

# Updating Managerial Economics

By Thomas P. Egan\*

*Managerial Economics must update its tools if it expects to address the needs of business unit managers in the twenty-first century. Models need to be recast in a multiperiod framework because of the two-to five-year decision horizons routinely faced by business unit planners. Models of demand, price and cost also must reflect the fact that today's units of product come intimately bundled with significant and differentiating customer service and quality elements. Finally, profit maximization, cost minimization and factor utilization tools must consider that today's products and services are frequently produced in multiproduct facilities. This paper suggests developmental directions for Managerial Economics that address these issues.*

**T**HE TRADITIONAL Theory of the Firm taught in Managerial Economics courses has a relevance problem today to the extent that it overemphasizes the optimization of quantity, price, costs and profits in a single time period for a single kind of "widget" produced in a single facility. Such optimization issues are still important to small farms, small natural resource producers or small factories serving local markets. However, the planning challenge for business units in most midsized and large corporations is how to optimize the growth in profits over several time periods by providing multiple products, each with unique quality and customer service elements. Furthermore, such multiple products and associated customer service elements are usually provided from

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multiple, shared product facilities to multiple market segments in multiple regions.

In spite of the relevance problem and the recommendations made below to address it, this paper is not an attempt to disparage the high value that the traditional Theory of the Firm contributes to economic theory and public policy debates. Applied economic models based on the single-product, single-production function, comparative static analysis framework will certainly remain highly useful for aggregated industry or economy-wide policy analyses well into the future. However, to managers in corporate business units, such analyses apply to highly aggregated special cases seldom encountered in day-to-day decision environments.

## PAPER ORGANIZATION AND ASSUMPTIONS

The paper begins by setting out some assumptions and definitions useful in understanding the organizational, decision and market environments that typical business units in mid- and large-sized firms face. It then makes recommendations on how the Theory of the Firm can be extended to respond to such environments. Four aspects of the Theory of the Firm are considered, in turn:

1. Profit maximization
2. Demand and price
3. Production and factor utilization
4. Cost minimization

The paper concludes with some brief recommendations on how Managerial Economics might grow even further in value and use by aggressively setting a more cross-disciplined language and model-development direction. Whether a business economist is employed as a staff economist or line manager, his or her value to the firm can only increase as the applicability and perceived value of Managerial Economics tools increase.<sup>1</sup>

<sup>1</sup> See footnotes at end of text.

## Corporate Organization and the Location of Economic Decisions

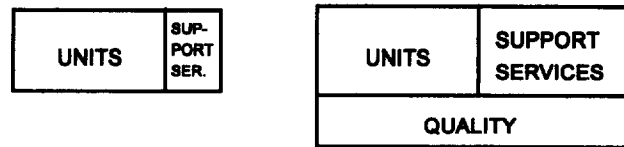
The decision environment in which Managerial Economics is applied in large corporations has the following characteristics:

1. The modern corporation is typically organized into business units (BU). BUs are typically self sufficient in that they design, sell, produce, deliver and provide pre- and post-order supporting services for a number of products or services, through a number of facilities, to customers around the globe. However, any of these BU controlled functions can be "outsourced" to "partners" in other BUs or other companies.
2. Each BU is typically accountable for its own profits or losses. This gives incentives to each BU to develop, promote, etc., in its own facilities or using its own partners, to gain as much financial control over its activities as possible. However, cross-BU facility sharing and "synergistic" attacks on new markets are often "encouraged" by headquarters organizations. Thus, cross-BU transfer pricing issues receive considerable management attention and often are highly politicized.
3. Planning is considerably decentralized. Corporate headquarters strategic planners (sometimes called business planners or long-range planners) typically focus on which multiproduct business units to enter and exit, while business unit strategic planners focused on dynamic rates of change in profits, revenues, prices and costs for entire product families over several years. Neither focuses very often on profit maximization for a single product or product family over a single year.
4. Business unit product line managers (sometimes called product marketing managers), do focus on profits for single products over the shorter term. However, the products and associated support services they manage are usually produced in multiproduct facilities, and product managers seldom have access to the kind of single-product cost versus quantity data needed to apply microeconomic tools effectively. Standard cost accounting systems do not forecast costs for individual products very well.<sup>2</sup>
5. Rapid advances in information technology will continue to change underlying production functions and the very nature of what "product" or "service" is delivered to customers. Such dynamics must be explicitly considered in selecting planning approaches, particularly at the strategic planning level.

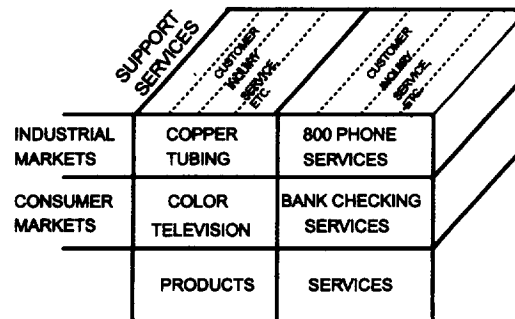
### The Output of a Typical BU

The output of a single BU is no longer a microeconomic "widget." Today, more typically it is a large number of products and/or services, each one of which might be depicted as a cell in a three dimensional BU output matrix. The axes of the matrix would be units, support services and quality. At the BU level, the number of "products" can be quite large. Figures 1a and 1b and depict how the concept of

**Figure 1a**  
Output of Nineteenth Century Firm and a Twenty First Century Business Unit



**Figure 1b**  
Relationship of Support Services to Traditional Product and Services Markets



"product" or "service" is increasingly viewed in the modern enterprise and is viewed in this paper.

Figure 1a is a representation that compares the output of the nineteenth century firm with the output of the twenty-first century BU, while Figure 1b shows examples of products, services and their relationship to support services. The third dimension, quality, is not shown in Figure 1b. However, quality is an increasingly important and identifiable part of the value delivered to customers with each unit of product or service and its associated support services. The importance of support services and quality is particularly true in high technology and other short lifecycle markets.<sup>3</sup> However, continued advances in information technology also are forcing continued support service innovations in markets normally regarded as having longer product lifecycles.

While varying from BU to BU, the associated bundle of support services typically provided to the customer with each unit of output sold consists of:

1. Customer inquiry services
2. Order entry services
3. Order status services
4. Delivery services
5. Billing services
6. Returns and repairs services

Often, one or more of the support services is particularly critical to a market segment and serves to

differentiate one competitor from another. For example, accurate and completely itemized billing for long distance services is particularly important for business customers of long distance telephone companies. Similarly, the IKEA furniture retailing chain differentiates itself from competitors largely in the way it processes customer inquiries, order entries and product deliveries. Customers inquire and order through catalogs located in designated areas of showrooms, without the intervention of traditional furniture sales personnel. Customers also pick up IKEA merchandise themselves at a shipping dock at the retail store. Thus, with support service innovations in customer inquiry, order processing and delivery, IKEA is able to offer its customers considerably lower prices than many of its competitors.

Because support services often provide substantial differentiation across competitors who are providing similar product or service units to customers, they also lead to market situations where a range of prices is consistent with supply and demand equilibriums. For example, support service differences provided to buyers of desktop computers typically lead to a range in price across competitors at any point in time, in a market that is quite competitive in the microeconomic sense.

Global competition and the Total Quality Management (TQM) movement are driving business units continuously to innovate to increase customer satisfaction in all of the support service areas, as well as satisfaction with the quality of the unit of output itself, i.e., does the unit delivered perform as expected with the reliability expected?

The sections that follow focus on how incorporating some extensions of the traditional Theory of the Firm into Managerial Economics might address the new business realities just summarized.

## **PROFIT MAXIMIZATION**

The Theory of the Firm section in standard Managerial Economics often begins with a graphical or calculus representation of a firm's profit maximization decision. This representation shows how the firm should maximize profits as a function of the number of units produced in a single time period. However, the profit maximization decisions business unit strategic planners face most often are how to maximize the growth in profits and the discounted value of cumulative profits over a two- to five-year horizon.

Extending Managerial Economics to meet this two- to five-year profit maximization challenge can be accomplished by reformulating the representation of the profit maximization decision from one of maximization of profits as a function of units produced and

sold in a single time period to one of maximizing profits as a function of time itself. In such dynamic representations, traditional concepts such as marginal and average profits will have to be redefined to mean the profits obtained by producing for one additional increment of time and the average profits per time increment, respectively.

Ready business unit applications exist for such dynamic extensions to traditional profit maximization formulations. These will include production ramp up rate and phase out decisions. Also strategic decisions, such as whether to be a technology leader or a quick technology follower, are likely applications for dynamic representations of the microeconomics of profit maximization.

## **DEMAND AND PRICE**

While business unit strategists need improved, multiperiod tools, business unit product line planners do frequently confront shorter run demand and price issues. However, what is being demanded in today's markets for a single product or service is not "units" or "widgets" in the traditional microeconomic sense. What customers actually demand today is a combination of physical units and bundles of associated support services and quality attributes.

Traditional Managerial Economics tools might be extended to address today's customer demand realities by representing demand as a surface instead of the traditional two dimensional curve showing units demanded as a function of price. For example, three dimensional demand surfaces might represent the quantity of both units and support services demanded as a function of price, perhaps with discrete increments of quality used as a parameter separating several demand surfaces in the same diagram.

One immediate benefit from such extensions to traditional demand and price analyses will be an increase in the power of Managerial Economic tools to explain, and perhaps predict, market phenomena such as multiple equilibrium prices at a single point in time. For example, at any point in time, equilibrium prices in the now reasonably mature desktop PC market vary considerably, depending on the level of quality and support services competing suppliers offer.

### **Transfer Pricing Issues**

Standard, single period microeconomic demand, supply and price models provide helpful insights to product line planners who quote prices to sales forces or directly to customers outside the corporation. However, difficult interdepartment and interbusiness unit transfer pricing issues also are encountered frequently

by product line planners in midsized to large corporations. The importance and complexity of such transfer pricing issues go beyond the recurring need to convince IRS auditors that internal transfer prices are in line with what the business unit would pay on the open market.

Conventional microeconomic transfer pricing analysis<sup>4</sup> does provide clear warnings that if upstream divisions in a firm seek to maximize profits by producing and selling the number of units indicated by equating their marginal revenues to marginal costs, the transfer prices charged to downstream divisions for things such as raw materials, components, subassemblies, communications, transportation or customer support services are likely to exceed their cost of production. This in turn gives downstream divisions setting marginal revenue equal to marginal cost the signal to produce fewer units than they would if upstream divisions transferred products and support services at cost. The end result for the firm as a whole is that profits are not maximized, particularly if important scale or learning effects are available but not captured, downstream or upstream.

In many real world cases, multiple upstream products or support services are produced in the same facility or a single product upstream facility supports multiple downstream business units. These situations add important layers of complexity to product line management decisions on transfer pricing. A full treatment of such issues is beyond the scope of this paper. However, a description of one issue illustrates both the complexity of real world transfer pricing problems product managers face and demonstrates an opportunity for Managerial Economists to add more value.

Assume a firm builds an upstream or "captive" facility with the mission of providing downstream divisions with multiple types of leading edge components, with superior quality, in quick turn, job-shop production mode and with superior support services (e.g., willingness to alter production schedules on short notice) than the downstream divisions can obtain from outside suppliers. Assume further that one or more of the components produced in the captive facility are used by the downstream divisions in moderate or even high volume and can be purchased from outside suppliers for commodity prices. Should the downstream divisions insist that the upstream divisions match the commodity prices obtainable elsewhere for products it uses in high volume, and should the upstream divisions comply? The conventional answer is yes, but when multiple upstream products are produced with superior support services by the same upstream facility, the issues are more complex.

If the upstream division in this example prices its

highest volume runners as competitive commodities and forgoes the margins that might be obtainable if it priced them to reflect the full value it adds to downstream divisions (i.e., added quality and responsiveness), it will probably have to raise its prices for its other, lower volume per year products or services to break even as a division. In turn, this can lead unsympathetic downstream product managers to raise a political clamor in corporate headquarters. Absent sound economic analyses of support service and other forms of value added by the upstream facility, the resulting decision may be decided in favor of the divisions with the greatest political clout.

### **The Strategic Planning View Of Demand**

Business unit strategic planners typically use the term "market demand" to mean the total revenues (i.e., price times quantity) available in the market that firms can compete for. Equivalently, when they speak of demand growth over time, strategic planners typically mean growth in the sum of the total revenues received by all the producers serving a market. Price determination is a very important element in forecasting market demand, as used here. However, it is forecasting price trajectories, not market clearing prices at a point in time, that receives the most attention from strategic planners. We need to distinguish price and cost trajectories for different generations of products that may exist in the market simultaneously, correcting for support service.

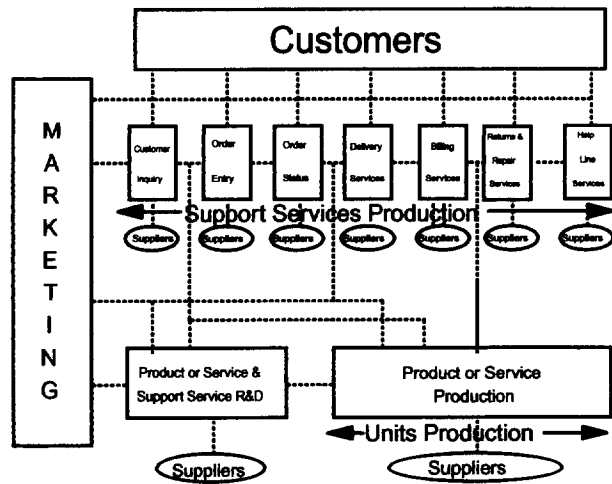
### **PRODUCTION AND FACTOR SUBSTITUTION**

Because products and support services are often produced by multiple business units in multiple product facilities, standard production function and factor substitution models must be updated. Unlike nineteenth century firms, today's large firms rarely if ever make capital and labor substitution decisions for all business units simultaneously, based on a single, stable corporate-wide production function. However, departments in business units of large firms are making outsourcing and reengineering decisions frequently, as the pressures of global competition and information technology change force repeated reexaminations of ways to serve customers and cut costs.

To begin the updating needed, it is useful to consider a block diagram representation of the facilities typically needed to produce the various units and support service outputs that are sold to customers. Figure 2 shows the production of both units and support services as well as the main information links between them and also to customers.

Each block in the diagram in Figure 2 typically

**Figure 2**  
**Business Unit Production Facilities that Produce**  
**Units, Support Services and Quality**



.....Major information routes & locations where information technology can improve differentiation, quality, cycle time and cost.

represents a single facility, but could represent an aggregation of facilities producing similar outputs, e.g., with retail sales outlets or telemarketing office locations handling customer inquiries. The description of the outputs of each of the facilities is likely to vary across facilities. For example, the output for the billing facility might be dollars billed per month or invoices processed per month, while the output of the customer inquiry facility might be customer calls handled per month or showroom visitors per month. The ovals below each of the facility blocks represent the network of suppliers and alliance partnerships that support each facility's efforts to produce outputs.

The output of each facility in Figure 2 is assumed to be generated by a "process," i.e., a set of linked "activities" that, together, produce output. The use of the nouns like "process" and "activity" in Managerial Economics courses rather than "production technology" will help align Managerial Economic concepts with total quality management (TQM) and activity-based costing (ABC) concepts that are currently receiving considerable management attention. TQM focuses heavily on improving "process quality," while ABC process cost information systems are widely recommended to help strategic planners, product planners and facility department heads understand and manage the costs of the activities for which they are specifically responsible.

### The Outsourcing Decision

The rapid advances in information technology and the competitive pressures to cut costs will continue to

force business units into recurring reexaminations of which support services they should provide themselves and which they should outsource to other business units or other companies. Here concepts from modern Industrial Organization Economics can add significant strategic insights.

The concept of transactions costs is fundamental to modern Industrial Organization Economics and is also central to the economics of the outsourcing decision.<sup>5</sup> Transactions costs between support service and units producing departments in a business unit include coordination costs as well as the costs imposed by asymmetries in information and motivation across departments.

The fundamental economic evaluation business units must make with outsourcing decisions is whether the increase in transition and transaction costs that are associated with outsourcing the production of units or support services will be more than offset by the decrease in the internal transfer or external market price paid for such services.<sup>6</sup> As information technology advances, transaction costs are invariably lowered and more and more outsourcing will probably occur.

### The Reengineering Decision

Information technology change and global competition also are forcing departments that are not outsourced to go through recurring reengineering. It is here that traditional process or activity function (i.e., production function) and factor substitution analyses find their greatest applicability.

In reengineering situations, choices among alternative process functions and factor mixes often are being made simultaneously. Furthermore, when process function, output level and input mix choices are made for one product or support service, they often impact the process functions or factor prices for other products and services made at the same facility.

Information technology innovations that lead to factor substitution-focused reengineering decisions are likely to be usefully analyzed with traditional managerial economic concepts. However, to do this it will be necessary to estimate process function (i.e., production function) models for the output of individual facilities, separately.

### COST MINIMIZATION

When products are produced in multiproduct facilities, strategic and product line planners frequently experience difficulties in obtaining forecasts of costs for individual products and product lines that are economically relevant for planning purposes. These difficulties arise from the fact that standard cost

accounting methods are primarily oriented to facility-wide financial reporting rather than product line planning needs and also from the fact that elements of the full chain of economically relevant product costs may lie upstream or downstream, in the activities of other independent company or business unit partners, along the chain of value being delivered to customers.

Forecasting costs relevant for planning can be improved considerably when modern cost accounting tools such as activity based costing are applied and whenever upstream and downstream partners compete in competitive markets. When upstream and downstream supplier markets are competitive, prices provide a sound basis to forecast costs for the elements of the value chain these outside companies deliver.

Additional applications should arise from the fact that modern operations management techniques often place considerable emphasis on managing operations to minimize cycle times, i.e., to deliver value in the form of units and support services to customers in the shortest time possible. Having predictions of how costs vary as functions of time should aid strategic and operations planners in determining optimum cycle time/minimum cost targets for various elements of the value chain for individual products.

## CONCLUSIONS AND ADDITIONAL RECOMMENDATIONS

This paper has set out a number of specific suggestions for making Managerial Economics more valuable to corporate managers. Many of these suggestions have the common denominator of explicitly including models of profits, prices, costs, etc. as functions of time as well as of units produced per time period. In addition, the transfer price and other complexities rooted in production from multiproduct facilities need greater emphasis.

Looking beyond the specific recommendation set out above, the nearly ubiquitous presence of desktop computers creates a broad opportunity for Managerial Economics to extend its reach and value by developing new kinds of desktop PC compatible models that will help managers analyze the microeconomic elements of a much broader range of issues than the traditional Theory of the Firm considers. For example, today's management teams are challenged by complex, cross-

discipline decisions regarding the interaction of quality, human resource strategy and environmental strategy options on profits and customer satisfaction. If Managerial Economics can provide intuitive microeconomic models that can help management teams make such decisions, the value and use of Managerial Economics will expand significantly.

## FOOTNOTES

<sup>1</sup> See P. Milgrom and J. Roberts, *Economics, Organization and Management*, Englewood Cliffs, NJ: Prentice Hall, (1992) for a comprehensive adaptation of the Industrial Organization Economics to the management decision environment.

<sup>2</sup> Problems and solutions associated with inadequate product cost data are discussed in the activity-based cost accounting literature. Papers such as R.S. Kaplan "One Cost System Isn't Enough," *Harvard Business Review*, January-February, 1988, pp.61-66 and R. Cooper & R.S. Kaplan "Measuring Costs Right: Making the Right Decisions," *Harvard Business Review*, September-October, 1988, pp.96-103 are typical.

<sup>3</sup> The reality that management must increasingly include support service production and marketing strategies as integral and critical elements of overall product line strategies is persuasively argued by former Intel Corporation marketing head William Davidow in W.H. Davidow, *Marketing High Technology, An Insider's View*, New York: The Free Press division of Macmillan, Inc., (1986).

<sup>4</sup> See Milgrom and Roberts, cited above, pp. 550-51.

<sup>5</sup> A full treatment of the issues associated with the impact of transactions costs on the extent of vertical and horizontal integration in firms is beyond the scope of this paper. Milgrom and Roberts cited above reference this literature and apply it to the management decision environment.

<sup>6</sup> The management strategy literature covers the pros and cons of outsourcing extensively. For example, C.K. Prahalad and G. Hamel's widely cited paper "The Core Competence of the Corporation," (*Harvard Business Review*, May-June, 1990) provides a strategic rationale for which divisions to keep (i.e., the ones that are core competencies). However, the microeconomic elements of such choices is not given sufficient attention and Managerial Economics can add value by providing models that fill this void.