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Manufacturing–missing link in corporate strategy

Too often top management overlooks manufacturing's potential to strengthen or weaken a company's competitive ability

Foreword

The thesis of this article is that manufacturing has too long been dominated by experts and specialists. For many years these were the industrial engineers; now they are the computer experts. As a result, top executives tend to avoid involvement in manufacturing policy making, manufacturing managers are ignorant of corporate strategy, and a function that *could* be a valuable asset and tool of corporate strategy becomes a liability instead. The author shows how top management can correct this situation by systematically linking up manufacturing with corporate strategy.

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A company's manufacturing function typically is either a competitive weapon or a corporate millstone. It is seldom neutral. The connection between manufacturing and corporate success is rarely seen as more than the achievement of high efficiency and low costs. In fact, the connection is much more critical and much more sensitive. 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 noncompetitive posture which may take years to turn around.

Research I have conducted during the past three years reveals that top management unknowingly delegates a surprisingly large portion of basic policy decisions to lower levels in the manufacturing area. Generally, this abdication of responsibility comes about more through a lack of concern than by intention. And it is partly the reason that many manufacturing policies and procedures developed at lower levels reflect assumptions about corporate strategy which are incorrect or misconstrued.

Millstone effect

When companies fail to recognize the relationship between manufacturing decisions and corporate strategy, they may become saddled with seriously noncompetitive production systems which are expensive and time-consuming to change. Here are several examples:

☐ Company A entered the combination washer-dryer field after several competitors had failed to achieve successful entries into the field. Company A's executives believed their model would overcome the technical drawbacks which had hurt their competitors and held back the development of any substantial market. The manufacturing managers tooled the new unit on the usual conveyorized assembly line and giant stamping presses used for all company products.

When the washer-dryer failed in the market, the losses amounted to millions. The plant had been "efficient" in the sense that costs were low. But the tooling and production processes did not meet the demands of the marketplace.

☐ Company B produced five kinds of electronic gear for five different groups of customers; the gear ranged from satellite controls to industrial controls and electronic components. In each market a different task was required of the production function. For instance, in the first market, extremely high reliability was demanded; in the second market, rapid introduction of a stream of new products was demanded; in the third market, low costs were of critical importance for competitive survival.

In spite of these highly diverse and contrasting tasks, production management elected to centralize manufacturing facilities in one plant in order to achieve "economies of scale." The result was a failure to achieve high reliability, economies of scale, or an ability to introduce new products quickly. What happened, in short, was that the demands placed on manufacturing by a competitive strategy were ignored by the production group in order to achieve economies of scale. This production group was obsessed with developing "a total system, fully computerized." The manufacturing program satisfied no single division, and the serious marketing problems which resulted choked company progress.

☐ Company C produced plastic molding resins. A new plant under construction was to come on-stream in eight months, doubling production. In the meantime, the company had a much higher volume of orders than it could meet.

In a strategic sense, manufacturing's task was to maximize output to satisfy large, key customers. Yet the plant's production control system was set up—as it had been for years—to minimize costs. As a result, long runs were emphasized. While costs were low, many customers had to wait, and many key buyers were lost. Consequently, when the new plant came on-stream, it was forced to operate at a low volume.

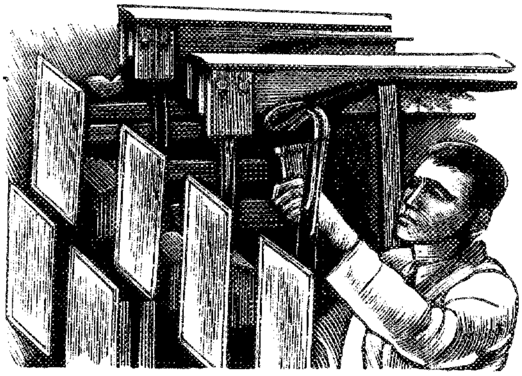
The mistake of considering low costs and high efficiencies as the key manufacturing objective in each of these examples is typical of the oversimplified concept of "a good manufacturing operation." Such criteria frequently get companies into trouble, or at least do not aid in the development of manufacturing into a competitive weapon. Manufacturing affects corporate strategy, and corporate strategy affects manufacturing. Even in an apparently routine operating area such as a production scheduling system, strategic considerations should outweigh technical and conventional industrial engineering factors invoked in the name of "productivity."

Shortsighted views

The fact is that manufacturing is seen by most top managers as requiring involved technical skills and a morass of petty daily decisions and details. It is seen by many young managers as the gateway to grubby routine, where days are filled with high pressure, packed with details, and limited to low-level decision making—all of which is out of the sight and minds of top-level executives. It is generally taught in graduate schools of business administration as a combination of industrial engineering (time study, plant layout, inventory theory, and so on) and quantitative analysis (linear programming, simulation, queuing theory, and the rest). In total, a manufacturing career is generally perceived as an all-consuming, technically oriented, hectic life that minimizes one's chances of ever reaching the top and maximizes the chances of being buried in minutiae.

In fact, these perceptions are not wholly inaccurate. It is the thesis of this article that the technically oriented concept of manufacturing is all too prevalent; and that it is largely responsible for the typically limited contribution manufacturing makes to a corporation's arsenal of competitive weapons, for manufacturing's failure to attract the top talent it needs and *should* have, and for its failure to attract more young managers with general management interests and broad abilities. In my opinion, manufacturing is generally perceived in the wrong way at the top, managed in the wrong way at the plant level, and taught in the wrong way in the business schools.

These are strong words, but change is needed, and I believe that only a more relevant concept of manufacturing can bring change. I see no sign whatsoever that we have found the means of solving the problems mentioned. The new, mathematically based "total systems" approaches to production management offer the promise of new and valuable concepts and techniques, but I doubt that these approaches will overcome the tendency of top management to remove itself from manufacturing. Ten years of development of quantitative techniques have left us each year with the promise of a "great new



age" in production management that lies "just ahead." The promise never seems to be realized. Stories of computer and "total systems" fiascoes are available by the dozen; these failures are always expensive, and in almost every case management has delegated the work to experts.

I do not want to demean the promise—and, indeed, some present contributions—of the systems/computer approach. Two years ago I felt more sanguine about it. But, since then, close observation of the problems in U.S. industry has convinced me that the "answer" promised is inadequate. The approach cannot overcome the problems described until it does a far better job of linking manufacturing and corporate strategy. What is needed is some kind of integrative mechanism.

Pattern of failure

An examination of top management perceptions of manufacturing has led me to some notions about basic causes of many production problems. In each of six industries I have studied, I have found top executives delegating excessive amounts of manufacturing policy to subordinates, avoiding involvement in most production matters, and failing to ask the right questions until their companies are in obvious trouble. This pattern seems to be due to a combination of two factors:

1. A sense of personal inadequacy, on the part of top executives, in managing production. (Often the feeling evolves from a tendency to regard the area as a technical or engineering specialty, or a mundane "nuts and bolts" segment of management.)

2. A lack of awareness among top executives that a production system inevitably involves trade-offs and compromises and so must be designed to perform a limited task well, with that task defined by corporate strategic objectives.

The first factor is, of course, dependent in part on the second, for the sense of inadequacy would not be felt if the strategic role of production were clearer. The second factor is the one we shall concentrate on in the remainder of this article.

Like a building, a vehicle, or a boat, a production system can be designed to do some things well, but always at the expense of other abilities. It appears to be the lack of recognition of these trade-offs and their effects on a corporation's ability to compete that leads top management to delegate often-critical decisions to lower, technically oriented staff levels, and to allow policy to be made through apparently unimportant operating decisions.

In the balance of this article I would like to . . .

—sketch out the relationships between production operations and corporate strategy;

—call attention to the existence of specific trade-offs in production system design;

—comment on the inadequacy of computer specialists to deal with these trade-offs;

—suggest a new way of looking at manufacturing which might enable the nontechnical manager to understand and manage the manufacturing area.

Strategic implications

Frequently the interrelationship between production operations and corporate strategy is not easily grasped. The notion is simple enough—namely, that a company's competitive strategy at a given time places particular demands on its manufacturing function, and, conversely, that the company's manufacturing posture and operations should be specifically designed to fulfill the task demanded by strategic plans. What is more elusive is the set of cause-and-effect factors which determine the linkage between strategy and production operations.

Strategy is a set of plans and policies by which a company aims to gain advantages over its competitors. Generally a strategy includes plans for products and the marketing of these products to a particular set of customers. The marketing plans usually include specific approaches and steps to be followed in identifying potential customers, determining why, where, and when they buy, and learning how they can best be reached and convinced to purchase. The company must have an advantage, a particular appeal, a special push or pull created by its products, channels of distribution, advertising, price, packaging, availability, warranties, or other factors.

Contrasting demands

What is not always realized is that different marketing strategies and approaches to gaining a competitive advantage place different demands on the manufacturing arm of the company. For example, a furniture manufacturer's strategy for broad distribution of a limited, low-price line with wide consumer advertising might generally require:

- Decentralized finished-goods storage.
- Readily available merchandise.
- Rock-bottom costs.

The foregoing demands might in turn require:

- Relatively large lot sizes.
- Specialized facilities for woodworking and finishing.
- A large proportion of low- and medium-skilled workers in the work force.
- Concentration of manufacturing in a limited number of large-scale plants.

In contrast, a manufacturer of high-price, high-style furniture with more exclusive distribution would require an entirely different set of manufacturing policies. While higher prices and longer lead times would allow more leeway in the plant, this company would have to contend with the problems implicit in delivering high-quality furniture made of wood (which is a soft, dimensionally unstable material whose surface is expensive to finish and easy to damage), a high setup cost relative to running times in most wood-machining operations, and the need to make a large number of nonstandardized parts. While the first company must work with these problems too, they are more serious to the second company because its marketing strategy forces it to confront the problems head on. The latter's manufacturing policies will probably require:

- Many model and style changes.
- Production to order.
- Extremely reliable high quality.

These demands may in turn require:

- An organization that can get new models into production quickly.
- A production control group that can coordinate all activities so as to reduce lead times.
- Technically trained supervisors and technicians.

Consequently, the second company ought to have a strong manufacturing-methods engineering staff; simple, flexible tooling; and a well-trained, experienced work force.

In summary, the two manufacturers would need to develop very different policies, personnel, and operations if they were to be equally successful in carrying out their strategies.

Important choices

In the example described, there are marked contrasts in the two companies. Actually, even small and subtle differences in corporate strategies should be reflected in manufacturing policies. However, my research shows that few companies do in fact carefully and explicitly tailor their production systems to perform the tasks which are vital to corporate success.

Instead of focusing first on strategy, then moving to define the manufacturing task, and next turning to systems design in manufacturing policy, managements tend to employ a concept of production which is much less effective. Most top executives and production managers look at their production systems with the notion of "total productivity" or the equivalent, "efficiency." They seek a kind of blending of low costs, high quality, and acceptable customer service. The view prevails that a plant with reasonably modern equipment, up-to-date methods and procedures, a cooperative work force, a computerized information system, and an enlightened management will be a good plant and will perform efficiently.

But what is "a good plant"? What is "efficient performance"? And what should the computer be programmed to do? Should it minimize lead times or minimize inventories? A company cannot do both. Should the computer minimize direct labor or indirect labor? Again, the company cannot do both. Should investment in equipment be minimized—or should outside purchasing be held to a minimum? One could go on with such choices.

The reader may reply: "What management wants is a combination of both ingredients that results in the lowest *total* cost." But that answer, too, is insufficient. The "lowest total cost" answer leaves out the dimensions of time and customer satisfaction, which must usually be considered too. Because cost *and* time *and* customers are all involved, we have to conclude that what is a "good" plant for Company A may be a poor or mediocre plant for its competitor, Company B, which is in the same industry but pursues a different strategy.

The purpose of manufacturing is to serve the company—to meet its needs for survival, profit, and growth. Manufacturing is part of the strategic concept that relates a company's strengths and resources to opportunities in the market. Each strategy creates a unique manufacturing task. Manufacturing management's ability to meet that task is the key measure of its success.

Trade-offs in design

It is curious that most top managements and production people do not state their yardsticks of success more precisely, and instead fall back on such measures as "efficiency," "low cost," and "productivity." My studies suggest that a key reason for this phenomenon is that very few executives realize the existence of trade-offs in designing and operating a production system.

Yet most managers will readily admit that there are compromises or trade-offs to be made in designing an airplane or a truck. In the case of an airplane, trade-offs would involve such matters as cruising speed, takeoff and landing distances, initial cost, maintenance, fuel consumption, passenger comfort, and cargo or passenger capacity. A given stage of technology defines limits as to what can be accomplished in these respects. For instance, no one today can design a 500-passenger plane that can land on a carrier and also break the sonic barrier.

Much the same thing is true of manufacturing. The variables of cost, time, quality, technological constraints, and customer satisfaction place limits on what management can do, force compromises, and demand an explicit recognition of a multitude of trade-offs and choices. Yet everywhere I find plants which have inadvertently emphasized one yardstick at the expense of another, more important one. For example:

□ An electronics manufacturer with dissatisfied customers hired a computer expert and placed manufacturing under a successful engineering design chief to make it a "total system." A year later its computer was spewing out an inch-thick volume of daily information. "We know the location of every part in the plant on any given day," boasted the production manager and his computer systems chief.

Nevertheless, customers were more dissatisfied than ever. Product managers hotly complained that delivery promises were regularly missed—and in almost every case they first heard about failures from their customers. The problem centered on the fact that computer information runs were organized by part numbers and operations. They were designed to facilitate machine scheduling and to aid shop foremen; they were not organized around end products, which would have facilitated customer service.

How had this come about? Largely, it seemed clear, because the manufacturing managers had become absorbed in their own "systems approach"; the fascination of mechanized data handling had become an end in itself. As for top management, it had more or less abdicated responsibility. Because the company's growth and success had been based on engineering and because top management was R&D-oriented, policy-making executives saw production as a routine requiring a lower level of complexity and brainpower. Top management argued further that the company had production experts who were well paid and who should be able to do their jobs without bothering top-level people.

Recognizing alternatives

To develop the notion of important trade-off decisions in manufacturing, let us consider *Exhibit I*, which shows some examples.

In each decision area—plant and equipment, production planning and control, and so forth—top management needs to recognize the alternatives and become involved in the design of the production system. It needs to become involved to the extent that the alternative selected is appropriate to the manufacturing task determined by the corporate strategy.

Exhibit I. Some important trade-off decisions in manufacturing—or "you can't have it both ways"

Decision area	Decision	Alternatives
PLANT AND EQUIPMENT	Span of process	Make or buy
	Plant size	One big plant or several smaller ones
	Plant location	Locate near markets or locate near materials
	Investment decisions	Invest mainly in buildings or equipment or inventories or research
	Choice of equipment	General-purpose or special-purpose equipment
	Kind of tooling	Temporary, minimum tooling or "production tooling"
PRODUCTION PLANNING AND CONTROL	Frequency of inventory taking	Few or many breaks in production for buffer stocks
	Inventory size	High inventory or a lower inventory
	Degree of inventory control	Control in great detail or in lesser detail
	What to control	Controls designed to minimize machine downtime or labor cost or time in process, or to maximize output of particular products or material usage
	Quality control	High reliability and quality or low costs
	Use of standards	Formal or informal or none at all
LABOR AND STAFFING	Job specialization	Highly specialized or not highly specialized
	Supervision	Technically trained first-line supervisors or nontechnically trained supervisors
	Wage system	Many job grades or few job grades; incentive wages or hourly wages
	Supervision	Close supervision or loose supervision
	Industrial engineers	Many or few such men
PRODUCT DESIGN/ ENGINEERING	Size of product line	Many customer specials or few specials or none at all
	Design stability	Frozen design or many engineering change orders
	Technological risk	Use of new processes unproved by competitors or follow-the-leader policy
	Engineering	Complete packaged design or design-as-you-go approach
	Use of manufacturing engineering	Few or many manufacturing engineers
ORGANIZATION AND MANAGEMENT	Kind of organization	Functional or product focus or geographical or other
	Executive use of time	High involvement in investment or production planning or cost control or quality control or other activities
	Degree of risk assumed	Decisions based on much or little information
	Use of staff	Large or small staff group
	Executive style	Much or little involvement in detail; authoritarian or nondirective style; much or little contact with organization

Making such choices is, of course, an on-going rather than a once-a-year or once-a-decade task; decisions have to be made constantly in these trade-off areas. Indeed, the real crux of the problem seems to be how to ensure that the continuing process of decision making is not isolated from competitive and strategic facts, when many of the trade-off decisions do not at first appear to bear on company strategy. As long as a technical point of view dominates manufacturing decisions, a degree of isolation from the realities of competition is inevitable. Unfortunately, as we shall see, the technical viewpoint is all too likely to prevail.

Technical dominance

The similarity between today's emphasis on the technical experts—the computer specialist and the engineering-oriented production technician —and yesterday's emphasis on the efficiency expert—time-study man and industrial engineer—is impossible to escape. For 50 years, U.S. management relied on efficiency experts trained in the techniques of Frederick W. Taylor. Industrial engineers were kings of the factory. Their early approaches and attitudes were often conducive to industrial warfare, strikes, sabotage, and militant unions, but that was not realized then. Also not realized was that their technical emphasis often produced an inward orientation toward cost that ignored the customer, and an engineering point of view that gloried in tools, equipment, and gadgets rather than in markets and service. Most important, the cult of industrial engineering tended to make top executives technically disqualified from involvement in manufacturing decisions.

Since the turn of the century, this efficiency-centered orientation has dogged U.S. manufacturing. It has created that image of "nuts and bolts," of greasy, dirty, detail jobs in manufacturing. It has dominated "production" courses in most graduate schools of business administration. It has alienated young men with broad management educations from manufacturing careers. It has "buffaloed" top managers.

Several months ago I was asked by a group of industrial engineers to offer an opinion as to why so few industrial engineers were moving up to the top of their companies. My answer was that perhaps a technical point of view cut them off from top management, just as the jargon and hocus-pocus of manufacturing often kept top management from understanding the factory. In their isolation, they could gain only a severely limited sense of market needs and of corporate competitive strategy.

Enter the computer expert

Today the industrial engineer is declining in importance in many companies. But a new technical expert, the computer specialist, is taking his place. I use the term "computer specialist" to refer to individuals who specialize in computer systems design and programming.

I do not deny, of course, that computer specialists have a very important job to do. I do object, however, to any notion that computer specialists have more of a top management view than was held by their predecessors, the industrial engineers. In my experience, the typical computer expert has been forced to master a complex and all-consuming technology, a fact which frequently makes him parochial rather than catholic in his views. Because he is so preoccupied with the detail of a total system, it is necessary for someone in top management to give him objectives and policy guidance. In his choice of trade-offs and compromises for his computer system, he needs to be instructed and not left to his own devices. Or, stated differently, he needs to see the entire corporation as a system, not just one corner of it—i.e., the manufacturing plant.

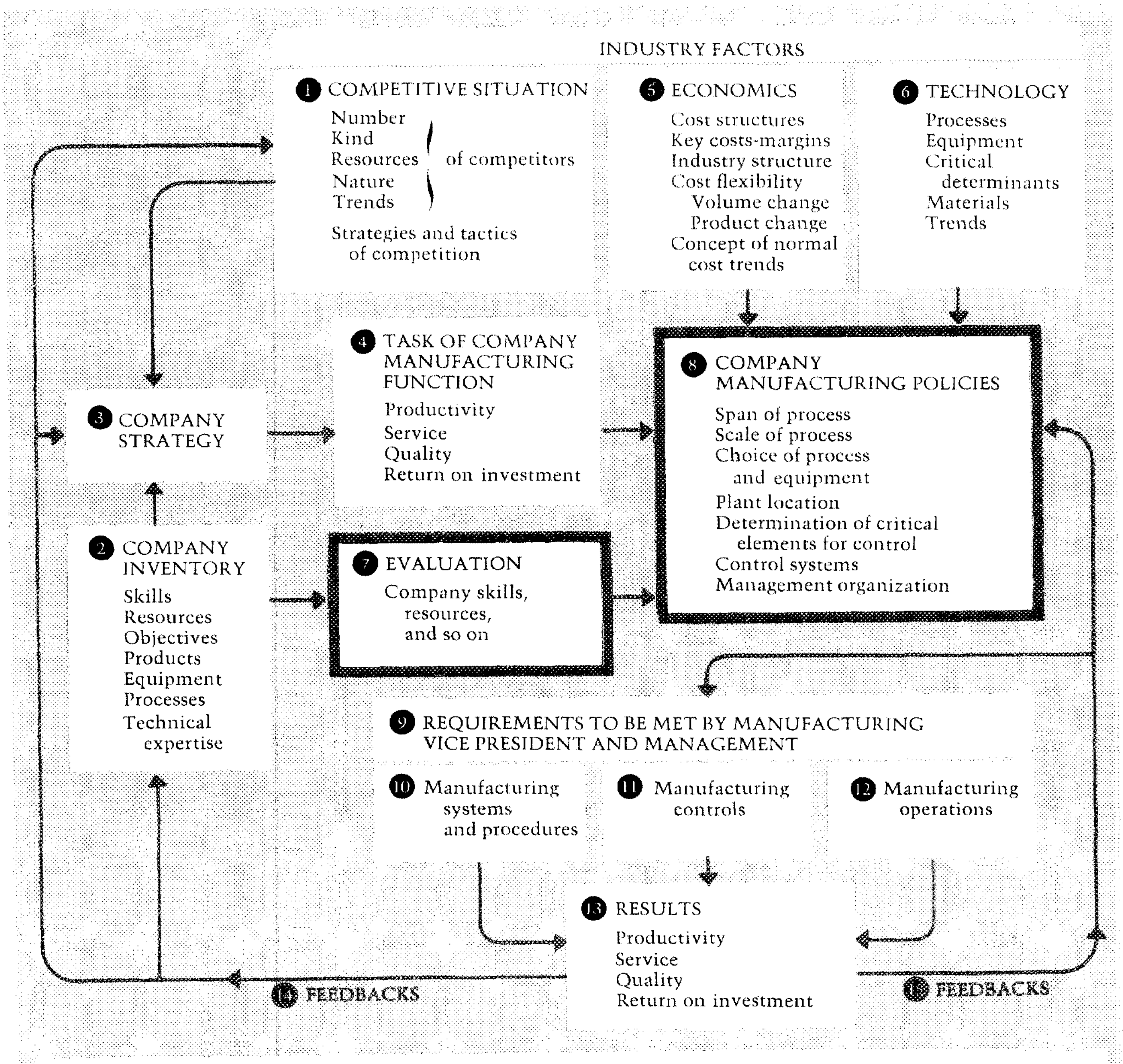
Too often this is not happening. The computer is a nightmare to many top managers because they have let it and its devotees get out of hand. They have let technical experts continue to dominate; the failure of top management truly to manage production goes on.

How *can* top management begin to manage manufacturing instead of turning it over to technicians who, through no fault of their own, are absorbed in their own arts and crafts? How can U.S. production management be helped to cope with the rising pressures of new markets, more rapid product changes, new technologies, larger and riskier equipment decisions, and the swarm of problems we face in industry today? Let us look at some answers.

Better decision making

The answers I would like to suggest are not panaceas, nor are they intended to be comprehensive. Indeed, no one can answer all the ques-

Exhibit II. The process of manufacturing policy determination



Key

1. What the others are doing
2. What we have got or can get to compete with
3. How we can compete
4. What we must accomplish in manufacturing in order to compete
5. Economic constraints and opportunities common to the industry
6. Constraints and opportunities common to the technology
7. Our resources evaluated
8. How we should set ourselves up to match resources, economics, and technology to meet the tasks required by our competitive strategy
9. The implementation requirements of our manufacturing policies
10. Basic systems in manufacturing (e.g., production planning, use of inventories, use of standards, and wage systems)
11. Controls of cost, quality, flows, inventory, and time
12. Selection of operations or ingredients critical to success (e.g., labor skills, equipment utilization, and yields)
13. How we are performing
14. Changes in what we have got, effects on competitive situation, and review of strategy
15. Analysis and review of manufacturing operations and policies

tions and problems described with one nice formula or point of view. But surely we can improve on the notion that production systems need only be "productive and efficient." Top management can manage manufacturing if it will engage in the making of manufacturing policy, rather than considering it a kind of fifth, independent estate beyond the pale of control.

The place to start, I believe, is with the acceptance of a theory of manufacturing which begins with the concept that in any system design there are significant trade-offs (as shown in *Exhibit I*) which must be explicitly decided on.

Determining policy

Executives will also find it helpful to think of manufacturing policy determination as an orderly process or sequence of steps. *Exhibit II* is a schematic portrayal of such a process. It shows that manufacturing policy must stem from corporate strategy, and that the process of determining this policy is the means by which top management can actually manage production. Use of this process can end manufacturing isolation and tie top management and manufacturing together. The sequence is simple but vital:

☐ It begins with an analysis of the competitive situation, of how rival companies are competing in terms of product, markets, policies, and channels of distribution. Management examines the number and kind of competitors and the opportunities open to its company.

☐ Next comes a critical appraisal of the company's skills and resources and of its present facilities and approaches.

☐ The third step is the formulation of company strategy: How is the company to compete successfully, combine its strengths with market opportunities, and define niches in the markets where it can gain advantages?

☐ The fourth step is the point where many top executives cut off their thinking. It is important for them to define the implications or "so-what" effects of company strategy in terms of specific manufacturing tasks. For example, they should ask: "If we are to compete with an X product of Y price for Z customers using certain distribution channels and forms of advertising, what will be demanded of manufacturing in terms of costs, deliveries, lead times, quality levels, and reliability?" These demands should be precisely defined.

☐ The fifth and sixth steps are to study the constraints or limitations imposed by the economics and the technology of the industry. These factors are generally common to all competitors. An explicit recognition of them is a prerequisite to a genuine understanding of the manufacturing problems and opportunities. These are facts that a nontechnical manager can develop, study, understand, and put to work. *Exhibit III* contains sample lists of topics for the manager to use in doing his homework.

Exhibit III. Illustrative constraints or limitations which should be studied

A. Economics of the industry

Labor, burden, material, depreciation costs
Flexibility of production to meet changes in volume
Return on investment, prices, margins
Number and location of plants
Critical control variables
Critical functions (e.g., maintenance, production control, personnel)
Typical financial structures
Typical costs and cost relationships
Typical operating problems
Barriers to entry
Pricing practices
"Maturity" of industry products, markets, production practices, and so on
Importance of economies of scale
Importance of integrated capacities of corporations
Importance of having a certain balance of different types of equipment
Ideal balances of equipment capacities
Nature and type of production control
Government influences

B. Technology of the industry

Rate of technological change
Scale of processes
Span of processes
Degree of mechanization
Technological sophistication
Time requirements for making changes

☐ The seventh and eighth steps are the key ones for integrating and synthesizing all the prior ones into a broad manufacturing policy. The question for management is: "Given the facts of the economics and the technology of the industry, how do we set ourselves up to meet the specific manufacturing tasks posed by our particular competitive strategy?" Management must decide what it is going to make and what it will buy; how many plants to have, how big they should be, and where to place them; what processes and equipment to buy; what the key elements are which need to be controlled and how they can be controlled; and what kind of management organization would be most appropriate.

☐ Next come the steps of working out programs of implementation, controls, performance measures, and review procedures (see Steps 9-15 in *Exhibit II*).

Conclusion

The process just described is, in my observation, quite different from the usual process of manufacturing management. Conventionally, manufacturing has been managed from the bottom up. The classical process of the age of mass production is to select an operation, break it down into its elements, analyze and improve each element, and put it back together. This approach was contributed years ago by Frederick W. Taylor and other industrial engineers who followed in his footsteps.

What I am suggesting is an entirely different approach, one adapted far better to the current era of more products, shorter runs, vastly accelerated product changes, and increased marketing competition. I am suggesting a kind of "top-down" manufacturing. This approach starts with the company and its competitive strategy; its goal is to define manufacturing policy. Its presumption is that only when basic manufacturing policies are defined can the technical experts, industrial and manufacturing engineers, labor relations specialists, and computer experts have the necessary guidance to do their work.

With its focus on corporate strategy and the manufacturing task, the top-down approach can give top management both its entrée to manufacturing and the concepts it needs to take the initiative and truly manage this function. When this is done, executives previously unfamiliar with manufacturing are likely to find it an exciting activity. The company will have an important addition to its arsenal of competitive weapons.

Innovative vs. professional management

The innovative attitude requires willingness on the part of the people at the top to listen, to encourage, and to go to work themselves at converting crude guesses into understanding, the first glimpse into vision, and excitement into results. This is not, as so many people believe, "creativity." Nor is it "disorganized." It is a highly organized, disciplined, and systematic process. But it requires a different approach and different procedures from those of the well-managed organization.

"Professional" management today sees itself often in the role of a judge who says "yes" or "no" to ideas as they come up. This leads, inevitably, to the situation described in the famous jingle which, legend has it, was found one day pinned to the organization chart on the bulletin board of the Unilever Company in London:

Across this Tree
From Root to Crown
Ideas flow up
And Vetoes down.

A top management that believes its job is to sit in judgment will inevitably veto the new idea. It is always "impractical." Only a top management that sees its central function as trying to convert into purposeful action the half-baked idea for something new will actually make its organization—whether company, university, laboratory, or hospital—capable of genuine innovation and self-renewal.

Peter F. Drucker,
The Age of Discontinuity,
New York, Harper & Row, 1969,
pp. 56-57.