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Abstract

As global businesses become more interdisciplinary in nature, colleges and schools of business appear to lag behind holding on to their functional orientation. The result may be having a dramatic negative effect on graduates. When three basic components of the operations management curriculum, are compared with a basic component of the marketing curriculum, conflicts emerge. The result of these conflicts may cause substantial damage to the global competitiveness of organizations. Students are frequently left on their own to uncover these conflicts and develop resolutions. A structural change may be required to bring business schools in line with business practices that will enhance students' understanding of the interdisciplinary nature of global business.

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Operations Theory and Marketing Theory: What are We Really Teaching?

Introduction

Marketing theory may be more fully developed and accepted by some than operations management theory. One foundation of general marketing theory is the product life cycle. Students are taught that as a product (a good or a service) moves, over time, across the product life cycle, different strategies are brought into play concerning the marketing strategies employed. The marketing strategies are the interaction of pricing, product, distribution and promotion strategies. The result is a well-managed product offering.

Viewed in the isolation of a single functional discipline, the marketing strategy makes sense. However, when the product-process framework common to operations theory is introduced, several inherent fundamental conflicts between operations theory and marketing theory emerge. The result of this conflict is that managers are routinely planning to be inefficient, less productive more costly and, in some cases, organizationally suicidal. Perhaps, worse still, students in business disciplines are routinely being taught ways in which this conflict is aggravated believing that this is good management.

The product-process framework in operations theory measures the effect of selecting a process strategy given certain product characteristics. Various text authors select various product characteristics to emphasize

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but the results are similar. There is also less of a general consensus among operations researchers concerning the process categories, although the differences are largely in the labels rather than the substantive process characteristics. It is generally recognized, however, that once a process is selected, the movement to an alternative process is costly, difficult to manage, and in some cases, impossible to accomplish. Yet, given the marketing theory discussed above, the change of product characteristics is not only to be expected, but, in many cases, pro-actively encouraged by managers.

This paper will identify some of the hidden conflicts between the two disciplines, even in some of the most basic principles being taught. It will then call for a blending of the two disciplines into a cross-functional academic organization as the means to expose and resolve this conflict for the benefit of the students and society. The blended disciplines approach follows, and is a logical extension of the current business environment, recognized in the popular business press and by professional societies such as the American Production and Inventory Control Society's Certification in Integrated Resource Management program.

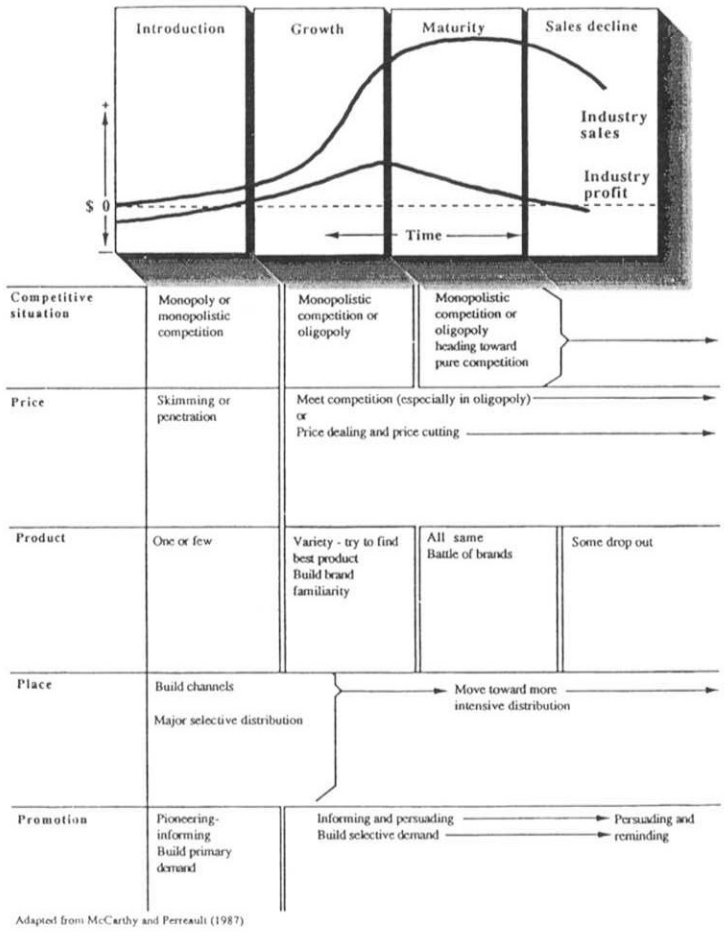
Marketing Theory

Marketing theory is developed primarily from micro-economics. Originally micro-economics was called "price theory" and the marketing field undertook pricing as one of its principle activities. As colleges and schools of business incorporated marketing functions that were being practiced in the field into the curriculum, distribution and promotional activities were included. Towards the late 1960s the "marketing concept" (McCarthy, 1987), developed to include product development into the marketing arena. The marketing concept identifies an unfulfilled need of a customer segment and then producing and delivering a product that fulfills that need at a profit, solidified the traditional four P's (components) of marketing strategy: Price, Promotion, Place, and Product.

A significant contribution to the development of marketing theory was the product life cycle (PLC). This concept is so widely recognized, now with only a few dissenters (Dhalla & Yuspeh, 1976), as a basic building block of marketing theory that no primary text could be found that excluded the idea. Figure one depicts a modified PLC from widely-used principles texts.

Figure 1

Typical Changes in Marketing Variables over the Product Life Cycle



Adapted from McCarthy and Perreault (1987)

Note that the theory depicts a change, or evolution, over time concerning the sales volume of a product offering and the expected profits. In the introduction phase, characterized by increasing sales at an increasing rate, profits may begin as actual losses to the organization and then turn profitable and increase rapidly thereafter. Since the product offering is new the firm enjoys a brief monopolistic advantage. A pricing strategy of-skimming

the marketplace by incremental price reductions or a different strategy of an initial low penetration price is used. The distribution strategy is primarily concerned with building channels and the promotion efforts are geared towards providing basic information to the potential customers.

In the second or "growth" phase sales increase but now at a constant rate. Competitors enter the market so that an oligopoly or even monopolistic competition emerges. Brand loyalty builds but begins to erode as competitors attempt to differentiate their product offering by adding features, improvements (real or imagined), and options. Pricing strategies shift to an oligopolistic matching of the competition, or we begin to observe an overall price reduction. Promotion focuses on persuasion and brand loyalty. Distribution become more intensive and less selective. Profits peak in the later stages of the growth stage.

In the third, or "maturity" stage, sales, over time are constant. Competition becomes greater as the product offerings all begin to appear the same. Pricing strategies attempt to regain lost share by selected price reductions. Promotion becomes frantic. Distribution moves towards highly intensive placement of the product. Profits decline throughout this stage.

In the fourth or "decline" stage, sales fall at an accelerating rate. Weaker competitors drop out reducing the number of products. Companies reduce options and focus on the most profitable products in their respective product lines. Promotion budgets are curtailed and reminder promotions are used. Price reductions may cause profits to again become losses.

Marketing students are taught to recognize the product life cycle stages and proactively change their strategies to reflect the environmental and competitive changes in the product offering's marketplace. This appears to be sound educational advise when the above concept is viewed in the isolation of a single business, function-Marketing. However, interesting results emerge when this concept is viewed from operations and the interactions between marketing and operations are analyzed.

Operations Management Strategies

What does operations management teach that interacts with the product life cycle? Three components of traditional operations theory: forecasting, product-process choice, and economic order quantities, will be discussed to illustrate the conflicts that emerge. A proposed educational change will be offered that may mitigate the conflicts.

Forecasting Problems and PLC

Let us examine a simple problem with forecasting. Figure two depicts the results of using a forecast based on averages. If we examine the actual sales history from periods one through six in figure 2a, it is clear that the sales are increasing at a rate of ten units per period.

Figure 2
Results of Forecasting Using Averages

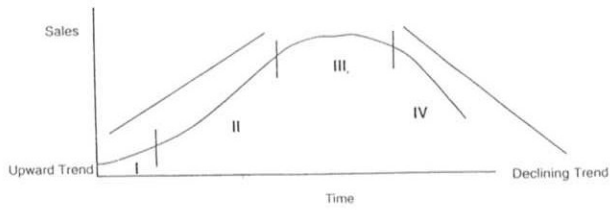
Period	Actual Sales	
1	100	
2	110	Ave = $\frac{750}{6}$ = 125
3	120	
4	130	
5	140	
6	150	
7	?	

2a) Forecast Lags An Upward Trend

Period	Actual Sales	
1	150	
2	140	Ave = $\frac{660}{6}$ = 110
3	120	
4	100	
5	80	
6	60	
7	?	

2b) Forecast Leads A Declining Trend

2c) Product Life Cycle



The obvious forecast for period seven is 160. It would take a relatively high degree of fortitude to suggest otherwise. However, when a simple arithmetic average is used the result is a forecast of 125. Upon reflection, there is no method based on averages (moving averages or exponential smoothing for example) that would give us a number greater than 150, and certainly no method of obtaining 160 (the correct answer) using an averaging technique. Thus, the correctly calculated forecast will lag an upward trend.

Similarly, in figure 2b we observe a declining trend and an obvious forecast for time period seven of 50 units. But again, using an average to calculate the forecast we obtain a forecast of 110 units. There is no way to calculate A forecast less than 60 units if we use any averaging technique. The forecast will overstate a declining trend.

An interesting result is obtained when we revisit the PLC diagram. In the introduction and growth stages an upward trend is present, but this is where an averaging technique lags the actual data. At the time when sales are increasing and marketing is proactively perusing a growth strategy, operations management is planning to actually under perform. Operations will plan on less capacity, fewer workers, and less material than should support the sales volume.

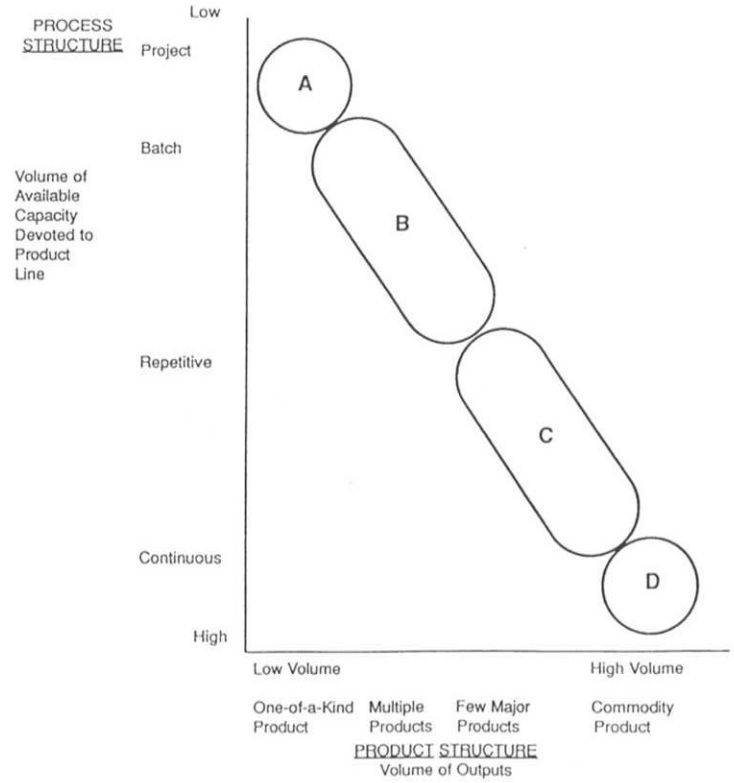
In the declining stage of the PLC, the forecast technique leads the actual data and tells operations to buy more and allow for more workforce and capacity than needed. This at a time when marketing strategy calls for squeezing the last ounce of profit from declining sales. Operations plans to spend more money on resources than needed. The result is an acceleration in the decline and the likelihood that the organization will be caught with surplus inventories and little market. Only in the mature stage of the PLC is a forecasting technique based on averages going to produce acceptable results. The conflicts between marketing strategies and operations are inherent in the forecasting process we teach.

The Product-Process Life Cycle

Hayes and Wheelwright (1979a, 1979b) wrote a two-part classic article that became the cornerstone for operations strategy. They present a product-process (PP) diagram that is now adapted in almost every operations principles text.

FIGURE 3

REVISED PRODUCT-PROCESS MATRIX



The PP diagram depicts a relationship between the product structure (from low volume, one-of-a-kind products to high volume, highly standardized products) and the process structure. The process structure is commonly labeled project, batch, repetitive, and continuous. A diagonal area is found where production occurs. Outside that diagonal no production was found to –exist, at least in the long run. Hayes and Wheelwright

proposed several reasons for the appearance of the diagonal and the absence of successful production outside the diagonal. They suggested that movement along the diagonal, that is shifting operations process from one strategy to another, was very difficult and costly for an organization. Organizations, therefore, choose a structure, (and related strategy) they must maintain that structure, if at all possible.

Again, viewed from one discipline the PP diagram explains amount of behavior and strategic consequences. However, another interesting result occurs when we examine the PP diagram and the PLC diagram together. Marketing strategy is proactive as a product migrates across the life cycle. Initially a product is relatively low volume and somewhat unique in the introduction stage.

Marketing proactively alters price, promotion, distribution and product strategies to move the product offering into the growth stage. Here we see an increased volume of production. But few companies can risk building a "green field" site for new products. Therefore, production of the new product line is often made in the same facility as existing products. Some of the existing products may, in fact, be in decline. Over time the product offering faces increased competition and the introduction, again by proactive marketing strategies, of additional features and options. The distribution strategy shifts to a more extensive widespread strategy. Perhaps even new market segments are identified some of which may be in foreign countries. As a result, the operations management in the existing facility is faced with multiple products and, perhaps, relatively low volumes.

In the mature stage, some competitors exit the market and the focus is narrowed to those products that are the most successful in the marketplace. Operations can now increase the volume in a relatively few number of products. Marketing strategy extends the distribution channels and reduces prices. Profits are reduced. Perhaps, far- sighted management now actively engages in the development of replacement, next generation, products. In the decline stage the facility, perhaps, produces only a single product line as it awaits the introduction of a new product offering.

It appears that these stages correspond to a degree with the PP stages. Yet, if operations theory is correct, an organization will be hard pressed to change from one process choice to another. This is especially true in the mature and declining stages when profits are squeezed. This is also the time when the forecasting methods are telling operations to overbuy and

overproduce. The results are not pleasant when the two strategies are combined, Marketing, at times, proactively changes its strategies to change volume at the time when operations is unable to respond. Again, the conflicts appear inherent in the process choice, but these are not routinely taught in individual courses. operations professors may assume that their marketing colleagues are teaching this topic and vice versa.

"Economic Order Quantities (EOQ)"

Another classic area of operations theory is the EOQ calculation. Although maligned now in the time of JIT, it still serves as a cornerstone of operations theory especially in retail and service applications. The components of the EOQ equation change somewhat based on the environment and complexity to be modeled. However, product demand is almost always included.

Let us use an example where the demand is forecasted to be 10,000 units. Given the other variable the EOQ is calculated to be 500 units or an expected average inventory of 250 units. What happens if marketing has succeeded beyond its wildest dreams and now expects to sell 100,000 units, ten times the amount previously forecasted? Finance asks operations how much average inventory is needed to support the marketing plan. A common answer would be that since sales have increased ten fold, then we will need at least ten times the inventory, and probably more. Operations swings into action, hires additional workers, buys additional material and produces at the higher volume.

However, the EOQ formula, which measures the quantity that minimizes total cost, is a square root function not a linear function. A change in one of the variables, demand, changes the quantity by the square root of the change, In this case a ten fold increase in demand increases the EOQ by 3.33 times and the average inventory by 3.33 times. What happens is that we produce more frequently at a relatively non-obvious lower quantity. Unless an operations manager is especially articulate in explaining the meaning of the square root formula, results may be lost on the organization. Certainly the onus is on operations to defend why they will be able to support marketing at a lower amount of average inventory then a one-for-one relationship to sales volume.

A less than enthusiastic operations manager may give in and simply make larger runs and allow the inventory to grow. Remember that only

one half of the carrying costs are actually reflected in the income statement. The opportunity cost of holding inventory is not an income statement item. Even that portion of the carrying cost that is reflected in the income statement is spread among many different budgets, very few of which are under the operations management department's responsibility.

The result is that the organization may tend to overproduce beyond the quantity that minimizes the total cost. In a rapidly moving marketplace with a short PLC, the organization may find itself sliding down the life cycle with excess inventory and a forecasting methodology that is planning more.

A Modest Proposal

A brief review of these three areas in operations strategy and marketing strategy reveals examples where there are inherent conflicts. Yet we do not teach solutions to these conflicts but, in fact, teach students ways to cause the conflicts. Business schools appear to teach students ways to cause the organizations that employ them to fail, or at least not to be as successful as they could be.

The business community appears to be struggling with some of the symptoms of these conflicts. At least one operations management researcher, Hill (1994), has proposed a blending of the marketing strategy and the operations strategy. See figure 4.

CORPORATE OBJECTIVES	MARKETING STRATEGY	HOW DO PRODUCTS WIN ORDERS IN THE MARKET PLACE?	MANUFACTURING STRATEGY	
			PROCESS CHOICE	INFRASTRUCTURE
• GROWTH • SURVIVAL • PROFIT • RETURN ON INVESTMENT • OTHER FINANCIAL MEASURES	• PRODUCT MARKETS & SEGMENTS • RANGE • MIX • VOLUMES • STANDARDIZATION VERSUS CUSTOMIZATION • LEVEL OF INNOVATION • LEADER VERSUS FOLLOWER ALTERNATIVES	• PRICE • CONFORMANCE QUALITY –SPEED –RELIABILITY • DEMAND INCREASES • COLOR RANGE • PRODUCT RANGE • DESIGN • BRAND NAME • TECHNICAL SUPPORT • AFTER-SALE SUPPORT	• CHOICE OF ALTERNATIVE PROCESSES • TRADE-OFFS EMBODIED IN THE PROCESS CHOICE • ROLE OF INVENTORY IN THE PROCESS CONFIGURATION • MAKE OR BUY • CAPACITY –SIZE –TIMING –LOCATION	• FUNCTION SUPPORT • MANUFACTURING PLANNING & CONTROL SYSTEM • QUALITY ASSURANCE AND CONTROL • MANUFACTURING SYSTEM ENGINEERING • COMPENSATION AGREEMENTS • WORK STRUCTURING • ORGANIZATION STRUCTURE

(adapted from Hill, 1994)

Hill suggests a process where an organization defines its objectives then establishes a marketing strategy that supports the objectives. Then a continuous process occurs of identifying order winners and order qualifiers (reflecting changes in the marketplace) which, in turn, affects process choices and the supporting infrastructure.

The American Production and Inventory Control Society also appears to be recognizing these conflicts. Their Certification in Resource Management program is a cross-functional assessment of an organization. There are other examples in the popular business press involving the flattening of the organization and the growth of the cross-functional team organizational structure. The term, "value chain management" is being more frequently used to describe the integrated view of the production process.

Is it time that the business schools examine their own structure? What would happen to teaching and research if business schools eliminated functionally based academic departments as businesses have done and taught courses such as Operations-marketing I, and Marketing-operations II? What would happen it operations faculty had to teach principles of marketing and the marketing faculty had to teach a section of operations management on occasion?

Perhaps APICS, other professional societies, and pressure from businesses can facilitate a blending approach as it appears that an external influence is necessary to motivate the academic change that appears to be necessary for students, faculty and the larger society.

References

Dhalla, N.K. and Yuspeh, S., "Forget the product life cycle", *Harvard Business Review*, Jan-Feb, 1976, pp.102-111.

Hayes, R.H. and Wheelwright, S.G., "Link manufacturing process and product life cycles", *Harvard Business Review*, Jan-Feb, 1979 pp. 133-140.

Hayes, R. H. and Wheelwright, S. G., "The dynamics of the process-product life cycles", *Harvard Business* Review, Mar-Apl, 1979, pp. 127-136.

McCarthy, E.J., and Perrault, W.D., *Basic Marketing*, 9th ed., Irwin, Homewood, Il., 1987.

Hill, T., *Manufacturing Strategy*, 2nd ed., Irwin, Burr Ridge, Il., 1994.