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A MODEL FOR THE DETERMINATION
OF MARKET BASED PRICING OF
TELECOMMUNICATION PRODUCTS

By

Katherine J. Sullivan

Thesis submitted to the Faculty of
the Graduate School of
the New Jersey Institute of Technology
in partial fulfillment of the requirements for
the degree of Masters of Science in
Management Engineering
May, 1988

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Based Pricing of Telecommunication Products

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ABSTRACT

Title of Thesis: A Model For The Determination of Market
Based Pricing of Telecommunication Products
Katherine J. Sullivan, Masters of Science, 1988
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The deregulation of AT&T, has impacted telecommunication product pricing in the U.S. market. Previously, pricing had been based on cost plus mark-up, as stipulated by regulatory commissions. Now, pricing decisions require consideration of the competitive impact, consumer demand for the product, corporate pricing objectives and marketing strategies. This paper proposes a pricing process that is relevant for this new environment which enables the product manager to price properly.

The method proposed utilizes microeconomic theory and takes into account the product test price, unit cost, opportunity cost, nonprice factor cost and consumer demand. Incorporating a number of different pricing strategies, it simulates their effect on the profitability of the firm and then identifies the product price that will maximize profit.

To facilitate the understanding of the proposed procedure, three cases are included that illustrate its application. Additionally, a product plan to aid in monitoring the market performance of the product is presented.

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To Ken, Kenny, Katie, Ed and Jill

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CHAPTER 1

INTRODUCTION

"If there is a substance to this thing called change in our changing society, it is unlikely that the trends of the last sixty years will dominate the rest of the century... Instead we can expect different and new trends to emerge and different and new concerns to claim our attention."

Peter F. Drucker

In January 1982, AT&T, the world's largest telephone company, prepared for a corporate restructure brought about by a number of complex forces, including changing public policies encouraging more competition, computer and communication technology mergers, and customer demand for more sophisticated services.

AT&T and its subsidiaries were regulated by state authorities and the Federal Communications Commission (FCC) in exchange for being the sole provider (monopoly) of telephone service. Government antitrust lawyers always felt, however, that AT&T had too much power. In 1949, the federal government brought the first antitrust suit against AT&T, and, in 1956, an agreement was reached whereby AT&T would confine its activities to communications. In effect, AT&T was allowed to retain its manufacturing subsidiary, Western

Electric, in exchange for not entering the new computer industry. In 1968, the FCC ruled that non-Bell equipment could be attached to the network, and, in 1969, MCI was allowed to build a microwave long-distance system in competition with AT&T.

In the mid-1970's, private antitrust suits were brought against AT&T by a number of telecommunication companies claiming AT&T would not allow them to compete. The major impetus for the massive restructure, however, was the second antitrust suit filed by the Justice Department in 1974, charging that AT&T was keeping potential competitors out of the equipment and long-distance markets. U.S. District Court Judge Harold H. Greene tried the case, known as Computer Inquiry II, and the terms were described in January 1982 by AT&T Chairman Charles L. Brown. In brief, the agreement contained the following major elements:

- 1) The Detariffing (unregulated) of:
 - a) customer premise equipment
 - b) enhanced services, i.e. computerized information systems that do more than carry information
- 2) The above items can only be offered through a fully separated subsidiary.
- 3) Non-Bell companies must be given access to the network on the same terms as Bell companies.

In effect, AT&T agreed to give up the local telephone companies (twenty-two Bell operating companies formed into seven regional telephone companies) in exchange for the ability to compete in markets that had been closed to the company in 1956, namely the computer industry. AT&T retained both Bell Laboratories (technology developer) and Western Electric (technology manufacturer) along with long-distance and international services.

As a result of the break-up of AT&T, fierce competition between telecommunication companies began. Companies are vying for the long-distance market, for the residential market (plain old telephone sets, sophisticated answering machines, cordless telephones), for the small business market (key systems and mini-PBX's) and for the large business market (integration of telephone and computer equipment).

Also, pricing methods are being reviewed and adjusted for this new environment. Rates are no longer set under regulatory scrutiny and consideration must now be given to the competitive impact. Consumer demand for the product, corporate pricing objectives and marketing strategies must be incorporated into the pricing decision. This paper proposes a method that is designed to consider these key price determinants with the purpose of providing a decision tool that enables the product manager to price properly.

The pricing procedure allows for the development of various pricing strategies that take into account the product test price, consumer demand for the product, the unit cost of the product, the cost of nonprice actions (such as advertising), and the cost of choosing one alternative over another (opportunity costs). The pricing model simulates the effect of these strategies on the profitability of the firm and then identifies the product price that will maximize profit.

In Chapter II, primary market structures are defined and analyzed in terms of supply, demand and profit maximization. This analysis is fundamental for an understanding of the nature of demand for a product, the degree and kind of competition and also, for determining an appropriate method for pricing. By understanding the characteristics of the market, a product manager can anticipate behavior for a particular product and will improve his chances of pricing the product so as to improve profit.

A necessary component for the proper pricing of a product is the specification of the minimum basic cost upon which the pricing decision should be based. Chapter III discusses the determination of these costs. The costs developed represent only those activities directly associated with the provision of the product to be priced and, as such, allows the effects of different product strategies to be easily assessed.

Key in a pricing decision is the product demand. Forecasted demand quantities are necessary to determine if there is sufficient consumer demand to warrant introduction of the product. Demand quantities must also be forecasted for the various pricing strategies in order to analyze the effect of the product price on total revenues, costs and profit to the firm. The forecasting of demand quantities is not an exact science, however, techniques are available to aid the forecaster in lessening the degree of uncertainty. Chapter IV describes the major forecasting techniques in use and discusses how product demand can be integrated into the pricing procedure.

To illustrate the application of the pricing procedure, three specific product cases will be presented in Chapter V. In two cases, the numerical determination of the product demand and price is documented. For the third example, the pricing model is used to identify profit levels as a result of the implementation of various marketing strategies.

Chapter VI presents a product plan that should be used to monitor the product performance once it has been introduced into the marketplace and allows for the formulation of alternative product strategies as the need arises.

The final chapter contains a summary of the points emphasized in this paper and concluding remarks.

Competition - effective, aggressive competition - means strife, industrial warfare; it means contention; it oftentimes means taking advantage of or resorting to any means that the conscience of contestants or the degree of the enforcement of the laws will permit.

Theodore Vail

President, AT&T

1910

CHAPTER II

MARKET STRUCTURES

Through an understanding of the characteristics of market structures, one has the necessary knowledge for analyzing the nature of demand for a product, the degree and kind of competition and also, the method for pricing a product. This allows a marketing manager to anticipate market behavior for a particular product and improve his chances of pricing the product in order to maximize sales and profits.

Buying and selling occurs in a market, which is defined as the location in which a voluntary exchange of goods or services takes place. The amount of a commodity that customers will purchase at a particular price is called the demand for the commodity. The demand for a specific product is dependent on a number of factors which generally includes the price of the product, its usefulness, its appeal to the consumer, the size of the consumer population and the availability of competitive products.

The quantity of a commodity that a market is willing to sell at various prices is called the supply of the commodity. The main factor which determines the market supply of a product is price. The greater the price a consumer is willing to pay for a commodity, the more eager a firm will be to supply it. It is assumed, therefore, that

the supply curve has a positive slope.

At the point of intersection (equilibrium point) of the supply and demand curves, all goods supplied are sold and all demand for them is satisfied. Past the equilibrium point, the excess quantity supplied above the quantity demanded exerts a downward pressure on the price. If the price is lower than the equilibrium price, the excess quantity demanded will push the price upward. The equilibrium price is the market price or the price at which the amount voluntarily supplied and the amount voluntarily demanded are equal.

This condition only exists, however, when there is perfect competition. Perfect competition occurs when a given commodity is supplied by a large number of vendors, when there is no restriction against vendors entering the market and when there is perfect knowledge of the market. The products are undifferentiated and there is assurance of complete freedom on the part of both the buyer and seller.

In reality, markets do not exhibit these characteristics. Various degrees of imperfect competition exist. Variables that explain these imperfections are the number of buyers and sellers, the differentiation among products and the ease with which new firms can enter

the market. These variables make up the market structure. The structural characteristics of the market determine the degree and kind of competition and also the method for pricing. On one end of the market structure spectrum there is perfect competition, with many sellers, and at the other end is monopoly, with one seller. Other conditions exist between the two, for example, oligopoly and monopolistic competition (See Table I).

For any firm, the ideal situation is one in which profits are maximized. In order to maximize profits, a firm must consider the supply and demand curves and the market price in its own pricing decision. Since various degrees of imperfection are encountered, the pricing decision will be somewhat different in each market structure.

PERFECT COMPETITION

Perfect competition exists when a large number of buyers and sellers act independently to maximize their satisfaction or their profit from a certain product. No individual firm can control the supply or affect the market price. The individual firm sees its demand curve as a horizontal line at the prevailing market price (See Figure I).

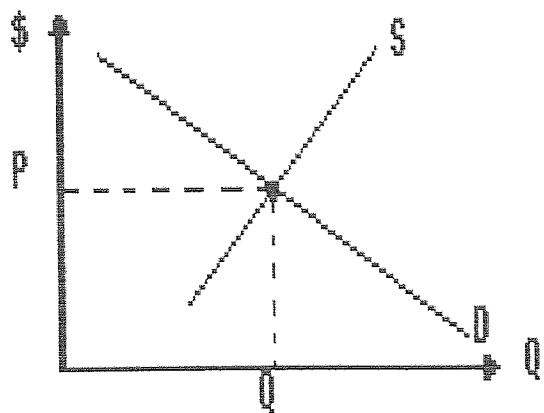
Although the firm has no control over the price of the product, it can control the quantity it produces. The firm

MARKET STRUCTURE SPECTRUM

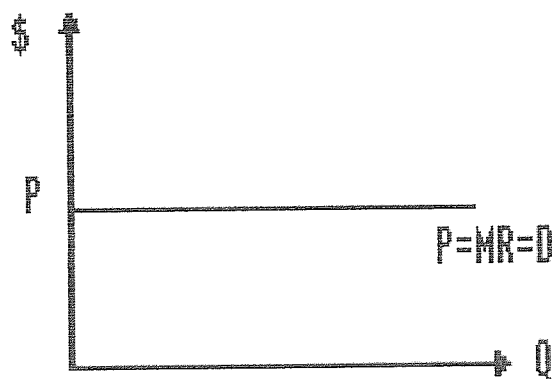
ONE SELLER	FEW SELLERS	MANY SELLERS	LARGE SELLERS
NO ENTRY	DIFFICULT ENTRY	EASIER ENTRY	EASIEST ENTRY
MONOPOLY	OLIGOPOLY	MONOPOLISTIC COMPETITION	PERFECT COMPETITION

TABLE I

PERFECT COMPETITION - DEMAND CURVES



THE
MARKET



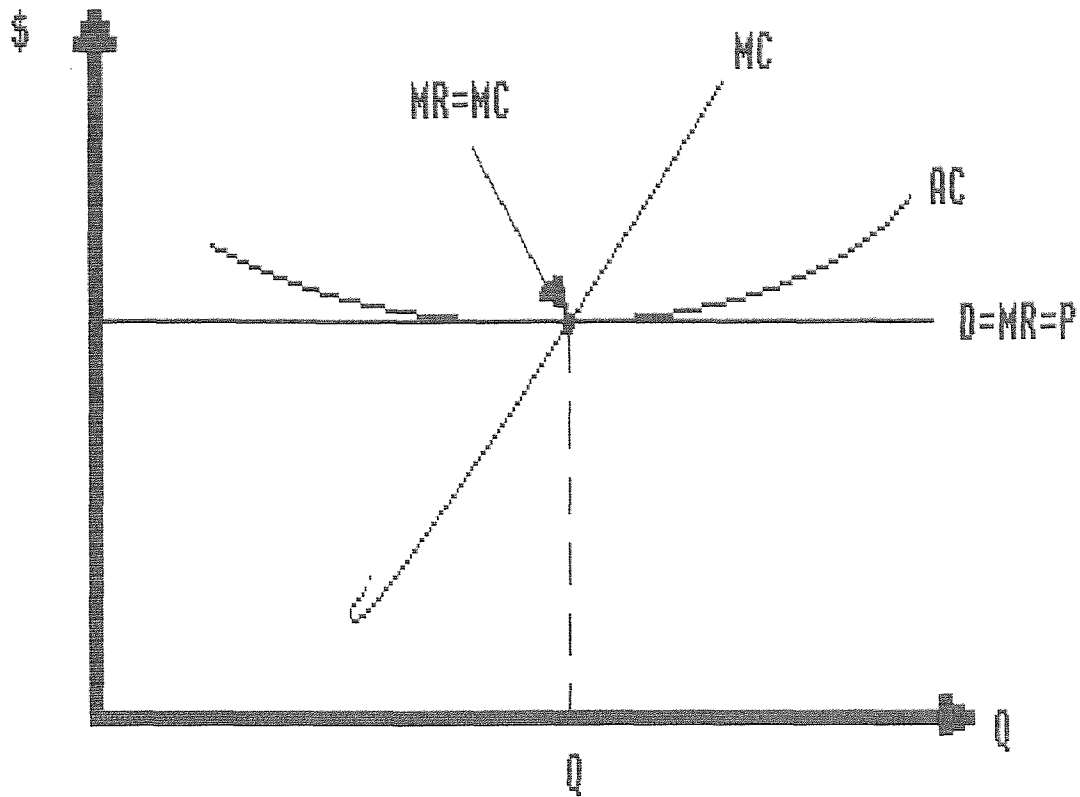
THE
INDIVIDUAL

FIGURE I

will supply the quantity which will maximize its profits. The costs of producing that quantity must be considered.

How much a profit maximizing firm produces depends on the marginal cost or the cost of producing one additional unit. As each unit is produced, the costs increase and each previous unit is burdened with the higher cost. For example, if one unit is produced at a cost of \$5 and two units are produced at a cost of \$12, the marginal cost is \$7 ($\$12 - \5). Each unit now costs \$7 to produce. The firm moves along the demand curve until it reaches the point where the marginal cost of the quantity produced is equal to the marginal revenue (market price) of the quantity demanded. Marginal revenue is defined as the amount of change in the total revenue when the output is increased by one unit. The marginal revenue or the extra revenue from the sale of one additional unit is the price of that unit. For example, if the market price is \$10 and the firm sells one unit, the total revenue is \$10. If the firm sells one additional unit, the total revenue is \$20 and the marginal revenue is $\$20 - \10 or the \$10 market price. When the marginal revenue and marginal costs are equal, profit maximization has been reached. This means that units of output are added as long as the change in total revenue for the additional unit is greater than the change in total cost for that unit. Figure II illustrates this concept.

PERFECT COMPETITION - PROFIT MAXIMIZATION



P PRICE

D DEMAND

MR MARGINAL REVENUE

AC AVERAGE COST

MC MARGINAL COST

FIGURE II

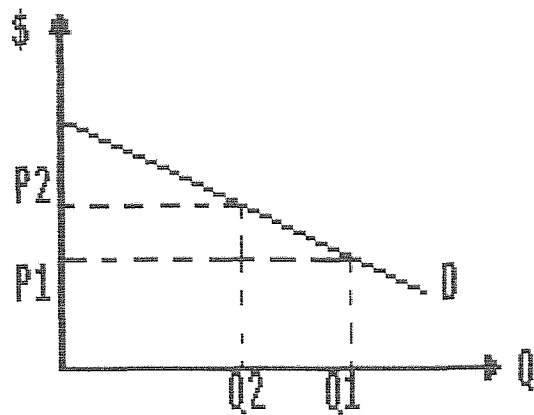
MONOPOLY

At the other end of the market structure spectrum is a market condition called monopoly. A monopoly exists when there is a single seller of a product or service. This situation is usually due to the existence of a product that is unique in its physical properties or of a service that is recognized as being distinct and, as such, no one else can compete in the marketplace. Legal restraints due to patents and government franchises are a cause of monopolies. In the case of local telephone service, the cause is a natural monopoly where duplication of facilities could cause service impairments.

The demand curve for a monopoly is always a negatively sloped curve. The slope is calculated as the change in quantity divided by the change in price. Therefore, if the price was to increase from \$8 to \$10, and the quantity decreased from 6 units to 4 units, the slope would be -1 , likewise, if the price was to decrease from \$10 to \$8, the quantity would increase from 4 to 6 units and the slope would be -1 . Figure III illustrates this negatively sloped demand curve.

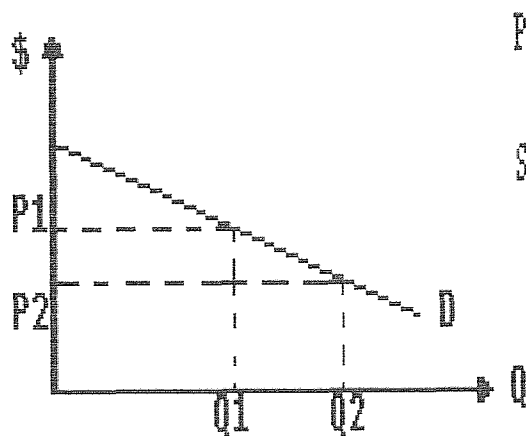
As the only firm in the market, the monopolist faces the entire demand curve and is free to choose any point on it. Theoretically, therefore, the firm can charge any price or supply any quantity that maximizes profits. As in the

MONOPOLY - DEMAND CURVES



$$P_1 = 8 \quad Q_1 = 6 \quad P_2 = 10 \quad Q_2 = 4$$

$$\text{SLOPE} \quad \frac{10 - 8}{4 - 6} = \frac{+2}{-2} = -1$$



$$P_1 = 10 \quad Q_1 = 4 \quad P_2 = 8 \quad Q_2 = 6$$

$$\text{SLOPE} \quad \frac{8 - 10}{6 - 4} = \frac{-2}{+2} = -1$$

FIGURE III

case of perfect competition, this occurs when the marginal revenue is equal to the marginal cost. Unlike perfect competition, however, the marginal revenue does not equal the price of the product and, as output levels increase, deviates further and further from the price. Table II illustrates this phenomenon. Therefore, the point of intersection of the marginal revenue and marginal cost curves identifies not only the quantity of the product to supply but the price to charge for the product as well.

Figure IV illustrates the profit maximization concept in a monopoly. When quantity Q_1 is produced, marginal revenue is equal to marginal cost and P_1 is the price that will result in maximum profit. The shaded region represents the total profits to the firm.

To prevent overcharging of the public, most monopolies provide public service and are regulated by state and federal authorities. The following paragraphs will explain how pricing is done under these conditions. Local telephone service is one example of such a monopoly being regulated by public utility commissions. These commissions historically have tended to establish telephone rates at the point where the average revenue is equal to the average costs, in other words, under this policy monopoly profits are eliminated and the firm receives normal or "fair" returns. The regulated rate forces the telephone company to lower their price and

MONOPOLY - MARGINAL REVENUE

<u>PRICE (P)</u>	<u>QUANTITY (Q)</u>	<u>TOTAL REVENUE (TR) (P)X(Q)</u>	<u>MARGINAL REVENUE (MR) $\Delta TR \backslash \Delta Q$</u>
10	1	\$10	\$10
9	2	18	8
8	3	24	6
7	4	28	4

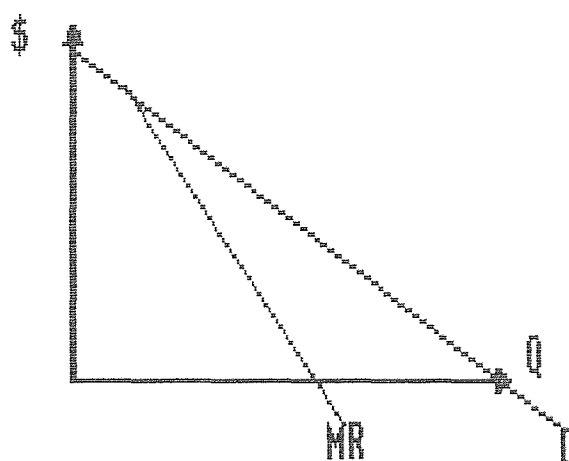
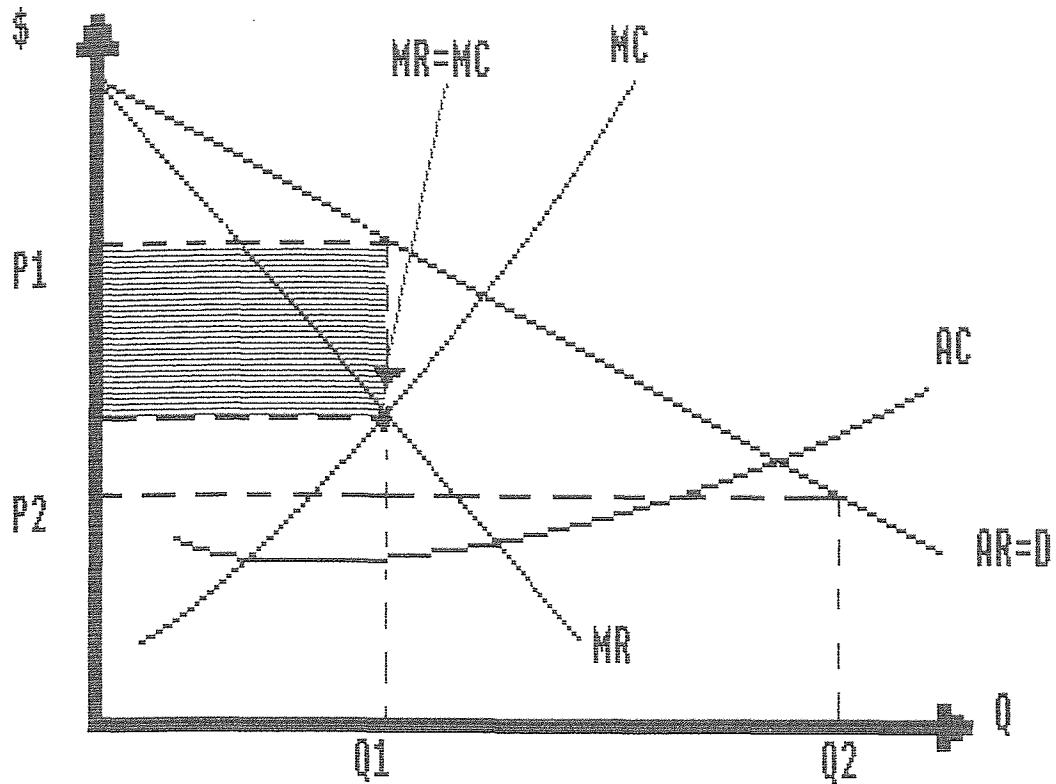


TABLE II

MONOPOLY - PROFIT MAXIMIZATION



AR AVERAGE REVENUE

MR MARGINAL REVENUE

AC AVERAGE COST

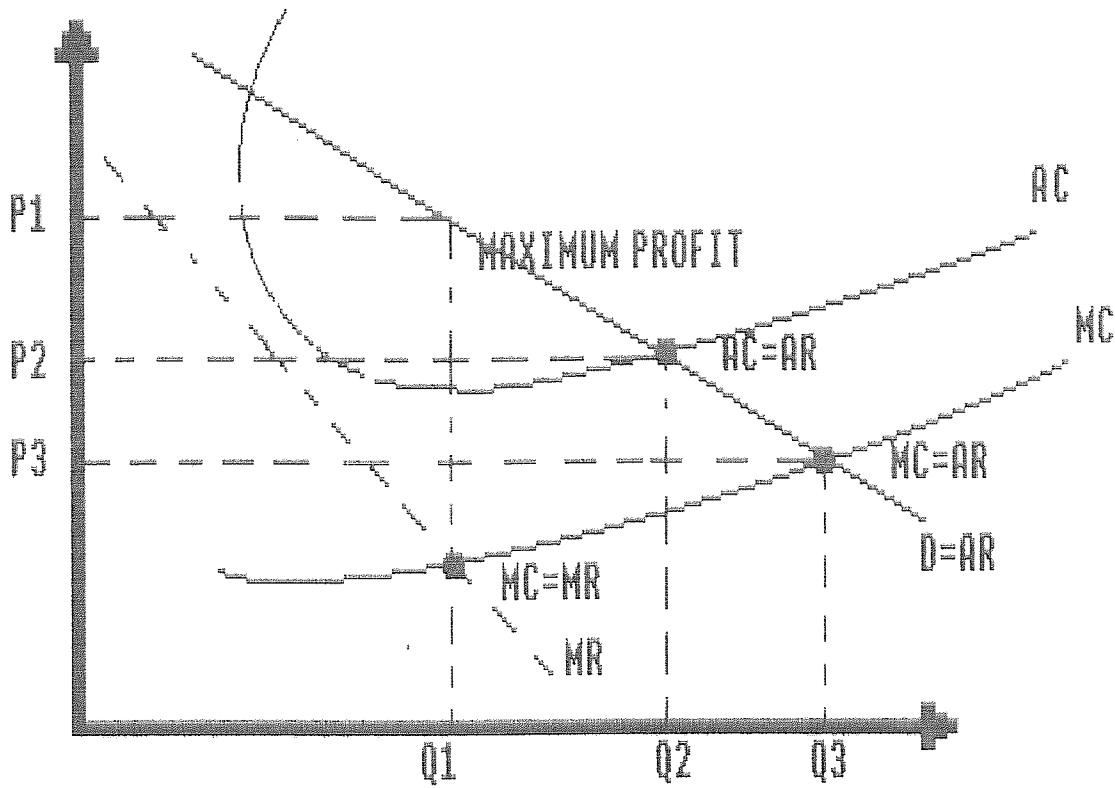
MC MARGINAL COST

FIGURE IV

increase their output. As seen on Figure V, maximum profits are reached when Q_1 is produced and the product price is P_1 . Regulated rates, however, are set at price P_2 and output is forced to Q_2 . Some economists argue that the regulated rate should be set at P_3 or where the marginal cost curve intersects the average revenue curve. This price, however, is lower than the average cost and losses would be incurred. This loss would necessitate a government subsidy which would require the collection of additional taxes, which in the minds of many, outweighs the advantages of pricing at this point.

OLIGOPOLY

An oligopoly describes a market where there are a few suppliers of a commodity. The products can be homogeneous as in the case of the steel industry or differentiated as in the case of the automobile industry. In either case, the products are substitutable, that is, you can purchase the product from any firm. A good example is the breakfast cereal industry. Taking the big three producers, Kellogg's, Post and Quaker Oats, one can see that the sellers offer a large range of substitutable but differentiated products. Large scale production is already set up for the three companies, so if another company tried to enter the market, it would meet with fierce competition and probably be unsuccessful in its attempt.



AR AVERAGE REVENUE

MR MARGINAL REVENUE

AC AVERAGE COST

MC MARGINAL COST

FIGURE V

Several economists have claimed oligopoly to be the prevailing market structure in the American economy. Economies of scale and mergers are part of the reason for this trend. There is no standard theory of behavior in the oligopoly market. Hence, each seller weighs the actions of others in determining price and output. Each new set of conditions results in a different pattern of behavior. Brand names, trademarks, service and advertising are methods used to shift competition away from price. Pricing in this market will be discussed in greater detail in Chapter IV.

MONOPOLISTIC COMPETITION

Monopolistic Competition exists when a large number of firms produce highly substitutable commodities and other firms are free to enter the market with a differentiated or similar product.(1) An example is milk. Anyone can produce milk products. Market entry is easy and products are differentiated on the basis of brand recognition and trademarks. Price competition is intense, since at a certain price, you will no longer care if the milk is packaged by Borden's or A&P. This is even more evident with the introduction of "No-Frills" products at the supermarkets.

The market demand curve is said to be elastic when the quantity demanded responds to changes in price and inelastic when quantity is not responsive. The price elasticity of demand is defined as the ratio of the percentage change in

the quantity demanded to a slight percentage change in the price ($e_p = (P \Delta Q) / (Q \Delta P)$). When the elasticity is greater than one, the demand is elastic and when the elasticity is less than one, the demand is inelastic. For the individual firm, the elasticity is greater than one. If the price of a product changes even a small amount, the quantity sold changes greatly. Figure VI illustrates the demand curves.

Monopolistic competition would like to maximize profits by setting price and quantity at the point where the marginal revenue and the marginal costs intersect. Due to the elasticity of the demand curve, new firms enter the market and reduce the existing firms' demand curve and profit. Nonprice competition, such as advertising, becomes very important in holding onto market share. Figure VII illustrates the shifting demand curve. Chapter IV will discuss nonprice competition in greater detail. Table III summarizes the points in this chapter.

(1) Haveman, Robert H. and Knopf, Kenyon A.,

THE MARKET SYSTEM, John Wiley & Sons, 1981, p.30.

MONOPOLISTIC COMPETITION - DEMAND CURVES

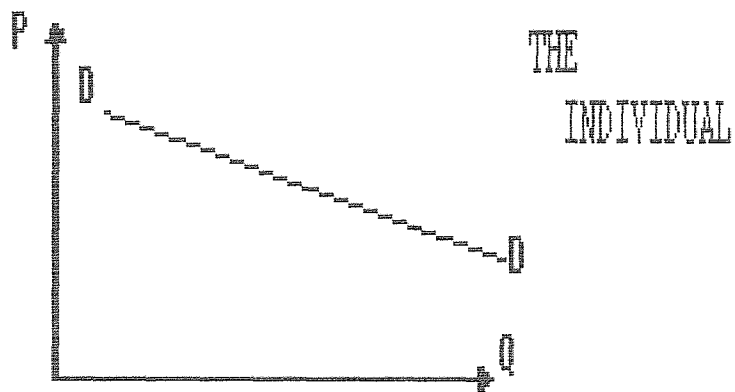
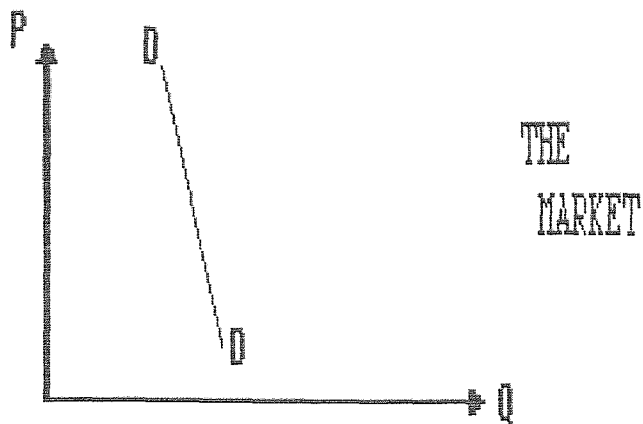
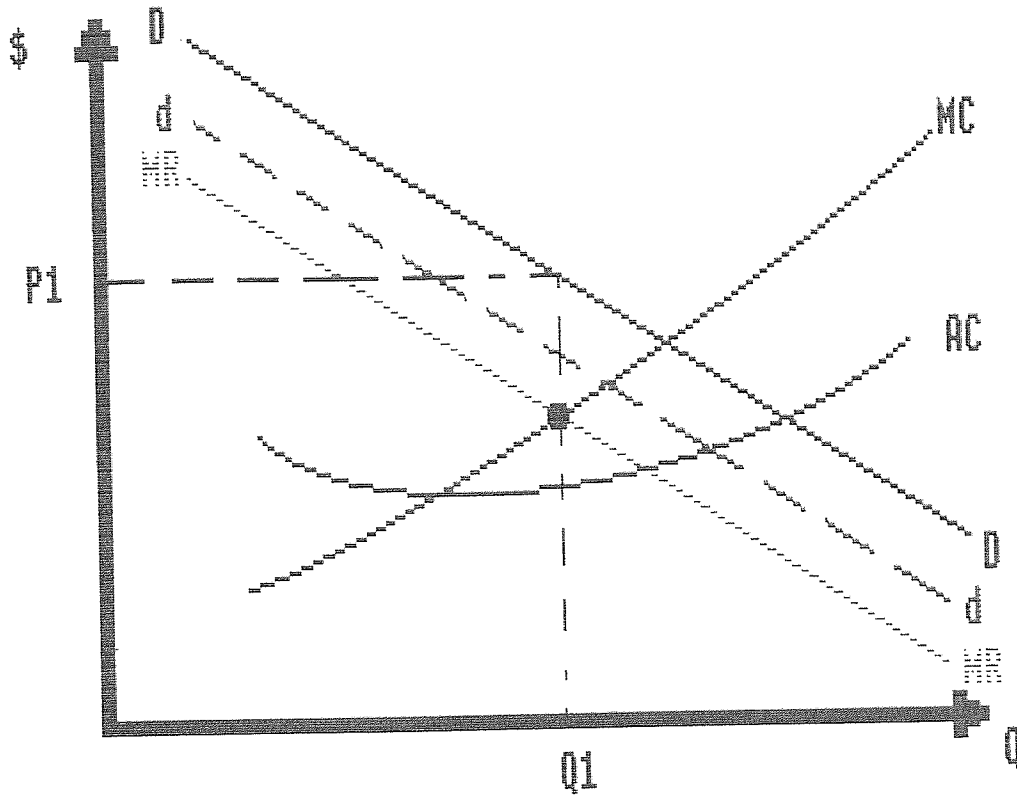


FIGURE VI

MONOPOLISTIC COMPETITION - PROFIT MAXIMIZATION



MC MARGINAL COST

AC AVERAGE COST

D DEMAND

d SHIFTED DEMAND

FIGURE VII

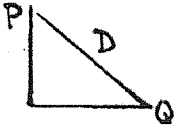
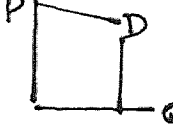
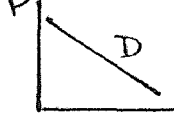

	MONOPOLY	OLIGOPOLY	MONOPOLISTIC COMPETITION	PERFECT COMPETITION
NUMBER OF SELLERS	ONE	FEW	MANY	VERY LARGE
PRODUCT	ONLY ONE	DIFFER- ENTIATED	DIFFER- ENTIATED	UNDIFFER- ENTIATED
EXAMPLES	UTILITY	STEEL, AUTO CEREALS	MILK, BREAD	AGRICULTURE
ENTRY OF NEW FIRMS	NONE	DIFFICULT	SOMEWHAT EASY	EASY
DEMAND CURVES				
PRICING	FREEDOM TO SET PRICES MAXIMIZE PROFIT	PRICE LEADERSHIP PRICE WARS	PRICE COMPETITION	NO CONTROL
PRICING INFLUENCE	CORPORATE IMAGE CONCEPT	TRADEMARKS ADVERTISING SERVICE	DESIGN BRANDS ADVERTISING	NONE

TABLE III

CHAPTER III

DETERMINATION OF COSTS

In order to price a product, it is necessary to develop a cost floor or minimum basic cost which must be recovered in the product price. The total cost of production for a firm is the combination of its total fixed costs (costs that are fixed regardless of output, such as executive salaries) and total variable costs (costs which are directly incurred as a result of producing a product or service, such as material cost and workers wages). For a pricing study, fixed costs are not relevant. Fixed costs do not change in total amount with changes in volume of output or activity of a product and since they can only be arbitrarily allocated to a particular product, the actual cost of the product can not be determined. Variable costs, on the other hand, are directly traceable to a particular product and vary directly by the volume of output. Since these costs are demand sensitive, they reflect the differences in costs resulting from alternate courses of action. The rate of change in the variable cost with the volume of production is called the marginal cost, the cost of producing one additional unit. By using the variable cost approach in combination with an estimation of demand quantities, a price can be developed that will approach profit maximization (marginal revenue equal to marginal cost).

The variable costs, in telecommunication costing terminology, will be defined as resource costs or the total direct costs associated with offering the product. Resource costs can be further categorized as investment-related costs and operating expenses. In order to simplify the cost estimate, the resource costs are assumed to remain constant. In reality, the costs tend to rise as a firm gains some economies of scale, levels out for awhile and then rises again.

INVESTMENT-RELATED COSTS

Investment is defined as the total installed cost of the product which includes materials, engineering and installation costs, and inventory costs. Material includes the price of all components comprising the product and can be obtained from the vendor's price list. Any freight costs, sales taxes or supply expense charged by the vendor must be obtained and included as part of the investment.

Engineering and installation costs are the total direct labor costs associated with planning, designing, ordering and testing equipment plus any incidental expenses. The hourly labor estimates are obtained from the respective department and multiplied by a forward-looking, directly assigned hourly labor rate to arrive at the total labor cost.

Inventory costs include charges for high volume and fast delivery options, field stock and refurbished stock. Inventory costs are based on the cost to order, warehouse and select material for shipment to the field. Stock levels are based on an estimate of demand. The inventory cost per unit is then developed.

OPERATING EXPENSES

Operating expenses are current costs resulting from daily operations of the firm. The major components of operating expenses are maintenance, administration and taxes. Maintenance is the cost incurred for maintenance material (replacement and repair) and for maintenance labor. The administrative expense covers all the directly assignable overhead items (commercial, accounting, etc.) that are not otherwise specifically accounted for in the cost study. A factor is applied to the total investment costs to determine the expense. Property taxes in a resource cost study are calculated by applying a factor against the investment. All of the above items are calculated on a per unit basis.

UNIT COST

The unit cost of the product is simply the total investment-related cost and the per unit operating expense. This unit cost is the minimum basic cost upon which a price

for a customer to purchase a product should be based. If, however, the product is to be leased to the customer the development of the unit cost changes. When a product is leased, it becomes an asset to the firm. The capital costs represent the repayment to the firm of investment dollars in an asset in the form of annually recurring amounts over the life of the product. Annual capital costs include depreciation (capital repayment), cost of money (return on investment) and federal income taxes (tax on return on capital). All capital cost calculations are based on the investment-related costs developed in the resource cost study. Operating expenses are calculated to provide annually recurring per unit amounts. The annual recurring capital costs and operating expenses are combined to arrive at the per unit cost. This cost is the minimum basic cost upon which a price to lease a product should be based. Present worthing techniques at the firm's cost of money interest rate can be used to adjust the annual cost to appropriate monthly unit costs for various lease arrangements. Tables IV and V present a computer model that can be used to mechanize the calculation of the product unit cost.

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ALGORITHM</u>
1.	Material Price	Input \$
2.	Invoice Service Charge	Input \$
3.	Inventory Costs	Input \$
4.	Sales Tax	(L1+2+3)(%)
5.	Supply Expense	Input \$
6.	Transportation Expense	Input \$
7.	Engineering Labor	Input \$
8.	Installation Labor	Input \$
9.	Total Investment Cost	(L1+...+L8)
10.	Maintenance Expense	Input \$
11.	Administrative Expense	(L9)(Input%)
12.	Property Tax	(L9)(Input%)
13.	Miscellaneous Expense	Input \$
14.	Total Operating Expense	(L10+...+L13)
15.	Unit Cost	(L9+L14)

TABLE IV

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>ALGORITHM</u>
1.	Material Price	Input \$
2.	Invoice Service Charge	Input \$
3.	Inventory Costs	Input \$
4.	Sales Tax	(L1+L2+L3)(%)
5.	Supply Expense	Input \$
6.	Transportation Expense	Input \$
7.	Engineering Labor	Input \$
8.	Installation Labor	Input \$
9.	Total Investment Cost	(L1+...+L8)
10.	Economic Life	Input #
11.	Cost of Removal	Input \$
12.	Gross Salvage	Input \$
13.	Net Investment Cost	*See Note 1
14.	Total Capital Costs	*See Note 1
15.	Annual Repair	*See Note 2
16.	Annual Maintenance Expense	Input \$
17.	Annual Administrative Expense	L9(Input %)
18.	Annual Property Tax	L9(Input %)
19.	Annual Miscellaneous Expense	Input \$
20.	Total Annual Operating Expense	(L15+...+L19)
21.	Cost of Money Rate	Input %
22.	Annual Cost To Lease	(L14+L20)
23.	Monthly Cost of X-Year Contract	*See Note 3

TABLE Va

*Note 1: Complex formulas based on development of Book Depreciation Reserve, Tax Reserve and calculation of depreciation, cost of money and federal income tax.

*Note 2: Based on cost of product repair and estimated annual failure rate.

*Note 3: Present worthing techniques at firm's cost of money interest rate.

TABLE Vb

CHAPTER IV

DETERMINATION OF PRICE

Costs are only one factor that determines the pricing decision. Demand quantities must be considered as well. Prior to the pricing of any product, a feasibility study should be undertaken to determine whether or not sufficient product demand exists to warrant introduction of the product. Some questions to be asked are: "What market segment are we interested in?"; "What market share is available from our own cross-elastic products?"; and "What market share is available from our competitors?". This preliminary forecast gives an indication of the availability of a market for the product and answers the question whether or not to continue with the pricing procedure.

Forecasting is not an exact science. No one can predict future activity with absolute certainty. There are, however, many techniques available to the forecaster to lessen the degree of uncertainty. Some of the available methods are listed in the following paragraphs.

MECHANICAL EXTRAPOLATIONS

Extrapolation techniques are distinguished from other forecasting methods in that they are essentially mechanical and not closely integrated with relevant economic theory and statistical data. Basically, this approach says that the

future is an extension of the past. Past data is collected over a period of time and analyzed. Statistical techniques, such as correlation and regression analysis, are employed to extend the past into the future. This method does not take into account any changes that may take place in the future which did not occur in the past.

BAROMETRIC TECHNIQUES

Barometric techniques are based on the idea that the future can be predicted from certain happenings in the present. Statistical indicators, selected time series which provide an indication of the direction in which the economy or particular industries are heading, serve as barometers of economic change.

OPINION POLLING

Opinion polling or sample-survey technique is a subjective method of forecasting. It is based on the idea that certain attitudes affecting economic decisions can be defined and measured well enough in advance so that predictions can be made. People who are directly involved are asked about their expectations of future events.

ECONOMETRIC MODELS

Econometric models are based on the idea that changes in economic activity can be explained by the relationship

between economic variables. Past economic activity and predicted future activity are explained by mathematical equations that express the most probable interrelationships among a set of variables.

All assumptions and sources of data should be documented. It is the understanding and interpretation of the data that lends credence to the forecast.

Having determined a potential market for the product, the pricing procedure can continue with the purpose of identifying the price to select for the product. This chapter describes the steps involved in the pricing process and presents a model that can be used to numerically identify the proper product price.

The key determinants that should be considered when selecting a product price are:

1. Pricing Objectives
2. Market Characteristics and Competition
3. Unit Costs
4. Test Prices
5. Opportunity Costs
6. Nonprice Factor Costs
7. Product Demand

The pricing procedure looks at a number of different product test price strategies that takes into account these key factors, simulates the various strategy effects on the profitability of the firm and finally, identifies the

product price that maximizes profit. Table VI summarizes the steps involved in the pricing procedure. The following paragraphs explain the procedure in greater detail.

PRICING OBJECTIVES

If there is sufficient demand, the next requirement is to identify the pricing objective for the product. Some common pricing objectives are:

1. Seeking a target return on investment
2. Maximizing profit
3. Stabilizing prices or outputs
4. Maintaining market share
5. Increasing market share
6. Meeting or matching competition

The first three objectives can be considered profit-oriented objectives and the product price is usually calculated by using a cost plus mark-up pricing method. The mark-ups are usually based on one or more of the following executive goals:(2)

1. What is believed to be a "fair" or "reasonable" return
2. Industry custom
3. A desire to equal or better the company's recent average return
4. What the company felt it could get

PRICING PROCEDURE

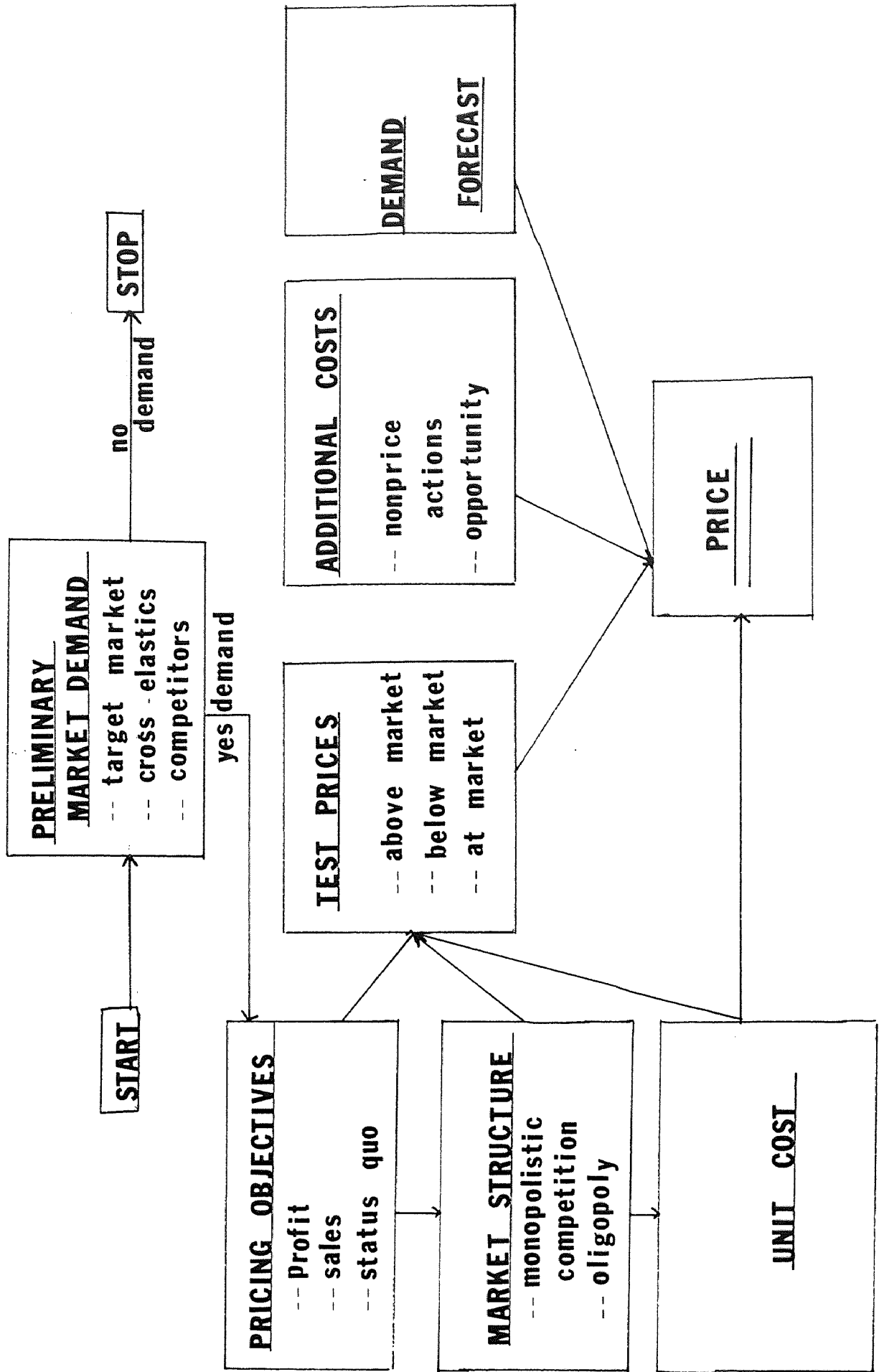


TABLE VI

5. Use of a specific profit target as a means
of stabilizing industry prices

The next two pricing objectives can be considered sales-oriented objectives and emphasis is placed on the demand for the product. Price is only one factor determining a product's market share and attention must also be focused on the nonprice factors affecting consumer demand, such as service, quality and advertising.

The final objective is status-quo. Prices are simply set at those of the competitor whether through fear of losing competitive status or fear of violating antitrust laws concerning price discrimination. Usually, a corporation prices to meet a number of these pricing objectives.

MARKET CHARACTERISTICS AND COMPETITION

Having specified the pricing objectives, the market characteristics and competition need to be considered. In the monopolistic competition marketplace, since there are so many competitors and entry is easy, products should be removed from price competition by differentiating the product. This can be accomplished by using an additional unique feature, new packaging or advertising to promote a different image.

Since there are only a few firms in the oligopoly marketplace, the firms practice leadership pricing and tend to price at the same level as their competitors. A price cut

by one firm is usually met with price cuts by competitors. The result is no new sales are gained and profits are reduced. The price leader is usually a firm that has been successful and whose judgement is accepted by the other firms in the industry. The price leader sets a price, dependent upon its own pricing objectives, and all other firms in the industry usually follow the leaders' initiative. Reasons for this type of action may be:(3)

1. A fear or desire on the part of the price follower to avoid provoking a price war
2. A belief by the follower that profits are larger in the long run under the refuge of the leaders' price umbrella for the industry as a whole
3. The follower finds it easier or more convenient to follow the leader
4. Suppliers to the industry have raised their prices and a "justified" (cost-induced) price increase is merely initiated by the leader

A firm must analyze the characteristics of the market segment the product will be in and combine those findings with its pricing objectives in order to arrive at a product pricing strategy.

TEST PRICES

Test prices should be set within the range delineated by the pricing objective, the market characteristics and the unit costs. Each test price is a price associated with a specific product strategy based on those factors.

For example, if the pricing objective is profit-oriented and the product is in the monopolistic competition marketplace, test prices could be set at:

1. Cost plus mark-up according to executive goals regardless of the market price
2. Price above the market price with intense nonprice actions to differentiate the product
3. Cost plus mark-up to insure profits but below the market price

If this firm also wanted to increase market share, they would not consider strategy 1. This strategy would not gain many customers but might yield the highest profit. It is, however, inconsistent with the sales-oriented objective and would not be considered as a viable strategy.

In the oligopoly marketplace, regardless of the pricing objective, a firm usually prices at the same level as competition. The firm can differentiate its product to gain some additional market share or control costs to gain

additional profit. If the firm is a price leader, it can set prices at a level to maximize its profits or at a level to maximize market share. Product differentiation becomes a very important aspect of the pricing strategy in this marketplace.

ADDITIONAL COSTS

Before the pricing process can continue, costs associated with nonprice actions and the opportunity costs of the cross-elastic products must be identified. The costs associated with the nonprice actions, if any, must be calculated for each pricing strategy. The costs are the total dollars to be spent for such activities as advertising, promotions, packaging, sales, training, etc. to achieve the strategy objective. Profit and demand are directly affected by these actions.

Opportunity costs are often overlooked even though they have a bearing on both the profitability and demand for the primary product. When a product is priced, it represents an acceptable alternative. But in doing so, the rejected alternatives either provide additional benefits (complementary cross-elasticities) or provide additional sacrifices (substitute cross-elasticities). These benefits and sacrifices are defined as the opportunity costs of the accepted alternative.

For a complementary cross-elastic product (a product whose demand grows along with the primary product), gained opportunity can be realized by the firm. Since the demand for the complementary cross-elastic increases, the selected alternative, the pricing of the primary product, has a positive effect. If the revenue gained minus the cost incurred is greater than zero, gained opportunity results.

The demand for a substitute cross-elastic product decreases as the demand for the primary product increases. When a substitute cross-elastic product is not sold as a result of the introduction of the primary product, lost opportunity results. All potential revenue is lost and no costs are incurred. If a product is taken out of service, revenue is lost, operating expenses are avoided and remaining capital costs are not recovered. If costs are greater than revenue, the opportunity is negative. The opportunity costs for each cross-elastic product for each year of each strategy are added together and the net opportunity cost per year per strategy results.

ACTUAL DEMAND

The next requirement in the pricing procedure is to forecast the product demand at the various assumed test prices and its corresponding strategy. This means that the forecast must take into account the effect the test price has on the total demand plus the effect nonprice factors,

cross-elastic products and competitors have on the demand as well.

CHOOSING THE PRICE

As discussed, the key determinants involved in pricing are the unit costs, the test prices for various strategies, the corresponding nonprice action costs, opportunity costs, and demand forecasts. Next one must combine the determinants, simulate the various strategy effects on the profitability of the firm and finally, choose the product price that maximizes profit.

All of the pricing procedure components are incremental (marginal) in nature; they only reflect the specific activities having a bearing on the product strategies. An incremental analysis is performed with the purpose of determining what effect the various strategies have on the total costs and on the profitability of the product in the future. The analysis shows the level of profit as a result of a change in any of the determinants with the ideal situation being where profits are maximized. A pricing model will be presented to demonstrate the incremental pricing analysis the procedure describes.

Pricing can be based on either the long or short term. Short term pricing, usually one to two years, is most appropriate in the oligopoly marketplace when competitors do not yet exist and when substitute products are not yet

available. Firms often wish to price high at the start and reprice when competitors enter the marketplace.

Long term pricing is appropriate in marketplaces where competitors already exist or where substitute products are available. A period of three to five years is normally long enough for the market as well as the firm to adjust to any changes.

TELECOMMUNICATION PRODUCT PRICING MODEL

Table VII presents a spreadsheet format that can be utilized to mechanize the pricing decision process. The following paragraphs present a line-by-line description of how to use the model.

The model is designed for a five year period. If the product is to be priced in the short term, only the first or second years would be included and for the long term, years three to five would be included depending upon the planning period.

The first component is the test price per unit. The test price is a per unit value since it is a demand sensitive component. Line 9 is the per unit test price corresponding to strategy 1, line 10 corresponds to strategy 2 and so on. The number of product strategies can be more or less than three. The test price is assumed to remain constant throughout the strategy planning period.

TELECOMMUNICATION PRODUCT PRICING MODEL

YEAR	I-INPUT			C-CALCULATION			E-SUM
	1987	1988	1989	1987	1988	1989	
TEST PRICE / UNIT							
Strategy 1	I9	I9	I9	I9			
Strategy 2	I10	I10	I10	I10			
Strategy 3	I11	I11	I11	I11			
TOTAL DEMAND							
Strategy 1	I13B	I13C	I13D	I13D			CE13
Strategy 2	I14B	I14C	I14D	I14D			CE14
Strategy 3	I15B	I15C	I15D	I15D			CE15
UNIT COST							
Strategy 1	I18	I18	I18	I18			
Strategy 2	I18	I18	I18	I18			
Strategy 3	I18	I18	I18	I18			
NON-PRICE FACTORS							
Strategy 1	I23B	I23C	I23D	I23D			CE23
Strategy 2	I24B	I24C	I24D	I24D			CE24
Strategy 3	I25B	I25C	I25D	I25D			CE25
OPPORTUNITY COSTS							
Strategy 1	I28B	I28C	I28D	I28D			CE28
Strategy 2	I29B	I29C	I29D	I29D			CE29
Strategy 3	I30B	I30C	I30D	I30D			CE30
TOTAL REVENUE							
Strategy 1	(I9) X (I13B)	(I9) X (I13C)	(I9) X (I13D)	(I9) X (I13D)			CE33
Strategy 2	(I10) X (I14B)	(I10) X (I14C)	(I10) X (I14D)	(I10) X (I14D)			CE34
Strategy 3	(I11) X (I15B)	(I11) X (I15C)	(I11) X (I15D)	(I11) X (I15D)			CE35
TOTAL COSTS							
Strategy 1	18(13B) + 23B + 28B	18(13C) + 23C + 28C	18(13D) + 23D + 28D	18(13D) + 23D + 28D			CE38
Strategy 2	18(14B) + 24B + 29B	18(14C) + 24C + 29C	18(14D) + 24D + 29D	18(14D) + 24D + 29D			CE39
Strategy 3	18(15B) + 25B + 30B	18(15C) + 25C + 30C	18(15D) + 25D + 30D	18(15D) + 25D + 30D			CE40
PROFIT							
Strategy 1	D33B - D38B	D33C - D38C	D33D - D38D	D33D - D38D			CE43
Strategy 2	D34B - D39B	D34C - D39C	D34D - D39D	D34D - D39D			CE44
Strategy 3	D35B - D40B	D35C - D40C	D35D - D40D	D35D - D40D			CE45

TABLE VII

The next component is the demand forecast. Line 13 represents the annual demand for the product as a result of implementing strategy 1. There is a different demand for each year of the planning period. Line 14 corresponds to strategy 2 and line 15 to strategy 3.

Lines 17 through 20 represent the unit product cost as described in Chapter III. The unit cost per product is later multiplied by the demand per year to arrive at the total product costs.

Nonprice factors, on lines 22 through 25, are the total dollars spent each year for each strategy for the nonprice actions having a bearing on the product demand.

Lines 27 through 30 are the total net opportunity costs associated with each strategy for each year of the planning period.

Total revenue for strategy one is the test price per unit for strategy one multiplied by the demand forecast for each year of the strategy one planning period (i.e. line 9 multiplied by line 13B, line 9 multiplied by line 13C, etc.). This process is repeated for each strategy. The total revenue for the strategy is the summation of the total revenue for each year of the strategy.

Lines 37 through 40 are the total costs. For strategy one, the total cost for year one is the unit cost times the strategy one year one demand plus the nonprice factor cost and opportunity cost for year one, strategy one. The

calculation is repeated for each year of each strategy. The results for each year are combined to arrive at the total cost for the strategy.

Profit is total revenue less total cost. For each strategy, the profit is calculated as the total revenue in a year less the total cost in a year. For example, the profit for strategy one, year one is line 33B (total revenue, strategy one, year one) less line 38B (total cost, strategy one, year one). The profit level for each year is added together to arrive at the total strategy profit over the planning period. The strategy with the maximum profit yields the optimum price. Finally, the model summarizes the pricing results. Chapter V will show the use of the pricing procedure and the pricing model.

(2) Seo, K.K. and Winger, Bernard J., MANAGERIAL

ECONOMICS, Richard D. Irwin, Inc., 1979, p. 292

(3) Ibid, p.290

CHAPTER V

CASE STUDIES

This chapter presents three case studies that demonstrate how the pricing procedure and model discussed in the previous chapters, are to be used as a decision tool for pricing a product. The first case study, Small Business PBX - The HMS, examines a firm that wishes to introduce a new product to a select market segment. The case demonstrates the first step required in the pricing procedure: a feasibility study to determine if product demand warrants the introduction of the product.

The second case, the Local Area Data Set (LADS), demonstrates the pricing of the product from the development of costs all the way through to the selection of the product price.

The final case, Long Distance Telephone Service, looks at an exception to the rule, a product where the pricing procedure objective is not to identify the product price that maximizes profit, but rather to identify product profitability as a result of the implementation of various marketing strategies.

CASE STUDY I - SMALL BUSINESS PBX - THE HMS

The PBX is a telephone switching system that is usually located on the customer premises and provides for internal communication within the customers organization as well as facilities for connecting these telephones to the outside telephone network. A firm wishes to introduce a new product, the HMS, to fill a need for a product in the small line size hotel/motel market segment. There is tough competition with many vendors already selling low priced reliable systems. These characteristics lead the firm to believe the product will be sold under monopolistic competition market conditions. At the same time, the firm feels that customers will perceive this product as different because of its unique features such as automatic wake-up service and single digit dialing.

The first step in the pricing procedure is to determine if there is a need for this product in the small line size hotel/motel market segment. An econometric model was used to determine whether there was enough demand to warrant introduction of the product. The following is a step-by-step process for determining the demand potential.

After extensive analysis of the factors affecting demand in this market segment, it was determined that interest rates determined what purchases were made. Small hotel/motel establishments must compete for investment funds, are high

risk and pay well above the prime rate. Fixed costs and provisioning expenses, such as food and beverages, continue to rise with inflation, leaving little capital for major investments.

A plot of the interest rates, obtained from the Federal Reserve Board, and past demand for communication systems in the hotel/motel segment similar to the HMS is shown in Figure VIII. Visual inspection of the plot points out there is an inverse relationship between the variables. As interest rates rise, the demand for systems decline.

HMS - INTEREST RATES vs SALES

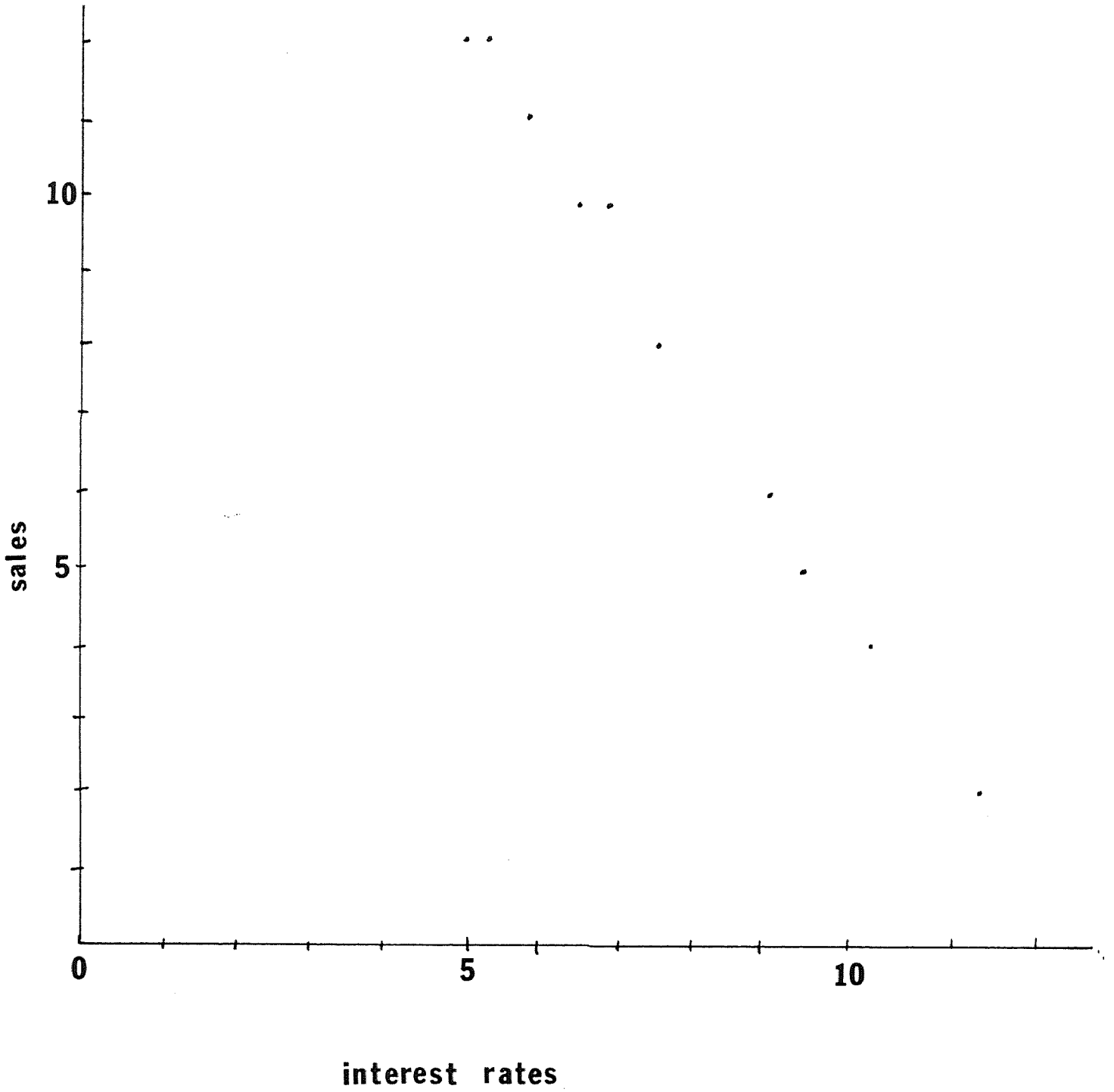


FIGURE VIII

The statistical method of least squares is used to determine the regression line. The following is a mathematical derivation of the regression equation:

TIME	INTEREST RATE(X)	SALES(Y)	(X)(Y)	x ²	y ²
Yr 1:1	5.25	12	63	27.6	144
:2	5.25	12	63	27.6	144
:3	5.42	12	65	29.38	144
:4	5.93	11	65	35.16	121
Yr 2:1	6.46	10	65	41.74	100
:2	6.78	10	68	45.97	100
:3	7.50	8	60	42.25	64
:4	9.09	6	55	82.63	36
Yr 3:1	9.50	5	48	90.25	25
:2	9.50	5	48	90.25	25
:3	10.21	4	41	104.24	16
:4	11.92	2	24	142.09	4
Total 12	91.81	97	665	759.15	923

$$\bar{X} = 7.65$$

$$\bar{Y} = 8.08$$

$$Y = a + bX$$

$$b = \frac{\sum xy - n\bar{X}\bar{Y}}{\sum x^2 - n\bar{X}^2} = \frac{665 - 12(7.65)(8.08)}{759.15 - 12(58.52)} = -1.35$$

$$a = -b\bar{X} + \bar{Y} = -(-1.35)(7.65) + 8.08 = 18.41$$

The equation for the regression line is $y = 18.41 - 1.35x$. Figure IX is a graphical representation of the regression line drawn on the scatter diagram of the variables.

To see whether or not this equation does indeed provide the "best fit" for the data, the standard error of estimate is calculated. Sales values (y) are calculated using the regression equation with the actual interest rates (X). The calculated sales values are compared to the actual sales values (Y) and the square root of the squares of the deviations ($Y - y$) is divided by the number of observations. The standard error of estimate is .64. This means that approximately 68% of the forecasted future sales, based on interest rates, will be within + or - .64 of the actual sales and 95.5% will be within + or - 1.28 of the actuals. The results are satisfactory for this analysis. Figure X is a plot of the actual versus calculated sales.

In addition to the graphical representation of the "fit" of the regression line, statistical methods can be used to determine the validity. One method is the coefficient of determination, r^2 . The mathematical equation

$$r^2 = 1 - \frac{\sum(d^2)}{\sum(y^2) - (\sum y)^2/n}$$

HMS - INTEREST RATES vs SALES

REGRESSION LINE

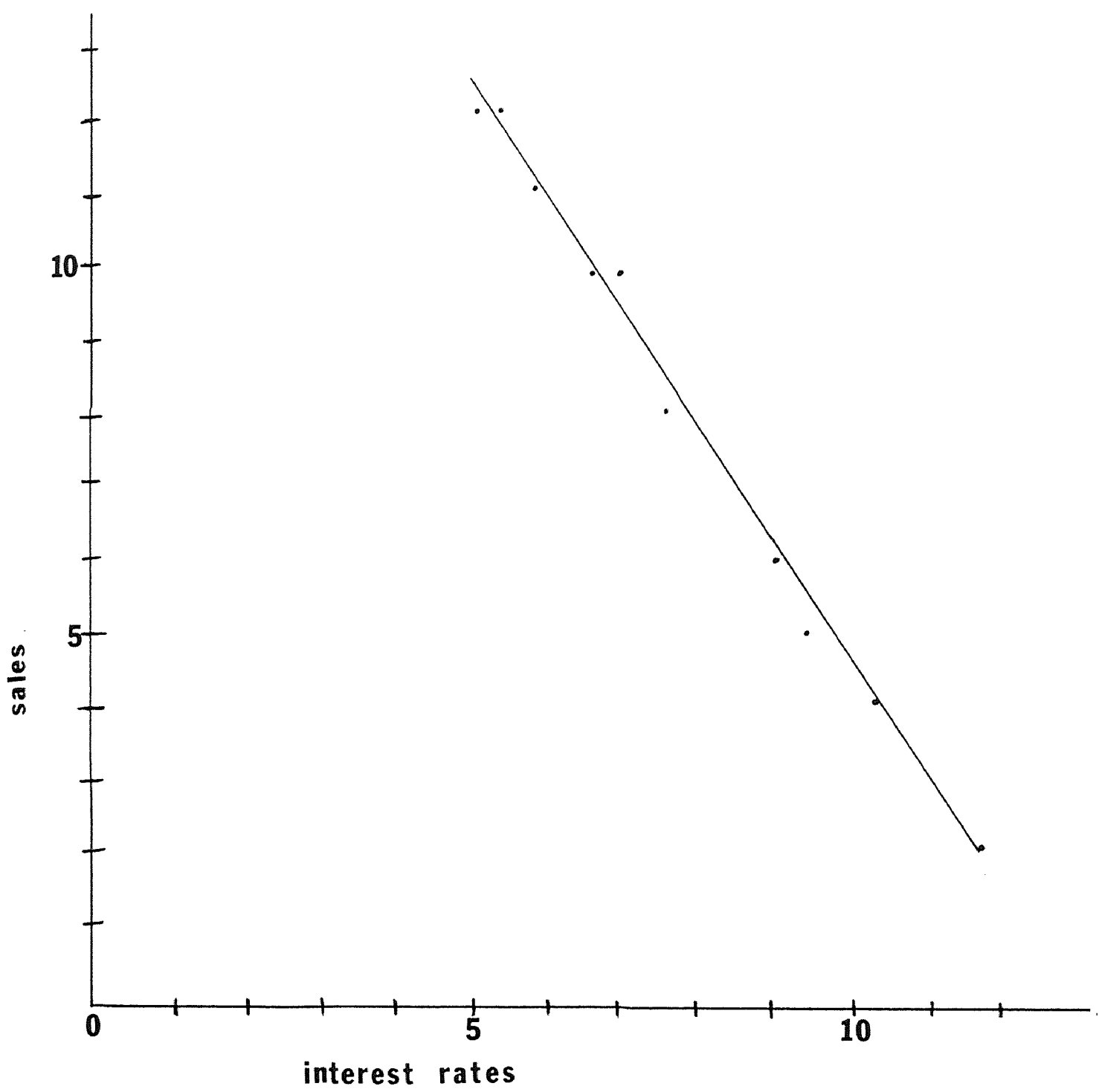
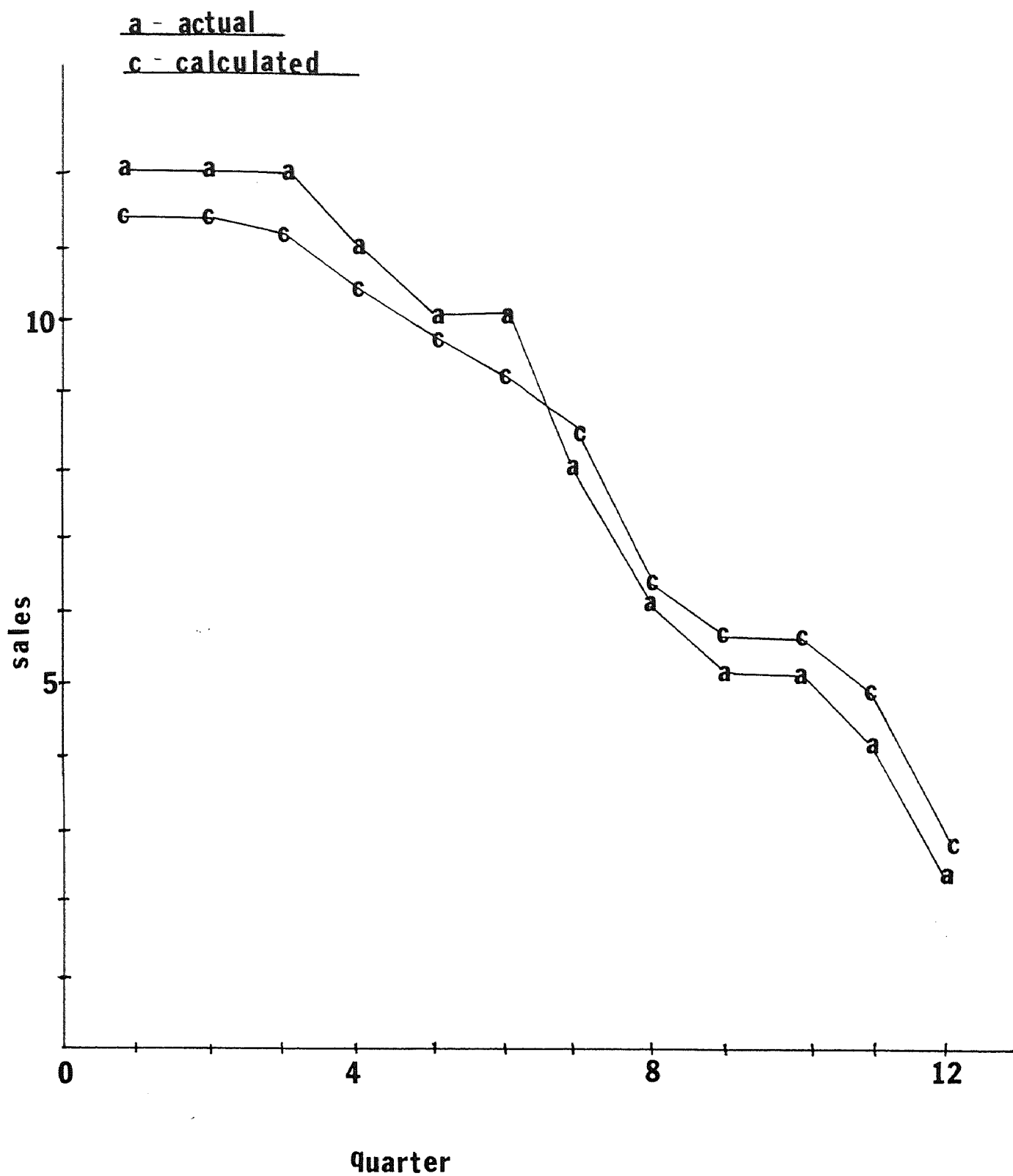


FIGURE IV

HMS - ACTUAL vs CALCULATED SALES



FIGIURE Y

The calculation is as follows:

ACTUAL (Y)	CALCULATED (y)	d = (Y - y)	d ²
------------	----------------	-------------	----------------

12	11.32	.68	.46
12	11.32	.68	.46
12	11.09	.91	.83
11	10.40	.60	.36
10	9.70	.30	.09
10	9.26	.74	.55
8	8.29	-.29	.08
6	6.14	-.14	.02
5	5.59	-.59	.35
5	5.59	-.59	.35
4	4.63	-.63	.40
2	2.37	-.37	.14
<hr/>			
97			4.09

$$r^2 = 1 - \frac{4.09}{9.23}$$

$$= \frac{9.23 - 4.09}{9.23} = .97$$

The coefficient of determination is equal to .97 or 97%.

This means that 97% of the variations in the demand for the product are in fact explained by the interest rates.

The model appears to be valid and will be used to determine whether or not to introduce the HMS. Interest

rates for the next four quarters are collected and using the regression equation, the anticipated sales are calculated.

Following are the calculations:

$$y = 18.41 - 1.35x$$

TIME	INTEREST RATES (X)	SALES (Y)
Year 4:1	12.53	1.5
:2	12.53	1.5
:3	10.23	4.6
:4	10.53	4.3

Figure XI plots the results.

As a result of this analysis, it was decided not to introduce the HMS at this point in time. Interest rates were not stable and were not expected to drop enough to justify the introduction of the product. The pricing procedure stops at this point.

HMS - ACTUAL & PROJECTED SALES

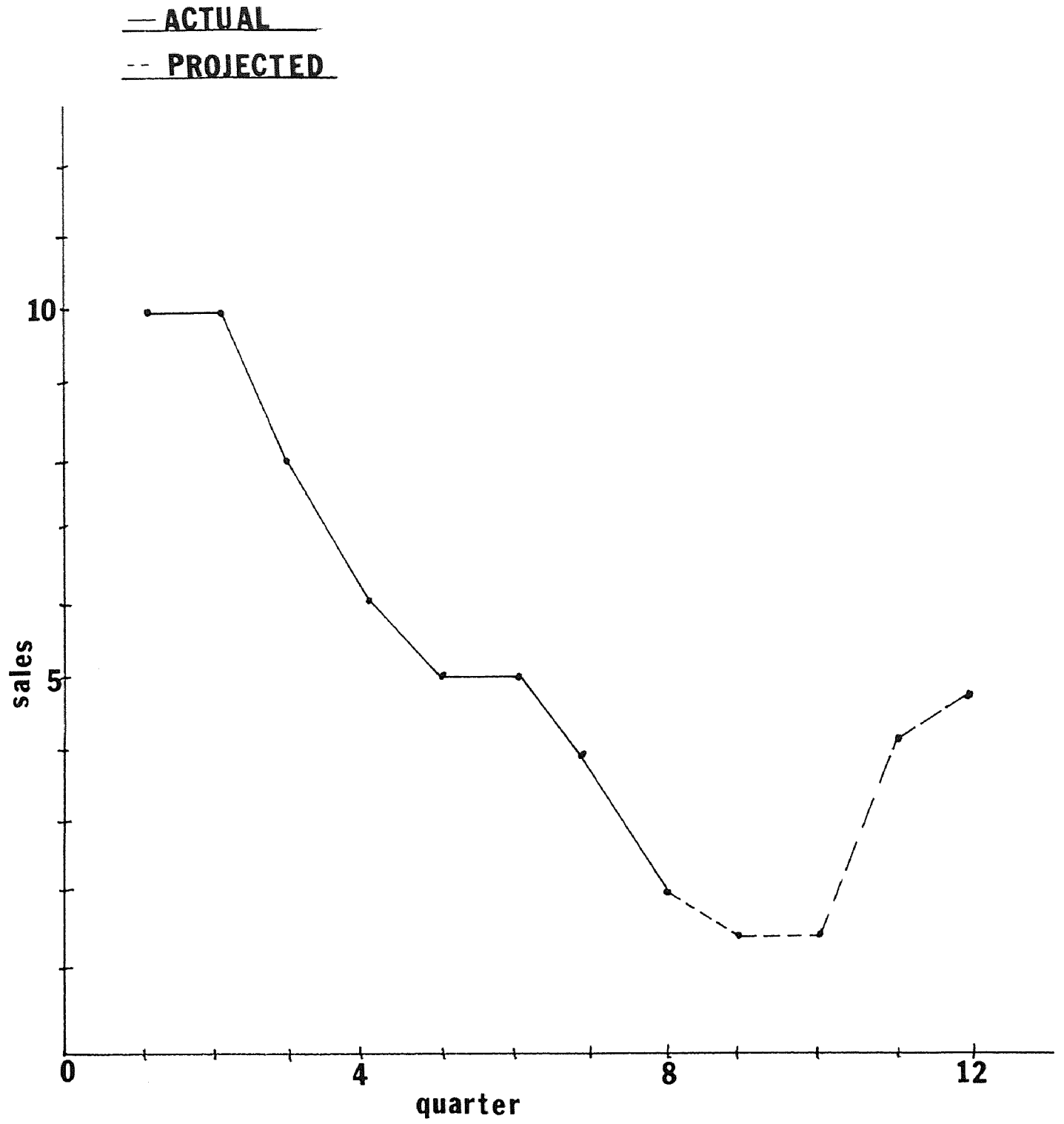


FIGURE VI

CASE STUDY II - THE LOCAL AREA DATA SET (LADS)

The Local Area Data Set (LADS) is a variable speed, limited distance data set designed to transmit and receive data at 2400, 4800, 7200, 9600 or 19,200 bps over Series 9000 2 or 4 wire non-loaded channels. Provided on two point channels between locations in a serving wire center, the LADS provides an ideal answer to data communications in applications where the user data processing function is concentrated in a localized area. These needs occur in industrial and governmental sites as well as large office complexes. Other typical applications are hospital environments and campus-type locations.

This product provides a low cost alternative to long haul data sets. The LADS is designed and engineered for maximum reliability and uptime. System performance is easily monitored through system status and mode indicators (LED's) which are front panel monitored. LADS incorporates simple test routines and diagnostics which permit verification of normal operation and fast, simple fault isolation. LADS provides capabilities for local loopback selftest and remote digital loopback selftest which can be performed on an unattended remote LADS. These tests provide positive verification that both local and remote LADS and the

connecting telephone lines are functioning properly. The question remaining to be answered is, should the product be introduced?

A customer pre-survey indicates that LADS is an excellent product. Some concerns raised by potential customers are planned obsolescence and adaptability, and need and availability of additional services. Price is a factor in relation to available alternatives.

Further analysis indicates there is an available market. Competitive products are not yet available. Office complexes are being built in the area and the majority will be using localized data communications. It is feasible to introduce the product.

The next step is to determine the unit cost for the product. The material price is obtained from the vendor's price list and includes all components needed for the complete installation of the product. The material cost for LADS is \$100.00. Other charges required by the vendor are an order invoice service charge of 2.54% of the material price or \$2.54. Transportation expense for the product is \$10.00 and miscellaneous supplies cost \$5.00.

Inventory costs are considered next. These costs are developed by setting an objective level of stock, based on ordering intervals, demand quantities, stocking facilities and product cost. The objective stock level is 16% or a cost of \$16.00. A sales tax of 6% is levied against the material

cost, invoice service charge and inventory cost for a total cost of \$7.11.

Engineering labor consists of planning, designing and ordering equipment. Installation labor consists of obtaining and installing the product. Labor hours are estimated by the appropriate departments by either using the technical specifications, performing a test installation or by using labor hours from a comparable product. The estimated labor hours are multiplied by directly assignable, forward-looking hourly labor rates to arrive at the total labor cost. The engineering labor for LADS is 1 hour at an hourly rate of \$74.60. The installation labor is 1.5 hours at an hourly rate of \$28.15 for a total cost of \$42.23.

Maintenance expense is estimated in the same manner as engineering and installation labor. Technical specifications, tests or similar products are used to estimate any miscellaneous materials or labor needed to keep the product in service. Maintenance labor is estimated to be 1/2 hour at \$28.15 per hour. Miscellaneous material is \$2.31. Total maintenance expense is \$16.38.

Administrative expense and property tax are developed factors applied to the investment cost. The factors are developed through extensive studies that consider the type of product and the directly assignable expenses usually incurred by that type of product. The administrative factor is .0242 and the property tax factor is .0153.

Administration costs are \$6.25 and the property tax is \$3.95.

Using a computerized cost model, as developed in Chapter III and shown in Table VIII, the unit cost to purchase a LADS is determined to be \$284.06.

The next step is to determine the pricing objective for the product. As stated at the beginning of the case, a customer pre-survey indicated that price is a factor, if alternatives are available at a lower price. LADS is designed to provide a low cost alternative to the higher priced long haul data sets. The company wants to keep the price low and gain as high a market share as possible. It is the belief of product management that once the target market is penetrated, the customers will be likely to continue to purchase data and communications products exclusively from the firm.

There are numerous vendors in the data set market. The LADS, however, is differentiated from other data products through its design and application, and, in addition, the market is limited to those complexes where the data processing function is concentrated in a localized area. The company expects only a few competitors to market a similar product very quickly and at a comparable price level. Therefore, the LADS should be priced under oligopoly conditions.

LADS - UNIT COST

<u>ITEM</u>	<u>DESCRIPTION</u>	
1.	Material Price	\$100.00
2.	Invoice Service Charge	2.54
3.	Inventory Costs	16.00
4.	Sales Tax	7.11
5.	Supply Expense	5.00
6.	Transportation Expense	10.00
7.	Engineering Labor	74.60
8.	Installation Labor	42.23
9.	Total Investment Cost	<u>\$257.48</u>
10.	Maintenance Expense	16.38
11.	Administrative Expense	6.25
12.	Property Tax	3.95
13.	Miscellaneous Expense	.00
14.	Total Operating Expense	<u>\$ 26.58</u>
15.	Unit Cost	<u><u>\$284.06</u></u>

Table VIII

The test price range is set on the lower end by the LADS unit cost of \$284.06 and at the high end by the price of a comparable long haul data set of \$830.00. A number of test prices can be set within this range. Product management determined from the customer pre-survey that the price of LADS had to be at least 25% lower than the long haul sets in order to be considered as a viable alternative. Therefore, the high end of the test price range is reduced to \$698.00. Within this range, test prices consistent with the pricing objective and market considerations are developed.

The first test price is a cost plus 30% mark-up or a \$370.00 price. Advertising and sales force expenditures will be kept to a minimum with emphasis placed on the price comparison to alternative products. A 30% mark-up is customary in the marketplace, if competitors enter the market, they will probably enter within that price range.

A second test price is \$485.00. This price is approximately midway between the high and low ends of the pricing range with a 70% mark-up over costs. Advertising expenditures will be high with emphasis placed on the innovativeness of the product, especially as a viable low cost alternative to present modes of data transmission, and on the reliability and adaptability of the product. The sales force will actively seek customers, reemphasize the advertising claims and calm customer fears about planned obsolescence and availability of additional services. With

this test price, the company feels it can make a substantial profit while still maintaining a price considerably less than any of the available alternative products, thus gaining the desired market share. Competitors are expected to follow this example and set prices either at or slightly below this level.

A third test price is \$570.00 which is double the cost of the product but still below the price of alternatives. Advertising will be the same as in the test price 2 strategy. Sales force expenditures will be increased so that more customers can be reached in a shorter period of time. The strategy here is to capture as much market share as possible at the higher price and to lower the price if necessary as competitors enter the market.

A fourth test price could be set at the high end of the price range or at \$698.00. At this price, however, most customers would not consider LADS. Any number of test prices could be developed within the pricing range, however, it is impossible to forecast demand for such slight changes in price. The three test prices are sufficient for this analysis.

The annual cost of advertising and sales force expenditures is calculated for each of the test price strategies. These costs represent only the additional costs

incurred by the firm as a result of introducing LADS. The company currently spends approximately 2% of its data product sales dollars on advertising and employs a data sales force of 100 representatives. Each time a new product is introduced, the representatives attend a one day training seminar at the corporate training center. The relationships between consumer demand and advertising dollars spent and between consumer demand and sales force expenditures are continually analyzed so that correlations can be made. This data is used to estimate expenditures for LADS.

For test price 1, advertising dollars spent will be \$1000.00 each year. This figure is based upon the minimum amount necessary to provide additional print ads for the product. The existing sales force will sell LADS through normal channels at no additional cost to the firm.

For test price 2, the firm wants to increase the amount of ads and provide promotional items, such as coffee mugs and key rings, at trade expositions. From past analyses, the cost to achieve this is \$8000.00 in the introductory year and \$5000.00 each year after. The sales force will contact potential customers by phone. Past data indicates that by using this method, 100 sales can be made by a sales rep in the introductory year and 250 sales once the product is accepted in the marketplace. The force will require additional training, concentrating on the technical design and application of the product. The cost for this training

is \$125.00 per representative (the cost of a technical instructor and educational materials). Based on the desired demand, this equates to a total cost of \$2500.00 (2000units/100sales x \$125.00) in the introductory year and \$1250.00 each year after.

For test price 3, the advertising expenditures will be the same as strategy 2. The sales force will actively seek out customers and contact them in person. Aggressive sales techniques are necessary to compensate for the higher price. Past data indicates that by using this method, 50 sales per representative can be made the first year and 125 sales each year after. Again, the force will require additional training at a cost of \$125.00 per rep. In addition, another \$125.00 per sales rep will be incurred for transportation and miscellaneous client entertainment expenses. Based on the desired demand, the total sales force expenditures will be \$5000.00 in the first year and \$2500.00 each year after.

Cross-elastic effects must be considered next and the opportunity costs calculated. There are no complementary cross-elastic products, since all long haul data sets are considered to be substitute products. Based on the cross-elasticity of demand formula, $e_D = P_x \Delta y / y \Delta P_x$, the decrease in demand for the long haul data sets (y) can be calculated relative to the price of LADS (x). The opportunity cost is the long haul data sets' estimated future demand less the calculated decrease in demand times

the price of the product. Using this method, for test price 1, 1/3 of the forecasted demand for the long haul data sets will be lost as a result of the introduction of LADS for the first three years. This equates to a lost opportunity of \$231,000, \$317,000 and \$417,000 each year respectively. For test price 2, the net opportunity cost for the first three years of LADS introduction will be \$115,000, \$159,000 and \$208,000. For test price 3, lost opportunity will be minimal at \$87,000, \$119,000 and \$156,000.

A product demand for each of the test prices and the corresponding strategy must now be developed. The product is being priced over a three year period. The firm does not expect competitors to undercut the price but does expect them to enter the market within the three year period. The forecasted product demand is based on the total potential target market adjusted for the assumed test rates and for the effect of increasing competition in years 2 and 3. The product demands are further adjusted to reflect the effect of advertising and sales force expenditures, and for customers who will stay with the long haul data sets regardless of the LADS price.

The forecasted product demand for each strategy is as follows :

Strategy	Year 1	Year 2	Year 3
1	2630 units	2850 units	3000 units
2	1820 units	2300 units	2450 units
3	930 units	1125 units	1300 units

The concluding step in the pricing procedure is to enter the data into the model and evaluate the results. Table IX presents the model and results.

The strategy with the maximum profit is strategy 2, specifying a price of \$485.00 per unit. This is the price that the firm should charge a customer for this product. Although strategy 1 will create the highest demand for the product and is consistent with the pricing objective of attaining the highest market share possible, it will lead to negative profit for the firm. Strategy 2 allows for the optimum level of market share and profit.

LADS - PRICING MODEL

I-INPUT		C-CALCULATION		E-SUM	
YEAR	1987	1988	1989	TOTAL	
TEST PRICE / UNIT	370	370	370		
Strategy 1	485	485	485		
2	570	570	570		
3					

TOTAL DEMAND					
Strategy 1	2630	2850	3000	8480	
2	1820	2300	2450	6570	
3	930	1125	1300	3355	

UNIT COST					
Strategy 1	285	285	285		
2	285	285	285		
3	285	285	285		

NON-PRICE FACTORS					
Strategy 1	1000	1000	1000	3000	
2	10500	6250	6250	23000	
3	13000	10000	10000	33000	

OPPORTUNITY COSTS					
Strategy 1	231000	317000	417000	965000	
2	115000	159000	208000	482000	
3	87000	119000	156000	362000	

TOTAL REVENUE					
Strategy 1	973100	1054500	1110000	3137600	
2	882700	1115500	1188250	3186450	
3	530100	641250	741000	1912350	

TOTAL COSTS					
Strategy 1	981550	1130250	1273000	3384800	
2	644200	820750	912500	2377450	
3	365050	449625	536500	1351175	

PROFIT					
Strategy 1	-8450	-75750	-163000	-247200	
2	238500	294750	275750	809000*	
3	165050	191625	204500	561175	

TABLE IX

CASE STUDY III - LONG DISTANCE TELEPHONE SERVICE

When AT&T had a monopoly on long distance telephone services, rates were continually scrutinized by state and federal regulators. Charges were set under a complex system referred to by AT&T as "nationwide average pricing" and "separations". AT&T priced its long distance services relatively high in order to subsidize local service to residential customers. AT&T's system of pricing kept the cost of basic telephone service low for the average customer and provided "universal service" or the ability for everyone who needed phones to have one.

In the mid-70's, the U.S. Appeals Court allowed full long distance competition by approving MCI's Execunet service. AT&T was still burdened, however, with providing universal service and maintaining the nation's wire and cable telephone network. MCI was able to build a microwave network between selected cities and capture some of AT&T's largest business customers by charging lower prices. MCI could not afford, however, to build a network to all locations. In 1978, AT&T and MCI worked out an agreement called ENFIA (Exchange Network Facilities for Interstate Access). MCI had to rent access from the Bell operating companies to their local exchanges. MCI agreed to pay \$235 per line, per month.

Other companies soon entered the market. About 400 or so discount carriers chipped away at AT&T's overwhelming market share. Each paid the access fee to the Bell operating companies and AT&T still kept its long distance prices at the higher level to subsidize other services. The growth potential of the discount carriers was limited, however, by the inferior connections provided to them by the local Bell operating companies. Subscribers to the alternate carriers had to dial a computer and then punch in an access code up to 6 digits. Many customers continually received busy signals if the carrier had not rented enough lines and many found the extra numbers an inconvenience. Many potential customers were lost because of the inconveniences and many of the carriers left the business.

In 1982, when the restructure of the Bell system took place, AT&T retained long distance service. It was no longer burdened with the local network and long distance service was finally truly competitive. A process called equal access was initiated. Each discount carrier was to receive the same superior access to the local network that AT&T had received and each had to help pay for maintaining the network as AT&T had previously done. AT&T had been paying well over \$600 per line, per month while MCI and others had been paying \$235. With equal access, the discount carriers' price rose to \$330 per line, per month while AT&T's decreased to \$330. The carriers' cost advantage over AT&T had been artificial. The

cost advantage over AT&T marketed to customers, by companies such as MCI and Sprint, no longer existed. The superior access marketed to customers by AT&T no longer existed. Price wars began.

For the next few years after the break-up, there was cut throat competition to sign up long distance customers. Competitors knew it would be tough to gain customers away from AT&T but they did not expect AT&T to match their marketing strategies. When MCI offered prospective customers an hour of free service for signing up for its services, AT&T and Sprint matched their offer. When AT&T cut its rates by 6.1%, MCI dropped its rates by 6%. Competitors started to slash rates and engage in expensive marketing tactics such as special promotions and expensive advertising campaigns.

Since the basic strategy was to gain market share and gain as much as possible and as quickly as possible, profit considerations were secondary. These marketing strategies became so expensive some companies were losing more money than they were making from new customers. Consequently, many were forced to drop out of the market.

For the carriers that remain, the marketing battle is expected to continue. New high tech competitors have entered the market and are building their own networks. This could result in further price reductions since there will be more

capacity than expected demand (AT&T can already handle all of the nation's phone traffic). Many companies feel, however, that demand will catch up with supply as new uses for phone channels, such as videoconferencing and data communications, develop. Again, emphasis will be on attracting market share with expensive marketing tactics and profit margins may be low, especially for those companies that must pay for local access.

Although the objective in this case is to maximize market share rather than profit, the pricing procedure can be utilized to identify the profit level for the various marketing strategies. The key determinants (costs, price and demand) must be developed and considered, however, emphasis is placed on the nonprice actions and the effect they have on product demand. Instead of implementing a market strategy that results in maximum market share but minimum profit, the firm can analyze the profit levels for the various strategies and choose the one that provides an acceptable level of both sales and profit.

It is anticipated that long distance service will begin to exhibit the characteristics of a normal consumer product once the competition is weeded out and the market stabilizes. Competition will distinguish their product by stressing brand recognition, quality and service. At this point, profit margins can once again be considered in the pricing decision.

To date, AT&T still maintains more than 80% of the long distance revenues, even in areas where competitors have aggressively sought out customers. AT&T has almost ninety million customers while MCI, in second place, has only two million. There is a fear by some industry leaders that by the end of the century, AT&T will again be the sole provider of long distance service and companies that invested more than \$6 billion dollars in plant and employed over 350,000 people will be out of business. The outcome of this marketing war is yet to be determined.

CHAPTER VI

PRODUCT PERFORMANCE PLAN

As indicated in the preceding text and exhibits, the market (external factors) plays a major role in the pricing of telecommunication products and services. The marketplace is dynamic and the product price and product strategies must respond accordingly. Once a pricing strategy has been selected for a product, a product performance plan should be developed. The purpose of the plan is to aid the product manager in implementing the selected strategy and also, for defining objective levels of market performance that can be used to monitor the product's success or failure and allow for the development of alternative strategies as the need arises.

CURRENT PRODUCT SITUATION AND ASSUMPTIONS

The first item in the plan should be a brief and specific description of the product strategy. For example, The existing LADS strategy is to gain market share. This will be accomplished with a price that is lower than any of the available alternative products. Advertising expenditures will be high and the sales force will actively seek out customers.

Key milestones should be used to track the success of a product strategy. For example, The sales goal for LADS is 100 sales per representative in the introductory year and 250 sales each year after.

A financial analysis for the pricing strategy (the results of the incremental analysis performed in the pricing procedure) should be included. The analysis allows the product manager to focus attention on critical factors affecting the product's success (See Table X).

The estimates used in developing the pricing strategy costs are the performance objectives for the product and must be included in this section.

Any product assumptions that affect the pricing strategy should be listed. Some examples are interest rates and residence/business population trends. Unique product assumptions include competition, customer reaction and technical engineering considerations. In the case of LADS, the pricing strategy is only valid under the assumption that the price of long haul data sets will remain higher than the LADS price.

CURRENT PRODUCT SITUATIONSAMPLE FINANCIAL ANALYSIS

PRODUCT

UNITS SOLD

TOTAL REVENUES

EXPENSES:

Maintenance

Administration

Taxes

Miscellaneous

TOTAL EXPENSES

Investment:

Material

Inventory

Labor

Miscellaneous

TOTAL INVESTMENT

STRATEGY COSTS:

Nonprice Actions

Opportunity

TOTAL PROFIT

RATIOS:

Revenues Per Unit

Expense Per Unit

TABLE X

MARKET AND COMPETITIVE ANALYSIS

Here, the market is defined in terms of customer characteristics and needs, market trends, market segment size and market growth forecasts. Competitors are identified as to the extent to which they meet or will meet market needs and trends. The firm's own product or service is analyzed as to its effectiveness in meeting customers needs, its strengths and weaknesses relative to competitors, its opportunities to serve existing markets and its opportunities to expand to new market segments.

The significant market trends are summarized and the forecasted demand quantities set forth in the pricing strategy are the objective level for demand.

STRATEGY IMPLEMENTATION GUIDELINES

This section concentrates on what specifically needs to take place in order to achieve the strategy described in the preceding sections. Resources and expenditures must be committed by other departments in order to implement the product plan. The strategy must be translated into step-by-step activities to be performed by the departments impacted. The description must include:

1. Definition of the program
2. Schedule for implementation with both long and short term emphasis

3. Organizations responsible for implementation
4. Critical dates
5. Budget and force impacts
6. Criteria for tracking and evaluation

The interaction between product managers and other departments will facilitate input, understanding and acceptance of the product strategy and will ensure that the product strategy is met.

A description of how the progress of the product strategy will be evaluated by the product manager should be developed. Key activities, milestones and performance measurements for the implementation phase of the product strategy must be tracked as well as the overall success of the strategy for the product. Measurements must provide a clear picture, both qualitative and quantitative, of the impact of the strategy on the product. Basic financial data, such as incremental revenue, expense and capital can be used as measurement tools. Unit based measurements, such as capital/unit, revenue/unit and utilization levels can also be used. An initial set of objectives for each performance measurement should be included in this section for the evaluation of achieved versus desired results during the planning period. Modifications of strategies will result from analysis of performance measurements.

RISKS AND CONTINGENCIES

Here, the product strategy risks are identified and contingency plans developed to minimize the impact of those risks. A financial sensitivity analysis can be used to prioritize the necessity of developing contingency plans for the most probable risks. For example: Risk- There were plans to order equipment from a specific vendor. This vendor has increased its prices substantially and without warning in the past. A sensitivity analysis has shown that a price increase of over 15% will substantially reduce profits because of the capital intensive nature of the offering; Contingency Plan- Identify alternate suppliers of compatible equipment and their ordering intervals so that an order can be placed with the alternate vendor without a time consuming search of the marketplace (See Figure XII).

EXECUTIVE SUMMARY

The executive summary informs upper management of the key points in the product plan. It summarizes, as completely as possible, how the product will carry out its strategy in light of market opportunities, threats, risks and its own capabilities. It indicates financial performance and strategic objectives of the product over the planning horizon. Finally, it provides a summary of resource

FINANCIAL SENSITIVITY ANALYSIS

REVENUES, EXPENSES AND GROSS MARGIN

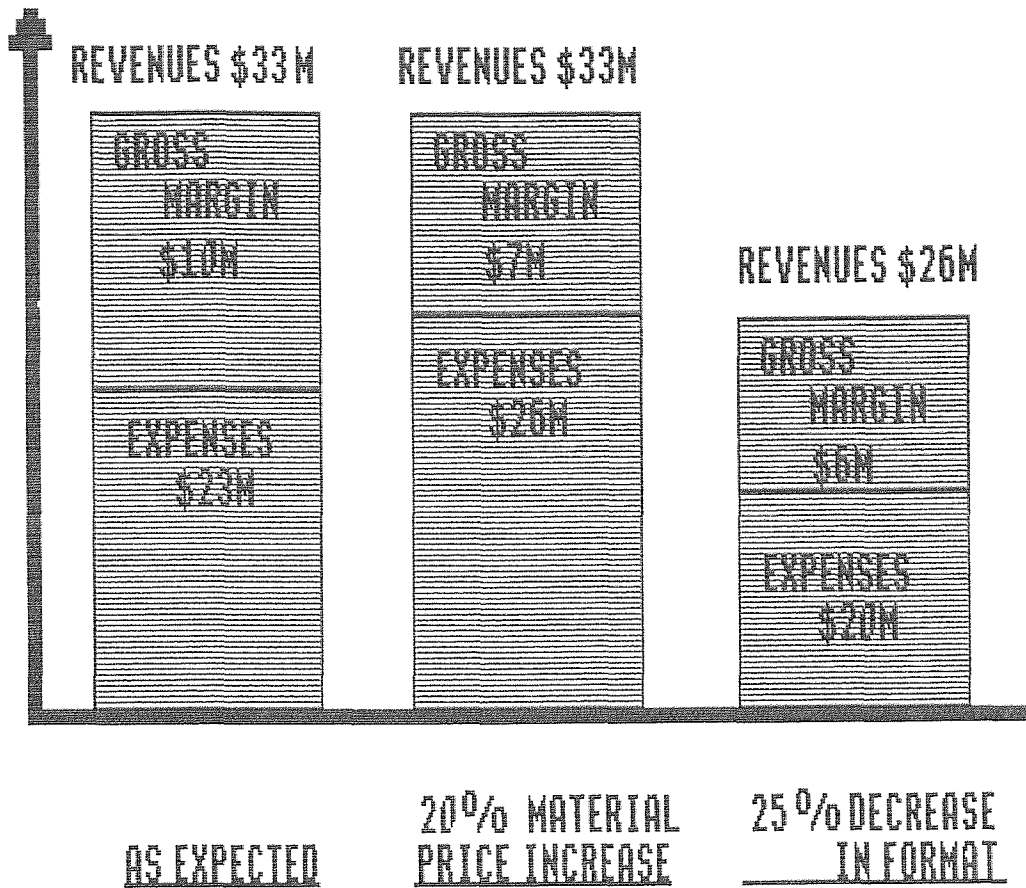


FIGURE XII

requirements for capital and other expenditures necessary for the programs recommended for the product.

Brief and concise statements accompanied by graphs is the best form of presentation. A one paragraph summary of the significant market trends and critical planning assumptions for the product can be accompanied by a graphical presentation of sales forecasts (the firm, competitors and total market) over the planning horizon. The product strategy can be summarized in one paragraph which identifies those critical items necessary for the successful deployment of the strategy. And finally, a table listing organizations responsible for strategy implementation, the financial impact on that organization and key dates should be presented.

RECOMMENDED PRODUCT LINE STRATEGY

The product plan just described sets forth the pricing strategy in a clear and concise manner and provides objective levels of performance so that the product manager can monitor the product success. Once the product has been introduced to the market and actual data can be collected, the plan can be used to compare the objective levels of performance to the actual levels. If discrepancies arise, the manager can formulate new product strategies.

This section synthesizes the comparisons of objective and actual product performance and describes any changes to

the strategy that has been set for the product. The product strategy is a logical conclusion drawn from the analysis of all the information that has been previously developed.

Following is a brief example of the way the data collected can be used to logically develop a product strategy:

1) Market Factors

- Market research indicates that small customers consider our product to be obsolete
- Large customers are actively seeking alternatives

2) Competitive Factors

- No competitor currently provides a state of the art replacement product
- Several competitors have recently increased their R&D budgets

3) Product Factors

- In service volume is not increasing
- No enhancements have been provided in several years

4) Financial Factors

- Investment is substantial
- Profit has not been growing

The strategy developed from this data might be to begin to withdraw the product, to develop and market a replacement product or to enhance the existing product. The decision belongs to the product manager.

FINANCIAL ANALYSIS

The purpose of this section of the product plan is to summarize the financial impact of the recommended strategy. The analysis contains a baseline view (product performance without any change in strategy) versus the incremental view (change in the base view as a result of recommended strategy implementation). Table XI and Figure XIII present a sample financial analysis.

Again, a financial sensitivity analysis should be used as input for the risks and contingencies section.

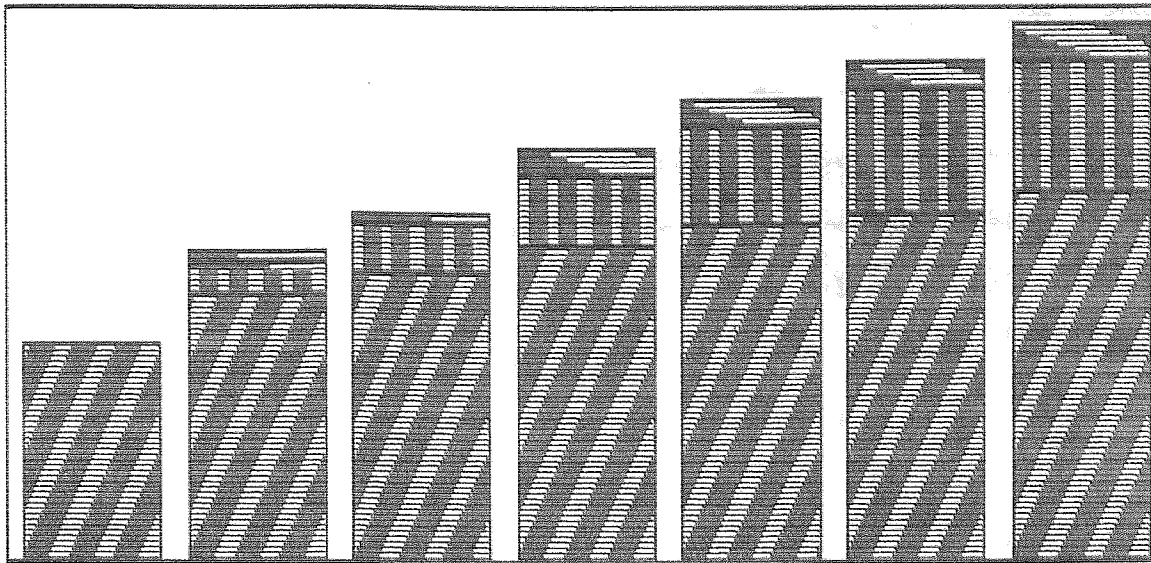
The comparison of objective levels of performance to actual results is an ongoing process. When the results are significantly different, alternative courses of action can be recommended.

FINANCIAL ANALYSIS OF RECOMMENDED STRATEGIES

	YEAR	1	2	3	4	5	6	7
UNITS SOLD								
Baseline View								
Incremental Strategy 1								
Incremental Strategy 2								
Total Units								
REVENUES								
Baseline View								
Incremental Strategy 1								
Incremental Strategy 2								
Total Revenues								
EXPENSES								
Baseline View								
Incremental Strategy 1								
Incremental Strategy 2								
Total Expenses								
INVESTMENT								
Baseline View								
Incremental Strategy 1								
Incremental Strategy 2								
REVENUES PER INVESTMENT								
Baseline View								
Incremental Strategy 1								
Incremental Strategy 2								

TABLE XI

REVENUE



 Baseline View

 Strategy 1

 Strategy 2

FIGURE XIII

CHAPTER VII

SUMMARY AND CONCLUSION

The pricing procedure presented in this paper applies microeconomic theory and recognizes the fact that cost is not the only factor in the pricing decision but serves as the starting point or minimum basic price. Incremental costs, or only those costs directly associated with the product under study, are used so that alternative strategies can be analyzed. By allowing for the development of various pricing strategies, this model considers pricing objectives and the nature of the marketplace.

Product differentiation, the nonprice actions that are important to marketing strategies, is recognized as a factor affecting the demand and as a cost affecting the profitability. Opportunity costs are included as well. Again, demand and profitability of one product or alternative are directly affected by other products or alternatives and must be considered in the process.

The pricing model recognizes the importance of demand. The demand reflects the effect of the price, product differentiation, cross-elasticities and competition. The calculated profit levels for various strategies reflect the effect of estimated demand quantities on costs and revenues.

Further, they also represent the difference between the incremental or marginal costs, the incremental or marginal revenues and the cost of nonprice actions and cross-elastic effects. The test price with the maximum profit over the planning period is the price to choose for the product. This price reflects the maximum demand for the product given that incremental revenues cover the incremental costs.

Finally, it is important to note that product management does not end once a product is priced. The marketplace is dynamic and the product strategy followed must be adaptable to the changing environment. A product performance plan enables the product manager to monitor specific product performance objectives and to develop alternative strategies as the need arises.

Regardless of the amount of data available for pricing and monitoring a product, it is necessary that skilled product managers are available to make product market assumptions and to predict future market trends with accuracy. It is the validity of the assumptions and the interpretation of the data that ultimately, enables the product manager to bring the right product at the right price to the marketplace.

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April 15, 1988

Dr. Carl Wolf
New Jersey Institute of Technology

Dr. Wolf,

I have read Katherine Sullivan's paper "A Model For the Determination of Market Based Pricing of Telecommunication Products" with great interest. As a District Manager with AT&T I have had responsibilities over the past twelve years in the areas of cost development, profitability analysis and pricing development for telecommunication products. I am currently a product manager with responsibilities for service offerings.

I found Ms. Sullivan's document to be a comprehensive analysis of the various factors involved in the development of pricing strategies and price levels for telecommunication products in a competitive environment. Her paper reflects an understanding of the interrelationships of the environment, costs, demand and pricing considerations which support the successful introduction and management of a new product.

Ms. Sullivan's work details the basis for pricing decisions and outlines an appropriate pricing model which would provide an excellent guide to anyone in this field.

Lori Walsh

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April 26, 1988

Dr. Carl Wolf,

This is in regard to Katherine Sullivan's thesis " A Model For The Determination of Market Based Pricing of Telecommunication Products". Over the years, I have worked for New Jersey Bell as a cost analyst, sales representative, and in the rate department. I currently work for Bell Atlantic in the Embedded Analysis Study Group analyzing the total costs and revenues for the firm. I am familiar with the various costing methods and the one presented in Mrs. Sullivan's paper is a good description of the method that should be used in product pricing.

Having also worked in the rate department, I have had experience with product teams and the various factors that must be considered in the pricing decision. Mrs. Sullivan's paper presents a clear and concise method that considers those factors and also expands on them to include the competitive environment. Her procedure and model present a suitable method to be used for pricing telecommunication products.

Rosann Cali

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