitors—and we used this concept to link a company’s manufacturing competence with its product and market competence. We also considered the management implications of selecting a product and a process position vis-à-vis others in the industry. While related to a company’s distinctive competence, this choice reflects the added dimension of viability and dominance in considering various positions on the matrix. Finally, we explored the problems that multidivisional companies face when their different divisions position themselves in different areas of the matrix. We suggested ways in which such companies might organize their manufacturing functions to better cope with such diversity. If nothing changed in the world, this matrix framework might serve only as an interesting adjunct to more traditional strategy formulation models—adding a nuance here and some extra insight there. The problem for corporate management is that everything is always changing, and simultaneously. Markets are evolving and maturing, processes are undergoing technological change, and costs and prices are continually being buffeted by forces ranging from the Organization of Petroleum Exporting Countries (OPEC) to the operating changes that result in the learning curve. The impact of such external forces is often to change a company’s position on the matrix, relative to many of its competitors, whether or not the company makes any changes in its own product or process structures. If such changes and their implications go unrecognized, the result can be a series of severe internal problems. These problems cannot be “managed away,” typically, since they arise out of basic structural inconsistencies and inadequacies. Good managers who are assigned to deal with them may become sacrificial lambs. In our observation of a number of manufacturing companies that have gotten into trouble, we have been struck by the sense of aimlessness, the low esprit de corps, and the lack of perspective that usually tend to permeate them. While there may be a variety of causes for their problems, two stand out as being particularly important. The first is that coordination and mutual understanding between the marketing and manufacturing functions have broken down. Second, one or both functions have lost their sense of focus; they no longer feel the sense of competence and the implicit understanding of priorities that come when both marketing and manufacturing know they are doing something that the company is particularly good at and that the market desires. Change in Position The framework of the product-process matrix concept provides an excellent vehicle for understanding why these problems occur and how they can be minimized. No matter how tightly focused and coordinated a company might be, any change in the relative positioning of either its products or its production processes will expose it to two kinds of danger. The first follows a change in either dimension without a corresponding change in the other so that there is a reduction in focus and increased difficulty in coordinating manufacturing and marketing. A company that automates its production process without understanding the problems that such automation is likely to cause for its marketing organization is laying the groundwork for a potentially acrimonious future relationship between the two functions. It is also impairing its ability to compete as effectively as can companies that have coordinated and matched more closely the changes in their product and process structures. The second difficulty, possibly even more dangerous than the first, follows when a company tries to respond to a change on one dimension by broadening its activity on the other; such as responding to a product shift, not with a corresponding shift in the production process but by adding an additional process. Loss of Focus The need for focus is quite well understood by marketing people. They segment markets and design products, prices, promotional strategies, and sales organizations to meet the specific imperatives of each segment. If the needs of one segment are quite different from those of another, they do not hesitate to pursue different strategies, and they often use different people in responding to these needs. Concentrating on a restricted segment of activities is just as important in manufacturing, but unfortunately the resistance to piecemeal changes and incremental expansion tends often to be lower there. The packaging operation of a major consumer products manufacturer provides an illustration of this latter difficulty. The sole reason for the division’s existence in the corporation was to offer a low-cost source for a highly specialized packaging product. This division, which was evaluated as a profit center, found that it could increase its revenues and profits considerably if it augmented its basic product lines with some new, less standardized, higher priced products. However, as the division pursued this additional business, it encountered pressure to change its process so that it could better meet the needs of its new customers. Responding to such pressures, the division began to dilute the focus it had maintained for several years. Another example is a company that found its standardized product line being challenged by other, more marketing-oriented companies that were seeking to segment the market and target specialized forms of the product for each segment. When the company responded by expanding its own line to offer specialized products, it found that its high-volume, standardized production processes were not economical at those lower volumes and that it could not compete effectively with other companies which had designed their processes for the specific volume and product standardization of their segments of the market. In both of these examples, if the company had considered coordinated, compensating changes in both the product and the process dimensions, it would have selected options that maintained or increased its competitive competence rather than simply tried to broaden its activity on one dimension or the other, which diluted its past competence. While the matrix concept can explain the causes of many failures in previously healthy companies, it can provide even more useful insights for planning product and process changes. Since planning for growth concentrates management attention on decisions regarding both product and process activities, growth is a natural framework for the next segment of this discussion. Planning for Growth Companies typically pursue four major types of growth. Going from the simpler types to the more complex, these can be summarized as follows: 1. Simple growth of sales volume within an existing product line and market. 2. Expansion of the product line within a single market, using an existing process structure (often called product proliferation). 3. Expansion of the process structure (usually termed vertical integration). 4. Expansion into new products and markets. While other forms of growth exist, they can generally be viewed as variations or combinations of these four types. Thus an understanding of the demands that each might place on manufacturing and marketing can do much to aid in planning for continued growth and focus of these functions. Type 1: Simple Growth The simplest form of growth consists of increased volume that is met with an existing product line and existing production process. This type of growth opportunity requires that extremely stable conditions exist—in terms of competitors, technology, and market tastes—with the only change occurring in the size of the market. Unfortunately, such conditions are the exception rather than the rule, and thus even when a company limits itself to fairly narrow product and process activities, periodic changes will be required as markets and technologies mature. In the context of a single product line and a single process structure, incremental changes in each reflect a type of simple growth. However, the company must now make two kinds of decisions. The first relates to both the entrance and the exit strategies for a specific market, and the second to the strategy to be pursued while the company is participating in that market. The matrix concept is useful for examining and planning for both of these. Entrance-exit strategies. In the first area, the company tends to follow one of four entrance-exit strategies. In summary, the company: A. Enters early and then, when technology stabilizes, profit margins narrow, and the larger companies following strategy C begin to appear, it leaves that product and attempts to exploit the company’s superior flexibility and technological skills in the introductory phases of some new product. B. Enters early and grows up with the industry, seeking to be a major factor in the business throughout the product’s entire life cycle. C. Waits on the sidelines until some degree of product and process stabilization has occurred and then enters the industry, so that it can better exploit its more massive production, distribution, and marketing resources. D. Waits to enter, anticipating that it is following strategy C, but when it does enter, fails to gain a sustainable market position and consequently chooses to withdraw without having made an adequate return on its investment. As shown in Exhibit II, the four segments of the product-market dimension of the matrix can be used to form a Latin square representing the combinations of entrance and exit strategies available to a company. Exhibit II Combinations of Entrance and Exit Strategies Until relatively recently, strategy B was considered the “ideal” or most desirable, while A and C were examples of either lost nerve or lucky accidents, respectively. The model of a successful company was one that developed a new product that became the basis for a major industry and then “rode on its back” to success. Polaroid and Xerox provide classic examples. But such a strategy can put an enormous strain on a company, particularly when its industry matures rapidly. The same people who managed the introduction of the new product may be called on to manage its evolution into a commodity item. The type of production process, the level of capital intensity, the marketing skills, the distribution channels, in fact the whole personality of the company, must undergo profound change in the space of a relatively few years. An example of such change is provided by the microwave oven business. As the market leader since the early 1960s, Litton Industries Atherton Division has emphasized flexibility in its production facilities to respond to the frequent product changes required by a young, rapidly growing market. With the maturing of the market expected in the late 1970s, however, the entry of more traditional appliance manufacturers, and increased competition from Japanese imports, Litton recently has been forced to review its earlier policies as to how far it should move toward vertical integration and more automated production processes. By the early 1980s, Litton-Atherton will be a very different company, requiring different skills, organizational practices, and probably a different management style, if it is to continue to mature with the market successfully and maintain its earlier position. Strategy C is particularly favored by large national or multinational companies whose production systems emphasize high, stable volumes and low, variable costs. These companies can exploit their large sales forces’ distribution channels, advertising expertise, and overall “market clout,” and they have easy access to capital markets for the funds required by the scale and capital intensity of their mode of competition. A number of large companies which were inefficient, high-cost plants and unneeded product and volume flexibility. Nor is it necessarily preferable for a company to try to position itself below the diagonal. The appropriateness of such a strategy depends highly on how rapid and invariable the product’s evolution along the product life cycle is. Moving vertically down the process dimension usually implies a reduction in cost per unit but an increase in capital investment and the breakeven point. As long as there is no major change in the design of individual products, or the volume mix across products in the product line, a company may achieve a significant competitive advantage from such a decision. Conversely, seeking to maintain a position below the diagonal can lock the company into a set of facilities and manufacturing capabilities that will make it difficult to respond to the market changes that usually accompany movement along the product life cycle. Moreover, if the product progresses too rapidly, the company may not receive its expected return. An investment in increased mechanization until after the next step in product evolution renders it obsolete. This explains why the required investment payback period in the electronics industry is typically less than 18 months and sometimes as low as 6 months, while it is typically 8 years or more in the steel and oil industries. A company also has to protect itself against the possibility of the product life cycle “reversing direction” after it has moved toward a more standardized production process. This is the familiar phenomenon of product proliferation that companies often succumb to when trying to stimulate sales in a relatively mature market. This can cause a company’s manufacturing strengths to become incompatible with its marketing strategy, particularly if it was already below the diagonal before the shift. William Abernathy’s research in the automobile industry has suggested that product innovation tends to lead in the early stages of the product’s progression through the product life cycle, while process innovation takes the lead later on.2 Although this analysis may hold in the majority of cases, a number of counter-examples can be identified. These suggest that innovation may follow a much more intricate pattern, with process and product interchanging leadership roles more than once. An example of such a pattern in the electronics industry is the radio. It followed the standard life cycle until about 1955, when a process innovation (printed circuit boards using trim pot) and product innovation (FM and stereo receivers) followed. Recently, another process innovation (microcircuitry) has resulted in the development of another product, the low-cost CB radio (a product which was also a receiver). For the radio, maturity appears to have been a transitory phenomenon. The Model T Ford provides another example of a product that was rushed to maturity. When Alfred P. Sloan of General Motors competed against this commodity product by offering product variety, he caused the industry to be reborn. A recent HBR article argues that such rebirth—the ability to create variety in a standard product, which in effect is moving it back along the product life cycle continuum—is the key to success for marketing organizations.3 A related issue that is perhaps even more interesting is determining why some products never seem to complete their progression down the matrix diagonal. Instead, they appear to have stalled at some point. Classic examples are home building and furniture, both of which seem to be victims of an arrested product development. Processes already exist that would carry both products further down the diagonal if increased product standardization were to be allowed by the consumer. In the case of home building, this appeared to become possible with the popularization of the mobile home, but, if anything, this product has become less standardized over the past decade. The mobile home industry now finds itself in the same frustrating predicament as the more traditional home industry. Once an industry stops progressing (other examples include construction equipment, sailboats, and clothing), a key question is how it can get started again. The answer to that question does not appear to lie in process innovation, given the abortive attempts in both home building (modular homes built from plastic or metal components) and furniture (molded or pressed plastic forms). The failure of these industries to achieve the systematic efficiency of the auto industry is not due to the lack of process opportunities but to the inability of the market to standardize. As might be expected, as a company moves too far away from the matrix diagonal in either direction, it becomes increasingly dissimilar from its competitors. This may or may not (depending on its success in exploiting the advantages of its niche), make it more vulnerable to their attacks. This position may also make coordinating marketing with manufacturing more difficult, since the two functions will develop different skills and priorities and will tend to respond to different sorts of opportunities. Not infrequently, companies find that, either inadvertently or by conscious choice, they have become “outliers” on the matrix and must consider drastic remedial action. Most small companies that enter a mature industry start off as outliers, of course, and therefore they have to solve the problems associated with moving closer to the matrix diagonal at the same time they are coping with the usual small company problems of lack of working capital, lack of management depth, and the conflict between entrepreneurial and bureaucratic management styles. Learning curve. A final aspect of the movement along both the product and the process dimensions of the matrix that is particularly relevant for a company planning the simple Type 1 growth is the notion of learning. Some companies have used the so-called experience effect, or learning curve, which argues that product costs (in constant dollars) should decline at a steady rate every time cumulative production volume doubles, as the basis for their competitive strategy.4 This learning phenomenon explains, for example, why companies with higher market shares tend to be more profitable (as measured in terms of return on investment) than their competitors.5 Unfortunately, the term learning curve strategy suggests a black-or-white choice: one either follows it or one does not. Progression along the product life cycle alone, without any change in the process used (i.e., proceeding horizontally across the matrix), would still provide numerous opportunities for cost reduction—through product redesign, product-line simplification, development of improved raw materials and parts, increased sales volume, use of less costly distribution channels, and the fact that over time the whole organization simply learns to do its job better. Similarly, moving vertically down the matrix provides other cost-reduction opportunities, through economies of scale, improved materials-handling technology, and better tools and equipment as well as reduced labor costs through automation. What is called the experience curve is simply the combination of these two effects resulting in movement down the matrix diagonal. In other words, the experience curve depicts the total improvement in unit costs obtainable by combining product evolution with process evolution. A company that prefers to follow a path above the diagonal (see Exhibit III) will thereby limit its cost-reduction opportunities, so that, when it reaches a given level of product standardization, it may be able to reduce its unit cost only 90% of its previous value after each doubling of cumulative volume. It will, however, preserve its flexibility to follow market movements quickly, and it will limit its capital investment. Exhibit III Possible Learning Curve Strategies > Note: An 80% learning curve implies that unit costs will be reduced to 80% of their previous value each time cumulative volume doubles. A company that chooses to follow a path below the diagonal may achieve even greater cost reductions for a given level of product standardization than those pursuing a path on the diagonal. The danger of this strategy is that those cost reductions may make the company very inflexible to product changes, and the benefits may be short lived. A company that follows a more balanced progression of product and process changes so as to remain near the matrix diagonal can often achieve faster rates of learning than those consistently above it but slower rates of learning than those below it. However, such an approach takes advantage of potential cost improvements coming from both dimensions while maintaining flexibility to respond to market shifts. For many companies, this flexibility is worth the forgone cost improvements available through more aggressive pursuit of process standardization. As with the other aspects of strategy examined in this article, no single answer fits all companies. The best strategy for a given company will depend on its resources, skills, market situation, competitive pressures, and general business philosophy. The real issue is not whether learning improvements will be pursued as the driving force for marketing and production decisions but rather the degree to which such improvement possibilities will guide management’s actions. Depending on whether a company seeks simple Type 1 growth by pursuing product and process movements on the diagonal, rather than above or below it, will largely determine the learning improvements that are likely to be realized. Type 2: Product Growth In the context of our matrix, this type of growth represents a broadening of the product line. Such growth can occur in two ways. One is by adding more standardized products while maintaining existing, less standardized products. The addition of new products, combined with a reluctance to drop a part of the product line, represents a shift to the left on the product dimension. Marketing believes that “good service” requires a “full line.” Manufacturing thinks that almost any sale can be shown to make a net contribution to overhead and fixed costs. As a result, even when a company is at capacity, it can sometimes be extremely difficult to get a consensus on a decision to narrow the product line. The other way that this type of growth can occur is to add special features to an existing, more standardized product line. Such product expansion also represents movement on the matrix from right to left that goes against the prevailing current of the product life cycle (which assumes continual standardization of products). This is often a cyclical problem in capital intensive industries as companies seek to use existing capacity to meet the specialized needs of a number of secondary markets. The real danger of such product proliferation growth, as many companies know too well, is that it may cause the company’s product structure to put unreasonable strains on its production processes. To avoid such problems, management must add products selectively and take actions related to physical facilities, organizational structures, and operating procedures that will compensate for many of these strains. (We discussed these and other actions in our earlier article.) Type 3: Vertical Integration Growth based on broadening the scope of the production process (vertical integration) can also be understood more clearly by using our matrix. In a manner analogous to product proliferation, this form of growth occurs when a company maintains existing processes and adds either less standardized, more flexible processes (forward integration) or more standardized, less flexible processes (backward integration) in hopes of either increasing sales volume and market responsiveness or reducing costs and improving dependability. The problems that companies often encounter when they vertically integrate, even in the simplest case where they begin making a part that they formerly bought from an outside supplier, can be significant. What is usually involved is not simply an expansion of the company’s processes but the production of a completely different product that may be at a very different point on the matrix. In other words, the company may have to think in terms of an additional matrix for that component part or raw material and develop strategies for it that are very different from those selected for the original end product. If this is not done, the company may be tempted to produce the new part with a process and an organizational structure that are completely inappropriate. An example of one approach to this problem is provided by the experience of the Trus Joist Corporation, which manufactures custom floor and roof support systems for both residential and commercial construction. Before 1970, the company used sawed lumber as the major raw material in its joist products, which were fabricated and assembled in a number of regional plants. These small, flexible plants were consistent with the company’s production line and markets and its made-to-order strategy. However, when it developed and introduced Micro-Lam, a unique laminated structural material, as a replacement to sawed lumber in many of its products, the company’s span of process became much broader than it had been. Given the capital intensity of the Micro-Lam production process and its high degree of standardization, Trus Joist chose to separate the two stages of its production process and to organize itself as if it were in two separate markets, even though it anticipated using all of its Micro-Lam output as raw material for its joist plants. Type 4: New Markets Growth through expansion into new markets. Type 4, is even more difficult to deal with than the other three types, because it may follow any of several paths. If the company can avoid product proliferation, for example, market expansion may simply imply an increase in scale (Type 1 growth). Alternatively, a company may want to reflect the individual requirements of the new market by creating a new matrix for it and plotting a separate strategy for that market. This requires the approach followed by Trus Joist when it broadened its process. More commonly, a company’s investment in a new market subjects it to pressures to expand its product line—in effect, to retreat horizontally on the matrix. This creates a situation that most companies find particularly difficult to deal with, because both the production and the marketing sides of the business encounter problems (different, but complementary) at about the same time—marketing because it is trying to adapt itself to a new market for which its process is not adequately suited, and production because it is trying to adapt to new products that put analogous strains on its process. This situation often leads to what can be described as the “creeping breakeven” phenomenon. In an effort to stimulate demand, a company enters a new market or introduces a new product. This step is successful at first, but the existing process is incapable of meeting the added scale and complexity without additional investment (more capacity, different equipment, more make rather than buy, or a more powerful inventory control system). Success tends to breed failure. The increased investment raises the company’s breakeven point, offsetting the expected gains from the increased sales volume. This motivates the company to pursue additional markets and products so as to break out of the box in which it finds itself. In Summary In this article and its predecessor, we have attempted to introduce and apply a framework that can help a company to conduct a diagnosis of its strategic evolution, think creatively about possible future strategic directions, and explicitly involve both marketing and manufacturing in coordinating and implementing its competitive goals. Moreover, in analyzing the various opportunities and pressures that companies face as markets and technologies evolve, the approach we describe illustrates why companies can so easily lose their way. Another advantage of this approach is that it encourages a company’s managers to think creatively about their strategy for process evolution: What kinds of process changes are appropriate and when should they occur? The managers can then use this framework to position themselves along these two dimensions so that both marketing and manufacturing are responsible for a restricted or focused set of products and process characteristics. The concepts outlined both in this and in our earlier article can be useful in the following ways: 1. Determining the appropriate mix of manufacturing facilities, identifying the key manufacturing objectives for each plant, and monitoring progress on those objectives at the corporate level. 2. Reviewing investment decisions for plant and equipment in terms of their consistency with product and process plans. 3. Determining the direction and timing of major changes in a company’s production processes. 4. Evaluating product and market opportunities in light of the company’s manufacturing capabilities. 5. Selecting an appropriate process and product structure for entry into a new market. 1. “Link Manufacturing Process and Product Life Cycles,” HBR January–February 1979, p. 133. 2. See William J. Abernathy and Phillip L. Townsend, “Technology, Productivity, and Process Change,” Technological Forecasting and Social Change, Vol. 7, 1975, p. 379; and James Utterback and William J. Abernathy, “A Dynamic Model of Process and Product Innovation,” Omega, December 1975, p. 639. 3. Nariman K. Dhalla and Sonia Yuspeh, “Forget the Product Life Cycle Concept,” HBR January–February 1976, p. 102. 4. Winifred B. Hirschmann, “Profit from the Learning Curve,” HBR January–February 1964, p. 125. 5. The research done by the Marketing Science Institute, and reported in this magazine, tends to confirm this; see Sidney Schoeffler, Robert D. Buzzell, and Donald F. Heany, “Impact of Strategic Planning on Profit Performance,” HBR March–April 1974, p. 137. A version of this article appeared in the March 1979 issue of Harvard Business Review.

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