

DEVELOPING A RETAIL CHANNEL FOR A MULTIUSER  
MICROCOMPUTER: AN ANALYSIS USING SYSTEM DYNAMICS

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ABSTRACT

Many computer manufacturers are turning to retail sales channels to sell microcomputers to small businesses. Through the development and analysis of a system dynamics model of a retail computer channel, we investigate and catalog the efforts one computer manufacturer to establish and manage a retail channel.

Our objectives in creating this model are three-fold: (1) to acquire a detailed understanding of the process of the developemnt of a retail channel for multiuser microcomputers, (2) to generate insight into the behavior of computer retail channels, and (3) to develop and test policies that will enhance the growth of microcomputer sales and the retail channel.

Our analysis indicates that the characteristics of the product offered for sale through computer retail stores strongly influence sales of the product and channel growth. In addition, the system dynamics methodology is useful for the study of retail channels of distribution.

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## 1 OBJECTIVES AND METHODOLOGY

### 1.1 INTRODUCTION

This thesis is the result of a field study sponsored by a major manufacturer of minicomputers. Based in the Boston area, Massachusetts Bay Computers (MBC) entered the computer market over fifteen years ago. Since that time, MBC has generated tremendous growth and become one of the leaders in the computer manufacturing industry. With a complete line of minicomputers, MBC recently sought to enter the market for small, desktop computers. As a result, they announced a family of multiuser desktop computers in 1983.

Critical to the success of any entrance into a new market is the development of a channel of distribution. Although all of MBC's current channels of distribution are appropriate for selling and distributing MBC's new desktop product, not all channels are appropriate for serving all market segments. MBC management believes that their current distribution methods would leave them without a way to reach the small businessman. Therefore, MBC management decided to recruit a network of independent computer retailers to carry the MBC line of small computers; however, MBC has begun to develop their retail channel with a product that differs greatly from many of the products traditionally sold through computer retail stores.

## 1.2 CLIENT AND PROBLEM DESCRIPTION

MBC's desktop computers are aimed at a number of markets: technical/industrial automation, small businesses, office automation, distributed data processing, computer aided manufacturing, computer aided design, and personal automation and productivity improvement.

Just as the target markets for these small computers differs, so do the methods used to sell these small computers to the end user. Depending on the characteristics of the end user and the likely size of an order, these small computers can be sold by the manufacturer's direct salesforce, through value added resellers (VARs) or original equipment manufacturers (OEMs), through industrial electronics distributors (IEDs), through a manufacturer-controlled telemarketing system, or through a network of independent computer retailers recruited to carry MBC's small computers. Not all of these marketing channels carry the complete line of desktop computers. For example, the lowest end model is sold through all channels except the IED in order to prevent price competition among the various channels serving the small business market.

In February of 1984, MBC's effort at developing a dealer

network was only five months old. MBC believes that the development of a presence in computer retailing is important for several reasons. First, the retail market hold the promise for substantial growth for the company.

Traditionally, MBC serves businesses that purchase minicomputers through the manufacturer's direct salesforce. Small businesses and individuals, who do not need the power of a minicomputer, are a large market for computers that MBC's competitors are only beginning to develop. Although desktop computers are much less expensive than minicomputers, and consumers in this marketplace generally only purchase one or two computers, the sheer number of consumers in this market make it attractive to MBC. Second, small computers provide a point of entry into the rest of MBC's product line. MBC computers are fully upward compatible, allowing the small businessman who uses MBC computers to improve his data processing system easily as his business grows. Many of MBC's competitors offer a complete family of computers. MBC may be at a disadvantage without a small computer as a point of entry. With hardware costs falling rapidly, more and more businesses are converting to automated data processing at earlier stages in the growth of their business. As computer prices fall, younger firms can afford computers. To capture businesses in the early stages of their development, and thereby have the opportunity to serve them throughout their lifecycle, MBC may need a low-end product. Third, the development of a retail sales channel for MBC's microcomputers



holds the promise of reduced selling expenses. MBC's traditional methods of selling -- through a direct salesforce, or through VARs who often employ their own salesforce -- are becoming more and more expensive. With the cost of hardware falling steadily, profit margins may be eroded. Desktop machines, with an average price of around \$10,000, are unable to support MBC's traditional methods of selling. Fourth, a presence in the retail marketplace would be necessary to support the introduction of any new MBC products aimed at the current market for personal computers. The majority of systems costing less than \$3,000 are sold through retail stores. To effectively compete in this market, MBC would need some retail method of distribution. Finally, competitor actions may be creating pressure for entry into the retail sales channel. IBM, Apple, and Digital already have established a significant presence in the retail marketplace, and that presence is improving sales of their products through all channels. To avoid being effectively shut out of the low end of the computer market, MBC management may view the development of a retail sales channel as essential.

MBC's desktop computer differs from most of the computers sold through computer retail stores. MBC's computer has true multiuser capability, while most computers sold through retail stores are designed for a single user. Although many single user computers can be networked together to give the appearance of a multiuser system, networks are not truly

multiuser in that two users cannot perform operations on the same file at the same time. This added capability of MBC's computer makes it more expensive than most computers sold through retail computer stores. In addition, these added capabilities give MBC's multiuser microcomputer a definite business focus. While many of the microcomputers manufactured by MBC's competitors are used in both the home and the office, MBC's multiuser capability really has no place in the home or with the professional interested in only a single user system. MBC's multiuser capability and definite business focus make it more difficult to sell through retail stores than many of MBC's competitors' products. In addition, the added complexity of the multiuser capability and the software needed to take advantage of the multiuser capability makes MBC's microcomputer more difficult to support.

### 1.3 OBJECTIVES

This study differs from many consulting projects in that MBC has no specific complaint or well defined problem concerning the development of the retail channel for their multiuser microcomputer. Instead, their interests are more exploratory. Without a long history, the retail channel's behavior is unknown. Still in its early stages of development, the MBC dealer network gave no indications that problems were beginning to arise. Therefore, rather than address a particular pattern of complaints, we seek to

approach this project from a descriptive rather than a normative viewpoint. Instead of describing what should be done, we are interested in describing what is being done, and how those actions will affect MBC's future.

In a broad sense, our objectives in this study are to develop an understanding of the process of the development of a retail channel for multiuser microcomputers, and through a fresh perspective, help to generate insight into the ramifications of the development of a retail channel for MBC. These broad objectives will be discussed in greater detail in the following three sections.

### 1.3.1 ASSUMPTION DEVELOPMENT AND TESTING

One of the primary methods we use to gain an understanding of a computer retail channel is to elicit, develop, and test assumptions concerning computer retailing. At MBC, managers hold particular beliefs about their product, the market for small business computers, and the climate in a computer retail store. We seek to explicitly express those assumptions in some comprehensive form. In short, we hope to develop a framework for thinking about MBC's development of a network of retail dealers for multiuser microcomputers -- a

framework that encompasses a broad range of managerial assumptions about the future of the marketplace, the nature of MBC's product, the nature of the competitors' products, the attitudes of the computer retailing community, the support of software vendors, and the reactions of consumers.

By expressing all of these related assumptions in a single forum, we hope to be able to examine the long term implications of policies based on these assumptions. For example, we hope to examine the effect of the introduction of a multiuser product in a retail channel dominated by single user systems. We hope to understand the implications of MBC's commitment to recruit dealers dedicated to servicing their products.

By examining the long term implications of MBC's method of developing a retail channel, we also hope to be able to use our understanding of their retail channel to comment on their marketing efforts in other areas. For example, with a clear understanding of the operation of the retail channel, we hope to be able to discuss possible interactions among the retail, direct sales, industrial electronic distributor, and OEM channels. In addition, an understanding of the development and operation of the retail channel may enable us to discuss the timing of MBC's decision to develop a retail channel.

### 1.3.2 POLICY DEVELOPMENT AND TESTING

In addition to developing an understanding of the growth of the retail sales channel, we also hope that our investigation will lead to the design of policies that will enhance the growth of the retail network, and sales of the MBC product through the retail channel. By making explicit managerial assumptions about computer retailing, we seek to identify variables and actions to which the retail channel is most sensitive. Having identified sensitive variables and actions, policies could be designed to influence the behavior of channel members in a desired fashion. For example, if our investigation are to reveal that the multiuser computer was difficult to sell through the retail channel, the effectiveness of several policies aimed at making the sale more simple could be tested.

Beyond the design of policies, we are interested in the systematic testing of policies. Policy testing is useful for two reasons. First, by testing policies, the uncertainty surrounding the introduction of policies can be reduced. Second, policy testing serves to improve managerial understanding of the arena in which they operate. If, after careful testing for example, policies fail to produce the desired effects, the diagnosis of that failure can improve a manager's understanding of the business system, and

consequently, the design of future policies.

### 1.3.3 ITEMS BEYOND THE SCOPE OF THIS STUDY

Having described our objectives, it may be useful to describe issues that are beyond the scope of this investigation. We are not interested in optimizing the efficiency of MBC's retail channel structure, or designing the appropriate channel for MBC's product, although we may be able to comment on these topics. Instead, we are interested in the consequences of MBC's decision to enter the retail market for microcomputers, and the effects of policies designed to help their entry be a successful one.

### 1.4 METHODOLOGY

#### 1.4.1 SIMULATION MODELING OF MARKETING CHANNELS

Marketing channels are often exceedingly complex business systems. Channels are usually composed of several separate institutions spread out over a large geographic area. In general, members of marketing channels are not all members of the same business organization. As such, the flows of information between members are often restricted, colored, or delayed. In addition, marketing channels are usually so large that they are beyond the control of any one individual or company, creating complex coordination problems.

Given their complexity and opaqueness, marketing channels lend themselves to simulation modeling. In general, through simulation modeling, the modeler strives to develop an understanding of the system being modeled. For example, simulation can help a good channel manager understand his success. "A seasoned manager may already know which particular actions work, and which do not work. What that manager really requires is a more thorough understanding of how the channel functions, i.e., why particular actions work and why other actions do not. Just as the experienced engineer gains additional insight from theoretical physics, the experienced manager gains additional insight from theoretical marketing." 1

Simulation studies can generate insight into the workings of a system through several mechanisms. First, a model forces managers to separate the relevant from the irrelevant. For example, in constructing the MBC retail model we originally focused on the implications of a decision to sell MBC's low end model through both the retail channel and the IED channel. Upon reflection, this issue seemed tangential to the workings of the dealer system. Competition from other channels can affect the behavior of the retail channel, but is not central to it. Our modeling effort directed our attention to those forces most central to the behavior of the retail channel.

In addition to focusing thoughts, a simulation model forces managers to make their assumptions explicit. In building a simulation model of a marketing system, Amstutz noted that "one of the first benefits to accrue from the development of a simulation system is the systematic testing of management conceptions of the environment in which they operate...management must make explicit the often implicit models on which their decision making is based." <sup>2</sup> In addition, simulation requires managers to identify and choose elements or variables that they feel are most influential in the behavior of the system. When developing parameters for the retail model, for example, MBC managers were asked to rank the importance of corporate advertising, dealer sales, and the presence of the retail network in influencing MBC's corporate market presence. Building the simulation model required



managers not only to think about the variables influencing their presence in the market, but to think about the importance of each variable.

System simulation can be suggestive of problems that have yet to occur. This may be of particular advantage when simulation models are used to support the development of new programs. In undertaking this modeling project, we hoped that our model would give MBC some idea of how they can expect their retail channel to develop. With an understanding of how a retail channel develops, system models can become a simple way to test a variety of management policies.

Given the congruence between the advantages of system simulation modeling and the objectives of our investigation of MBC's development of a retail channel for multiuser microcomputers, simulation modeling seems to be an appropriate method of investigation. In general, simulation studies are conducted in the following stages: (1) development of a qualitative description of the market system to focus the modeling effort, (2) definition of the major relationships, subsectors, and patterns, (3) refinement and quantification of those relationships, and (4) testing and generation of managerial insight. As will be explained in the model description in Chapter 4, our modeling project followed these steps.

#### 1.4.2 SYSTEM DYNAMICS MODELS

System dynamics models are simulation models based on "the application of feedback control systems principles and techniques to managerial, organizational, and socioeconomic problems." <sup>6</sup> System dynamics studies are concerned principally with the development of an understanding of the forces in a system that influence the stability or growth of the system. A system dynamics study looks at behavior that is structurally determined over time. In other words, system dynamics studies are concerned with behavior that is internally generated and needs no influences from outside the system boundaries.

System dynamics modeling is an appropriate system simulation technique given the objectives of our study with MBC. First, the flexible nature of system dynamics modeling allows us to easily translate MBC's descriptions of the operation of computer retailing into the simulation model run on the computer. Our interest is in understanding the development of the retail channel from the perspective of MBC. Therefore, any simulation technique to be used must preserve and represent their perceptions of computer retail channels. Second, the system dynamics methodology provides a clear way of thinking through complex issues. Its reliance on feedback loops and explicit representation of ideas in mathematical

equations forces discipline on the thinking of both the modeler and the managers providing verbal descriptions to the modeler.

1.5 NOTES

1. Abel P. Jeuland and Steven M. Shugan, "Managing Channel Profits," Marketing Science, vol 2, Summer 1983, 241.
2. Arnold E. Anstutz, Computer Simulation of Competitive Market Response, (Cambridge, MA: MIT Press, 1967), 440.
3. Edward B. Roberts, "System Dynamics--An Introduction," in Managerial Applications of System Dynamics, Edward B. Roberts, Ed., (Cambridge, MA: MIT Press, 1973), 3.

## 2 REVIEW OF MARKETING AND MODELING LITERATURE

### 2.1 INTRODUCTION

The marketing literature on the managerial aspects of channel development is fragmented. No comprehensive body of literature describes or catalogues the process of the development of marketing channels. Although there is a great deal of literature on marketing channels, by and large the body of literature is abstract and theoretical. As such, the marketing literature offers little practical guidance to the manager interested in influencing a channel's development.

Despite the dearth of directly applicable literature, there are four areas of the marketing and modeling literature that are of interest. Papers discussing general market diffusion processes lay the groundwork for an understanding of our model of the development of a retail channel. Descriptions of channel development and evolution provide a view of how others see the process of channel development. The literature on channel design reviews the issues surrounding the task of organizing and designing marketing channels. Finally, simulation studies of marketing channels demonstrate the value of computer modeling in channel design and management.

## 2.2 DIFFUSION MODEL LITERATURE

The marketing literature describing diffusion processes is of interest because our model of the development of a computer retail channel is based on the principles of diffusion. Diffusion models are frequently used by marketing scientists to describe the process of product adoption or innovation adoption. The development of a retail channel for computers can be viewed as a diffusion process analogous to the diffusion processes at work in the introduction of new products. In essence, the manufacturer of a computer is trying to sell the product to retailers. As such, the processes that govern the adoption of new products in the marketplace as a whole can also govern the adoption of new products by segments of the marketplace -- in this instance, by the computer retailing community. In addition, the development of the retail channel for computers can be viewed as the interaction of two diffusion processes. The marketplace may adopt computers through a diffusion process. In turn, the rate of acceptance of computers in the marketplace affects the adoption of computers by computer retailers. In this sense, the development of a retail channel for computers can be viewed as a series of diffusion processes, one nested within the other, and each dependent upon the other.

In general, diffusion models represent the spread of an innovation or product through an given population as a function of both the size of the population and time. The general structure for diffusion models was developed through work in the medical and biological sciences. Attempting to describe the movement of disease through a population, researchers formulated equations that describe the size of the sick population as a function of the susceptible population and time. Recognizing the similarity between the spread of new products and the spread of disease, marketing researchers altered the biological models to describe the spread of new products from manufacturers to users. In addition, much of the marketing diffusion research has focused of the role diffusion plays in the development of the product life cycle curve. <sup>2</sup>

The basic structure of diffusion models rests on the assumption of three states of a market. First, customers exist in the untapped market, which represents the total number of customers in the marketplace less those customers classified as potential customers. Second, potential customers are those customers susceptible to adopting a new product. Finally, the current market represents all potential customers who have purchased the product. The rate of transition of customers between states depends on innovation and imitation. Some customers are innovators, and move to adopt new products without waiting to see if a new product

becomes popular. Other customers adopt new products only after some segment of the population has already adopted the product. These customers are imitators. <sup>3</sup>

The first comprehensive development of a diffusion model for new product adoption was developed by Bass. <sup>4</sup> Although other researchers had hypothesized the existence of both the imitation and innovation effects, Bass was the first to include both effects in a single model of new product adoption. His model used mass media communication and word-of-mouth communication as the principle mechanisms by which customers transfer from one market state to another. Like many of the early models of diffusion of new products, Bass assumed that the number of potential customers was fixed over time.

Bass' work has been criticized for being too theoretical. Because specific marketing programs, such as advertising campaigns or price relationships, are not explicitly represented in Bass' model, many marketing researchers believed this model to be of little use to managers. As a result, a number of extensions of Bass' original product diffusion model have been proposed and tested. By and large, these extensions do not alter the original structure of Bass' diffusion model, but instead argue over the magnitude, location, and existence of the effects of various marketing programs. <sup>5</sup> For example, Bernhardt and Mackenzie develop six



theoretical models designed to remove or ameliorate the restrictions of the Bass model. <sup>6</sup>

Most of the extensions of the Bass model have centered on the inclusion of marketing decision variables in an effort to make diffusion models more useful to the practicing manager. For example, Robinson and Lakhani developed a diffusion model that incorporated the effects of price changes on the product adoption process. <sup>7</sup> Specifically, Robinson and Lakhani hypothesize that changes in price affect only the rate of imitation. The value of a change in price in terms of increased sales of a new product depends not on the size of the potential market or the rate of adoption by innovators, but on the strength of the price effect and the strength of the imitation effects at work in a market.

In contrast, Horsky and Simon argue that price changes affect the size of the potential market rather than the rate of imitation. <sup>8</sup> They argue that as more and more consumers adopt a new product, the cumulative volume of production will increase. Along with increased volumes of production come declining production costs as a result of learning and experience effects. Declines in price accompany declines in production costs, thereby bringing the new product into the budget set of a larger segment of the untapped market. In addition, Horsky and Simon argue that advertising does not affect imitators but affects innovators instead. As such,

managers should launch new products with large advertising campaigns in order to accelerate the product diffusion process.

In response to the work of others such as Robinson and Lakhani, and Horsky and Simon, Bass recently developed a model that allows marketing variables to influence the rate of adoption. <sup>9</sup> Bass merges the theory of experience curves with his original model of product diffusion to incorporate the effects of changing prices on product diffusion. He argues that price changes affect product diffusion through the price elasticity of demand, and that these changes affect adoption through both imitation and innovation.

Other studies have incorporated marketing variables other than price into basic diffusion models. For example, Lilien and Rao include the effects of personal selling on the innovation effect in their study of the adoption of new drugs. <sup>10</sup> Peterson and Mahajan have included the effects of other products in their work on diffusion models. <sup>11</sup> Recognizing the new products do not exist in isolation, Peterson and Mahajan examine four types of product relationships and the effect those relationships can have on product adoption. They examine products that are functionally independent but display synergies in adoption, complementary products, contingent products, and substitute products.

Extensions of diffusion models have also argued that the size of the potential market should be dynamic instead of static. Dodson and Muller, for example, argue that marketing variables act to increase the size of the potential market rather than the rate of adoption by the potential market.<sup>12</sup> They believe that both advertising and word-of-mouth effects act to move customers from the untapped market into the potential market. As such, marketing managers are attempting to promote consideration of the new product rather than trial of the new product. In a similar vein, Mahajan and Peterson have developed a dynamic model of product diffusion.<sup>13</sup> Mahajan and Peterson's model allows the number of potential adopters to be a function of "all relevant exogenous factors -- both controllable and uncontrollable -- affecting" the population of potential adopters. "Examples would include socio-economic conditions, social system population increases or decreases, government actions, marketing efforts and the like." Mahajan and Peterson see their work as important for two reasons. First, the development of dynamic diffusion models should allow for better prediction of diffusion processes. Second, the development of dynamic models may permit a more detailed and rich explanation of diffusion processes.

Further extensions of the basic diffusion models need to be undertaken with respect to time and space and their effects on the diffusion process. For example, Brown has completed

work in geography on the effect of distribution on the diffusion process <sup>14</sup>, but as of yet, little work has been done on the effect of distribution on diffusion in the marketing field. In addition, implicit in Brown's work is the assumption of the existence of a distribution network. Therefore, additional work on the diffusion of distribution systems must be done.

The marketing literature on diffusion processes, then, seems to be focused on the introduction of new products and the effect changes in price and advertising can have on diffusion. The idea that channels of distribution can be described through a diffusion process does not seem to have surfaced. In addition, the diffusion literature does not seem to have evolved to the point that nested diffusion processes have been studied. In fact, the bulk of the work on diffusion in marketing can be described as a series of "individual efforts...to incorporate only one variable into the model; and different arguments have been made to incorporate the same variable either in the coefficient of internal influence, or the total number of potential customers." <sup>15</sup> Mahajan and Peterson conclude: "Most importantly, it is necessary to deliberately build into the models the impact of marketing variables. Although attempts to include price and advertising [have been made], there remains a woeful lack of accomplishment in this domain." <sup>16</sup>

### 2.3 CHANNEL DEVELOPMENT AND EVOLUTION LITERATURE

The literature surrounding the development and evolution of marketing channels is largely descriptive. One of the seminal works in the development of marketing channels was penned by Bucklin<sup>17</sup>. By tracing the development of marketing channels, Bucklin derives some general principles concerning the development of channels. For example, Bucklin sees marketing channels as largely evolving out of economic necessity. Chain stores have developed because they offer a number of economic advantages over atomized stores. Chain stores have improved bargaining power over manufactures by virtue of their size, they enjoy the efficiencies that accompany multiple stores, and chain stores are generally more efficient in the performance of wholesale and other functions as a result of their increased size.<sup>18</sup>

In addition to work in channel development, Bucklin's work has also been instrumental in the development of a theory of channel structure.<sup>19</sup> Bucklin argues that customer needs spur the development of marketing channels, and that channels are structured so as to best fulfill those needs. Marketing channels provide four basic services to customers: spatial convenience, advantages of lot size, improved waiting or delivery time, and product variety. The demand for these four services combine with the abilities of channel members to develop a channel structure that provides these services to

the satisfaction of both the customer and the channel members. While clearly explaining the development of channels and channel structures, Bucklin's work is of little value to the practicing manager. Bucklin says little about how to manage the development of a marketing channel.

Guiltinan, in the course of developing a comprehensive theory of channel evolution and development, wrote an effective summary of the marketing literature on channel evolution and development. According to Guiltinan, the bulk of the channel development and evolution literature can be summarized by four forces that influence channel development: constraints on evolutionary behavior, changes in distributive institutions, changes in the allocation of functions, and relationships among channel members. <sup>20</sup>

Having summarized the four forces that the marketing literature claims influence channel structure, Guiltinan complained that the marketing literature on channel evolution and development was fragmented. Although many authors have dealt with evolution and development issues, no comprehensive theory of channel evolution has emerged. <sup>21</sup> In response, Guiltinan proposed a five stage model of channel evolution. His theory argues that change in marketing channels is not a natural evolutionary process. Instead, "changes in the structure of a given channel can be explained by changes in the strategic distribution objectives of key channel members."<sup>22</sup>

A summary of Gultinan's model is presented in Exhibit 2.1.

STAGE	PRIMARY SOURCE OF INFLUENCE OR POLICY	ILLUSTRATIVE POLICIES
I. CONTACTUAL/ COMMUNICATION	PRODUCE CHARACTERISTICS	M-W-R CHANNEL LITTLE DIRECTION
II. COVERAGE/ CAPACITY	INSTITUTIONAL EFFECTIVENESS IN REACHING CUSTOMERS	INTENSIVE DISTRIB. MULTIPLE BRANDS
III. CONTROL	MEMBER RELATIONSHIPS AND MARKETING POLICIES	FRANCHISING EXCL. DISTRIBUTION
IV. COST	ECONOMIC EFFICIENCY	VOLUNTARIES, COOPERATIVES
V. COOPERATION/ CONSOLIDATION	ACCESS TO CAPITAL	VERTICAL INTEGRATION

GULTINAN'S MODEL OF CHANNEL EVOLUTION  
EXHIBIT 2.1

#### 2.4 CHANNEL DESIGN LITERATURE

The literature focusing on the design of marketing channels deals with the decisions surrounding the organization of the marketing channel. Questions regarding channel length and efficiency of various structures, the types of middlemen to be used, and the degree of market exposure for the product are addressed here. <sup>23</sup> Much of this literature is addressed to the practicing manager, but focuses on solving specific problems related to channel design rather than addressing the issue of management of the development of a marketing channel. For example, the issue as to which types of middle men to use

has received a good deal of attention. Kotler discusses a number of techniques for determining the appropriate middleman. <sup>24</sup> His weighted factor score method has the channel manager rank and weight the five factors of most importance in considering alternative distribution strategies. A weighted score is calculated for each distribution alternative, and the strategy that performs best is chosen. Kotler also discusses use of the hierarchical preference ordering method for choosing distribution strategies. A minimum performance level for each factor is set, and distribution strategies that fail to meet minimum performance requirements are eliminated. Finally, Kotler suggests using simulation as a method of choosing from among alternative forms of distribution. The costs and benefits of each distribution alternative are simulated over time, and the most profitable channel is chosen. Kotler's simulation is static in that all variables are determined exogenously.

In short, the channel design literature, while addressing many of the day-to-day problems faced by marketing managers, does not seek to develop a detailed understanding of the workings of marketing channels, or assist the manager in the long-term development of marketing channels.



## 2.5 SIMULATION MODELING AND MARKETING CHANNELS

Simulation modeling of marketing channels can be useful to the practicing manager because simulation requires "a mathematical description of logical channel relationships."

<sup>25</sup> Unfortunately, most of the simulation models of marketing channels focus on channel efficiency and management (for example, Kotler), rather than the management of channel evolution and development.

The first simulation model of a marketing channel was developed by Forrester. Forrester's model described the flows of goods and information among manufacturers, wholesalers, distributors, retailers, and the market. Focusing on swings in production and inventory levels, Forrester clearly explains characteristic swings in inventory levels and their effects on production and distribution policies. <sup>26</sup> Forrester's model, however, says nothing about the development of marketing channels. Balderston and Hoggatt developed a model of the lumber industry distribution process. They focus on an optimal channel structure, but do not describe the evolution of channels toward that structure, or how managers can affect the development of the channel. <sup>27</sup> Amstutz developed a simulation model of distribution channel systems in order to evaluate changes in marketing strategy under existing channel structures. Changes in consumer behavior in response to changes in marketing strategy affected channel demand, but

changes in channel demand did not affect the channel structure or size. <sup>28</sup> Amstutz's model is complete and realistic in that it allows some interaction between the market and the channel. Unfortunately, it relied on such an extensive database that its use was impractical.

Three system dynamics simulation models have sectors that are of interest here. Forrester's market growth model describes the process by which a firm's direct salesforce channel grows. <sup>29</sup> Forrester sees the development of the direct salesforce channel as the instrument of growth in many markets. He notes that "salesmen book orders...which generate revenue which produces the sales budget which permits hiring still more salesmen. In short, salesmen produce revenues to pay for the further expansion of the sales effort." <sup>30</sup> To Forrester, the evolution of the direct salesforce channel is both a cause and a consequence of the success of the firm. Forrester's model is interesting because its salesforce sector can display many of the properties of the diffusion models discussed earlier. Nevertheless, his salesforce model is not directly applicable to the development of a retail channel. Forrester's focus is on the development of firms and markets, as opposed to the development of retail channels. As such, his model, while providing an interesting explanation for the development of some types of marketing channels, does not offer much insight to the manager interested in developing a retail channel. In addition, all decisions with respect to

the development of the salesforce channel are within the control of the firm. No competition for salesmen, for example, is represented in Forrester's model. Therefore, it is not directly analogous to a manufacturer's attempts to develop a retail channel in an environment where there is competition for the retailer's attention.

Of more direct interest is a model of an apparel company by Roberts. <sup>31</sup> Roberts' model contains a retail sector in which retailers choose to carry or discontinue an apparel manufacturer's line based on the retailer's attitude toward the performance of the apparel manufacturer's line. From the retailer's perspective, Roberts' has modeled the development and evolution of the retail channel. Roberts' focus, however, is not on the development and performance of the channel, but rather on the performance of the apparel manufacturer as a whole. The performance of the retail channel plays but one role in the performance of the manufacturer, and as such, the retail channel receives little attention. Managers interested in managing the development of a retail channel receive an interesting perspective on channel growth, but because Roberts' focus is on the company rather than the channel, Roberts' has little to offer the channel manager.

Finally, a recent model by Morecroft incorporates many of the principles of diffusion into an examination of the market for automated storage and retrieval systems. <sup>32</sup> Not squarely

examining channel development, Morecroft's analysis of the automated storage and retrieval market relies on a diffusion model in which the rate of growth of sales is influenced by industry reputation and sales effort. His representation of the salesforce, while not the focuss of his work, provides an interesting example of the interactions between product diffusion and channel growth.

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### 3 SMALL-BUSINESS COMPUTERS AND COMPUTER RETAILING

In this chapter we provide background on both the small business computer market, and small computer retailing. We identify several trends that will influence the futures of computer retailers and the manufacturers of products handled by computer retailers.

#### 3.1 SMALL-BUSINESS COMPUTER MARKET

Small business computers travel under many names. Microcomputers, personal computers, and minicomputers are but a few of the terms used to describe small stand-alone computers used for a variety of small business applications. For our purposes, we will use a modified version of the Dataquest's definitions of small business computers. Exhibit 3.1 displays Dataquest's definitions of computer systems.

EXHIBIT 3.1

COMPUTER TYPE	HOME COMPUTER	PERSONEL COMPUTER	VERY SMALL BUSINESS	SMALL BUSINESS	LARGE BUSINESS	MAINFRAME
PRICE	\$100	\$1-5K	\$5-30K	\$30-80K	\$80-300K	\$300K

Dataquest defines computer systems by price, and as such, these definitions are appropriate for use in this analysis



because small businesses typically choose their system based on price rather than industry nomenclature. Our interest is in the small business microcomputer segment of the computer market, this segment defined as systems costing between \$3,000 and \$20,000.

The small business segment of the personal computer market is large and growing. Shipments of personal and small business computers totaled over \$5 billion in 1982. Although not all of these computers were purchased by small businesses, small business represents a significant growth opportunity for manufacturers of small computers. Table 3.1 displays the market potential for business systems in the United States.

MARKET POTENTIAL FOR BUSINESS SYSTEMS  
(U.S. -- 1980)

BUSINESS REVENUE RANGE NO. OF BUSINESSES	\$100K-\$500K 2,000,000	\$500K-\$1M 330,000
TOTAL ANNUAL REVENUES AVERAGE REVENUE	\$420B \$210K	\$230B \$700K
DP PURCHASING POWER PCT. ANNUAL REVENUES DOLLAR RANGE AVERAGE	1-3% \$1,000-\$5,000 \$2,100-\$6,300	1-3% \$5,000-\$30,000 \$7,000-\$21,000

TABLE 3.1

Source: DATAQUEST

Given that our segment of interest is defined by machine price, approximately 2.3 million small businesses are in the potential market for small business computers costing between \$3,000 and \$20,000. Of these 2.3 million businesses, only about six percent have already purchased a computer.

Therefore, small business computer systems represents a large and as of yet undeveloped market.

The growth of the small business system market should be rapid. A recent survey conducted by Time Magazine estimates that small business computer use will increase by 47 percent in 1984, with the bulk of that growth coming from companies with fewer than twenty employees. <sup>1</sup>. Over the longer term, growth in the small business computer market should be equally spectacular. For example, Future Computing, a computer industry market research firm, estimates that the personal computer market will quadruple between 1982 and 1987, growing from \$4.4 billion to \$18.5 billion in retail sales. Sales to small businesses will grow from \$2 billion in 1982 to \$6.6 billion in 1987. <sup>2</sup> Dataquest is equally optimistic, predicting that the small business segment of the computer market will grow at an annual rate of 33 percent between 1982 and 1987 -- a rate that far exceeds the computer industry average of 18 percent. Under any circumstances, the rate of growth of the small business segment of the computer industry should be large.

The size and potential of the small business computer market has not escaped the notice of computer manufacturers. Hundreds manufacturers offer microcomputers for small business use <sup>3</sup>. These computers are coupled with software packages to offer solutions to a variety of small business problems.

General accounting, spreadsheet, and personal automation and productivity packages are the most popular packages with small businesses, although many small businesses also use software that has been developed especially for their business or industry.

Small business computers are sold to end users in a variety of ways. Most small business computers are sold through one of the following six channels:

(1) Manufacturer's Sales Force: A manufacturer's sales representative makes a face-to-face call on the small business owner. Personal contact between the sales representative and the small businessman is maintained throughout the sale.

(2) Business Computer Centers: Potential customers are invited to visit a special center established by the computer manufacturer. At the center, potential customers are shown business computer products. The sales pitch is kept very low-key.

(3) Original Equipment Manufacturers (OEMs) or Value Added Resellers (VARs): Typically small systems houses, VARs combine hardware and customized software to reach vertical or specialty markets.

(4) Retail Stores: Retail stores serve both the consumer and the business market through a variety of store types. Manufacturer owned stores carry a single brand of computer. Independent computer stores and independent computer store chains carry several brands of computers, and may specialize

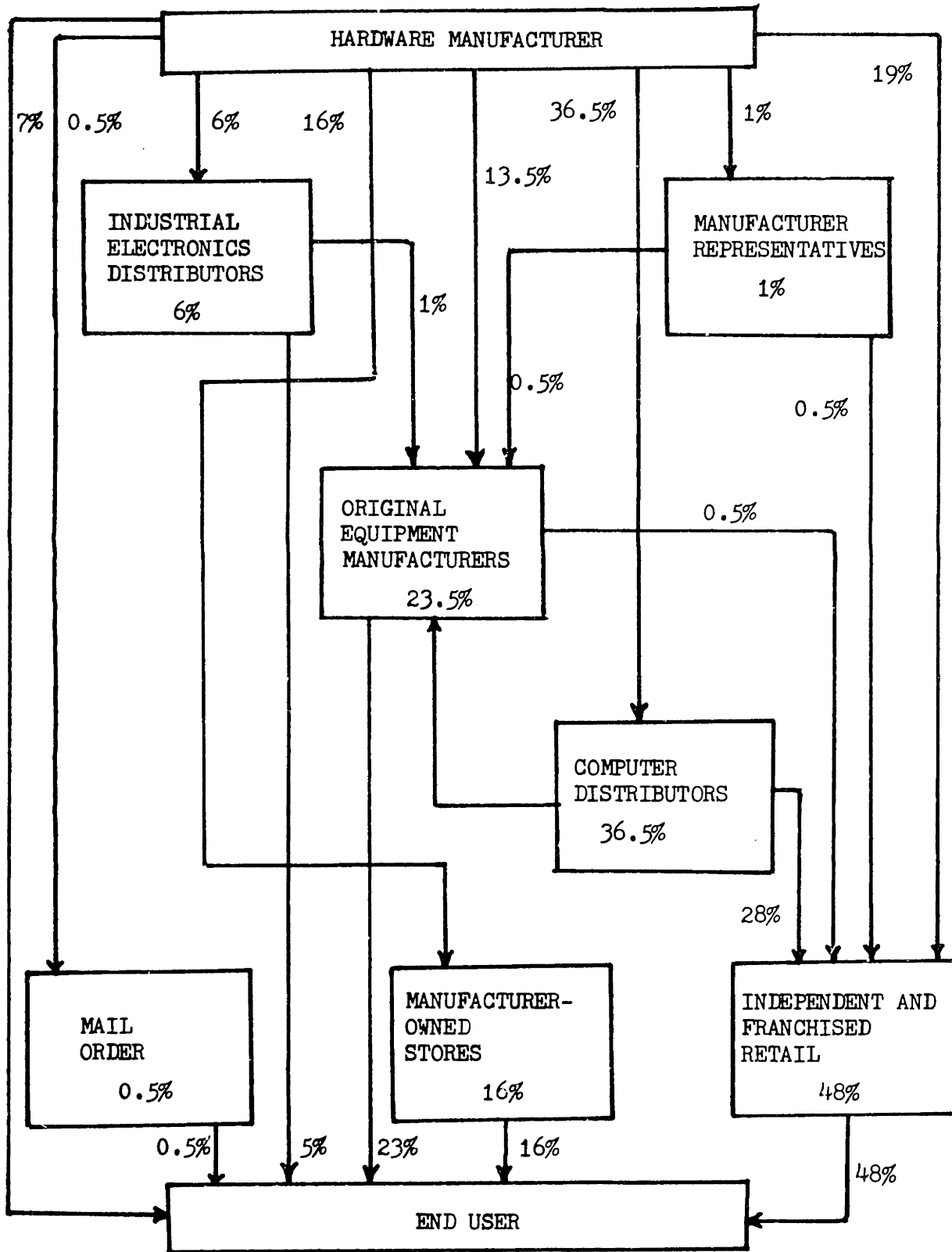
in serving the business market. Department stores typically carry a number of brands aimed at the home computer market. Office Product Dealers carry a wide variety of office products and supplies of which computers are only one.

(5) Mail Order Houses: These houses may carry a variety of lines, but offer no sales counseling or support, and as such are not well suited to the small business market.

(6) Industrial Electronics Distributors (IEDs): In addition to computers, IEDs carry a variety of electrical components, parts, and systems. Although typically serving OEMs, some IEDs sell directly to the end user, but, like mail order houses, offer no service or support. As such, the IED is not suitable for the first-time computer buyer.

Although retail sales is only one of six channels of distribution of small business computers, it is the most important of the six in terms of dollar volume. Exhibit 3.2 explains how small business computers reach their users. Independent and franchised retail stores accounted for nearly one-half of the dollar value of sales of small business computers in 1981. Future Computing predicts that computer retail stores will sell over one half of the \$12 billion of personal computers sold this year <sup>4</sup>.

All indications are that computer retailing will remain an important sales channel for small business computers. There are approximately 2,000 to 2,500 computer retailers in



PERCENTAGE OF DOLLAR VALUE PASSING THROUGH DISTRIBUTION CHANNELS IN 1981

EXHIBIT 3.2

the United States, <sup>5</sup> with their ranks growing to 6,000 to 7,000 by 1988. In total, computer retailers could sell \$30 billion in 1988 <sup>6</sup>.

One of the primary computer markets served by computer retail stores is the small business market. According to a recent survey of small businesses that use computers, "retail computer stores were the most common source of computer acquisition, followed by direct purchase from the manufacturer." <sup>7</sup> Not only do small businesses rely on computer retailers, but computer retailers rely on small businesses for a large fraction of their sales volume. Table 3.2 shows the fraction of total sales in computer retail shops sold to small businesses. Over forty percent of all computer

	PERCENTAGE OF RETAIL SALES TRACEABLE TO SMALL BUSINESSES					
	100%	75-100%	50-75%	25-50%	10-25%	<10%
RETAIL COMPUTER STORES	43.1%	18.8%	8.8%	15%	13.8%	2.5%

TABLE 3.2

retail stores serve small businesses exclusively, and nearly 70 percent of all retailers rely on small businesses for at least one half of their sales. <sup>8</sup>

Although computer retailers come in all shapes and sizes,

the average computer retailer can be described by sales volume and profit margins. A 1981 survey of computer retailers found that retailers averaged 26 percent profit on sales of computers and computer related materials. <sup>9</sup> In 1982, computer retailers' gross margins ranged from 14 to 25 percent, with store sales averaging \$1.5 million. Under any circumstances, these margins are well below the 30 percent margin other specialty retailers earn on average. <sup>10</sup> Annual store sales vary greatly, with computer retailers doing anywhere between \$50,000 and \$25,000,000 worth of business each year. Table 3.3 displays a distribution of computer retailers by annual sales volume.

		ANNUAL RETAIL SALES				
		\$100K	\$100-\$500K	\$500K-\$1M	\$1-\$10M	\$10-\$50M
RETAIL COMPUTER STORES		18.8%	45%	16.3%	18.8%	1.3%

TABLE 3.3

The variety of computer retailers notwithstanding, computer retailing will become a more powerful force in the small business computer industry. As computers become more powerful, less expensive, and smaller, the role of the retailer is changing. "The original way of selling directly through a company's own sales force still plays a dominant part, as do sales through OEMs or systems houses. Other

marketing avenues, such as retail stores, distributors, and specialty stores, are taking on greater importance with the proliferation of newer systems." <sup>11</sup>

The power of the retail force in the computer industry should not be underestimated. Some observers see the retail channel of distribution as holding the key to industry survival. Crowded retail channels, for example, may be limiting the industry's growth rates. "If newcomers into this expanding industry are to prosper two changes are needed: new ways of selling and a bigger profit for the retailers." <sup>12</sup> In fact, the true test of survival in the personal and small business computer markets may lie not in pleasing the consumer, but in pleasing the retailer. <sup>13</sup>

The next five sections of this chapter will discuss many of the forces acting upon the computer retailer as he enters the small business computer market, and how those forces will affect the way the retailer does business.

### 3.2 COMPUTER RETAILING AND VERTICAL MARKETS

Business computer applications are typically divided into two groups: horizontal market applications and vertical market applications. Horizontal market applications are driven by horizontal market software -- that is software that has broad appeal to a large number of business users. For



example, general ledger accounting packages, spreadsheet packages, and word processing packages are popular horizontal software applications. Vertical market applications, on the other hand, are targeted at a more narrow segment of the business market. Packages designed for use in physicians' offices, engineering laboratories, or pharmacies are examples of vertical market software. Although small businesses have use for some horizontal applications, a large fraction of the small business market is interested in vertical applications that have been designed specifically for their business or industry.

The traditional methods of selling vertical market applications to small businesses are so expensive that hardware manufacturers, seeking higher profit margins, are looking to other channels of distribution for small business computers. A single face-to-face sales call, for example, can cost over \$100, and the sales costs associated with the sale of a small business system can total several thousand dollars. <sup>14</sup> A VAR, serving a particular market segment cannot afford to continue to sell small business systems in this fashion, especially when hardware costs are falling. Computer retailers have recognized this cost squeeze on the VAR and are beginning to move into vertical markets. Jim Clare, Executive Vice President of Balance Computer in Baltimore, MD, realizes the advantages of serving vertical markets through retail channels. "That kind of overhead is too high to make money

selling a \$10,000 microcomputer. Since we have our outlets, we don't need a large outside sales force, and we can spend money on advertising and promotion." <sup>15</sup>

While the sales cost squeeze on VARs is providing the opportunity for computer retailers to enter the vertical business market, the heavy discounting that characterizes the home computer market is providing them with the incentive to move. Intensive distribution of many popular brands of microcomputers is creating intense price competition among computer retailers, forcing their already low margins even lower. <sup>16</sup> Searching for markets with higher margins, many retailers have turned away from home and horizontal business markets to the vertical business markets. <sup>17</sup> As a more specialized and less competitive segment of the small business computer market, the vertical market seems to be the natural refuge for the computer retailer because the vertical market offers "a more sophisticated customer base...to bolster slim profit margins." <sup>18</sup> Some observers have been so blunt as to link retreat into the vertical markets to survival. "Success in this case goes to the firm that can capture vertical markets." <sup>19</sup>

The migration of computer retailers from horizontal to vertical markets is well under way. Although fewer than one-third of retail computer stores currently describe themselves as specialists in a vertical market, that fraction

is sure to grow as the retail computer market becomes more competitive. <sup>20</sup> The result of this migration will be a merger of systems houses and retail stores. "[T]he standardization of and low-cost hardware of the traditional micro vendor, the retail outlet, is joined with the vertical market expertise and service orientation of the traditional mini vendor, the systems integrator. The business is probably run out of a store front (a la micro), but offers house calls or on site service (a la mini). <sup>21</sup>

In general, the small businessman has been supportive of the trend toward serving vertical markets through retail channels. The small businessman purchasing the computer is "typically the owner of the company, with no previous data processing experience, intent on saving as much money as possible." <sup>22</sup> Used to buying office equipment and supplies through a retailer, the small businessman apparently is comfortable purchasing his computer in the same fashion. They still want "some guidance, but they are not, on the whole, willing to pay several thousand dollars additional for a \$10,000 system" for the extra support provided by a VAR <sup>23</sup>.

In spite of the businessman's willingness to shop computer retail stores for a small business system, the entry of computer retailers into vertical markets has not been as smooth as it may appear. The market circumstances that created computer retailing and shaped the development of the

computer retail system differ from the forces that are creating the trend among retailers to vertical markets. Customers that bought the first microcomputers were adventurers, willing, even eager, to tinker with the machine without the guidance of the seller. Even though computer retailing has shifted to a new kind of customer, the small businessman, "the micro distribution pattern has so far remained largely unchanged. Businessmen are finding themselves in unaccustomed surroundings as they search for the latest in deskware." <sup>24</sup>

To succeed in serving the vertical market, the computer retailer must change the way he sells computers. In general, computer selling methods should be matched to the market, and a distribution strategy aimed at small businesses will differ greatly from a distribution strategy aimed at hobbyists. <sup>25</sup>

The vertical market will require the computer retailer to adapt his selling approach to the needs of the businessman. For example, selling to vertical markets requires a more knowledgeable sales staff that selling to horizontal markets requires. According to Jim Clare, Executive Vice President of Balance Computer in Baltimore, "You've got to understand what the prospect's business is all about, and then you find the software to fit the need. You also have to have a sales and technical staff with much more product knowledge than usual." <sup>26</sup> The development of the requisite technical and sales staff

is a stumbling block for many computer retailers. Learning to sell to a vertical market takes a great deal of time and expense, and not all salesmen are capable of selling to all vertical markets, thereby reducing the flexibility of the retailer's salesforce. Lawrence Stein, President of Prodigy Systems of Iselin, NJ, complains that "there's no way to train a salesman in a store to sell to several vertical markets."

<sup>27</sup> In short, selling to vertical markets is a very different business from selling to horizontal markets. Even the philosophy of business differs between a vertical and a horizontal retailer. "A retailer just selling a box will try to sell the most expensive item he carries, but in vertical marketing you want to establish long-term relationships with customers," according to Ed Flystra, General Manager of Interdynamics Data Systems in New York. <sup>28</sup>

The additional knowledge required to sell to the vertical market, and its concomitant reduction in salesperson flexibility manifests itself in a longer sales-cycle for vertical market systems than for horizontal market systems. In general, a sale to a vertical market will take more salesperson time and effort than a sale to the horizontal or home markets. <sup>29</sup> Machines that have an exclusive business focus are traditionally more difficult to sell. <sup>30</sup> As such, it is frequently more expensive for a computer retailer to operate in a vertical market than it is for him to continue to operate in the horizontal and home markets. <sup>31</sup>

Selling to vertical markets differs from selling to horizontal markets for three main reasons. First, obtaining and understanding the vertical market software necessary to succeed in vertical markets poses a great challenge to the computer retailer. Second, the increased attention to service and support demanded by the vertical market will strain the retailer's resources. Finally, trends in the marketplace will leave the computer retailer with the least sophisticated segment of the consumer population as his customer base. These three trends will combine to change the nature of computer retailing.

### 3.3 VERTICAL MARKET SOFTWARE AND COMPUTER RETAILERS

Perhaps the most important element of a small business computer system, especially a system to be used in a vertical market application, is the software. Surveys of small business computer buyers revealed that the availability of software was the most important element of their purchase decision -- even more important than system price <sup>32</sup>. In fact, the lack of software for particular applications has been blamed for lost sales. In a recent survey of computer salesmen, salesmen were asked to describe some of the most difficult problems they encountered when selling computers. "[M]ost salespeople included 'an application for which there was not good software.'" <sup>33</sup> In fact, software is so important to the small businessman that he will typically examine

software packages before looking at hardware. <sup>34</sup>

Given the small businessman's insistence on appropriate software, the computer retailer hoping to enter the vertical market faces a difficult problem. In horizontal markets it was relatively easy to obtain good software. Packages were available commercially, and every computer store carried similar packages. In vertical markets, however, businessmen are interested in specific application packages -- packages designed to solve the business problems of a specific industry. To manage the transition from horizontal to vertical markets, retail computer outlets need to make vertical market packages available. But vertical market packages will not be made available in large numbers until there is a large retail demand for such packages. A classic chicken-and-egg problem, software availability is a key to the transition of computer dealers from horizontal to vertical markets. <sup>35</sup>

Those retailers that have attempted to make the transition from horizontal to vertical markets have been relatively unsupported by software manufacturers. In 1981, for example, most small business computer owners who had purchased a computer from a retail store went to some other source to purchase the software. <sup>36</sup> Industry observers predict that for some time, "the micro retailer will probably be able to demonstrate and compare a variety of word

processing, spread sheets and other general products, but will have little information to offer about specific applications."

37

The most likely source of software for vertical market applications for the retail channel will be current OEMs or VARs. These system houses have developed numerous software packages aimed at specific small business markets. Lured by the opportunity for wider distribution of current products, many VARs will make their products available for sale through retail computer stores. Computer stores will add value for vertical market customers by "combining third-party applications software with microcomputers..."<sup>38</sup> It is important to note, however, that the support of vertical market systems sold through retail channels will differ greatly from the support provided by a systems house. Although the systems house may be the author of the software package, the system house is not the vendor of the software, and as such, may not feel responsible to support the software. In addition, the documentation accompanying vertical market packages is frequently inferior to the documentation accompanying horizontal market packages. Given the intensely competitive marketplace in which computer retailers operate, the retail channel may not be able to fill the support void left by systems houses. One observer believes that availability of comprehensive support "will always be limited because necessary distribution channels cannot exist in that



marketplace as it has evolved."<sup>39</sup>

The acquisition of vertical market software by the computer retailer will affect the retailer's business. First, selling software is less profitable than selling hardware. "Though a programme costs much less than the machine it runs on, users need just as much help....If you answer three questions, you've lost money on the sale," says one computer retailing consultant. <sup>40</sup> Therefore, the dealer's natural inclination is to sell software bundled with hardware to prevent the diversion of the salesman's time from high ticket hardware to low ticket software. <sup>41</sup> If software were to be sold unbundled, or were to become so complex that took a great deal of time to sell and explain, software would divert salesman hours away from hardware sales, thereby depressing hardware sales and retail revenues.

The acquisition and management of vertical market software poses a great challenge for computer retailers. The successful transition of computer retailers to a vertical market customer base depends critically on the availability of specific, vertical market application packages. The availability of packages has been limited, but is improving as more OEMs are making available their proprietary packages for resale through retail channels. Nevertheless, the nature of these packages and the techniques required to sell them affects the way the retailer manages his store and allocates

his sales effort.

### 3.4 SUPPORT AND SERVICE REQUIREMENTS OF VERTICAL MARKETS

Computer service and support is a broad term that encompasses a variety of activities. Service and support include assistance in installation of the system, training, program customization and modification, answering user questions after installations, maintenance and repair, follow on sales of peripherals and supplies, and consultation on future business needs and current data processing capability. In short, service and support encompasses all computer-related activities that the user is unwilling or unable to undertake for himself.

In the business market, support at the sale is a critical determinant of the success of a sales attempt. Emphasizing that support at the time of sale is the key difference between the home and business computer markets. John P. Frank, National Sales Manager for Zenith, remarked, "It's not like selling TVs." <sup>42</sup> In addition to support at the time of sale, users often need assistance after the sale has been made. In fact, "computer merchants are unusual in the extent to which success depends on providing post-sale support. They must be able to hold hands with the nervous, instruct the computer illiterate, and tailor the right combination of different manufacturers' hardware, software, and peripherals to a

customer's needs." <sup>43</sup>.

Computer retailers are fully aware of the importance of service and support in selling computers to small business. Service has been described as the "computer retailers' primary marketing tool."<sup>44</sup> Computer retailers promise prospective system owners that their salesforce "stands ready to do as much handholding as necessary -- from sending a sales representative directly to the customer to installing the computer, training the user, and answering questions at all hours about the machine's mysterious workings." <sup>45</sup> In fact, promises of service and support are becoming so important to the sale of a small business system that even retailers of used computers are beginning to promise to support what they sell. <sup>46</sup>

In serving a vertical market, promises of service and support must not be hollow. Frequently, repeat business is the bread and butter of computer retailers. A 1981 survey of small business computer owners revealed that 88 percent had already purchased additional computer equipment. <sup>47</sup> The magnitude of add-on business usually approaches 30 to 40 percent of the original system price within three years. Already, computer retailers are heavily dependent on their current customer base for revenues. Over thirty percent of the average computer dealer's revenues are traceable to current customers. <sup>48</sup> In short, "because previous customers

are so important to future sales, both in buying additional equipment, and in providing invaluable references, it is essential that dealers maintain user satisfaction...The dealer must keep in close contact with the user. Preventive maintenance checks, newsletters, and user groups are methods of accomplishing this."<sup>49</sup>

Apparently, computer retailers are keenly aware of the importance of service and support. Eager to keep the goodwill generated by good service for themselves, most computer retailers perform their own service. Over 80 percent of all computer retail stores complete service in-house, while 13 percent rely exclusively on third parties for service. <sup>50</sup> Although most dealers are making an effort to provide service, the quality of service available is unknown. Certainly, the complexity of system problems can exceed the expertise of a dealer's salesforce. As dealers enter vertical markets and offer more complex systems and applications to small business, complex system problems are more likely to arise. In addition, service and support time can represent a drain on the computer retailer. In a recent survey of computer retailers, one dealer believed that "it was important to limit (sales) growth so as not to outgrow service capabilities." <sup>51</sup>

In short, computer retailers entering vertical markets must recognize that the service and support needs of vertical markets differ greatly from those markets traditionally served

by computer retailers. Small businesses require a great deal of support, both during and after the sale. Failure to provide this support can damage a dealer's reputation and his business.

### 3.5 CUSTOMER SATISFACTION AND COMPUTER RETAILING

In general, the retail channel is used by the less sophisticated classes of computer users. Computers, peripherals, and supplies are available to the small user through a variety of channels. Mail order houses and distributors, for example, frequently serve the small user and typically have lower prices than the computer retailer because they offer no service or support. For the sophisticated computer customer, the lack of service and support from mail order houses or distributors is of little consequence. But to the first time purchaser, the relative inhospitality of these channels effectively forecloses them to him. As a result, the computer retailers are left to serve the most unsophisticated, small user. <sup>52</sup>

These unsophisticated, small users come to retailers in large numbers. Joel Skolnick, a former Vice President of the Computer Store, Inc. notes that "there are over 100,000 microcomputers sold every month, and they're going to less technically sophisticated people. Companies are buying computers for their employees and saying 'here, use this'

without any instruction." 53

Frequently, computer retailers lack the expertise to provide much guidance to the buyer. The seller, in effort to match the customer's needs with his available equipment, frequently forces the match given what is available to him. The buyer, relying on the wisdom of the seller, is powerless. "All too often, neither the buyer nor the seller, has any knowledge of computer technology and how it can be applied to solve business problems. Yet between them, they select and install thousands of systems every month." 54

This lack of retailer expertise is unfortunate in that the retailer fails to fulfill his primary function -- adding value through expertise. Traditionally, computer hardware and software retailers have added value and justified charging more than their costs through hardware. More recently, especially with the development of computer retailers and the emergence of the unsophisticated marketplace, dealer expertise is the value added that justifies the dealers mark-up. 55 Customers apparently believe that a dealers experience is important. For example, a survey of computer retailers revealed that store owners believed that the quality of the system was as important as a salesman's skill and expertise in closing a sale. 56

The ignorance of the customer and the retailer lengthens the sales cycle for vertical market small business systems. There are two reasons for this. First, computer retailers believe that the lack of customer knowledge of the product is a major problem. It is more difficult to sell to an ignorant customer than it is to sell to a sophisticated customer.<sup>57</sup> Second, the rapid advancement of computer technology compounds the confusion of both customers and retailers. As more and more sophisticated applications and hardware become available, the potential customer is less and less sure what he wants his new computer system to accomplish.<sup>58</sup> As a result of the tendency of the ignorant to become the customer base for computer retail stores, the retail "industry has the exasperating task of teaching the public about computers. Retailers have to answer most of the questions from puzzled users. They are often ill-prepared to do so. The proliferation of new systems makes it hard for salesmen to keep abreast of what they sell."<sup>59</sup> All of this education adds to the length of the sales cycle.

The computer retailer's problems with unsophisticated customers and salespeople and the resultant lengthening of the sales cycle is exacerbated by the recent trend toward selling multiuser microcomputers through the retail channel. These "top-of-the-line microcomputers offer multiuser, multifunction capabilities...Since the supermicrocomputer is new to the business market, thorough comparative information is hard to

find. This means that today's manager must sort through a bewildering number of arguments concerning system price, price per unit, distributed v. centralized data bases, system configuration, and various fine points of system architecture in order to make his selections." <sup>60</sup> An unsophisticated computer shopper in search of a multiuser microcomputer system is truly in a desperate state. To compound the customer's confusion, many retailers lack the expertise necessary to sell multiuser systems. Ed Flystra, General Manager of Interdynamics Data Systems in New York notes that "getting good sales and technical people is difficult, though. There aren't that many around who are trained in systems work." <sup>61</sup>

In response to customer demand for computer knowledge, some computer retailers are spinning off their training activities into separate businesses with profit-and-loss responsibilities. <sup>62</sup> This trend to retailer training is not large, however. The establishment of training centers is capital intensive and diverts managerial attention away from the retailing business. Therefore, few retailers are able to afford to establish large scale training programs. <sup>63</sup>

In summary, the fact that the computer retailer's customer base will be composed largely of the computer illiterate means that a salesman will be spending more time answering questions and holding customer's hands, and less time writing orders. To compound this effect, the trend



toward serving vertical markets through retail channels will further lengthen the sales cycle. These factors will combine to make computer retailing more expensive than it had been previously.

### 3.6 COMPUTER RETAILING TRENDS AND THEIR EFFECTS ON MANUFACTURERS

The rapid growth of the market for microcomputers, and the tendency for the most difficult sales to be left to the retail sector have combined to create a shortage of retail outlets for microcomputers. <sup>64</sup> And given the shortage of experienced salespeople, especially as vertical markets become more important to computer retailers, the outlook for industry expansion is not as optimistic as one might think. With the exception of the large computer retail chains, growth may be limited. "Most smaller computer chains have fewer than 50 outlets. Many are under-capitalised. Others have succeeded in selling to businessmen and not just hobbyists, but are reaching the limits of managerial competence." <sup>65</sup>

This dearth of quality computer retailers is sparking intense competition among some computer manufacturers for retail attention and shelf space. Most retail computer shops carry several brands of computers. A recent survey of computer dealers found that 91 percent of all computer retailers carry more than one manufacturer's computers. <sup>66</sup>

Yet a retailer's ability to carry computers is limited, typically to between three and five different brands of computers. <sup>67</sup> Two factors limit the number of brands a computer retailer is able to carry. First, shelf and storage space in a computer store is finite. Although shelf space seems to be a minor constraint at first glance, industry observers believe it to be a significant constraint. Roger Badertscher, President of Mindset Corp., a manufacturer of microcomputers believes that "There's no question that the retail channel has a lot of products, and shelf space is an issue." <sup>68</sup> Second, the dealer's ability to understand and service his products is finite. A salesman must be able to understand the product he is selling to be effective. A retail outlet that carries too many brands will be ineffective at selling none of them. <sup>69</sup>

Within these constraints, the typical successful computer retailer will carry a product line composed of three products: (1) a portable computer, (2) a \$3,000+ system that is fairly complete for the horizontal market, and (3) a \$5,000+ system to be used as a workstation in small businesses. <sup>70</sup>

With more than 200 manufacturers offering over 400 microcomputers for sale through the retail channels <sup>71</sup>, the competition for the favor of the computer retailer can become intense. <sup>72</sup> Of particular interest is the competition among manufacturers of hardware used in vertical market systems.

According to Mr. Gail James, Vice President of Marketing for North Star, a manufacturer of multiuser microcomputers, "To reach those [vertical] markets the dealers and distributors are beginning to play a more important role, and are also adding a new layer of competition for suppliers. There's no question about the competition for dealers out there." <sup>73</sup>

Some of the less prominent manufacturers of microcomputers have begun to deemphasize the importance of independent retailers as a result of the competition for retailer attention. Honeywell, Wang, and Xerox concede that their preference for non-retail channels has been caused, at least in part, by saturation of retail channels by IBM, Apple, and Digital. <sup>74</sup>

Saturation of products at the retail level can create a major problem for computer manufacturers -- especially manufacturers without much of a history with the retail body. Some observers believe that retailers hold the power to determine which manufacturers survive and which manufacturers die. "As [retail] chains become more powerful, manufacturers are increasingly having to demonstrate that their products will sell even before the chains will accept them...It's a chicken-and-egg sort of thing. What retailers carry determine what gets sold." <sup>75</sup> So acute is the competition for retail attention that at least one industry observer predicted that "a lack of dealer shelf space could be a determining factor in any shakeout among vendors." <sup>76</sup>

With such large stakes resting on the outcome of the battle for dealer attention, manufacturers are trying several techniques to get dealers to carry their products. Many manufacturers are emphasizing the price and margins their machines earn for a retailer. In short, the dealer should carry a computer because it makes him money. <sup>77</sup> In addition to price, computer retailers want a computer that fits their stores' image. For instance, a retailer interested in attacking small business vertical markets will want to carry a line of products that has a strong reputation with the business community. Some ComputerLand stores dropped the Apple line of computers because they believed that Apple did not enjoy a businesslike reputation. <sup>78</sup> Many dealers are dropping the Hewlett-Packard desktop machine because they believe that the computer is too engineering oriented, and that there are many other machines waiting to fill a void in their product lines. <sup>79</sup> Support of the manufacturer for the retail channel is also important in convincing retailers to carry or keep a line of computers. Other Hewlett-Packard dealers dropped the HP line because they felt that HP was not committed to the idea of retailing computers. Instead, retail was a way to get rid of machines left over from the unsuccessful attempts of the direct salesforce. <sup>80</sup> With competition for shelf space as intense as it is, manufacturer support can be critical. Bruce Broderick, President of the Kansas City area ComputerLands, believes that "Vendors must create a need for their products, and people aren't coming

into our stores asking for them. Hewlett-Packard hasn't penetrated the business market, which is what we're in." 81

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## 4 MODEL DESCRIPTION

### 4.1 INTRODUCTION

This chapter presents a detailed description of the model we produced to study the development of a retail channel. This model served several purposes. First, it served as a tool to learn about the important issues relevant to the problem of channel development. The model increased the speed with which we could separate the important issues from those which may have received a lot of attention but were really not instrumental in the effort to establish a retail channel. Second, the model ensured that all of the relevant issues were in fact being considered. Although the people at MBC were well informed about the computer industry and marketing, this did not guarantee that they recognized all the factors that needed to be considered in their efforts. Third, the complete model was used and can be continued to be used to analyze the behavior of the system it represents and to investigate the validity of the assumptions and perceptions on which the model is based. In this way the experience gained from working with the model can, in many ways, supplement or serve as a surrogate for experience that one could obtain from working in computer retailing.

It is important to note that the model we produced is not a normative model of a retail system. It is a model of the way the managers we interviewed perceive a real system. Such a model is valuable because it can be used to identify those areas where perceptions of reality and reality itself conflict. In using the model, however, one should keep in mind that the validity of results and conclusions drawn from its workings rely on the validity of the assumptions upon which it was constructed.

In our efforts to construct the model we brought very little, if any, new knowledge to MBC about computers, retailing, or marketing. We did not interview dealers, other computer manufacturers or retailers. Nevertheless, we did provide a new way of investigating a problem. We used system dynamics modeling to leverage what the people at MBC already knew about their retail channel. Everyone we spoke to was an expert on some issue relevant to the problem of establishing a retail channel. We were able to gather these pieces of expert knowledge and by linking them together in their natural way, produce an accurate representation of the model as a whole. In spite of their expertise, the mental models which managers have of business systems are often inaccurate because of the complexity of business systems. The accuracy of the model which we produced is only limited by the accuracy of the individual components of which it was constructed. Since those who we interviewed understood these finite components

quite well, our model can simulate the behavior of the real system quite accurately.

#### 4.2 MODEL DESCRIPTION

Although the model produced was encoded onto a computer using the Dynamo language, one need not be familiar with programming or this language to understand the details of the model. A complete listing of the model appears in the Appendix for those who are experienced with Dynamo. The rest of this chapter presents a detailed description of the model. This description is written such that anyone should be able to understand the way in which the simulation is accomplished.

The description which follows serves two purposes. First, it presents all of the issues that we felt were important to MBC's effort to develop a retail channel for its desktop computer. Second, the description tells how we translated these issues into relationships that could be formulated mathematically. Where it is important to understanding how the equations were formulated, we give the equations and graphs related to the formulation. These equations are written in such a way that anyone familiar with algebra will understand them.

The model description is long and detailed. It is not

necessary to thoroughly read the complete description to understand in principle how the model works, but the details are provided so that anyone who wants to investigate the assumptions on which the model is based can do so. The detailed model description is presented to improve the reader's understanding of the model's behavior. We do not claim that the model will always represent the behavior of the real world perfectly, but if it does not, it is because some detail of the model is either missing or incorrectly represented. Therefore, those who raise objections to the results of our simulations can use the detailed model description to find the flaws that are causing this discrepant behavior.

#### 4.2.1 MODEL OVERVIEW

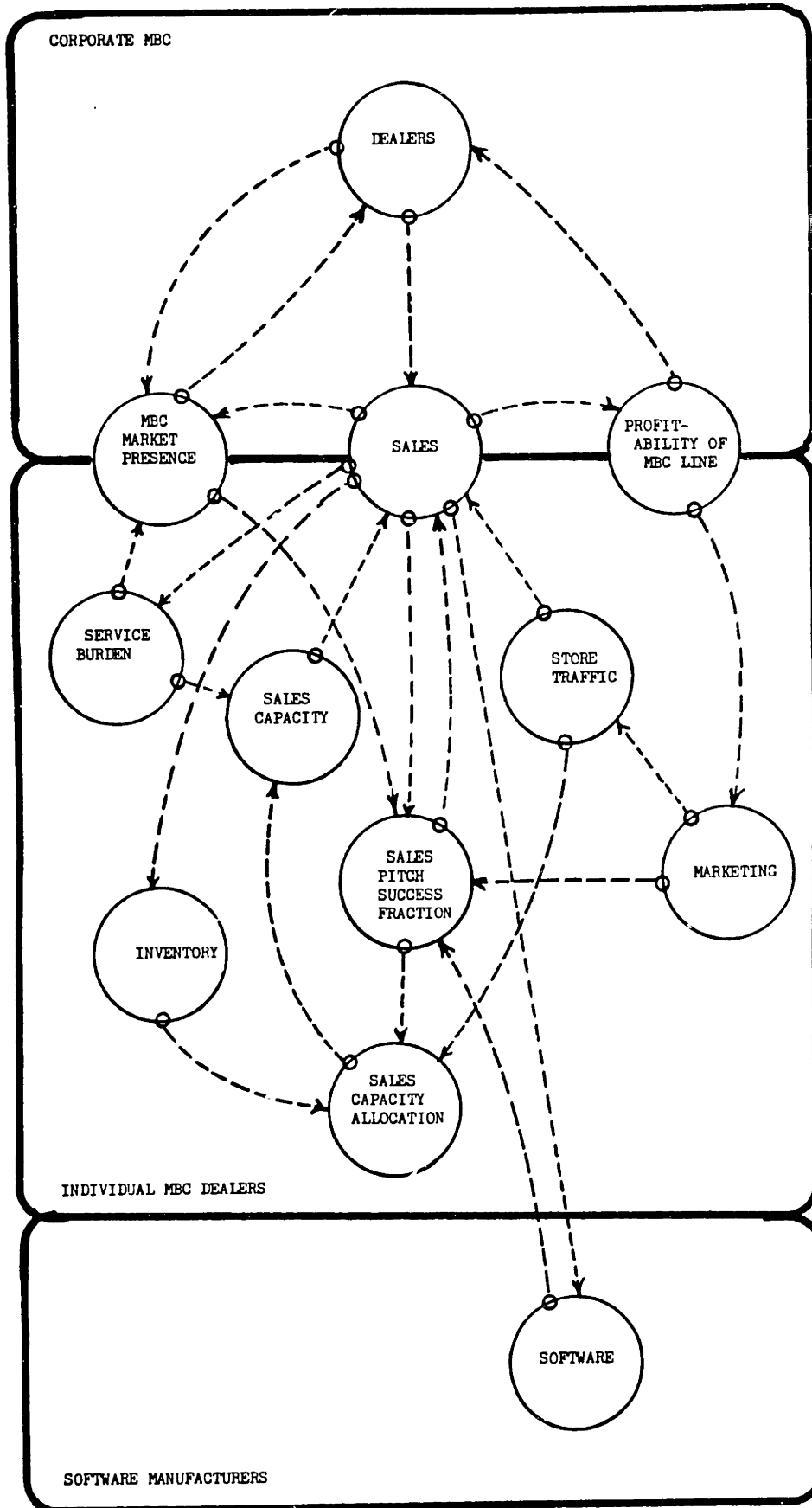
The development of a retail channel is affected by the actions of many people. In order to model this behavior in a meaningful way, the individual players must be aggregated into groups that respond similarly to various influences. For example, MBC is recruiting many dealers to sell its desktop computers. Although each of these dealers has a different number of employees, sells to a different market, and stocks different computers, generalizations can nevertheless be made about dealers as a group. In general, dealers like to carry products for which there is great demand; they emphasize products that have a high profit margin; they attempt to

maintain sufficient inventories to cover expected demand. Although individual dealers may respond somewhat differently to the pressures they face, as a group their behavior will be predictable.

Groups, such as dealers, are the building blocks of our model. Diagram 4.1 presents an overview of the system that controls the development of a retail marketing channel for MBC's computers. There are three major perspectives from which the individual factors are viewed or grouped: MBC, the individual dealers, and the software producers. Many of the factors are common to more than one group, but each group may respond to or influence each factor differently. To decide which factors to include and which responses and effects to model, we looked for those elements that were necessary to accurately describe the development of the retail channel. In drawing system boundaries and modeling behavior, we attempted to include only sufficient detail to describe those issues that were important to or could be affected by MBC.

Each "bubble" in Diagram 4.1 represents a group of related issues whether they be policies, activities, behavior, or facts. The arrows and their direction indicate an influence which may be as concrete as a movement of products or as subtle as the exchange of information. First, we will examine the factor's under MBC's control. Of primary importance to MBC is the total sales of its computers, and

Diagram 4.1



MBC's primary instrument for affecting these sales is the management of its retail channel. The company must recruit and retain dealers to sell the computers. MBC's success in establishing and maintaining the channel is strongly affected by the dealers' profits from carrying the MBC line, and MBC's presence in the market. Market presence affects the recruitment process, and the success or failure of the recruitment process also affects MBC's reputation in the market. Naturally, computer sales are also important to MBC's presence in the market.

Each dealer shares some of the same concerns as MBC. For instance, the reputation of the company and its products affects the success that the dealers have in selling MBC computers. The term we call "sales pitch success fractions" represents the fraction of customers who buy a given computer after a salesman makes a sales pitch for that computer. This fraction is used to determine the sales rate of each computer and is one input to a salesman's decision about which computers to push. The sales pitch success fraction for MBC equipment can change with MBC's reputation, software availability, dealer marketing, and average dealer experience from sales.

Average computer sales per dealer affects each dealer's profitability and the inventory which he maintains. Determining each of the dealer's sales rates is the capacity



available for selling, the sales pitch success fraction for each computer, and the "traffic" or number of customers visiting each store. Each computer that is sold creates some drain on a dealer's sales capacity because of "service" requirements. Also affecting each dealer's sales capacity is the way in which his salesforce allocates their time. If the salespeople choose to sell computers that have a long sales cycle, then the number of customers that they can serve is reduced. The "sales capacity allocation" of the salesforce can change over time in response to pressures from the volume of traffic through the store, inventory costs, and the expected success in selling each type of computer.

The traffic in a dealer's store is / influenced by the marketing activities of the dealer. If he spends a great deal on advertising then the number of potential customers entering the store will be large. Usually the marketing expenditures of a dealer are more closely related to the funds available from profits than it is to some decision about a target traffic size.

Software has become a driving force behind computer sales and its effects must be taken account of in order to develop a meaningful model. As Diagram 4.1 indicates, software availability influences the success that dealers have in convincing customers to buy computers. Software production is neither static nor unrelated to computer sales. Linkages

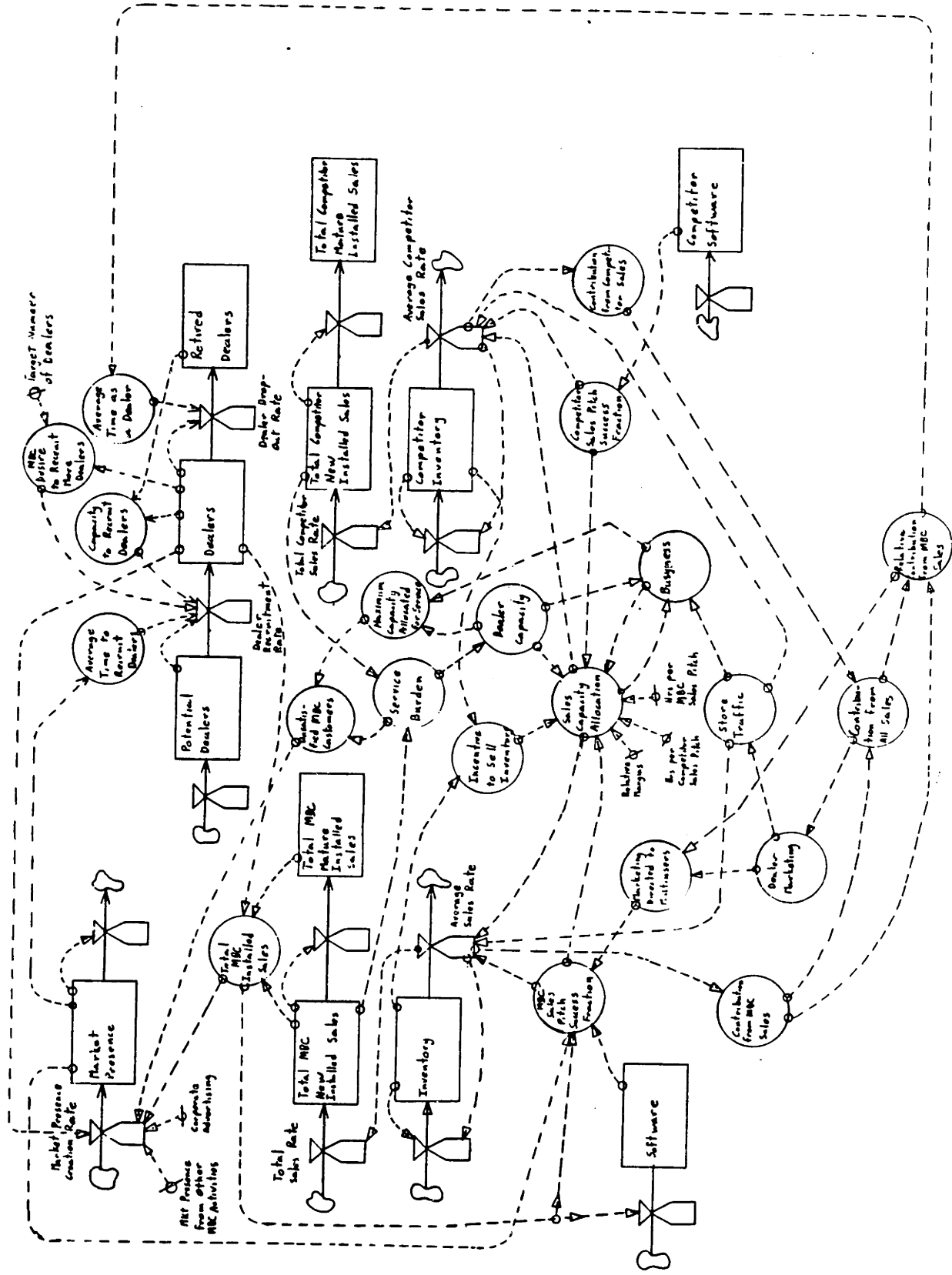
between the sales and production of these two complementary products are included in the model.

Diagram 4.1 is only a conceptual overview of a detailed and complex model. Diagram 4.2 is a more detailed and rigorous presentation of the model that we constructed. This diagram appears imposing but the meaning of its various components and the linkages between them are in most cases quite simple and intuitive. To make the presentation of the model clear, we have broken it up into logical units each containing a group of interrelated components. Each of these units has a diagram devoted to it and an accompanying section of explanatory text. Readers interested in a complete understanding of the model should read the model description thoroughly. Those interested in only certain aspects of the model's formulation, however, should have little difficulty in finding the section of interest to them.

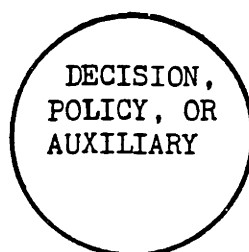
#### 4.2.2 POLICY STRUCTURE DIAGRAMS

Diagrams 4.2 through 4.13 are "policy structure diagrams." Policy structure diagrams are tools used in system dynamics modeling to characterize and present the behavior of a system. The symbols used in the technique are simple and natural. We refer to the symbol illustrated below as a "bubble." As with all of system dynamics' symbols, a bubble usually has an assigned numerical value at any instant in time

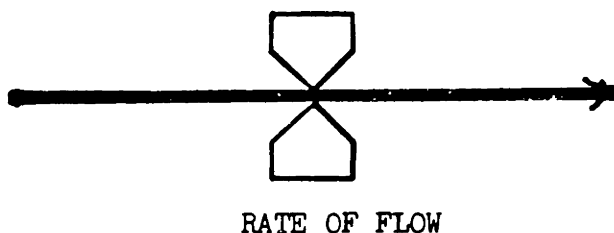
DIAGRAM 4.2



and a unit of measure. The numerical value can and usually does change over time during runs of the dynamic model. Each bubble is labeled according to the concept it represents. In general, bubbles represent decisions, either explicit or implicit, made within the system.

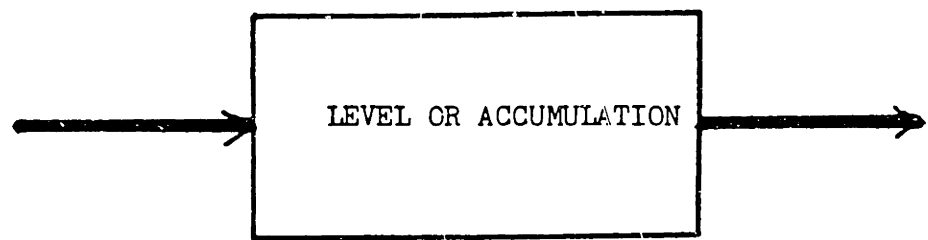


The symbol below is a valve, and it represents a rate of flow. The valve may stand alone with its label nearby or an explanatory bubble may be attached to the valve with a dotted line.

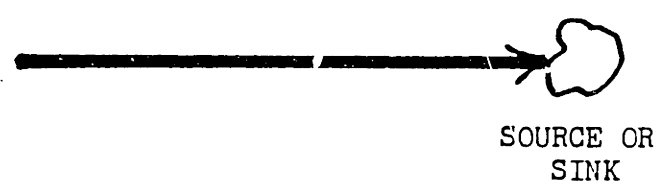


The level, represented by the rectangle below, can be thought of as a pool into which something accumulates. As illustrated in Diagram 4.4, valves often control a rate of

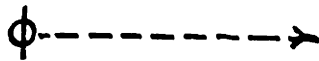
inflow into a level as well as a rate of outflow. In this example there is a market creation rate, a level of market presence, and an outflow or market presence decay rate. Solid lines represent the movement of that which is flowing and arrows indicate the direction of the movement.



As illustrated below, "clouds" represent sinks or sources which are can be thought of as levels of unlimited capacity.



Constants are indicated by the symbol below. These represent inputs which do not change over time to factors in the model.



CONSTANT

The conceptual linkages between components of a model are portrayed in policy structure diagrams by dotted lines. The meaning of each line in a model can be quite different; dotted lines can represent information, constraints, results, affects, decisions and a variety of other interpretations. The meaning of all the symbols should become clear during the explanation of each model section.

Each of the policy structure diagrams has a border with some of the symbols lying inside the boundaries and others outside. This boundary is somewhat arbitrary but does determine which are discussed in detail in the accompanying section of text. The symbols lying outside of the border are related to the subject under discussion, but, they are more completely described in another section.

### 4.2.3 DEALERS

Although a difficult activity to manage, the establishment and management of a retail marketing channel is relatively simple to model at an aggregate level. Diagram 4.3 illustrates the important aspects controlling the process. At any time, a number of dealers are currently carrying the MBC computer. This is represented as "MBC Dealers." In addition, there are dealers who have either stopped carrying the MBC line or have gone out of business entirely. The length of time that these dealers carry the MBC line is primarily determined by the profitability of the MBC line compared to the profits a dealer could realize from other lines. The changing dealer drop-out rate is simulated in the model with the following equation:

$$\text{dealer drop out rate} = \frac{\text{(number of dealers)}}{\text{(average time as a MBC dealer)}}$$

As this equation reveals, the number of dealers retiring over any given time period is directly related to the current number of dealers. Although the percentage of dealers that drop out over any given time period may not change, the absolute number will certainly increase if there are more dealers who might leave.

The time that dealers continue to remain in business and sell the MBC computer varies. Some will drop the line promptly whereas others may not drop the line for years even

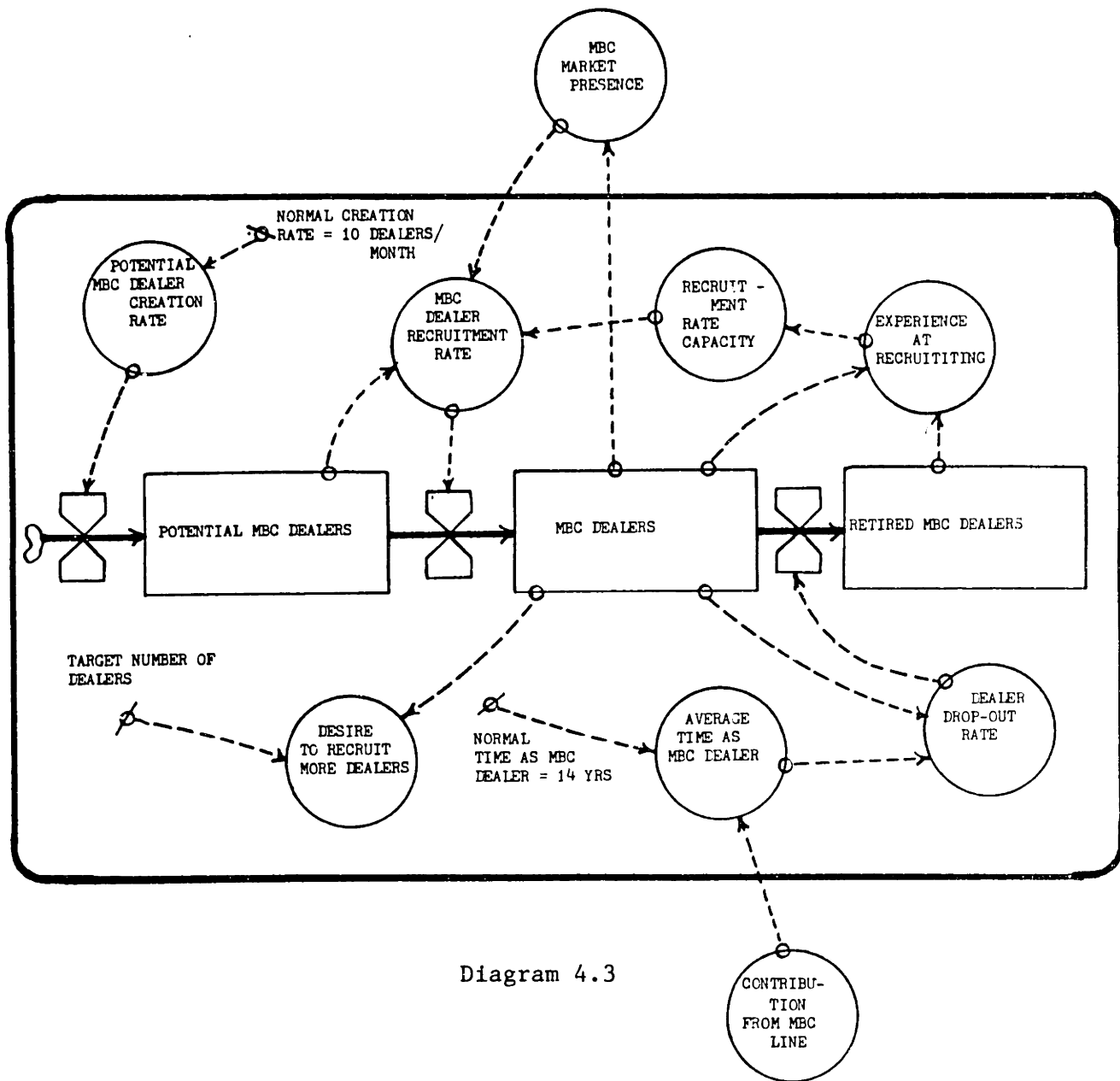
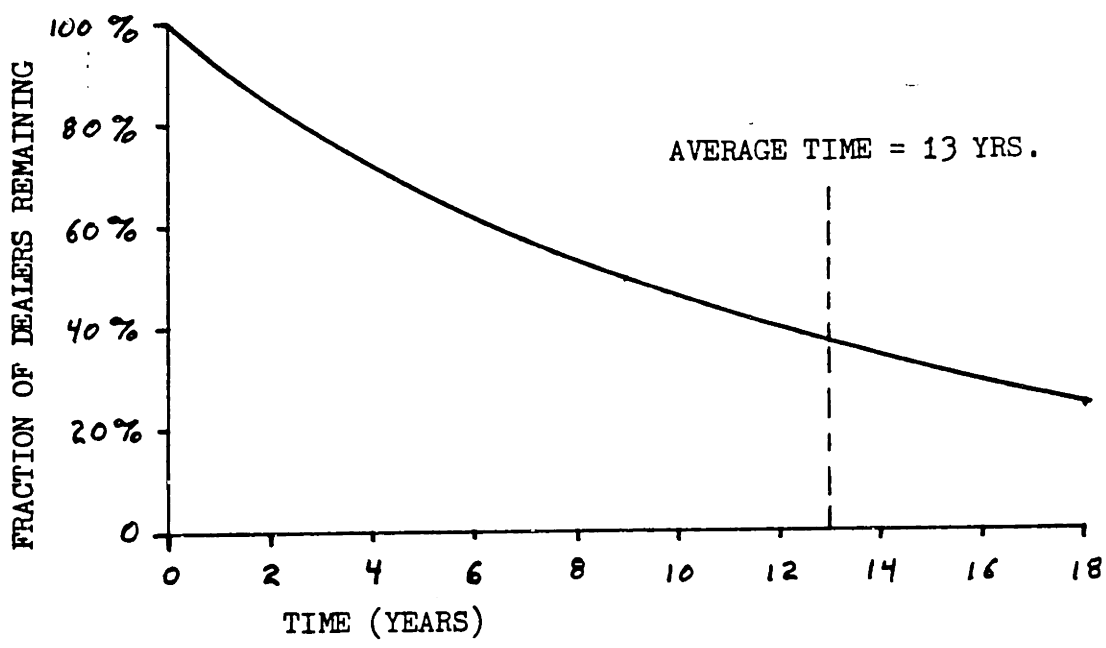


Diagram 4.3



though it may prove not to be very profitable. Figure 4.1 illustrates the way in which we have modeled the normal rate at which MBC dealers retire under normal conditions. This

Figure 4.1



behavior results from the equation for dealer drop-out rate if average time as a MBC dealer remains constant. This is a standard modeling formulation for a decay rate where the rate is an exponential function. <sup>2</sup> In our model the average life of a MBC dealer may be as great as 39 years if the MBC line is very profitable; however, under normal conditions it is 13 years.

For example, if MBC currently has 100 dealers then in approximately 9 years only half, or 50, of these dealers would still be selling computers for MBC. At the end of 18 years only 25 of the original dealers would still be around. The rate at which dealers retire is not entirely under MBC's control since it is influenced primarily by the profitability of the line within each individual store. Nevertheless, MBC can still regulate the number of dealers existing at any time by its recruiting efforts.

Four items control the recruitment process:

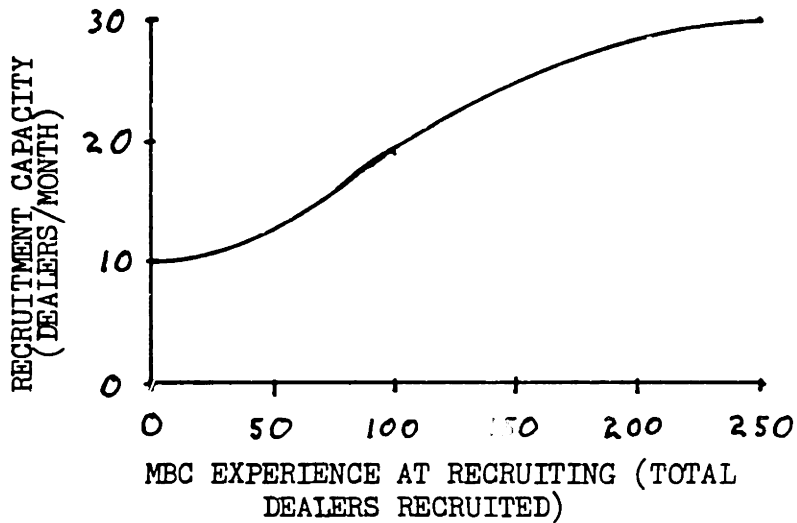
- 1) MBC's experience at recruitment.
- 2) MBC's "market presence" in the eyes of the dealers.
- 3) The number of dealers eligible to carry the MBC line of computers.
- 4) MBC's desire to add additional dealers.

The process of recruiting dealers is not easy. Potential dealers must be identified and contacted, a convincing sales pitch must be given to encourage a dealer to sign up, the qualifications of a dealer must then be researched to ensure that he does indeed meet MBC's requirements to sell the MBC computer, and finally the dealer must be trained how to sell MBC computers. Dealer recruitment takes not only time and money. It also takes experience to learn how to do it effectively. In their first attempts at recruiting dealers, therefore, MBC will be limited in the number of dealers it can

recruit in any given month by its experience at recruiting.

MBC's experience at recruiting dealers is represented as the sum of all the dealers it has recruited in the past. As Figure 4.2 shows, MBC's capacity to recruit dealers increases from 10 dealers per month to a maximum of 30 dealers per month. The graph shows that it becomes increasingly difficult

Figure 4.2

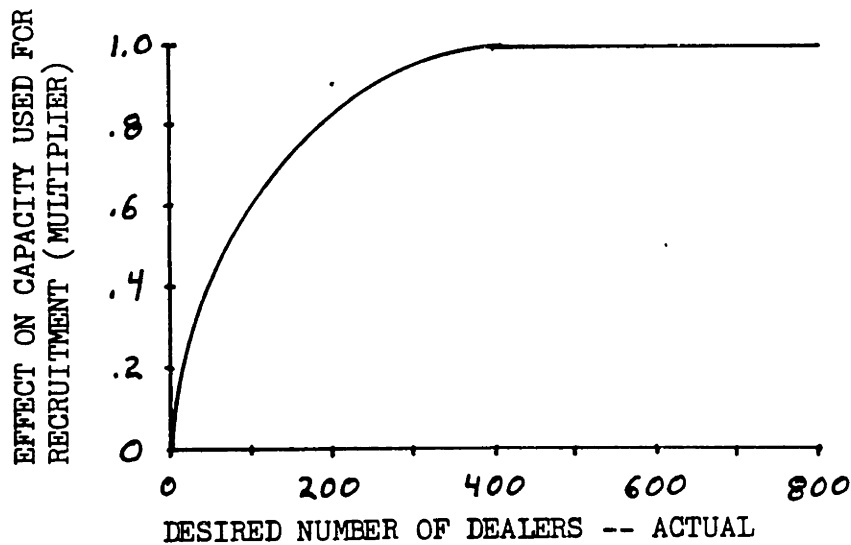


to increase the recruitment rate as the physical limitation of 30 dealers per month is approached. At this point the limitation of funds, facilities, and personnel available to devote to dealer recruitment prevents further increases in the recruitment rate. MBC reaches this maximum capacity rather

quickly. After it has signed-up 250 dealers MBC has its 30 dealers-per-month capacity.

The total number of dealers that MBC would like to have selling its computers is limited. Although MBC wants good geographic coverage for sales points all across the country, they do not want the dealers to start competing for the same customers. In particular, MBC is promising its dealers that they need not worry about another MBC dealer being put in their back yard. MBC will maintain no more than 1000 dealers. Figure 4.3 shows how we modeled MBC's decreasing recruiting effort as the target number of dealers is approached. The

Figure 4.3



Y-axis is a multiplier which puts a ceiling on the recruitment rate as the difference between the current number of dealers and the target number approaches zero. This multiplier ranges from 0 to 1 so that the effective capacity to recruit dealers is either at its normal value or reduced by some fraction. As the target number of dealers is approached the effective capacity to recruit is curtailed to represent MBC's resistance to adding more dealers to its network.

There are approximately 2500 computer retailing stores in the United States currently and this number is projected to grow to 6000 by 1989. Not all of these dealers are eligible to become MBC dealers, however. A retailer must meet three requirements in order to be considered a potential dealer for MBC computers. A dealer candidate must

- 1) have been in business for at least three years.
- 2) have over one million dollars in sales.
- 3) have at least \$100,000 net worth.

In the model the dealers who meet these requirements are represented as "potential MBC dealers." Currently there are approximately 1000 "potential dealers." As new dealerships are formed, however, the number of potential MBC dealers is increased at the potential MBC dealer creation rate. In the model this rate remains constant at the normal creation rate of ten dealers per month.

The number of "potential dealers" is important because it controls the ease with which MBC can recruit them to sell computers. Just as the "dealer drop-out rate" is directly related to the number of "MBC dealers, so too the "MBC dealer recruitment rate" is directly related to the current number of "potential MBC dealers." If the only influence on the recruitment rate were the number of potential dealers, then the recruitment rate would be expressed as:

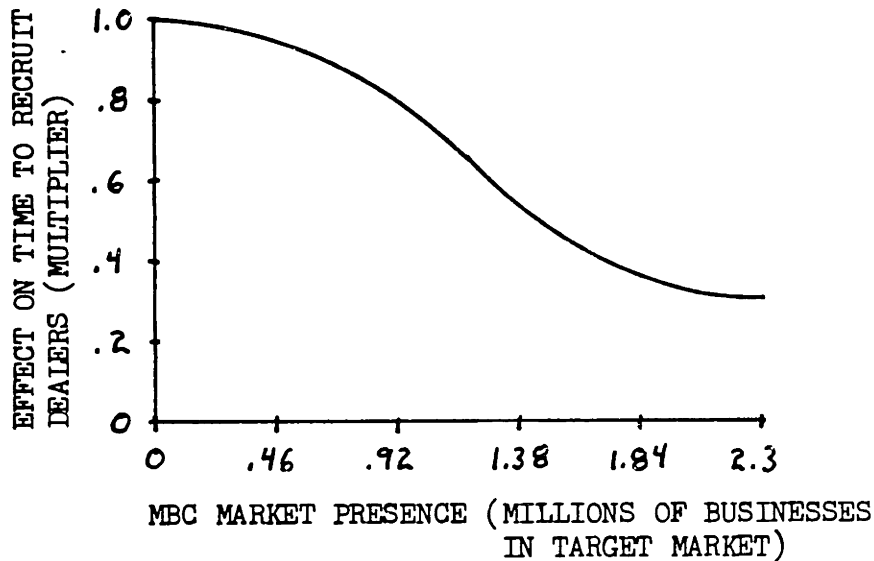
$$\text{MBC DEALER RECRUITMENT RATE} = \frac{\text{POTENTIAL MBC DEALERS}}{\text{AVERAGE TIME TO RECRUIT DEALERS}}$$

Under normal conditions, the number of original potential dealers would decline exponentially. The model uses 12 months as the average recruitment time which means that if MBC had unlimited capacity and all influences were held constant, then after about 8 and 1/2 months half of the original dealers would have been recruited.

The time it takes to recruit a dealer to sell the MBC computer is not simply the time necessary to identify the dealer and put him through a training process. Much of the recruitment time is spent convincing the dealer that the MBC computer is worth carrying. This task is in large part affected by MBC's reputation in the market, both in terms of the products it sells and its name as a corporation and supplier to retailers. This MBC market presence can reduce the average time required to recruit dealers. Figure 4.4 shows that as the number of businesses who have favorable impressions of MBC increases, the time for recruitment can

decline to as little as 30 percent of its normal time of 12 months. The shape of the curve captures the fact that a

Figure 4.4



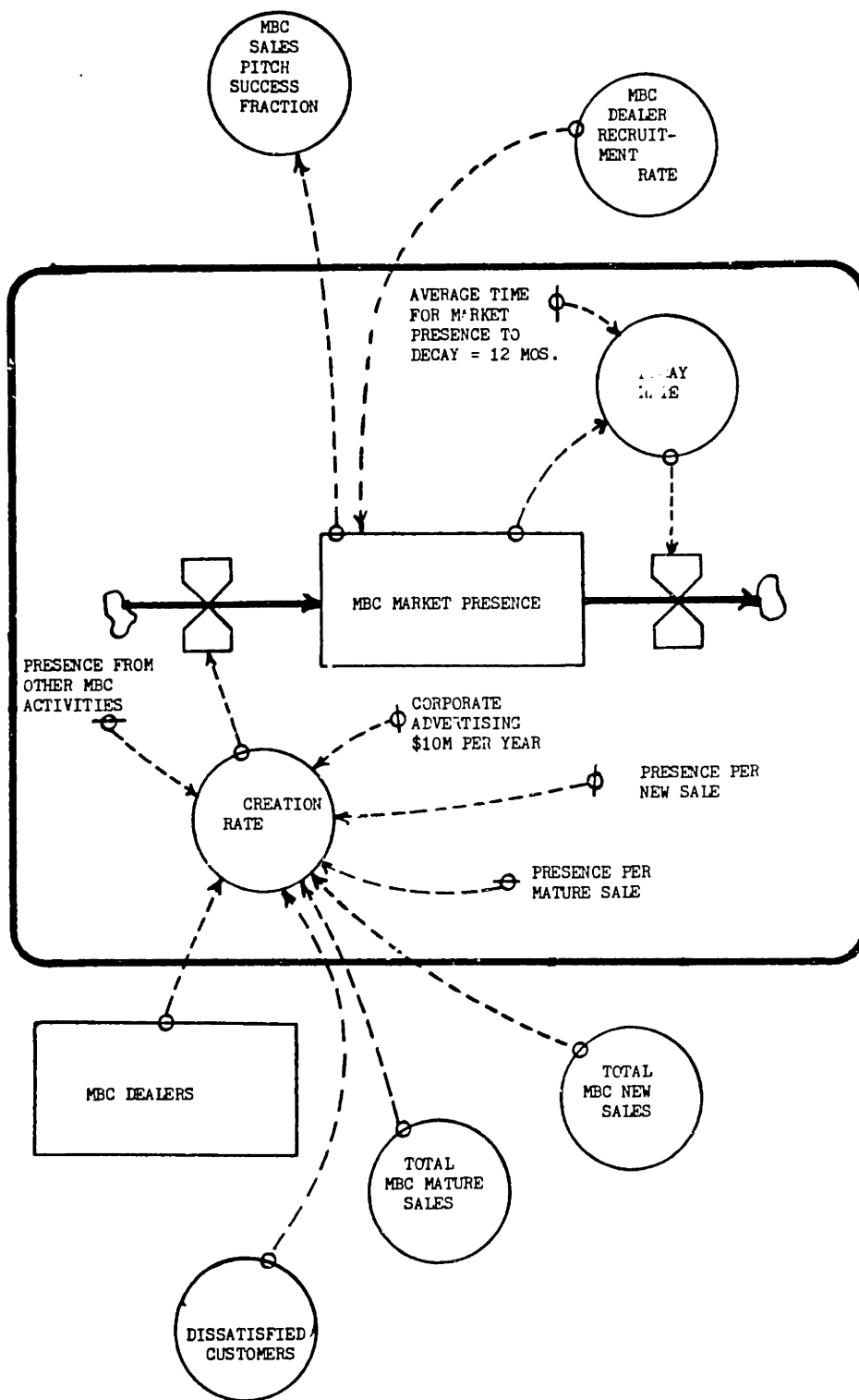
little bit of market presence affects the recruitment rate by only a small fraction. As a significant fraction of the target group of small businesses starts becoming aware of the MBC name, however, improvements in market presence have an increasingly large effect on the ease of recruitment. As one would expect, the effect of increases in market presence diminishes as a major fraction of the businesses become familiar with MBC. Market presence alone cannot reduce the time to recruit dealers to zero.

#### 4.2.4 MARKET PRESENCE

MBC's market presence affects not only MBC's ability to recruit dealers, but the success that dealers have in selling the computers, as well. Therefore, it is important to capture in the model the changes in market presence that occur over time. Diagram 4.4 presents the factors needed to represent market presence. MBC's market presence at any given time is represented as a level of awareness of the company and its products. Since there are 2.3 million businesses in the target market for the MBC microcomputer, market presence is measured as the fraction of businesses in this group that have a favorable impression of MBC. As people forget the good things they have heard or seen about MBC, the company's presence in the market deteriorates. Once again we have used the standard technique of dividing the current level of market presence by an average time for market presence to decay in order to produce an exponentially declining level of market presence. In the model the average time for market presence to decay is equal to one year. This time to decay implies that if 100 people were isolated from any news about MBC for 8 and 1/2 months, 50 of these people would no longer hold opinions, either positive or negative, about MBC. Alternatively, one might view the effect from market presence to only be half as powerful after 8 and 1/2 months.



Diagram 4.4



Market presence can be created in many ways. Five different sources of market presence are captured in the model. They are:

- 1) Computer sales.
- 2) Dealers.
- 3) Corporate advertising.
- 4) Other MBC activities.
- 5) Dissatisfied customers.

Each of these factors are acting individually to make businesses aware of the MBC name. To get the total effect, each of the individual contributions are summed together yielding an aggregate market presence creation rate. Each source of market presence will be explained in detail.

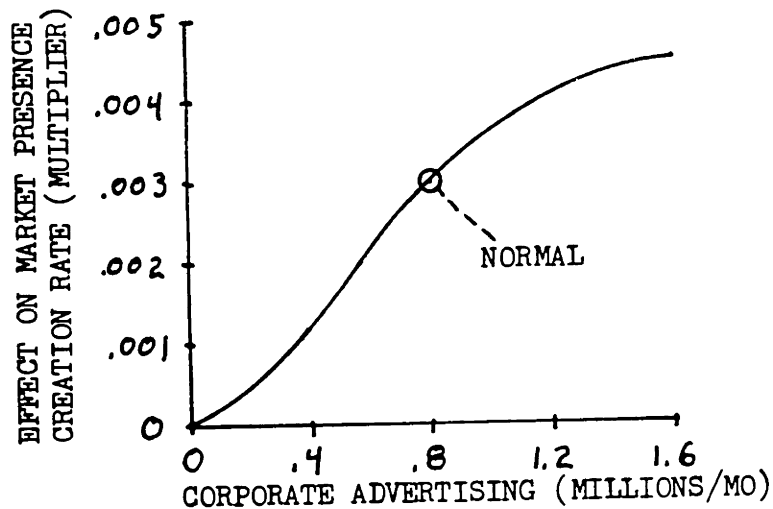
Each time a dealer sells a MBC computer he has installed a potential source of market presence. The new computer owner is likely to tell other business friends about his new piece of equipment and these businesses will form a more favorable impression. This is a continuous process through which businesses in MBC's target group become more aware of the MBC name as they come in contact with the computers or their owners. Of course, the excitement of purchasing a new computer eventually wears off and a computer owner tells fewer of his friends about the investment. Therefore, we have modeled the generation of market presence from new computers to be three times as significant as the effect from older computers. Each computer less than one year old makes

slightly over two businesses favorably impressed with MBC and its products each year; whereas, a computer older than one year would create less than one favorable impression per year.

The existence of a retail channel is an extremely important factor in making businesses more knowledgeable about MBC. The dealers advertise in newspapers and circulars, put up billboards and signs, and display the MBC computer in their stores. For every dealer currently in the MBC network, 48 small businesses become favorably impressed with the MBC name each year.

At the corporate level MBC can take measures to improve its presence in the market. By increasing expenditures on corporate marketing, MBC informs potential customers about the merits of MBC or at least ensures that people have heard the name. Figure 4.5 illustrates a typical advertising response. The "S" shaped curve indicated that, at high levels of advertising, additional marketing expenditures have a declining marginal value. For example, the difference between spending 16 million dollars on corporate advertising and 12 million is only slight in terms of the number of businesses that become aware of the MBC name. Similarly, at low levels of advertising, the effort is not very productive since there is a threshold level at which people respond to hearing an advertisement. Under normal conditions MBC spends 10 million dollars yearly for corporate marketing. Thirty-six thousand

Figure 4.5



small businesses in the target market become aware of MBC as a result of this marketing effort.

Market presence arises from other sources that are even more significant than corporate advertising. The bulk of MBC's products are sold through the direct sales channel and the awareness of MBC generated from these sales is certain to bleed over into the target market of small businesses. In addition, industrial electronics distributors and value added resellers are marketing MBC computers, news articles are published about MBC, books are written, and a host of other activities go on that contribute to the growth of MBC's market

presence. This forms the "normal market presence creation rate." Under normal conditions, 108,000 businesses made aware of MBC per year.

The last effect on market presence is detrimental. Most purchasers of a new computer require some after-sale service if only to have a few questions answered about the machine's operation. If a dealer does not adequately provide this service the customer is likely to become disillusioned with MBC and relate this feeling to other potential customers. In fact, a dissatisfied customer will do more to degrade MBC's market presence than a satisfied customer will to enhance it. We have represented these negative effects as being twice as potent as the positive effects mentioned earlier. Each dissatisfied customer creates four unfavorable impressions in the target market of small businesses. Whenever there are dissatisfied purchasers in the marketplace, they continue to reduce the rate at which MBC builds market presence.

#### 4.2.5 SALES RATES

The success that each dealer has in selling computers is of primary importance both to the dealers and MBC. The factors controlling the sales rates are given in Diagram 4.5. In the model, there are two subsections like Diagram 4.5, one modeling the sales of the MBC computer and the other modeling the sales of the competing lines. Since there are important

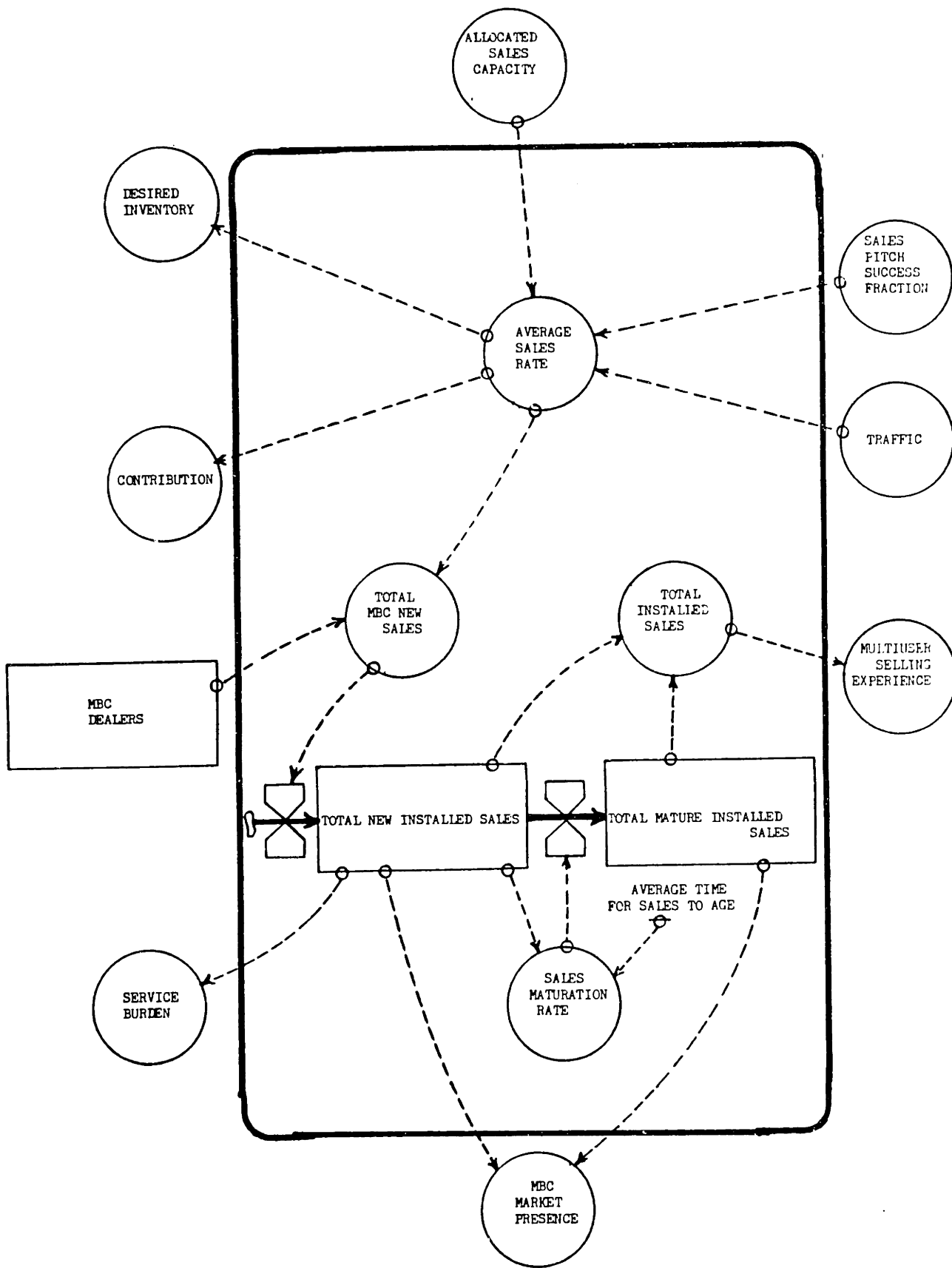


Diagram 4.5

differences between the MBC computer and most other computers, we can aggregate the sales into "MBC Computers" and "Competitor Computers." The important distinction between the two types of computers is that the MBC computer is a multiuser system, and its name is not as well known in the market as some of its competitors. Although there are other multiuser computers on the market, very few dealers will carry these systems in addition to the MBC line. Most dealers carry between three and five computer lines, each targeted to a somewhat different market. In most dealerships the MBC computer will be the "high-end" product in the store, targeted to a small business rather than an individual user.

Since the MBC computer is a multiuser system and its name is not as well known as other lines, it will be more expensive and harder to sell than the average competitor product.

Two factors control the corporate MBC sales rate: the sales per dealer and the total number of dealers. The factors determining dealer recruitment were discussed previously. The sales rates per dealer of MBC's products and competitor products are determined by three factors:

- 1) Number of customers coming to the store.
- 2) The effort or capacity the salesmen in the store devote to pushing each computer line.
- 3) Fraction of customers that buy each computer once a salesman has waited on them.

If a dealer does not bring enough potential customers into his store, he will not sell many computers. In the model potential customers are represented as "Traffic" which is the average number of customers entering each dealership per month. The section devoted to "Dealer Marketing and Traffic" explains our representation of traffic in each dealership.

Some customers coming into a store will know precisely what computer they want and will use the salesman only as an "order-taker." In contrast, a larger number of people will not be certain as to what they need or what is available, and as a result, they will rely on the salesman to assist them in their purchase. Each salesman can serve only a finite number of customers and can exercise a great deal of discretion as to which computers he pushes when waiting on these customers. In effect, he allocates a certain number of hours each day to sell the MBC computer and the remaining hours to sell competitor computers. This process is discussed in detail in the section on "Sales Capacity Allocation." By allocating his time between selling the MBC and competitor computers, each salesman has determined the number of customers to whom he will give a sales pitch for either the MBC computer or competitors' computers. His time allocation puts an upper bound on the number of computers he can sell from each group regardless of the level of traffic in his store.



Also regulating the rate at which each computer is sold is the success that salesmen have in convincing a customer to buy the computer for which they have been given a sales pitch. This "Sales Pitch Success Fraction" differs for each type of computer and its determinants are explained in a later section.

In summary, we view the determinants of sales rates as follows: On average, a certain number of customers come into each store every day. Although the customer may have some predispositions as to which computer he would like to buy, the salesman exercises some latitude in deciding which computer he would like to try to sell. He allocates a certain amount of effort to pushing each line of computers and the combination of the time he has allocated and the success he has in actually convincing customers to buy determines the sales rates of each computer. As will be discussed later, these average sales rates determine the profits or "Contribution" that arise from each computer line and are also used in setting inventory policies.

Each dealer has an installed base of computers, this base being the sum of all his sales since he first began to carry the MBC line. In the model we calculate the average installed base for the average dealer by dividing the total sales of MBC computers by the retail channel since its inception, by the current number of dealers. Although this does not capture the

spectrum of experience of dealers, in the aggregate it does accurately represent the average installed sales per dealer.

We have broken the installed sales into two groups: "new sales" and "mature sales." It is important to represent these two groups because their influences on other model variables are different. First, new sales create market presence to a greater extent than mature sales. Second, as will be discussed in a later section, new sales impose a greater service burden on the sales force than mature sales. Once again we have used the standard exponentially-decaying rate to represent the transition of a computer from "new" to "mature." On average a computer is considered new for one year.

#### 4.2.6 SALES CAPACITY

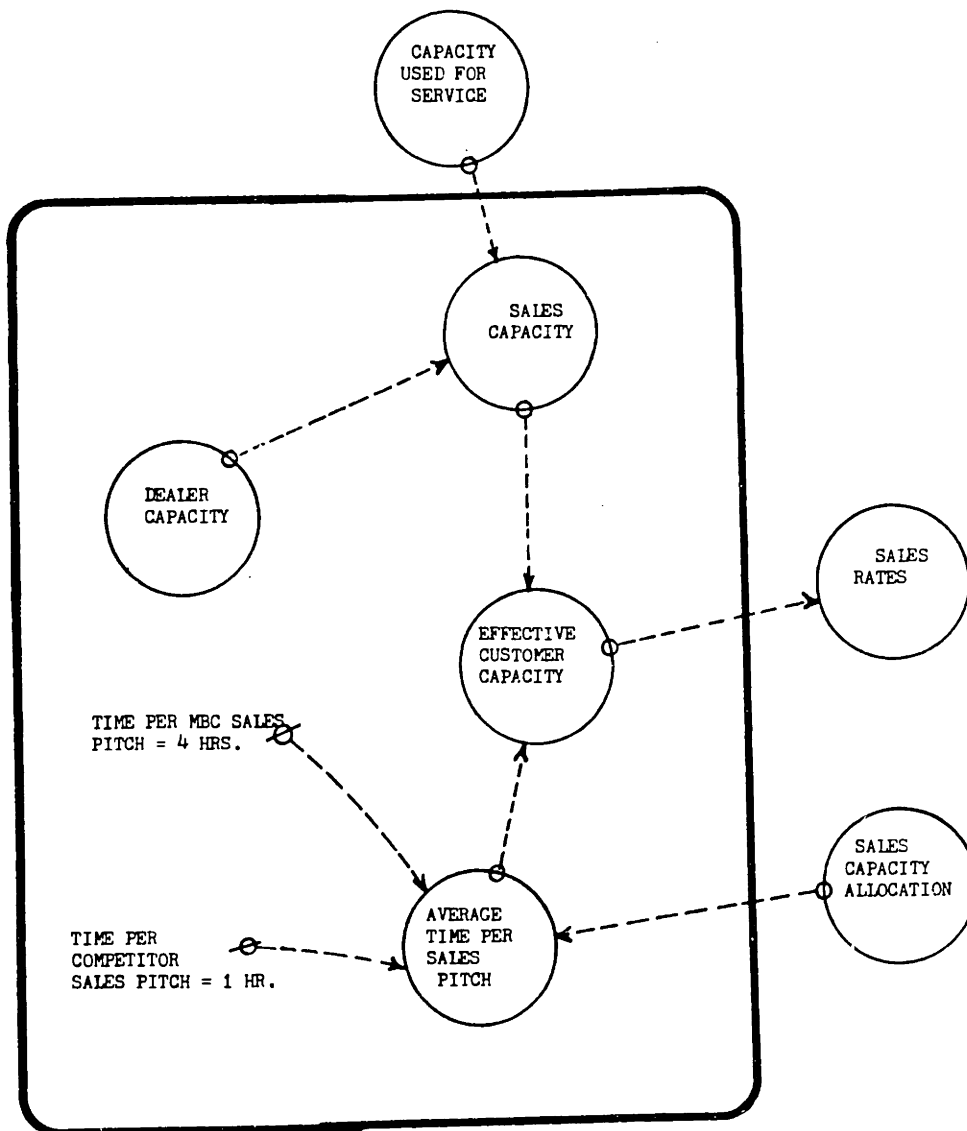
Computer retailers can vary in size. Both the size of their facilities and the number of employees can vary. In the model, we have set the average time available for sales at 800 hours. This means that the average dealership has approximately 5 full-time employees devoted entirely to computer sales. This average figure does not change over the life of the model.

Although our assumption of fixed store size may not be appropriate for some dealers, it is accurate on the whole. Some dealers can expand their facilities, expansion is not a

common activity. Computer store expansion requires large capital expenditures beyond the reach of many dealers. More likely, a dealer would increase or decrease the number of employees on his payroll. This method of expansion is limited, too. The maximum number of employees that can operate efficiently in one store is limited, and there is a minimum number that a dealer must maintain to serve customers during peak demand times. In the growing computer market there will be very few dealers who are cutting back on the number of employees, anyway. A final constraint on dealer sales capacity is the availability of trained salesmen. Trained salesmen are in short supply. Therefore, the availability of salesmen limits the sales capacity in retail marketing.

Diagram 4.6 portrays the important variables affected by and affecting sales capacity. Of the 800 hours that the average dealer has available to sell computers, some time is spent handling service requests from customers. As will be discussed in the section on "Service" no salesman can or would want to completely ignore questions from customers who have purchased a computer. Once the service burden has been satisfied, the remaining time of the salesforce can be spent trying to sell computers.

The number of customers that a salesman can wait on is



not entirely determined by the time he or she has available. For some computers, a long time is required to explain the intricacies of operation and the variety of applications. Other computers, require less time because they are recognized quality products, simple to operate, and many customers have already seen or used the products at work or school. On average, the competitors' computers will require a shorter "sales cycle" than MBC computers. In the model, the average time required to give a sales pitch for a competitor machine is one hour, while it takes four hours to give a sales pitch for a MBC system. The implication of this difference in sales cycles is that the number of customers that a salesman can see can be constrained by his decisions to sell one computer over another. Therefore, how the salesmen spend their time determines the effective capacity that the dealers have to sell computers to the customers who come into their stores. How the salesmen decide to allocate their sales capacity is discussed in detail in a later section.

#### 4.2.7 SERVICE

Most dealers have a service group are dedicated to handling maintenance requests from customers who have problems with their computers. The service department is often a profitable group that make no demands on the sales activities of the dealer. Nevertheless, salespeople are never completely insulated from the problems of their customers. Once a person

has been sold a computer he may have questions about its installation, use of the software, where to get maintenance, or who to contact about software problems or new packages that become available. These questions almost always are directed to the salesman who sold the computer system.

A salesman does not always have to completely satisfy the "service burden" that his customers impose. As salespeople know, the time that one must spend answering after-the-sale questions is time that could be spent trying to sell computers. As a result, when a retail computer store becomes busy with customers, the salespeople will be tempted to ignore service requests.

Diagram 4.7 presents the model-representation of service activities and how they influence other variables within the system. The total service burden is determined by the total new installed sales of computers as well as the mix of MBC and competitor computers in this installed base. Mature computers, those that are more than one year old, are not likely to be the cause of many inquiries from customers. By that time, the owners will understand the basic operation of their machines and any new questions are likely to be directed to a hardware service organization or a software producer. Of course, the owners will have occasional questions about additional pieces of hardware or new software programs, but these can be considered part of sales effort devoted to new

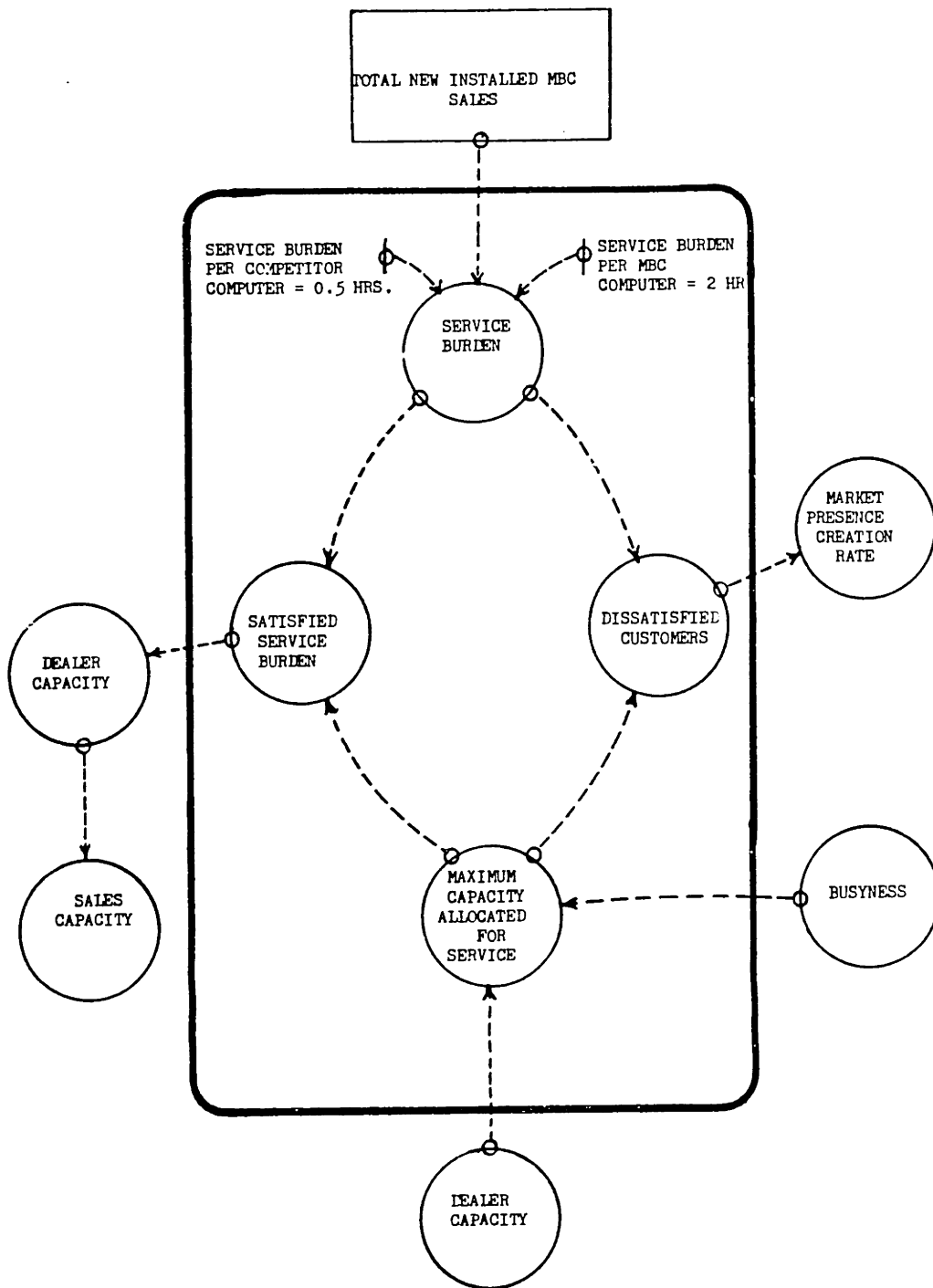


Diagram 4.7

sales.

The mix of MBC and competitor products in the installed base is important because owners of MBC equipment will require greater support after the sale than the owner of a typical competitor computer. The MBC system is complex and usually will be placed into an environment where it performs more sophisticated functions. For instance, the MBC system might be employed in a doctor's office to perform billing tasks while at the same time looking up patient histories and calculating financial information. In comparison, an Apple II computer might have been purchased to do only word processing and spread-sheet analysis for a single user. The result of this difference in system use and complexity is that MBC computers should have a greater service burden per sale. In the model, the average service burden per new installed competitor computer is 1/2 hour per month. For every MBC computer under one year old, the owner will ask that the sales people spend 2 hours per month answering questions.

As we have mentioned, the sales people do not have to meet all the demands that their customers make on their time. In effect, the sales force allocates a certain fraction of their available time to satisfy the service burden. The time they are willing to spend assisting the customers is very much related to how busy they are. If there are no customers in a store, a salesman would be willing to spend all of his time



satisfying a previous customers questions. The salesman appreciates the fact that after-sale support is important to his reputation and will make an effort to protect it. Nevertheless, when the number of customers in the store makes it impossible for the salesforce to wait on everyone, then every minute a salesman spends talking to an old customer is time that he could have spent trying to make a new sale. In the model, "Busyness" represents the ratio between the number of customers who are in the store looking to buy a computer and the number of customers that the salesforce can actually wait on. As the volume of traffic through the dealerships becomes great, the salesman will allocate only 5% of their time to assisting customers with questions about the computers they have purchased. This 5% of capacity that was spent satisfying the service burden decreases a dealer's total sales capacity by 5%.

If some of the service burden goes unsatisfied, there will be some dissatisfied computer owners. If a large number of these people own MBC equipment, this is of particular concern to MBC. The effect that dissatisfied customers can have on a manufacturer's presence in the market is large and detrimental. In the model, we represent the effect from dissatisfied customers as reducing MBC market presence. This effect is twice as potent as the effect from a satisfied new computer owner. For each dissatisfied MBC customer, 10 businesses per year in the target market develop a negative

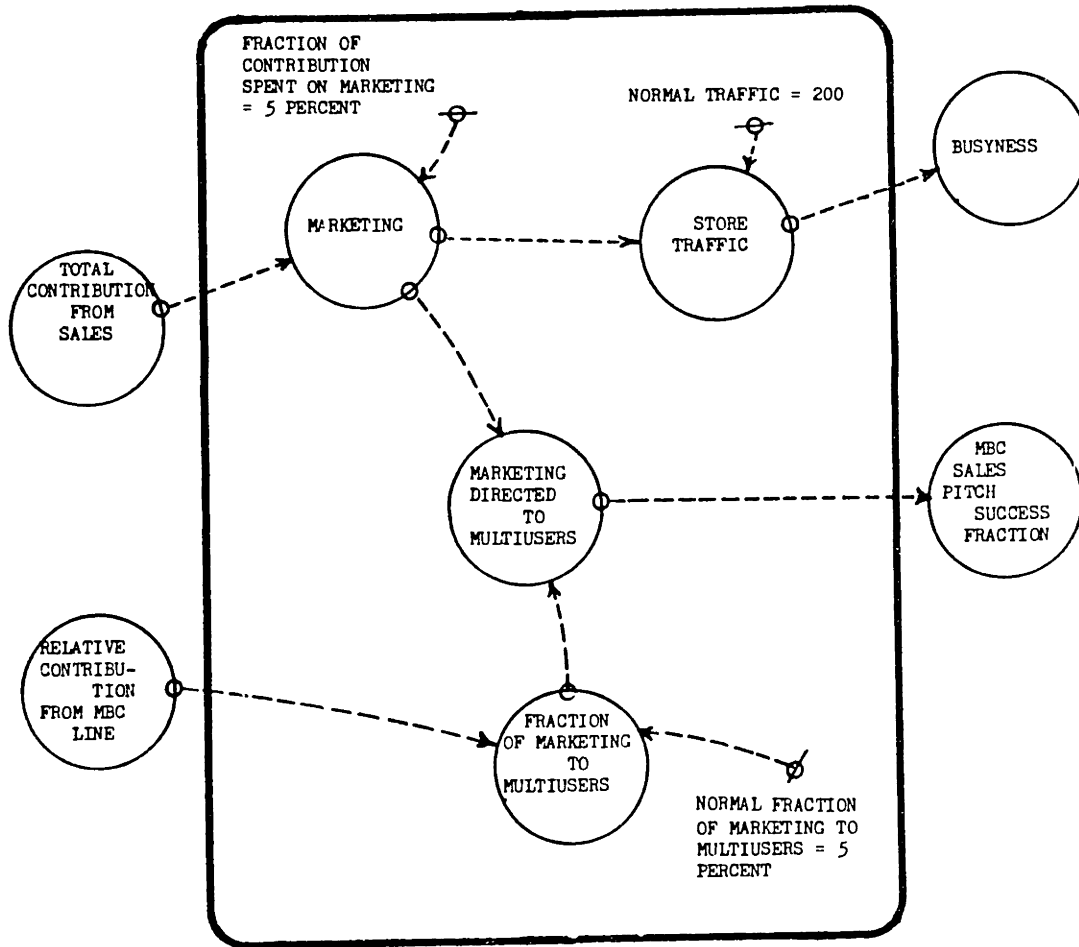
impression of MBC and its products.

#### 4.2.8 DEALER MARKETING AND TRAFFIC

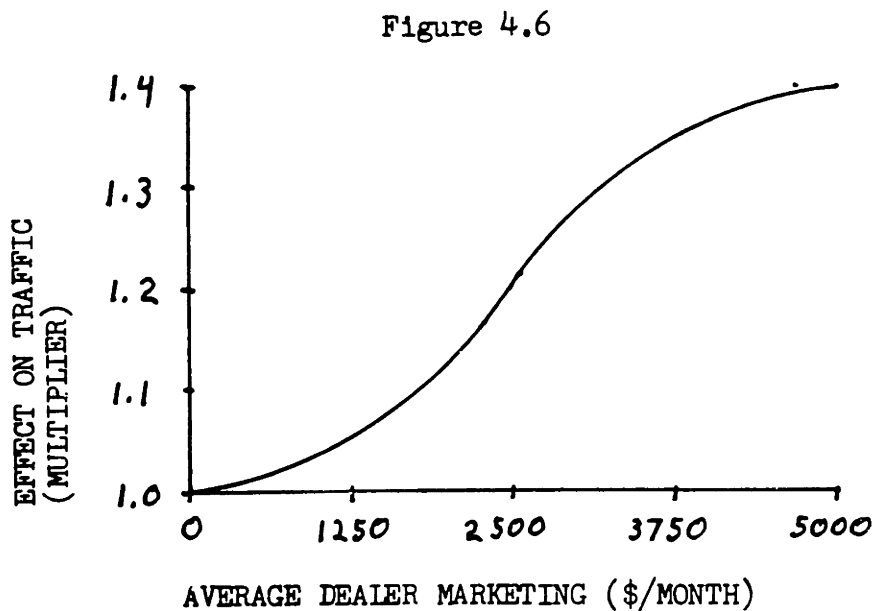
Most retail computer dealers spend some of their profits on marketing to bring potential customers into their stores. The amount of marketing done by each store and the policies they use to regulate their marketing efforts can differ. Nevertheless, it is reasonable to assume that a typical dealer will allocate a certain fraction of his projected profits for marketing expenses. After all, the dealers recognize that marketing is an important business activity. They are not going to spend more than they can justify financially; however, as revenues and profits increase, one would expect a typical dealer to increase his marketing expenditures.

In the model, we do not keep account of absolute profits or revenues. We do track the average contribution towards fixed costs that dealers are realizing; however. Contribution is revenue minus dealer cost of goods sold, or dollar margin per computer times the total number of units sold. We have assumed that the typical dealer spends 5% of his current period's total contribution on marketing. The accuracy of the figure itself is not important in determining the behavior of the model. What is important is the strength of the assumption that marketing increases with profits and the effect that this marketing has on the dealer's business.

Diagram 4.8



Dealer marketing increases the number of customers that come into a dealer's store. Whether it be a billboard, flyers sent through the mail, phone calls, or an advertisement in a local newspaper, all of these marketing techniques are designed to inform potential computer buyers that a dealer is available to serve them. On average our model assumes that 200 customers visit a typical dealer store per month. Figure 4.6 indicates the effect that a dealer's marketing effort can have on the traffic through his store. The vertical axis is a



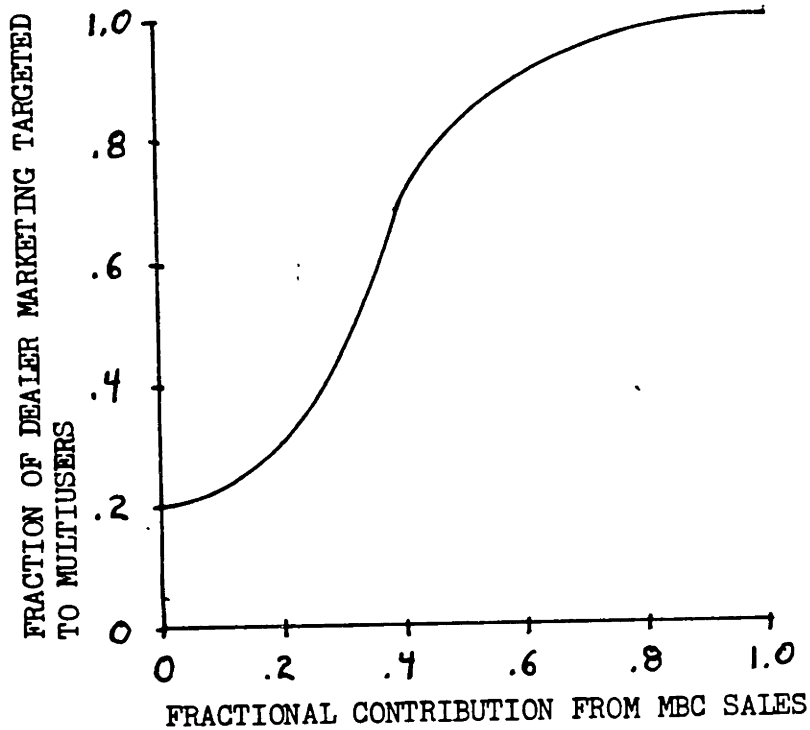
multiplier which increases the observed volume of traffic. If a dealer were to spend \$5,000 or more per month on marketing,

he could increase the volume of traffic by as much as 40%. As the shape of the curve indicates, the effect of marketing is not substantial at very low levels and has a decreasing effect for each dollar spent at very high levels. This is consistent with the "S"-shaped response curve that is common in marketing theory.<sup>3</sup>

A dealer can choose from among many ways of marketing his dealership and products. Some of the techniques available to him can be targeted to people and businesses whose computer needs may be very specific. For instance, to sell low end computers to customers interested in playing games or simple applications, a dealer might send out flyers to students or people with children. But more important to MBC is the marketing that a dealer does to small businesses who are likely to buy a multiuser system. Since the dealers that MBC recruits have a strong interest in selling MBC computers to the business market, the dealers require very little encouragement target their marketing effort in this way.

Figure 4.7 indicates the fraction of a dealer's marketing effort that is directed to the "multiuser" market increases as his success at selling the MBC line increases. Each dealer is aware of the fraction of contribution to his total profits that is traceable to sales of MBC computers. If a dealer carries 4 lines, one might expect that 25% of a dealer's profits to come from each line. MBC dealers feel that it is

Figure 4.7



in their long term interests to pursue specialization in the multiuser business market, however, so it takes only slightly encouraging sales figures to prompt dealers to market the MBC line aggressively. Even when the fractional contribution from sales of MBC computers is zero, a dealer will allocate 5% of his total marketing dollars to multiuser marketing. When MBC sales account for 25% of his total contribution, a typical MBC dealer will allocate about 40% to this market that is likely to buy MBC computers. In those rare cases where MBC sales represent 80% of a dealer's contribution, he will specialize entirely in the multiuser market and allocate his marketing expenditures accordingly.

The important result of a focused marketing effort is that focused marketing changes the character of the customers who visit a dealer's store. This in turn changes the probability that a given customer will buy a given computer when approached by a salesman. For instance, if more doctors with private practices start coming to a dealership, then a salesman in that dealership will meet with more success in trying to sell customers a MBC computer that is particularly well suited to the needs of a medical office. This is represented in Diagram 4.8 by the "MBC Sales Pitch Success Fraction" which will be discussed in a later section.

#### 4.2.9 CONTRIBUTION

The difference between the price at which a dealer sells a computer and its cost to him is the contribution that that computer makes towards the dealer's fixed costs. The contribution that results from the sales of computers from each manufacturer's line within a given store is given a lot of attention by a dealer. If a dealer is carrying four lines, one might expect each line's contribution to be approximately 25% of the total. Of course a variety of factors might affect the contribution that a dealer expects from each line -- factors such as the variety of offerings within the line, the manufacturer's reputation, or the margin per sale. In our model we monitor the dealer's total monthly contribution as well as the fraction that is due to sales of MBC computers.

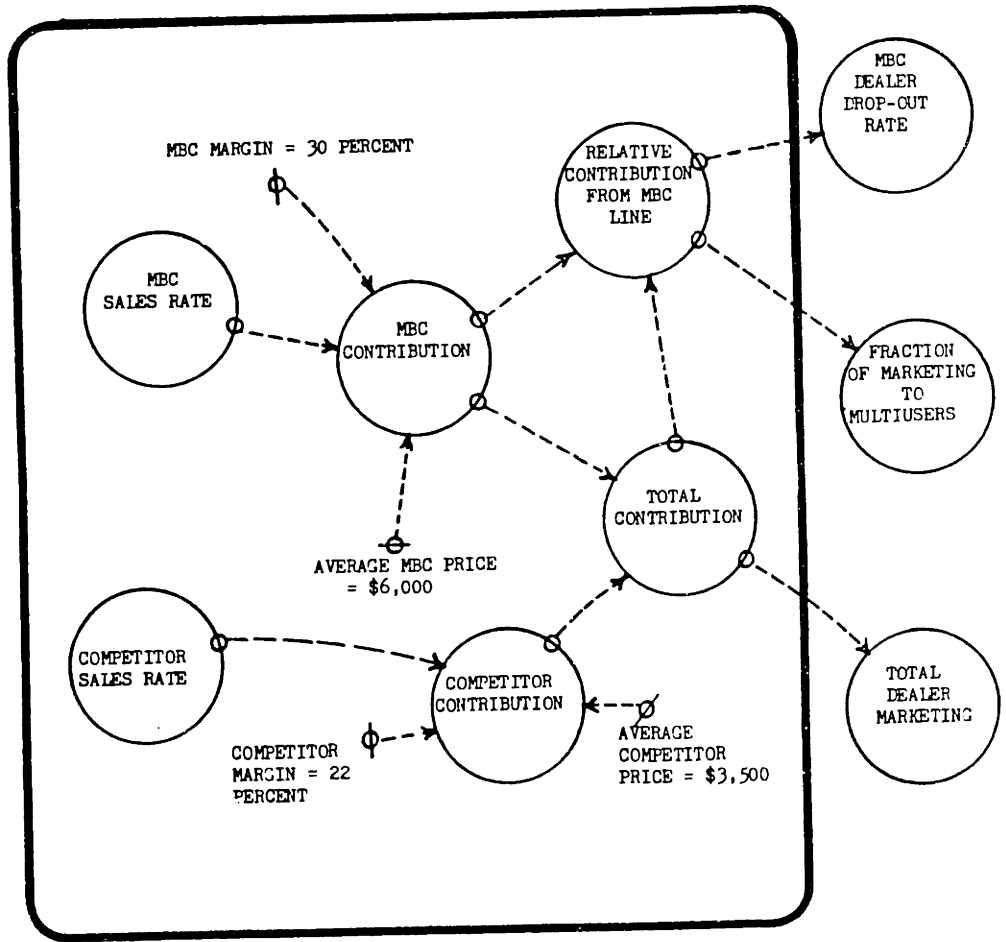
Diagram 4.9 presents the way in which contribution is calculated as well as its effect on other variables.

There are three inputs that determine the contribution from each of the computer lines: sales rate, average sales price, and dealer margin. The average price of a MBC system is greater than that of an average competitor system within a dealership. As we have discussed the MBC system will be sold because of its greater capabilities for use in more sophisticated applications. Therefore the price of a MBC computer with the peripherals that a buyer is likely to add, will be greater than that of a single-user computer.

MBC charges its dealers 70% of list price for the computers they sell. An average competitor manufacturer sells their computers to the dealers for 60 to 70% of list, which would lead one to assume that the dealers profit more from the competitor products. Nevertheless, current market prices for retail sales of computers indicates that dealers' margins are between 20 and 25%. What has happened is that competition has forced the dealers to cut their prices and thereby reduce the margins that they retain. MBC, however, has arranged to sell its computers on a consignment basis through the dealers, thereby forcing the dealers to sell at the prices set by MBC. This has the effect of preventing discounting, ensuring dealer margins, and reducing dealer inventory carrying costs.



DIAGRAM 4.9



The product of sales rate, margin, and average selling price yields the monthly contribution for a given computer line. In the model we have set the average price of a MBC system at \$6,000 and a competitor system at \$3,500. The margin on MBC equipment is fixed at 30% of list whereas the competitor margin is in effect only 22%. Using the contribution from each line it is a simple matter to calculate the total contribution from sales and the fractional contribution from MBC sales. It is this fractional contribution that we have labeled "Relative Contribution from MBC" and use to affect the dealer drop out rate as well as the fraction of marketing allocated to multiusers. In addition, total contribution is the only dynamic input controlling dealer marketing.

#### 4.2.10 SALES CAPACITY ALLOCATION

The way in which a salesman allocates his time is perhaps the single most important determinant of how well a computer line will do in a dealership. This allocation of time or sales effort is also one of the most difficult activities to represent realistically in a model. Nevertheless, in this model we have captured the important effects of the salesforce behavior and the necessary inputs to the behavior.

No salesman would arbitrarily try to sell a specific customer a randomly chosen computer. In fact, in some situations a salesman acts only as an order-taker because the customer may already be clear as to which computer he wants to buy. In these cases, the salesman has very little control over which systems he sells. More frequently, however, a salesman, especially a MBC salesman, is a consultant to the customer. Prior to a sale, a salesman will interview a customer in an attempt to determine his computing needs and which computer system might best suit those needs. He then will give a "sales pitch" for that computer system. In these cases where the customer has not already decided which computer to buy, the salesman can exercise a lot of freedom in choosing which system to push. The factors which determine which system a salesman chooses to push are a combination of what will benefit him and what he perceives is good for the customer. In electing to emphasize one computer over another,

a salesman has allocated a certain fraction of his total sales capacity to each product. When a salesman decides to make a sales pitch to a somewhat uncertain customer for an Apple MacIntosh rather than an IBM PC Jr., he has allocated some of his sales capacity to the Apple line. These incremental decisions may not appear to make much difference but at the aggregate level they can mean a great deal if most of the salesforce is responding to the pressures in a similar way.

In the model we have represented five of the inputs that affect a salesman's decision to allocate his sales capacity. These forces as depicted in Diagram 4.10 are:

- 1) Relative time per sales pitch
- 2) Relative dollar margin per computer sale
- 3) Relative sales pitch success fraction
- 4) Relative inventory cost
- 5) Busyness

Each of these forces encourages the salesforce to dedicate a greater or lesser fraction of their time to making sales pitches for MBC computers. The relative size of each effect and the factors upon which they are based can be quite different. In the model we express the aggregate or average fraction of sales capacity which is allocated to pushing the MBC line as follows:

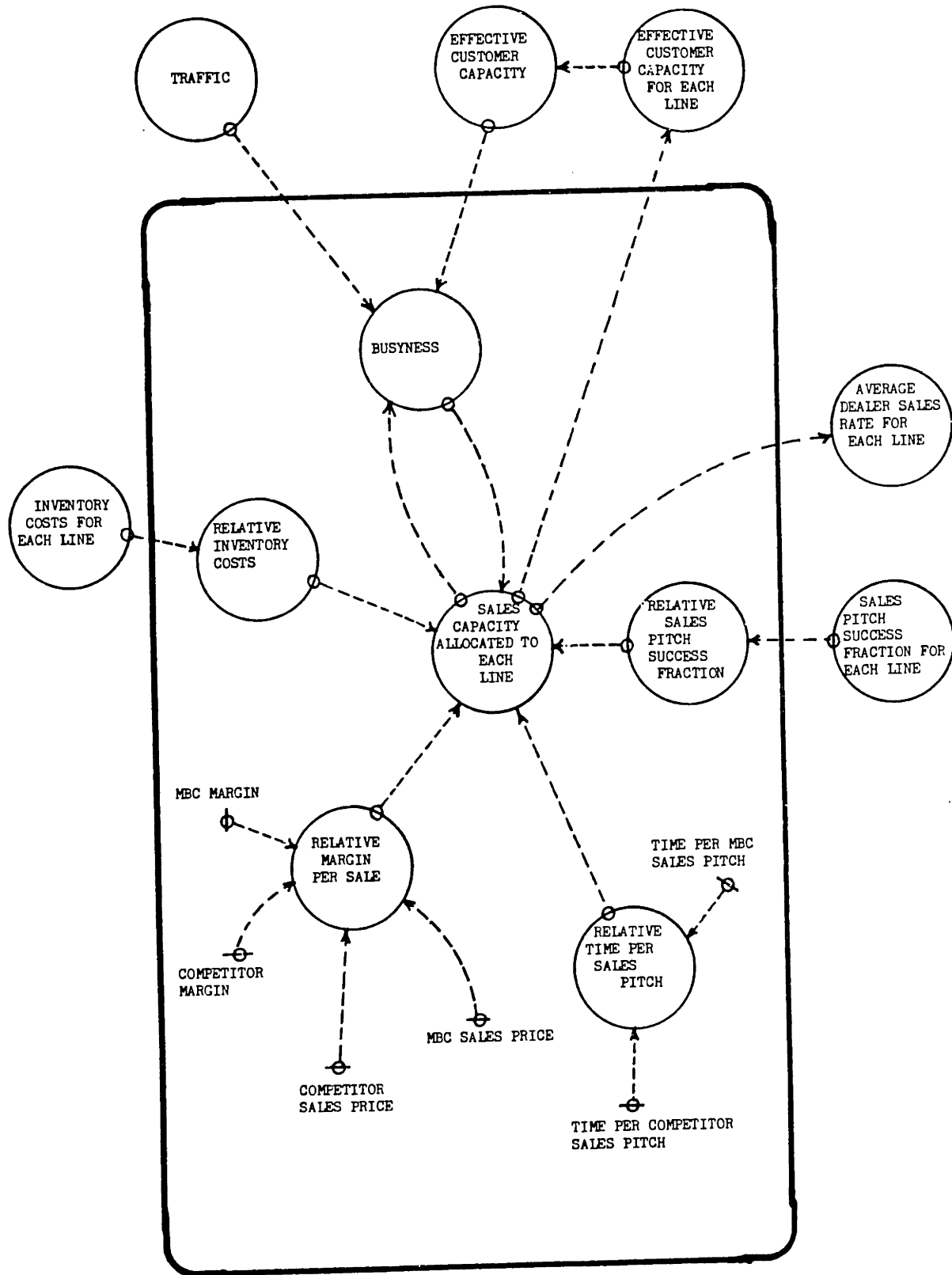


Diagram 4.10

(Fraction of Sales Capacity Allocated Due to Relative Time for Sales Pitches and Normal Other Effects)

X (Effect of Relative Margins)

X (Effect of Relative Sales Pitch Success Fractions)

X (Effect of Relative Inventory Costs)

X (Effect of Busyness)

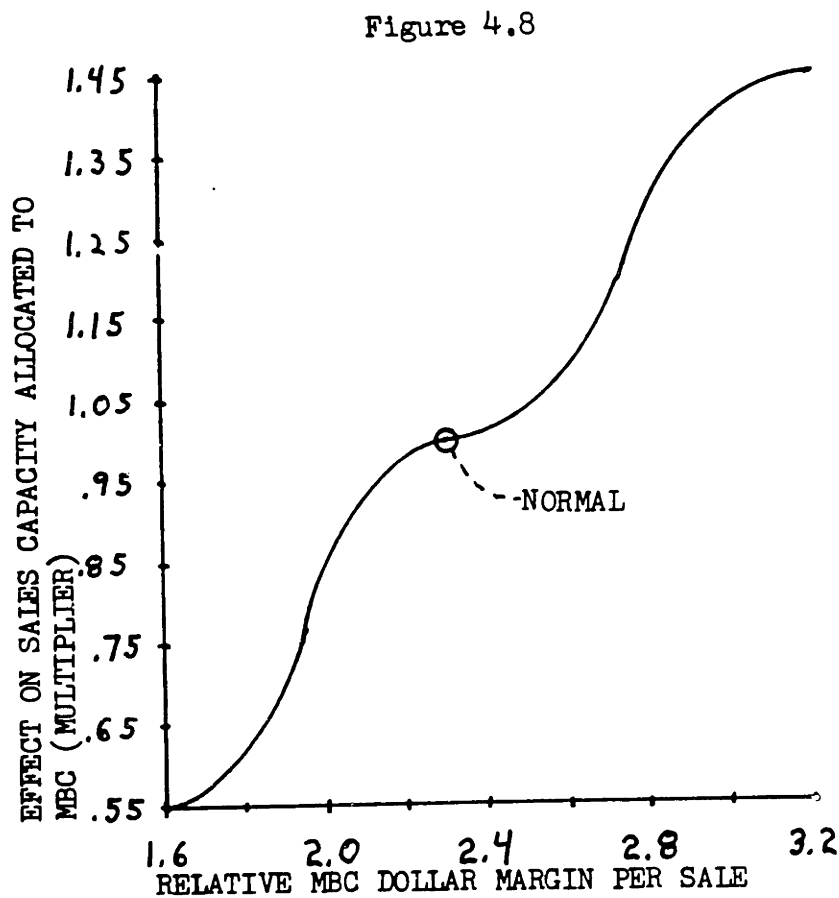
= Total Fraction of Sales Capacity Allocated to MBC

Under normal conditions the salesforce will allocate 25% of their effort to trying to sell MBC computers. The first variable in the above equation represents this "normal" value which does not change during the life of the model. Although it takes longer to make a sales pitch for a MBC computer and the normal sales pitch success fraction is lower than that for the typical competitor computer, the commission on a MBC sale is greater. Additionally, the salesforce is somewhat dedicated to the dealer's efforts to specialize in selling the high-end computers. Thus, for a dealer carrying four computer lines, it is reasonable to assume that one-fourth of the sales effort will be devoted to the MBC line.

Each of the effects in the equation for sales capacity allocation is represented as a multiplier which is either somewhat greater than or less than one, depending upon whether the factor has a favorable or unfavorable effect on MBC sales effort. Figures 4.8, 4.9, 4.10, and 4.11 present these effects. As indicated, under normal conditions MBC's line of

computers will be allocated 25% of the sales capacity; however, under extreme conditions the allocation could conceivably range from as little as 5% to as much as 60%.

Figure 4.8 portrays the strong effect that the expected margin from the sale of a given computer can have on the salesman's incentive to push that particular computer. The



x-axis is the ratio of the dollar margin per MBC computer to that of the average competitor computer. In the initial base

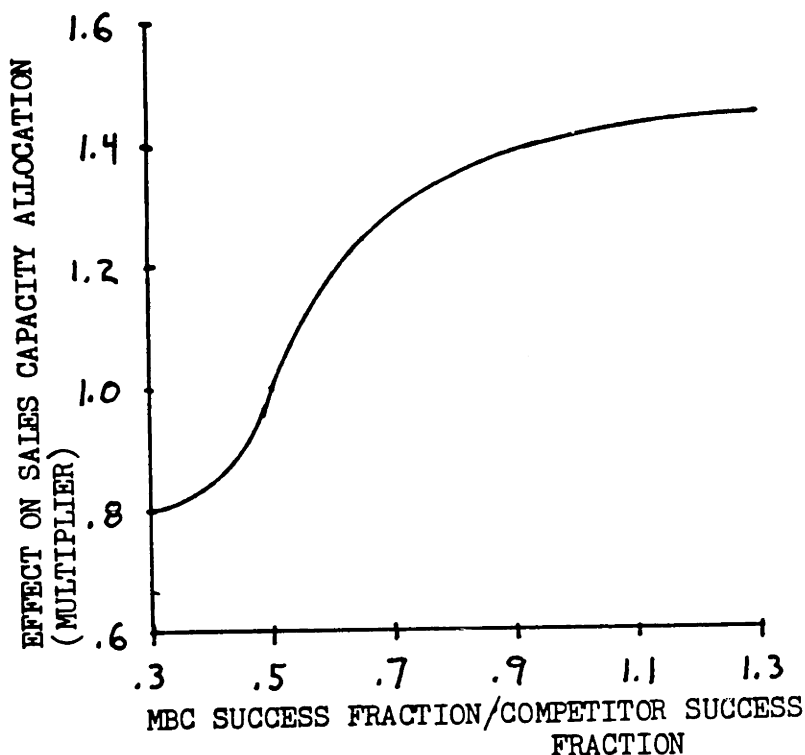
runs of the model this ratio is 2.3 as computed from  $[30\%(\$6,000)]/[22\%(\$3,500)]$ . Small variations in this ratio are not easily recognized by the salespeople and as the graph shows they do not significantly alter the time they allocate to selling MBC equipment. Nevertheless, as the difference in these margins becomes large, the salesforce will allocate up to 45% more or less sales capacity to selling the MBC line. Extreme differences in margins do not result in much greater changes in sales capacity allocation since the salesman still must consider the needs of the customer. Even if a dealer earns nothing on the sale of a computer, he might still sell that computer to a customer who requested it. The dealer and salespeople are conscious of their reputation in the market place and will respect the differing needs of the customers.

The probability that a customer will actually buy the particular computer for which a salesman gives a sales pitch to a large extent determines the incentive for the salesman to push that computer. If a customer is not certain that he needs a computer at all, then a salesman might be more likely to try to sell him a low-priced, popular-brand computer like the Apple II. The salesman knows that if he tries to push a \$6,000 MBC system then he might lose the sale altogether. The aggregate result of this type of behavior is that MBC is allocated less sales capacity when few of their computers are purchased after the salesforce spends the time to make a pitch for the machines.



Figure 4.9 shows how this pressure is represented in the model. The x-axis is the ratio of the fraction of customers that buy a MBC computer after they have been given a sales pitch for the machine to the fraction of customers who actually purchase a competitor computer when they have been given a sales pitch for that machine. Initially the success

Figure 4.9



fraction for MBC equipment is only one in ten whereas the analogous fraction for competitor equipment is one in five. Thus salesmen expect a sales pitch for a MBC computer to meet with success only half as often as a pitch for a competitor computer. If the salesmen find that these success fractions have changed significantly; however, they will quickly adjust

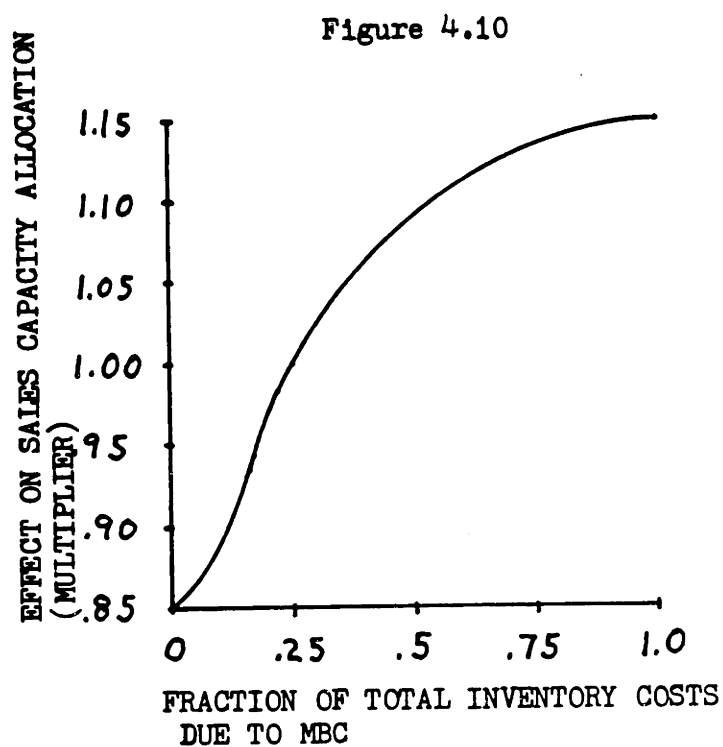
the effort they devote to pushing each line. In extreme cases, the salesforce will increase the fraction of time spent trying to sell the MBC line by as much as 50% or alternatively they might decrease the allotted time by as much as 30%.

There are many costs associated with operating a retail store and some of these costs can influence the sales activities within the store. The cost of stocking inventory is one important cost that often results in clearance sales and price cutting in retailers like department stores. Although this type of behavior is not often found in computer stores, the pressures to reduce inventory stock do exist. To the extent that this consciousness of inventory carrying costs is communicated to the salesforce, the sales effort allocated to selling each line can change.

The managers of a retail computer store do not always use a sophisticated inventory control system to monitor the carrying costs of their inventory. Nevertheless, they do appreciate the cost of maintaining inventory. When a manager walks into the stock room and sees 100 computers sitting in boxes, he knows that they are costing him money since what he paid for those computers could be in the bank or another investment earning interest. Those working in a dealership are likely to become more keenly aware of the this inventory carrying cost the longer that the inventory sits idle. In the section "Inventory" we talk about how dealers manage their

inventory and their perceptions about its costs.

Figure 4.10 indicates how we have represented the effect that the relative inventory costs of each line has on the sales effort devoted to pushing each line of computers. Under

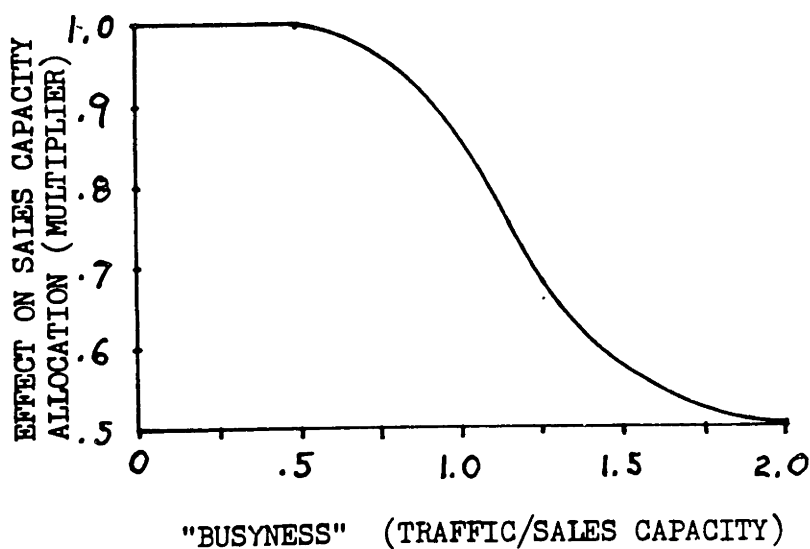


normal conditions when the MBC inventory cost is 25% of the total, there is no pressure to allocate more or less sales capacity to selling the MBC line, so a multiplier of one is used to produce a neutral effect. When the cost of MBC inventory relative to total inventory costs becomes very great, the sales force may increase the effort with which they try to sell these computers by as much as 15%. On the other

hand, if competitor inventory becomes very costly, then 15% of sales capacity may be transferred from the MBC line to the competing lines. These effects are relatively small, particularly when the dealers manage their inventory well, but they can only help make the model more realistic when they are included.

Figure 4.11 represents what is by far one of the most important inputs to a salesman's decision as to how he allocates his time. As the store in which a salesman is

Figure 4.11



working becomes busy, he is more likely to sell those computers that require the least effort. The reputation, low

cost, and short sales cycle for the competitor computer systems makes it a simple matter for a salesman to sell many of these machines when the store becomes busy. By emphasizing the sale of the cheaper computers, a salesman can also wait on a greater number of customers. Therefore, as indicated in Diagram 10, the salesman's decisions affect and are affected by how busy the store is.

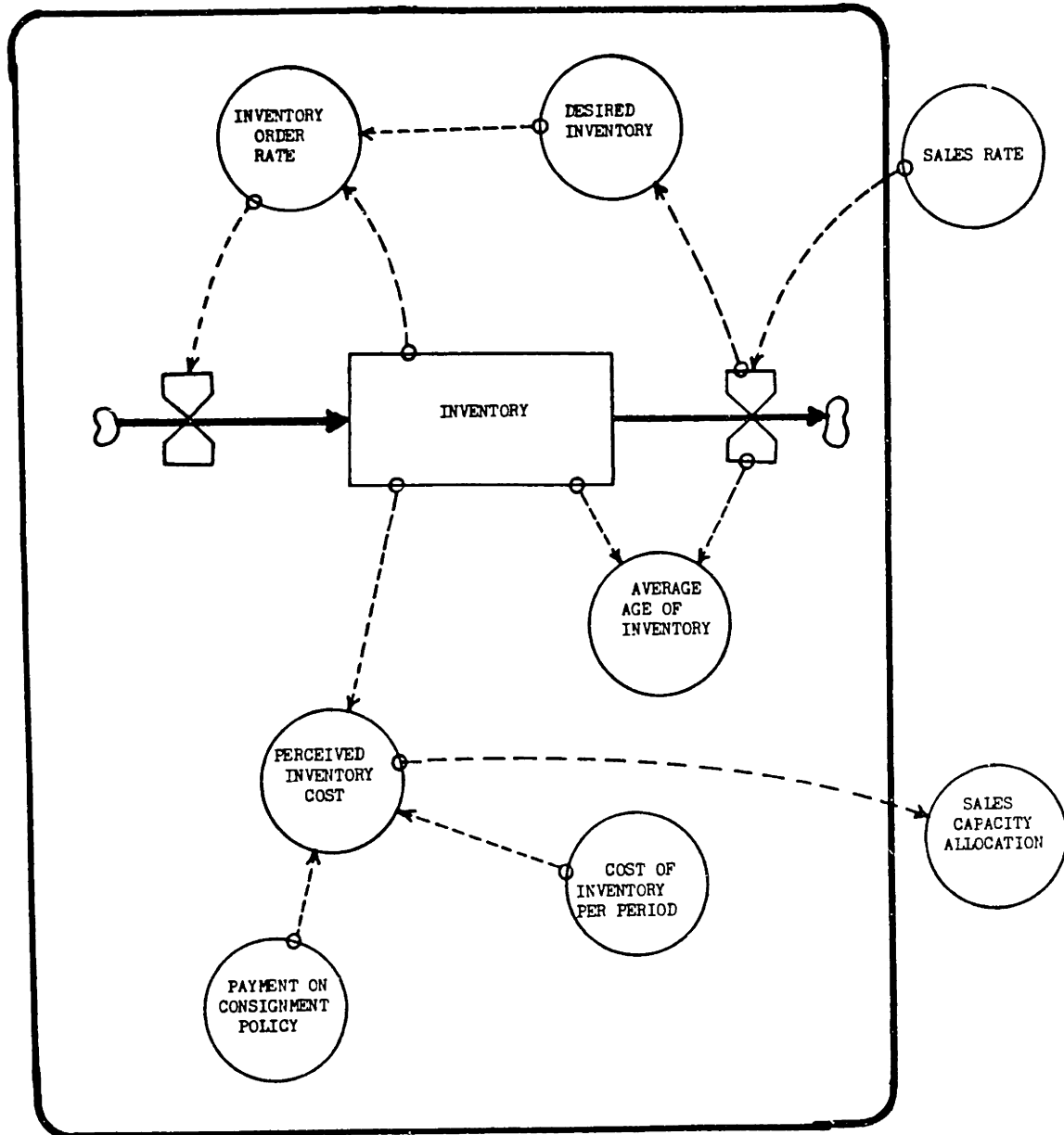
In Figure 4.11 the x-axis, "busyness", is the ratio of the number of people who would like to be waited on to the number of customers who actually can be served. If all the customers in a store can be attended to, then the salespeople will have little inclination to try for the "quick sale." When the salesman has no free time at all, however, he will allocate on average 15% of his sales time away from the harder sell MBC computers. At the extreme, when there are twice as many or more customers than the store can handle, the typical salesman will only allocate half as much effort to selling MBC machines as he normally would. Few of these decisions are made instantly, are based on entirely accurate information, or are the same for any two salesmen. Nevertheless, there is an aggregate effect from the pressures that a salesman faces that we have attempted to represent in the model. Certainly, even if the magnitudes of these effects are not entirely accurate, their direction and influence on the system's observed behavior are correct.

#### 4.2.11 INVENTORY

In principle, inventory management has become a rather simple procedure for retailers. Each dealer attempts to maintain enough stock on hand to supply customer demands. In addition, he will keep some extra inventory to cover those times when there is an unusually large demand for a specific product or a shipment gets delayed. In our model each dealer tries to keep enough inventory on hand to satisfy six weeks worth of average demand. Diagram 4.11 presents the important aspects of inventory management. As the complete system diagram shows, the model contains a similar structure for the MBC line as well as the competitor line of computers within a store. The desired inventory is a function of the dealer's perception of the sales rate of each computer. The difference between the current and the desired inventory levels determines how much additional inventory that the dealer will order. Naturally, orders received by a dealer increase his inventory level, and sales decrease it.

In the model we represent the perceived inventory cost of each line as the monthly cost of capital, multiplied by the average age of the inventory, multiplied by the total dealer cost of that inventory. If the current volume of inventory is divided by the average sales rate, one gets an idea of how long those products are likely to stay in inventor. Since MBC computers are sold on consignment there is no cost of capital

Diagram 4.11



per se to the dealers. However, two months after shipment of a computer MBC does charge a dealer 3% per month if that computer does not sell. For example, if a dealer has a \$6,000 MBC computer in stock that is five months old, his total carrying cost for that piece of inventory is 3% of \$6,000 X (5-2 months) or \$540. Typically, competitor manufacturers give a 30-day grace period before a dealer must pay for the inventory he has received. Assuming the dealer cost of capital is 2% per month, the cost to a dealer for a \$3,500 competitor computer that has been in stock for 5 months is 2% of \$3,500 X (5-1 months) or \$280.

The result of the difference between the two manufacturer's policies is that MBC inventory is cheaper as long as the inventory turn-over rate is high. On the other hand, MBC computers can be quite costly if they remain unsold much longer than the 2-month grace period. The perceived costs of each of the inventories that a dealer holds affects the sales capacity allocated to each line as discussed in the previous section.

#### 4.2.12 SALES PITCH SUCCESS FRACTION

Not everyone to whom a salesman makes a sales pitch for a MBC computer will in fact end up purchasing that computer. The customer may decide to buy a computer from another line in the store, purchase the computer at another dealer, or elect

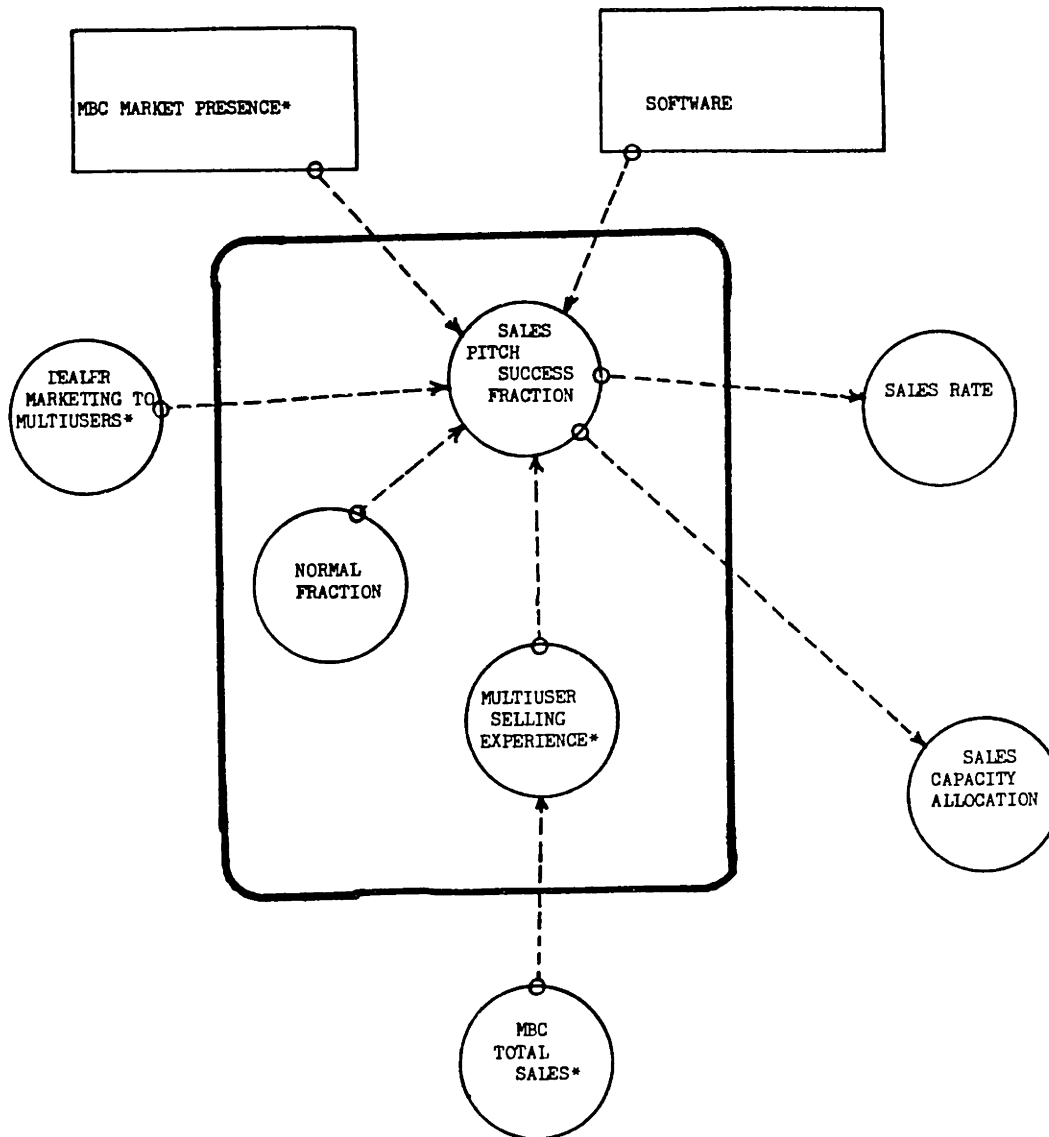


not to buy a machine at all. In the model we have represented this phenomenon as the "sales pitch success fraction" and its features are given in Diagram 4.12. There is a sales pitch success fraction for the MBC line and the competitor line. In technical language, the sales pitch success fraction is the probability that a customer will buy a specific computer given that a salesman has made a sales pitch for that computer. Alternatively, it is the fraction of customers who actually bought a given computer after they received a sales pitch for it.

As mentioned previously, the sales force is conscious of the sales pitch success fraction for each type of computer, and they take it into consideration when deciding which computers to push. In the model, the fraction is also used in calculating the actual sales rates of each type of computer. The number of sales pitches for a computer multiplied by its individual sales pitch success fraction yields the number of computers actually sold.

We have identified five determinants to the sales success of a MBC computer. They are:

- 1) Overall quality
- 2) MBC Market presence
- 3) Software availability
- 4) Dealer's experience at selling multiuser systems
- 5) Dealer marketing



\* Indicated items applicable only to MBC.

Diagram 4.12

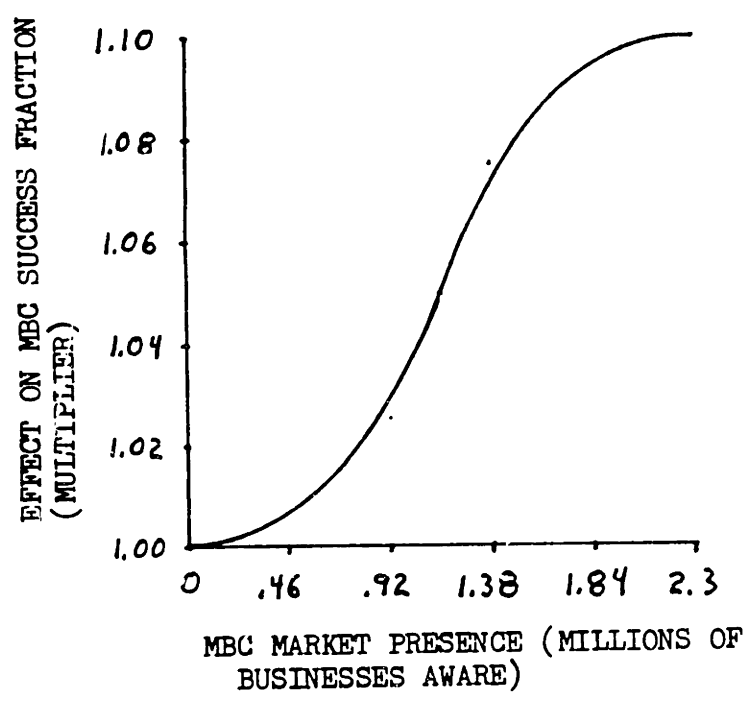
To construct an equation representing the sales pitch success fraction for MBC computers we took factors and constructed multipliers which would correspond to the relative importance and direction of influence for each factor. Figures 4.12, 4.13, 4.15, and 4.16 give the graphical representations of how these factors are controlled.

First, there is a normal fraction of customers who will buy MBC computers. This normal fraction is a function of the machine's quality, capabilities, appearance and other features that make the hardware itself desirable to some percentage of the population. This normal fraction has a value of 0.1. This means that for every ten people who are given a sales pitch for a MBC computer, one person will actually purchase. The competitor computers also have a normal fraction based on computer quality and attributes. In the model, one out of four customers will buy a competitor computer after a sales pitch is given for the machine. This large percentage is representative of the great popularity of personal computers such as the IBM PC and the Apple II.

Part of the reason that the Apple and IBM computers do so well in the market is that their names are well known and respected. As MBC's market presence increases, people will be more willing to consider or buy a MBC computer. We have modeled many of the factors that determine MBC's presence in

the market and in the section "Market Presence" we explain how this attribute is tracked. Figure 4.12 presents the effect that market presence has on the success fraction for MBC computers. Market presence is measured as the number of

Figure 4.12



businesses out of the 2.3 million small businesses in the target market who are aware and favorably impressed by the MBC name in desktop computers.

MBC currently has very little market presence in the small business market and therefore its name has little influence on whether a potential customer decides to buy one of its computers. Hence, the normal success fraction is

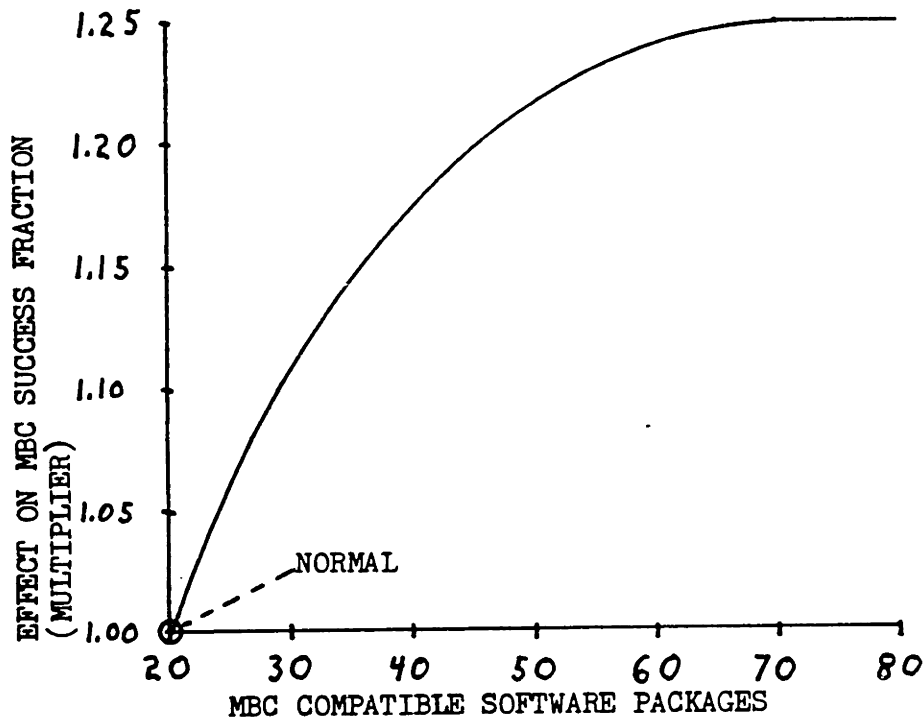
multiplied by 1 for low levels of market presence. The effect of market presence is similar to advertising in that it has an "S"-shaped response curve. As Figure 4.12 shows, market presence can improve the success fraction for MBC computers by as much as 10%. Since competing computer lines have a well established presence in the market already, we did not attempt to model any changes in competitor market presence over time. Their current level of market presence is reflected in their normal success fraction of 25%.

Computers are no longer being thought of as novelties that technically oriented people use for solving math or science problems. Individuals and businesses are now buying computers to solve specific problems or to improve some aspect of their operations. As a result the software packages that address the needs of business problems are becoming the driving force that sells the computers. Not all software packages will run on all computers, so the computer that a particular customer buys depends very much on which application program or programs he would like to run. Some applications packages such as "Wordstar," "VisiCalc," and "1-2-3," have become so popular that few people would buy a machine that would not run these programs, even though that might not be the primary use for which the computer were purchased. MBC's computers do support many popular software packages, but not all.

There are many specialized application programs that will enable MBC computers to solve the needs of customers in a variety of businesses. The availability of software for MBC computers will have a strong influence on how well they sell. When a customer walks into a dealership and says he manages an auto parts store and needs to get his inventory management under control, the probability that he will buy a MBC computer increases dramatically if the dealer can take a program off the shelf and show the customer how this program will solve his problems. Therefore, the variety of programs that a computer will run as well as the availability of a specific program that addresses an individual customer's needs affects the number of people who will buy the computer.

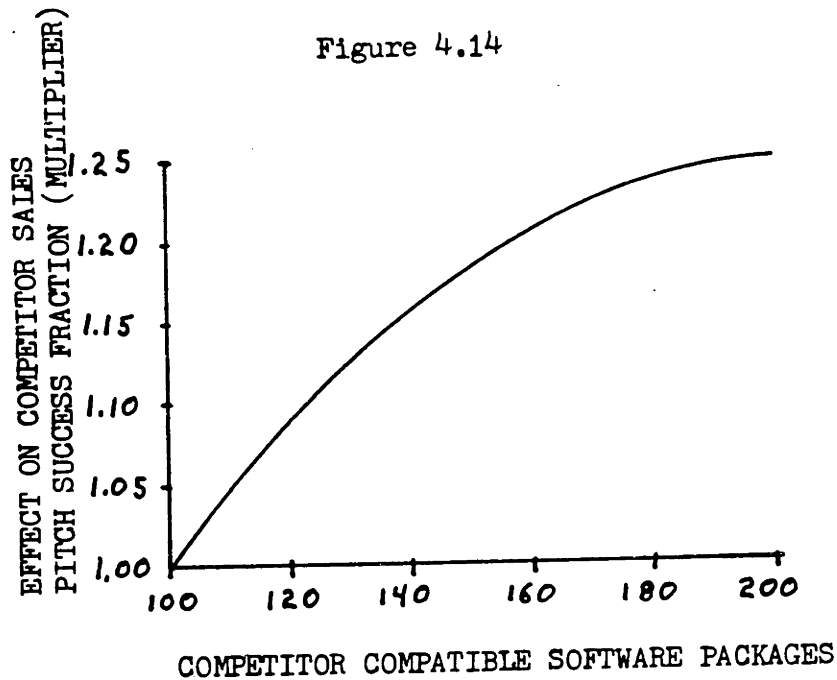
Currently there are about 20 specialized software packages readily available through dealers that run on MBC computers. As Figure 4.13 indicates, this is considered the "normal" level of software availability, and at this value the software multiplier is one. As the number of packages increases, the sales pitch success fraction for MBC computers increases. When each dealer is carrying an average of 70 applications packages or more, the sales pitch success fraction is increased by 25% and can go no higher. With 70 packages available, one would expect each dealer to be able to satisfactorily address the needs of the market in which he specializes. If a dealer tries to stock more than 70 programs, the sales force will be unable to sell the computers

Figure 4.13



any more effectively because there will be too many programs to keep track of.

The number of programs available to run on competitor computers is also increasing and will increase the chance that a given customer can justify a computer purchase. Figure 4.14 presents the effect that software availability has on the competitor sales pitch success fraction. Since there are more computers in all the competitor lines, the number of programs that run on the machines is greater. Therefore, when the model starts, the effect of 100 software packages is neutral. As the number of software packages grows to 200, however, the



average sales pitch success fraction for competitor computers will increase by 25%. Once again, the availability of software cannot increase the success fraction beyond this upper limit.

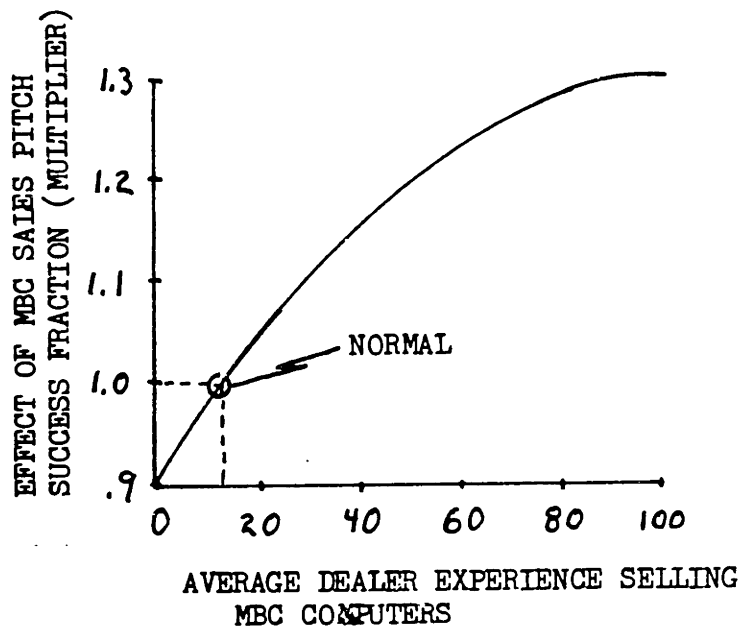
MBC desktop computers are more complex than the average computer sold by retailers. In addition, the machines are being sold to solve more sophisticated problems. As a result, a salesman trying to sell a MBC system faces a difficult task. Not only must the salesman become familiar with the software packages that run on the MBC machine and the unique features of the computer, he must also learn about how a multiuser



system is operated. In addition, since the MBC computer is targeted at a somewhat different market than the salesman has traditionally addressed, he must become familiar with the needs of that market. To help dealers acquire the skills needed to sell MBC computers to the small business market, MBC gives training courses to new recruits. Nevertheless, training courses will never replace the experience that a dealer's sales people must acquire to effectively sell the MBC computer.

Figure 4.15 indicates the effect that experience has on the success that dealers will have in selling the MBC line of computers. The x-axis is "multiuser selling experience" which is directly related to the total number of MBC computers that an average dealer has sold. Initially, when a dealer has not sold a single MBC computer the sales force will not be as familiar with the operations of the computers, their potential applications, or the software available. As a result the sales people will give ineffective sales pitches for the machines and realize a success fraction only 90% of the expected or normal fraction. As their experience at selling multiuser systems to small businesses increases, the sales pitch success fraction may rise to 130% of its normal value. At this level of experience, the sales force is giving as effective a sales pitch as can be given, and additional experience cannot improve their efforts.

Figure 4.15

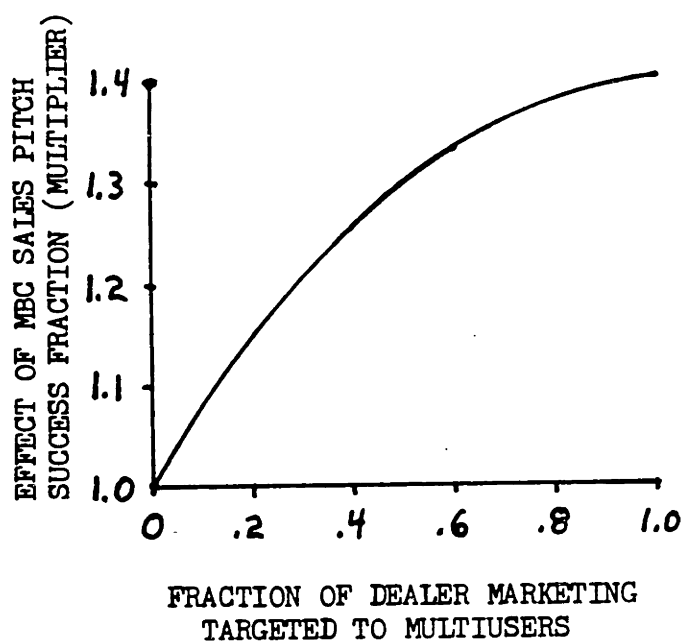


Since the salesforce is already quite experienced in selling competitor products and these products require less sophisticated sellers, we have not incorporated any effects from selling experience for the competitor lines of products. The important effect to be captured is that the dealers are new to selling MBC's products and will therefore move down a steep learning curve. In contrast, dealers are operating on a fairly flat portion of their learning curve for selling competitor computers.

The amount and type of marketing a dealer does not only affects the volume of traffic through his store, but also the purchasing interests of the customers. If a large portion of a dealer's marketing effort is directed to bring in businessmen who need a multiuser computer system, then the salespeople will sell the MBC computer more successfully. A dealer cannot change the computer needs of individuals; however, he can control the type of people who come to his store and thereby influence the computer needs of the average customer that his salesmen wait on.

Figure 4.16 illustrates the effect that marketing targeted to multiusers has on the MBC sales pitch success fraction. If a dealer does general marketing which is not intended to bring in customers with specific computer needs, then there will be no change in the purchasing behavior of the typical customer that a salesman serves. Therefore, the normal multiplier on the Y-axis is one. If, however, a dealer targets a large fraction of his marketing effort to small businesses that are likely to need multiuser computer systems, the spectrum of customers coming into the dealership is changed. Salesmen find that the marketing effort increases the fraction of customers to whom they can sell a MBC computer. As Figure 4.16 indicates, the MBC sales pitch success fraction may be as much as 1.4 times its normal value as a result of dealer marketing.

Figure 4.16



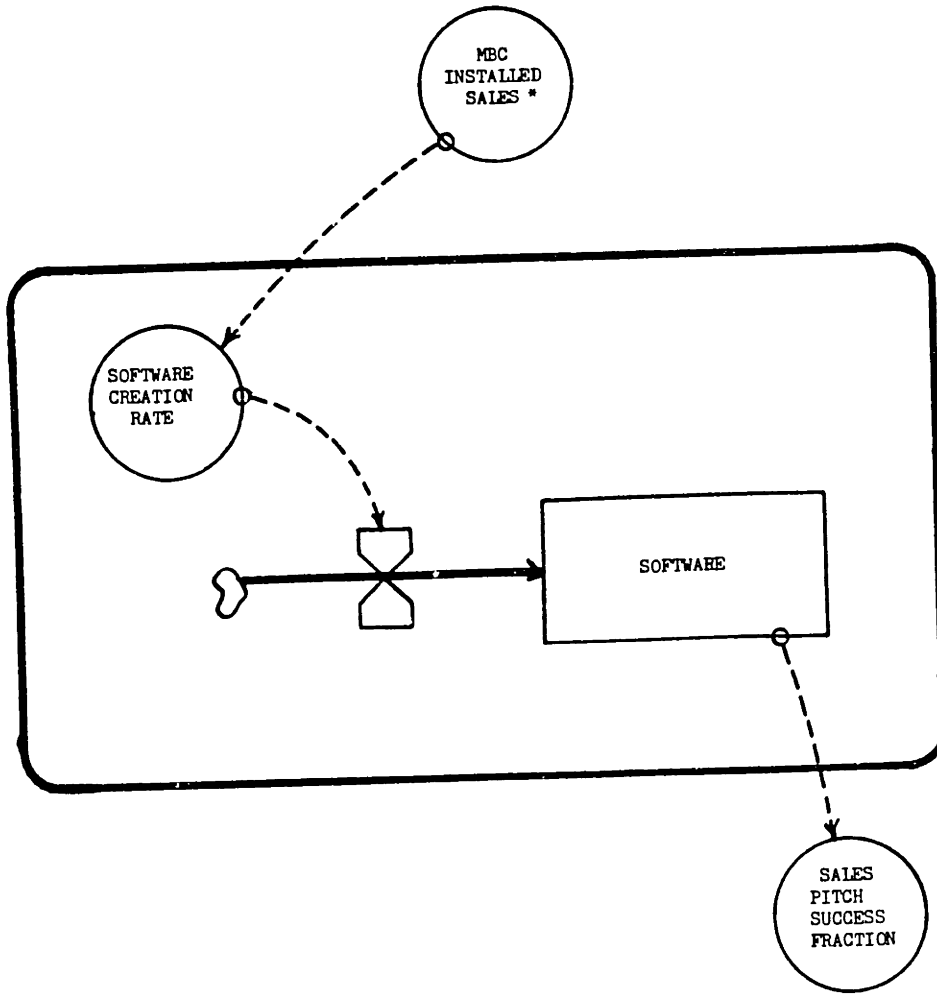
The marketing effort has little effect on the fraction of customers who can be sold a competitor computer. The important distinction that is represented in the model is that most everyone who comes into a computer store can be convinced to buy a relatively inexpensive computer; however, a customer must have specific needs in order to buy a MBC computer.

In the model, the five factors influencing sales pitch success fractions can act to make MBC's fraction as large as 0.25 or as little as 0.09. The competitor's sales pitch success fraction ranges from 0.2 to 0.25.

#### 4.2.13 SOFTWARE

Our model of software production is quite simple. Nevertheless, it captures the important effect software have on sales as well as the influence that sales has on software production. In the model, "software" refers to the average number of application packages that each dealer is familiar with and has readily available for purchase by interested customers. Thus, the "software creation rate" is determined not only by the rate at which MBC-compatible programs are produced, but also by the time required for dealers to find, acquire, and become familiar with these programs. Since dealers will specialize in specific markets, each dealer will carry a different selection of software. As represented in Diagram 4.13, the size of this selection affects the sales pitch success fraction for the computers on which the software runs.

The incentive for software writers to produce or release programs that run on MBC computers is primarily determined by the number of these computers in use. The success of a program is controlled not only by its quality but also by the number of people who can run the program on their computer. Since the sales of MBC computers by retailers is expected to represent a substantial fraction of total MBC desktop computer sales, these sales will affect the software creation rate.



\* Indicated items applicable only to MBC.

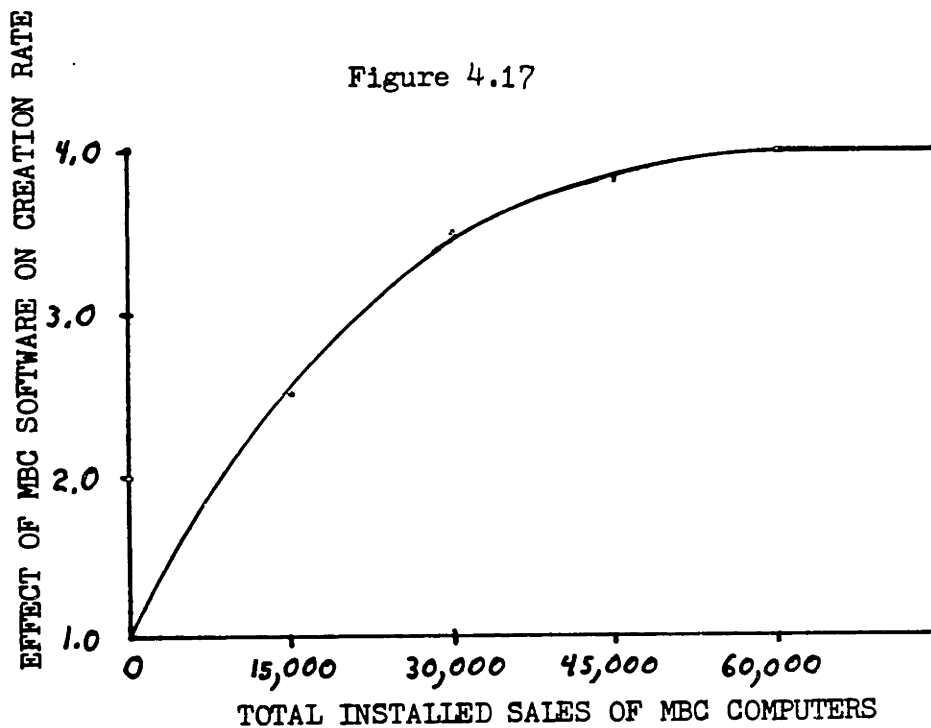
Diagram 4.13

MBC is providing its dealers with lists of programs that have been written by VAR's to run on MBC computers. It is not always a simple matter to acquire and learn these programs; however, as a dealer becomes experienced with MBC computers he will want to find more software to satisfy his customers' needs. For these reasons, the total installed sales of MBC computers increases the MBC software creation rate.

Normally, MBC dealers add one MBC program per month to their software offering of twenty programs. As the total sales of MBC computers by dealers increases, this software creation rate may quadruple. Figure 4.17 shows the nature of this relationship.

Since the number of programs available for competitor computers is also increasing, we have incorporated separate equations for MBC and competitor software creation. Unlike the modeling of MBC sales, the model shows only a small percentage of the total sales of competitor computers. These computers are being distributed by many sources other than the dealers that MBC recruits. Thus, the total competitor sales as duplicated in our model do not significantly affect the competitor software creation rate.

In fact the rate at which competitor software is created



is fairly constant since it is constrained by the ability of dealers to adopt the programs. The sales of competitor computers do not strongly influence software producers since there is an abundant stock of these computers already in the market. In short, the rate at which competitor software is produced and distributed is constrained only by the capacity of writers and dealers.

Since there are many more competitor computers already in the market, the number of programs available and the rate at which they are being created is greater for competitors than it is for MBC. In the model each dealer initially carries an



average of 100 competitor programs. This number is increased at a rate of 1.5 programs per month. Although the number of available programs grows interminably in our model, the effect of this abundance of programs does not. Dealers will either refuse to carry additional programs or else the effectiveness from carrying additional programs will be small.

### 4.3 NOTES

1. For a more detailed explanation of the use of symbols in system dynamics see George P. Richardson and Alexander L. Pugh, Introduction to System Dynamics Modeling with DYNAMO, (Cambridge, MA: MIT Press, 1981). For a critique of system dynamics symbols, see John D. W. Morecroft, "A Critical Review of Diagramming Tools For Conceptualizing Feedback System Models," Dynamica, vol. 8, Summer 1982, 20-29.
2. A complete mathematical explanation of exponential growth and decay models appears in Richardson and Pugh, previously cited.
3. Philip Kotler, Marketing Decision Making: A Model Building Approach, (New York: Holt, Rinehart, and Winston, 1971).

## 5 ANALYSIS OF SYSTEM BEHAVIOR AND POLICY TESTS

### 5.1 ORGANIZATION AND PURPOSE

In this chapter, the output of the MBC retail sales channel model will be presented and analyzed. By examining the behavior of the model under base run conditions, we hope to reveal areas where MBC can intervene to improve the performance of its product and the development of its retail sales channel. Having identified these areas of intervention, we will introduce changes into the model and examine the model's behavior as compared to the desired behavior of the channel.

The base run of the MBC retail sales model uses the parameter and function values supplied by MBC and described in Chapter Four. The behavior of the retail model under base run conditions reflects only the internal influences described in Chapter Four. In other words, all movement in variables results from changes within the system instead of resulting from changes in the system's environment. The base run of the model covers one hundred months because some of the more subtle dynamic behaviors of the retail system take place over long periods of time.

Our objective is not merely to present the output of the model and explanations for the movement of variables over time. Instead, we seek to use the model output, the system dynamics technology of feedback loops, and explanations from the feedback perspective to develop a deeper understanding of the retail channel system. The development of this understanding should have a managerial slant. It is not enough to understand that movement in one variable is caused by movement in another variable. A deeper level of understanding requires a synthesis of behavior and explanations to derive general principles about the operation of the retail sales channel system. Even from the relatively simple dynamic structures represented in this retail sales channel model, rich dynamic behavior emerges. This behavior has implications for MBC's management of the retail sales channel system.

The output and analysis of the retail sales channel model should, in a very real sense, be viewed as feedback on a manager's mental models of workings of the retail channel. The results and explanations offered here should stimulate discussion, challenges, and exploration of the channel among MBC management. The true value of this modeling effort lies not in the model or its output, but rather in the dialectic process that surrounds the development of the model and the discussion and analysis of the model's results.

## 5.2 MODEL BEHAVIOR

The base run of the retail sales channel model reveals some general insights about the movement of a multiuser microcomputer through a retail channel, and about the efforts required to develop a retail sales channel for microcomputers. These insights fall into two broad categories: (1) product/channel interactions and the nature of in-store competition, and (2) service requirements, competition, and channel development.

### 5.2.1 PRODUCT/CHANNEL INTERACTIONS AND IN-STORE COMPETITION

In general, the nature of the product offered through a sales channel affects both the success of the product, and the success of the sales channel. For example, the success of a product often depends on the appropriateness of the product for the particular channel through which it is offered. There are two reasons why the product characteristics and channel characteristics must be well matched. First, on a superficial level, the type of customers that frequent a particular channel must be the type of customers that are likely to purchase a product offered through that channel. Industrial solvents are not offered through convenience stores because very few convenience store shoppers are interested in purchasing industrial solvents. Second, and more important, the nature of competitive products influences the

appropriateness of a channel for a particular product. Assuming an appropriate match between channel customers and product characteristics, differences among products aimed at the same market influence the success of a product. For example, many brands of household cleaners sold through supermarkets remove dirt just as well as industrial cleaners. But cleaners sold through supermarkets and packaged in easy-to-use bottles sell better through those channels than cleaners sold in bulk from large vats. Therefore, although both products perform equally well, the added convenience of the packaged variety make it a favorite of the supermarket shopper.

In addition to influencing the success of the product in a given channel, product characteristics also influence the development of the channel itself. The success of a channel is not divorced from the success of a product. Tupperware and Avon have managed to develop successful direct sales channel because their products are successful. Few householders would agree to sell Tupperware or Avon if the product did not sell through these channels. Conversely, the success of the product is not divorced from the success of the channel. The channel is more successful than the mere horizontal summation of the success of its members because success breeds success. Breadth of distribution comes only from a successful product. Yet it is difficult to have a successful product without broad distribution to the target market.

In much the same way the characteristics of household cleaners and Tupperware influenced the development of their retail channels, the characteristics of the MBC computer influences the development of its retail channel. The base run of the model reveals that MBC's product is at a relative disadvantage compared to competitive products when it is offered through the retail channel. This relative disadvantage is related to the characteristics of the channel, and the interactions among MBC's product and competitors' products as determined by product characteristics. MBC's disadvantage manifests itself in sales rates that are lower than those of the competition, and a shorter life cycle for the product within a retail store.

#### 5.2.1.1 DEPRESSED SALES RATES

Sales rates for the MBC multiuser computer in computer retail stores are below expectations for the life of the product. Figure 5.1 plots the sales rates of the MBC computer and competitor computers over time. Table 5.1 provides numerical values for MBC and competitor sales rates, as well as the share of the dealer's contribution provided by MBC computer sales, and sales capacity absorbed by attempts to sell MBC computers.

We expected the MBC sales rate to be well below the

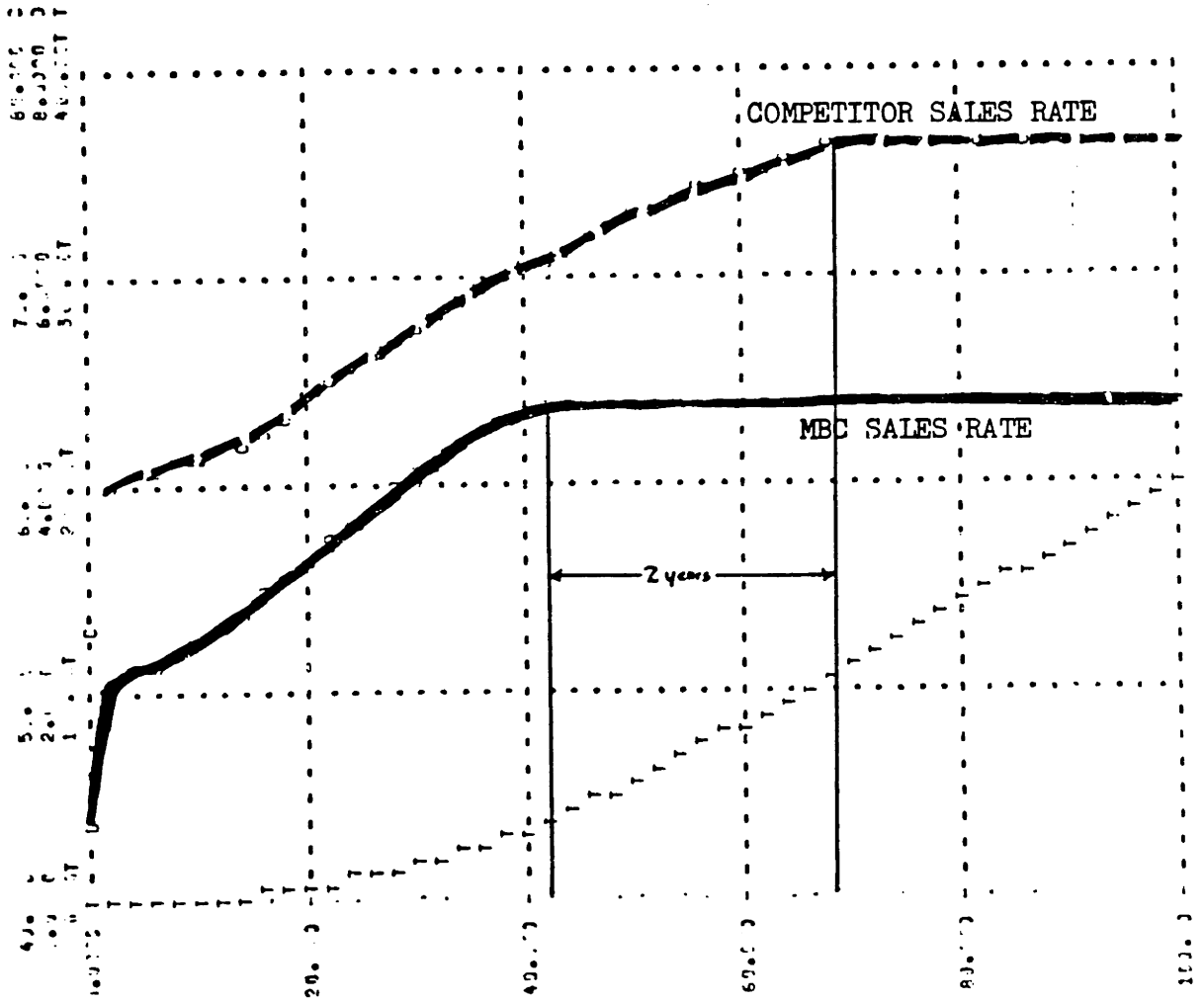


FIGURE 5.1



	INITIAL	MAXIMUM	% CHANGE	% OF TOTAL
MBC SALES/PERIOD	2	4.75	150%	6%
COMPETITOR SALES/ PERIOD	60	76	27%	96%
MBC CONTRIBUTION/ PERIOD	\$3,125	\$8,600	275%	12.8%
COMPETITOR CONTRIB- UTION/PERIOD	\$46,250	\$58,750	27%	87.2%
MBC SALES CAPACITY	168.75	175	4%	22%
COMPETITOR SALES CAPACITY	575	500	-13%	62.5%
SERVICE CAPACITY	56.25	125	122%	15.5%

## ANALYSIS OF THE BASE RUN

TABLE 5.1

competitor sales rate because the MBC machine is more difficult to sell. Nevertheless, the relative disadvantage of MBC computer becomes clear when contribution and sales capacity use are examined. The MBC product consumes far more sales capacity than competitor products relative to the contribution it generates.

The development of MBC's sales over time can be explained in two phases: the early phase of growth in MBC sales, and the latter phase of stagnation of sales. In the early stages, MBC computers are receiving more attention from the salespeople, and the salespeople are learning to better use their capacity to sell the MBC computer. In the latter stages, the longer sales cycle associated with the MBC

computer, and the attendant difficulties of selling a multiuser computer as opposed to a single user computer, cause the stagnation of MBC's sales rate.

Figure 5.2 illustrates the early success of the MBC computer in the retail sales channel as salesmen devote more sales capacity to the MBC computer and become more experienced at selling multiuser systems. Loop One governs the allocation of sales capacity to the MBC computer. In the early stages of the MBC product's life in the retail store, salesmen are eager to try selling the MBC product. Armed with fresh training, salesmen spend a certain fraction of their time making sales pitches about the MBC multiuser system to customers. The more time they allocate to the MBC, the more sales pitches the salesman makes. Some of these sales pitches result in sales, the exact number determined by the sales pitch success fraction. For a variety of reasons, the sales pitch success fraction increases as MBC sales increase. As the sales pitch success fraction increases, salesmen are more likely to allocate time to selling the MBC computer. In this fashion, successful selling of the MBC computer is self-reinforcing. In the absence of other influences, Loop One will produce ever increasing success of the MBC computer because salesmen will allocate more and more of their sales capacity to the MBC computer as more and more MBC computers are sold.

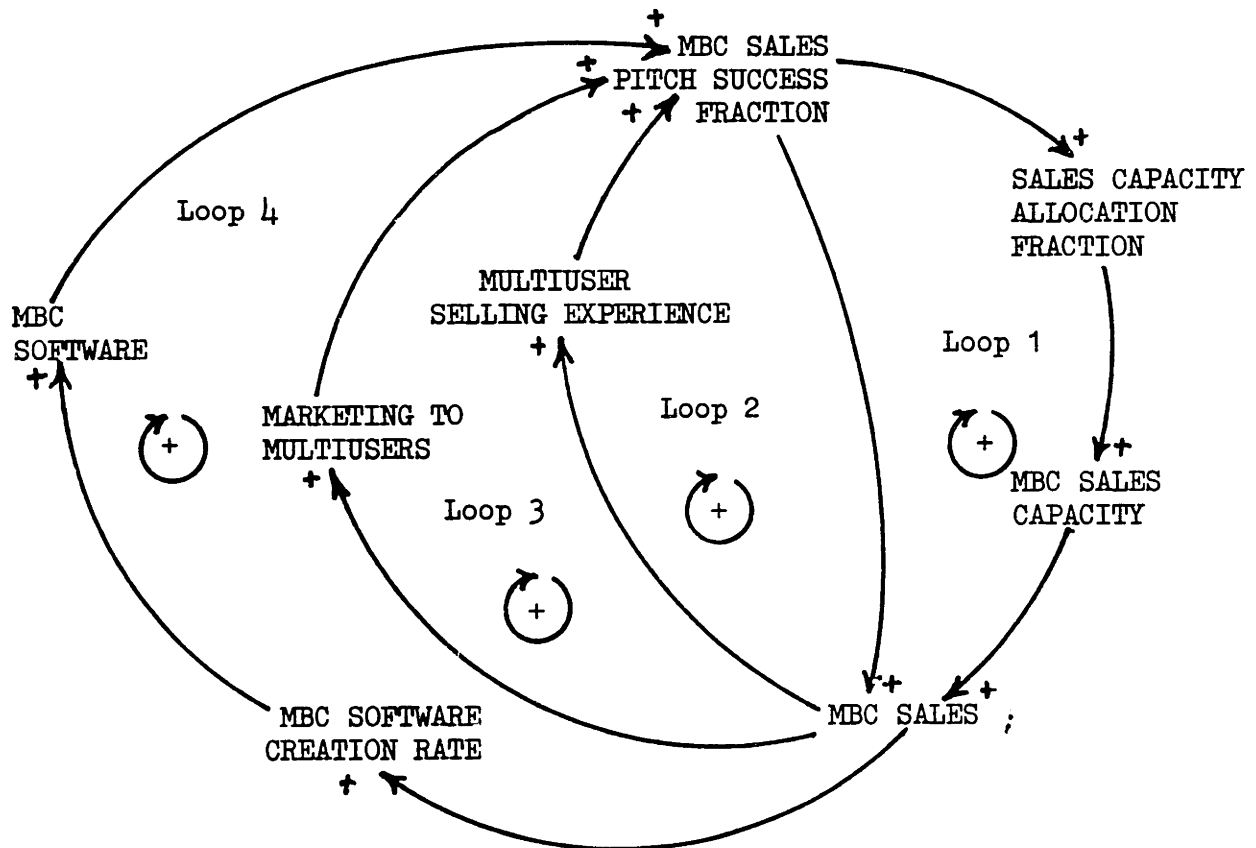


Figure 5.2

The self-generating growth of Loop One is reinforced by Loops Two, Three, and Four in Figure 5.2. Just as Loop One allocated more capacity to MBC as MBC succeeded, Loops Two, Three, and Four make each unit of MBC sales capacity more productive as MBC succeeds.

For example, Loop Two represents the effect that salesman learning has on his ability to sell. When a computer store takes on a new product line, a great deal of time and effort is consumed preparing for the sale. The salesman must be knowledgeable about the product, its capabilities, and the marketplace toward which it is targeted. Much of this learning can only take place on the job. By selling more computers, the salesman learns to tell successful approaches from unsuccessful ones. This learning effect is represented in Loop Two. MBC sales generate experience at selling multiuser computers which, in turn, improves the salesman's success fraction. Improvements in the success fraction increase sales, and reinforce selling experience.

In a similar fashion, Loop Three represents the effect that targeted marketing can have on the sales pitch success fraction. This marketing is target toward prospective customers likely to need a multiuser computer. Improvements in MBC sales generate revenues, a fraction of which is devoted to dealer marketing. As MBC sales become a larger fraction of total store revenues, the store manager is likely to become

convinced that the MBC product is of value to him. He will allocate a larger fraction of his total marketing budget to be aimed specifically at multiuser computer prospects. This improved multiuser marketing effort alters the class of customers entering the computer retail store. A larger fraction of these customers, having been previously exposed to marketing designed to promote interest in multiuser computers, will be disposed to the purchase of a multiuser computer. This change in the nature of the customers in the store will increase the sales pitch success fraction, and in turn increase sales, thereby reinforcing the tendency to allocate marketing resources to prospective multiuser computer buyers.

Although similar in operation to Loops Two and Three, Loop Four acts to reinforce the growth of MBC sales over a longer time frame. Loop Four argues that increases in MBC sales create a demand for MBC software. In response to that demand, software is produced or released. The creation of MBC software increases the number of potential applications of the MBC computer, thereby generating a broader base of interest, and improving the sales pitch success fraction.

Therefore, the early growth of the MBC sales rate within computer stores is self reinforcing. As computers are sold, salesmen are more likely to allocate sales capacity to the MBC computer, and are more effective with the capacity they allocate.

Retail sales of MBC computers do not continue unimpeded, however. The unique characteristics of the MBC product interact with the nature of computer retailing and the characteristics of competitor models to limit the growth of sales of MBC computers. The complexity of the MBC computer and the attendant long sales cycle relative to competitors' computers stifles growth because growth itself creates conditions that impede the sale of computers.

Figure 5.3 displays the forces that act to restrain computer sales through retail sales channels. In general, computer retail sales are limited by the competition for sales capacity among the various makes of computers available for sale within the store. Loops Five and Six explain how competition for capacity limits retail sales.

In Loop Five, MBC computers compete for sales capacity with competitors' computers through the capacity allocation fraction. The capacity allocation fraction is the sales capacity allocated to sell MBC computers relative to total capacity available for selling. Increases in the capacity allocation fraction increase the total hours available for selling the MBC computer. As the number of hours allocated to selling MBC computers increases, salesmen are able to make more sales pitches for the MBC computer. Because the MBC computer is a multiuser computer, it takes longer to make a sales pitch for the MBC computer than it takes to make a sales

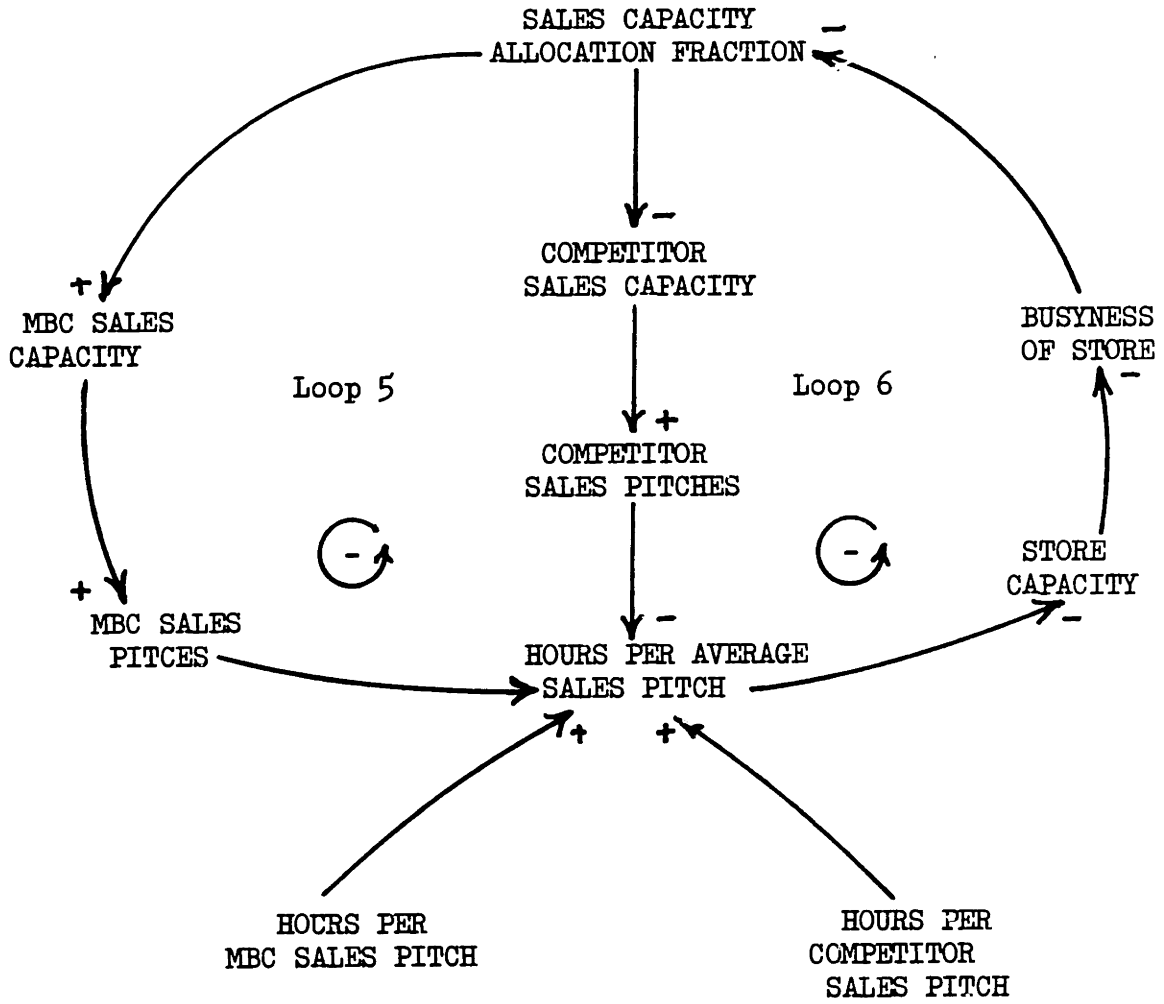


Figure 5.3

pitch for a competitors' computer. Therefore, increases in the number of sales pitches made for MBC computers will increase the length of the average sale pitch within a given store. For example, a store that makes sales pitches only for the MBC computer will be able to make fewer sales pitches than a store that attempts to sell both the MBC computer and competitors' computers. If the length of the average sales pitch increases, the computer store will be able to handle fewer customers with its sales capacity than it would be able to handle had its average sales pitch been shorter. As the number of customers a store can serve declines, the store will appear more busy to the salesman. This apparent increase in store activity creates pressures for the salesman to allocate more time to selling the competitors' computers because they take less time to sell. Therefore, as MBC computers begin to sell well, they affect the ability of the salesman to serve all the customers entering the store, thereby creating pressures to reduce effort directed at selling MBC computers. The result is stagnating growth of MBC sales.

A similar loop is in operation stifling the sales of the competitors' computers, as shown by Loop Six. Decreases in the sales capacity allocation fraction represent increases in the capacity available for selling competitor products. As competitor sales capacity increases, the number of competitor sales pitches will increase, thereby reducing the length of the store's average sales pitch because a competitor sales



pitch is shorter than a MBC sales pitch. A drop in the length of the store's average sales pitch increases the number of customers the store can serve, reducing the pressure to allocate sales capacity away from MBC and toward the competitor.

In summary, the finite bounds of a computer store act as the ultimate limitation on a computer store's sales. The interactions among the computer store's lines of products, as determined by the characteristics of the products and the effect those characteristics have on the selling cycle, divide that finite sales capacity among MBC and its competitors. As the computer store grows, the division of sales capacity is more and more likely to favor the competitor over MBC.

#### 5.2.1.2 STUNTED PRODUCT LIFE CYCLE

In addition to sales rates that are below those of the competition, MBC's computer also shows a shorter life cycle within the retail channel than the competitors' products show. As with lower sales rates, this disappointing performance of the MBC product in the retail sales channel can be traced to the characteristics of the MBC product, the characteristics of the competitors' products, and the nature of the sales channel.

The sales rates shown in Figure 5.1 indicate that the MBC computer reaches its maximum sales rate much earlier than the competitors' products reach their maximums. In fact, the competitors' products continue to grow for at least two years beyond the life of the MBC computer, indicating a product life cycle within the retail sales channel for the competitors' products that is at least 60 percent longer than the MBC life cycle.

The MBC computer exhibits a shorter life cycle in the retail sales channel because its attributes force it to suffer more than competitor products suffer when sales capacity becomes constraining. Figure 5.4 shows the feedback process responsible for the early maturation of the MBC product. Maturation of the MBC and competitors' products is governed by Loops Seven and Eight. Loop Seven acts to constrain the growth of the MBC product when sales capacity gets tight, while Loop Eight develops and reinforces the dominance of the competitors' products in the retail store. As with the sales rates, the early maturation of the MBC product is determined not by market forces, but by the interactions of the channel with the characteristics of the MBC computer and the competitors' computers.

The behavior of Loop Seven becomes important when the constraints of Loops Five and Six in Figure 5.3 become operational. Loop Seven adds additional constraints on the

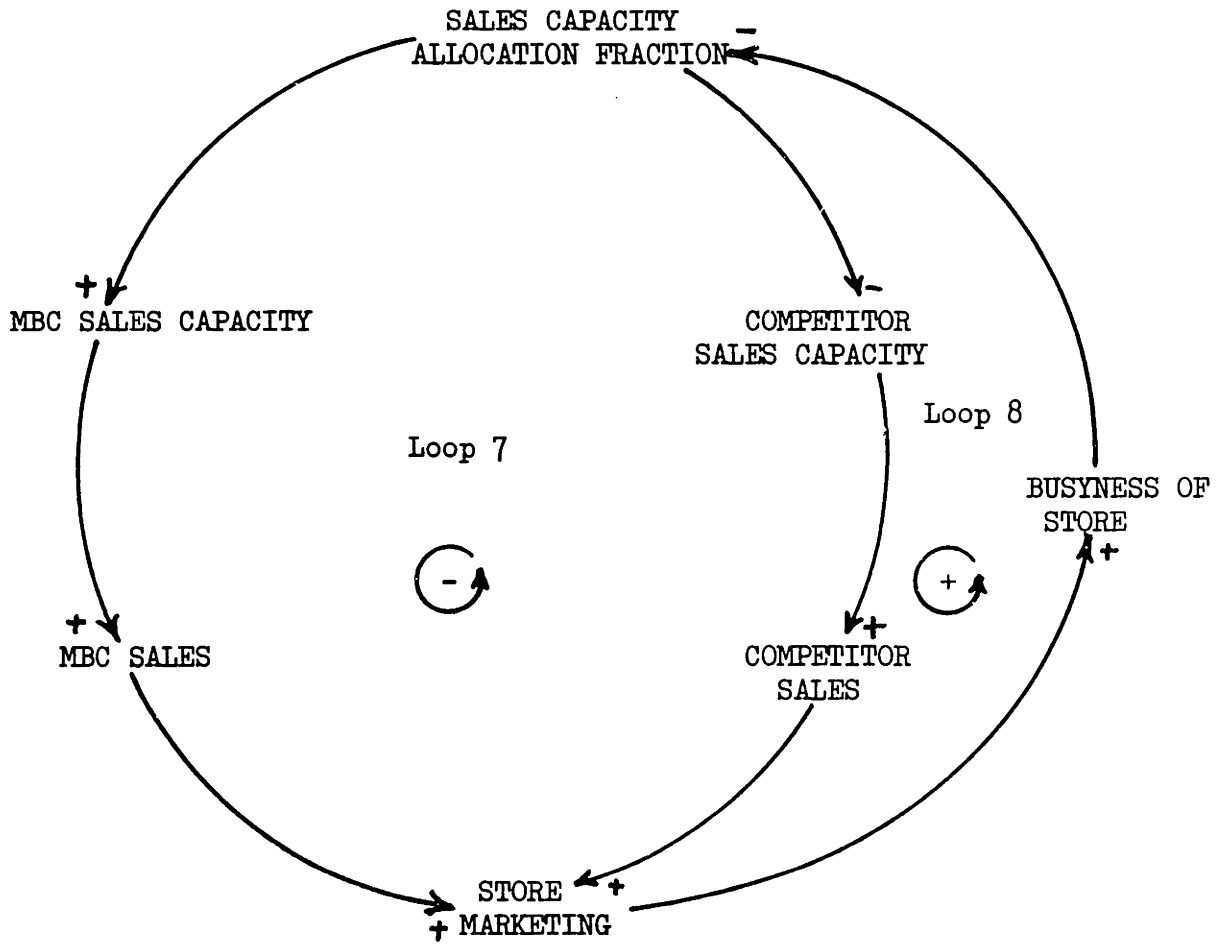


Figure 5.4

growth of MBC sales. As MBC sales increase, computer store revenues increase. Increases in computer store revenues yield larger marketing budgets, thereby increasing the customer traffic in the store. As the store becomes busy, pressures are created for the salesman to allocate sales capacity away from the MBC computer and toward the competitors' computers. This reduction in sales capacity allocated to MBC computers decreases sales of MBC computers. In this fashion, Loop Seven operates to stifle MBC sales rate growth.

The corresponding Loop for the competitors' products is shown in Loop Eight. While Loop Seven restricts the growth of MBC computer sales, Loop Eight acts to increase the sales of the competitors' computers. Increases in competitor sales also produce increase in the marketing budgets and store traffic. But increases in traffic and the accompanying store activity allocate sales capacity toward the competitor and away from the MBC computer because the competitor sales cycle is shorter than the MBC sales cycle. Therefore, while increases in store sales serve to restrict the growth of MBC products, increases in store sales encourage the growth of the competitors' products. It is important to realize that MBC sales contain the seeds of MBC sales stagnation, and spur the growth of competitors' sales. Competitor sales also contains the seeds of MBC sales stagnation, and spur the growth of competitor sales. This inequitable treatment of products and the resulting stagnation of sales rate growth stems primarily

from differences in the MBC and competitor products.

Once the MBC product begins to mature in the retail sales channel, other loops begin to operate that reinforce the maturation of the MBC line. Figures 5.5 and 5.6 display the movement over time of the dollar contribution towards fixed costs of MBC and the competitors' lines, and the movement over time of dealer marketing, and the fraction of marketing that is directed to potential MBC customers. Note that relative contribution, measured as the fraction of total contribution that traces to the MBC product line, peaks and then declines as the MBC product line matures. The fraction of marketing aimed at multiusers behaves similarly.

The behavior of relative contribution and multiuser marketing reinforces the maturation of the MBC line. As MBC sales begin to mature and competitor sales continue to rise, the relative contribution of the MBC line begins to fall. As a result of the decline in relative contribution, the fraction of marketing that is aimed at multiusers declines, thereby reducing the MBC sales pitch success fraction. This drop in success fraction reduces the MBC sales rate, reinforcing the maturation of the MBC product line.

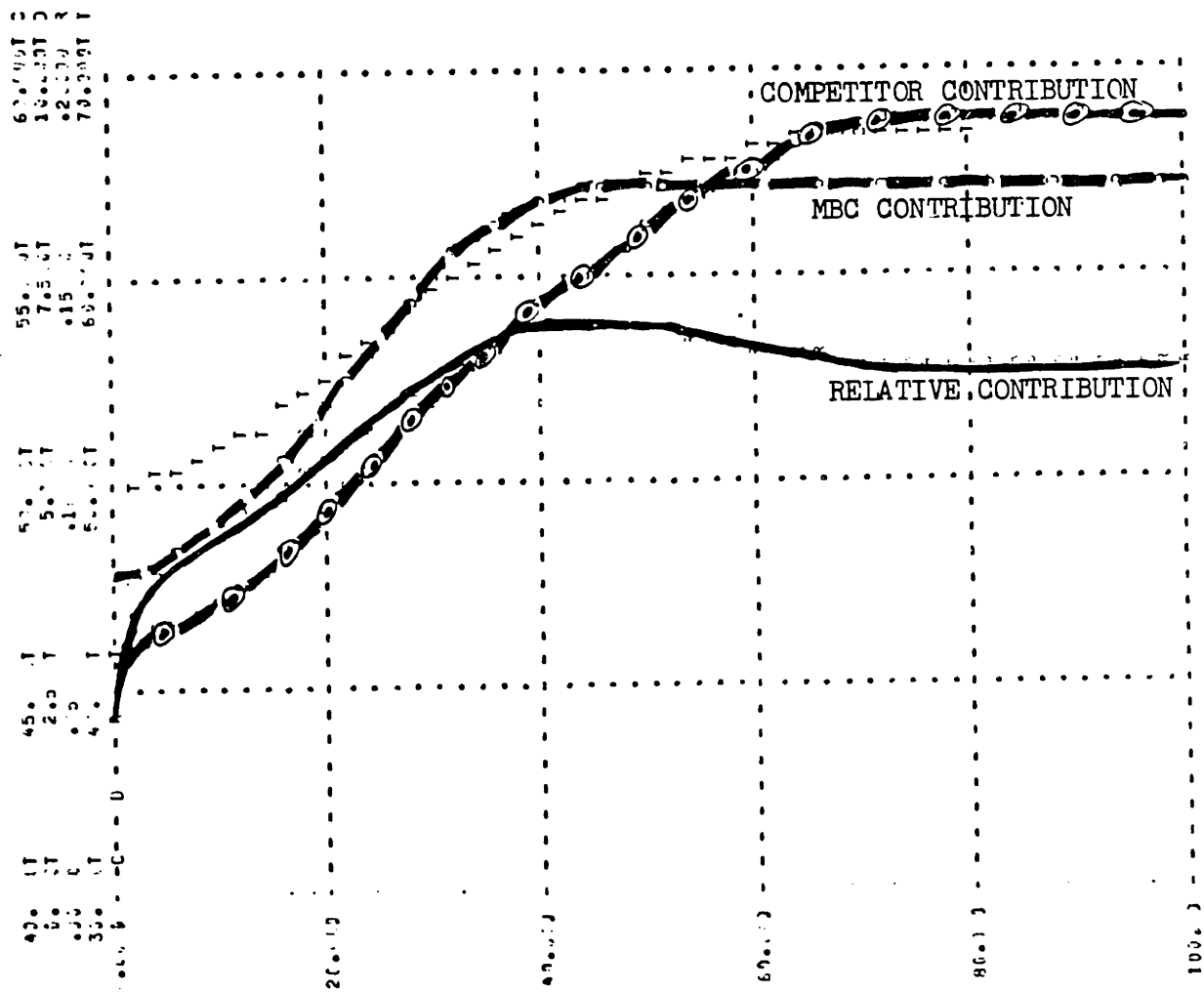


Figure 5.5

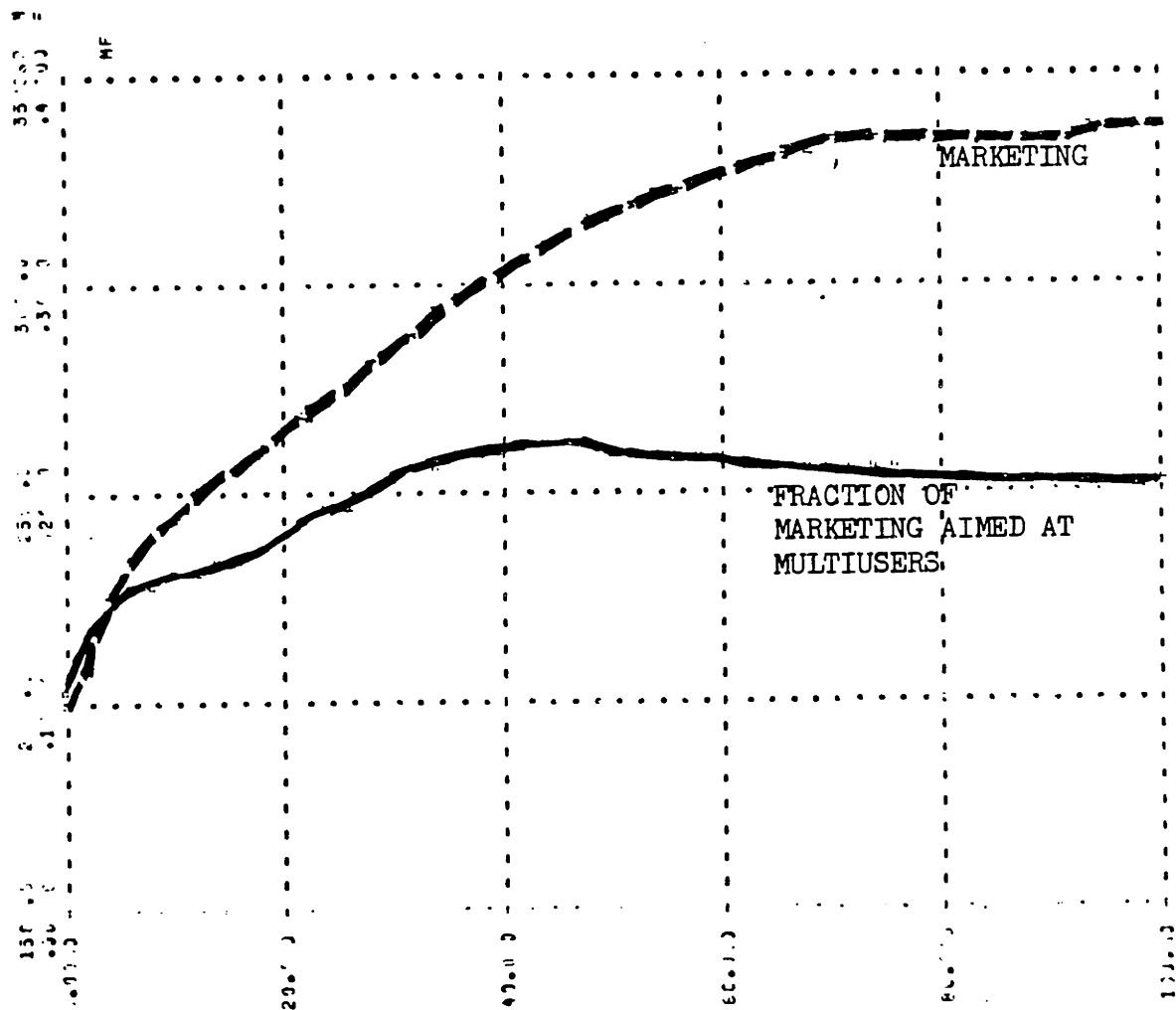


Figure 5.6

### 5.2.1.3 STUNTED GROWTH OF THE RETAIL CHANNEL

Up to this point, the discussion has focused on the sales of the MBC computer and the ways its characteristics interact with the retail channel to limit sales. But the sales of the MBC computer both affect and are affected by the development of the MBC's dealer network. Therefore, the development of the MBC dealer channel cannot be separated from the in-store dynamics between the MBC computer and its competitors.

The poor performance of the MBC computer relative to its competition is indicated by MBC's lower sales rate through retail stores, and the hasty maturation of the product line when offered through retail stores. The performance of the MBC line within the computer retail stores determines the breadth of the MBC computer's distribution. As calculated in the base run, the behavior of the MBC dealer network is displayed in Figure 5.7. The number of computer retailers carrying the MBC line grows steadily over time, peaking at about 600 dealers after approximately five years of recruiting effort.

The variable of importance in Figure 5.7 is the dealer drop-out rate. The dealer drop-out rate is a function of normal attrition and is accelerated by poor performance of the MBC line relative to the performance of competitive lines. The early rise in the dealer drop-out rate is caused by normal



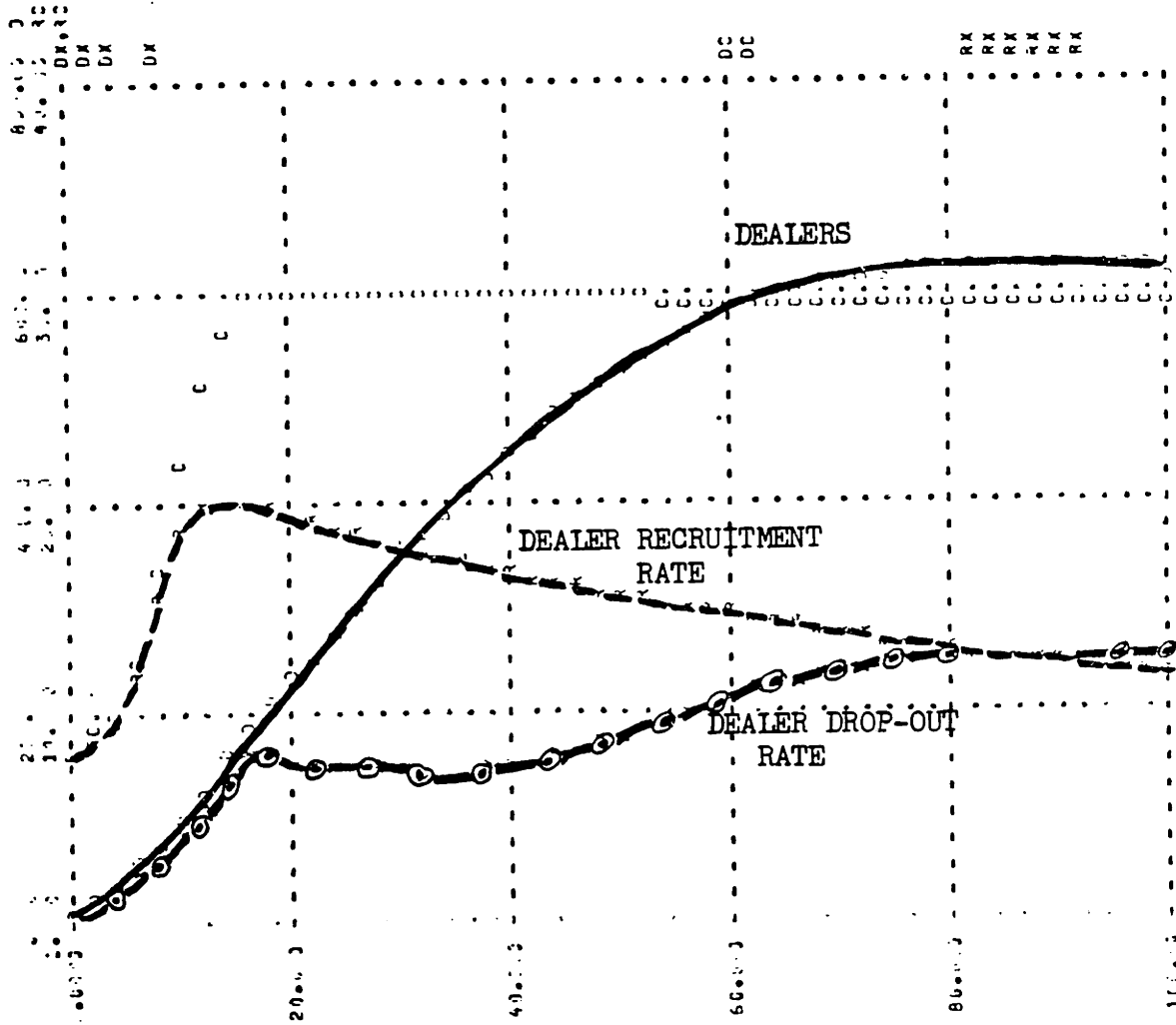


Figure 5.7

attrition and poor relative profitability of the MBC line as it attempts to take hold in retail stores. Once the MBC computer line begins to find a following, however, the dealer drop-out rate begins to decline. As the MBC line begins to mature and perform poorly relative to its competitive lines, dealers become disenchanted with the MBC line of computers and the dealer drop-out rate begins to climb. The result of these movements in the dealer drop-out rate is the steady climb and levelling of the number of dealers carrying the MBC line. /

This behavior of the number of dealers and the dealer drop-out rate is explained by the feedback loops presented in Figure 5.8. Loop Nine is responsible for the growth of the MBC dealer network. As MBC sales begin to climb, the fraction of total contribution made by the MBC line of products also begins to climb. Dealers carrying the MBC line are pleased with the performance of the MBC computer and continue to sell it in spite of the pleas of other computer manufacturers to fill shelf space with their line. Fewer dealers decide to drop the MBC line, and the number of dealers carrying the MBC line increases. This increase in dealers increases the presence of MBC in the small business computer market, and thereby makes the MBC computer easier to sell. In this manner, increased sales of the MBC computer reinforce the growth of the MBC dealer network. The growth of the MBC dealer channel as generated by Loop Nine is strengthened by Loop Ten in Figure 5.8. In Loop Ten, increases in the MBC

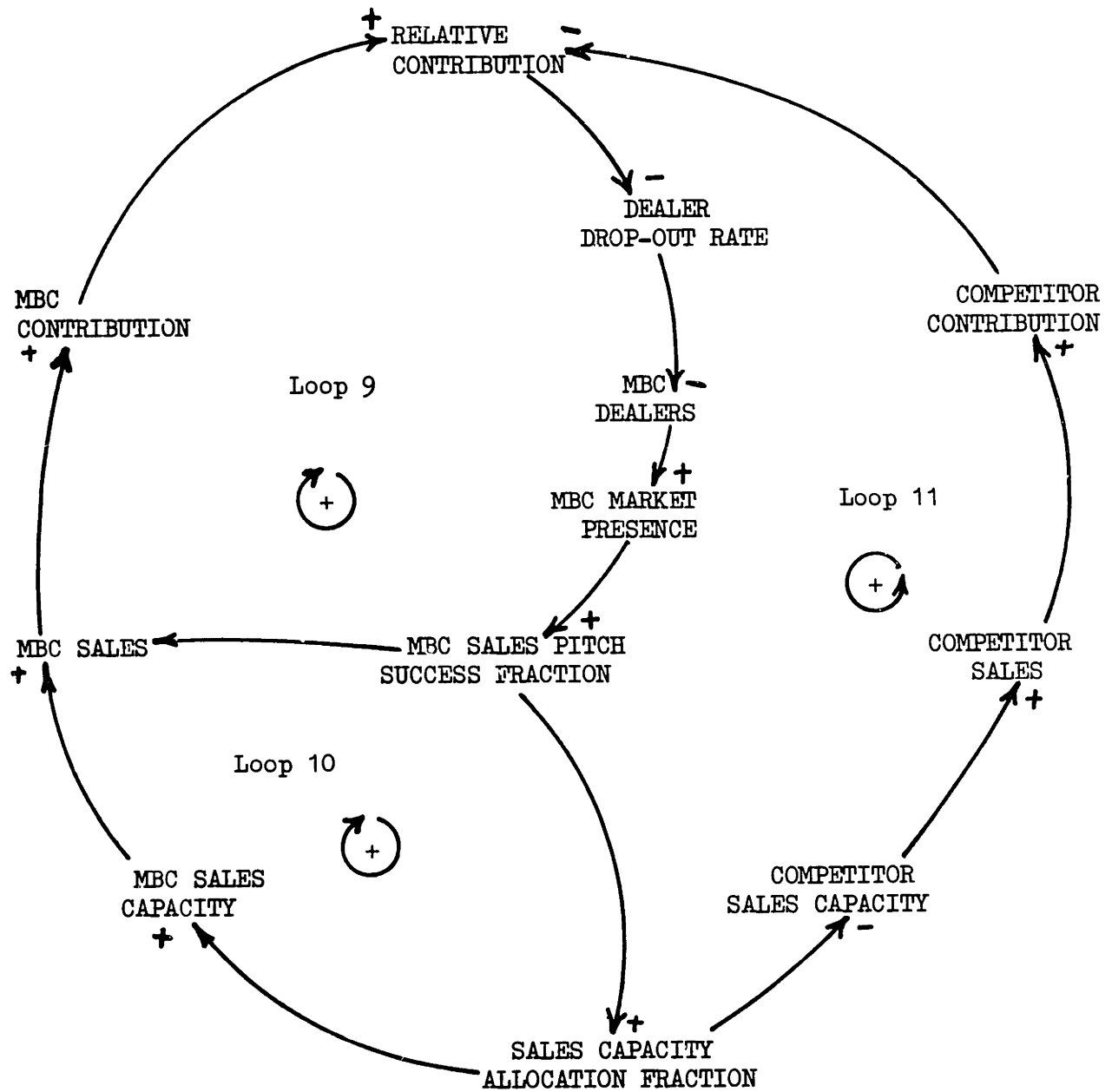


Figure 5.8

success fraction caused by increases in MBC's market presence act to allocate more sales capacity to MBC and away from competitor models. This increase in sales capacity for the MBC computer results in an increase in MBC sales, and strengthens the growth of the dealer network as generated by the process described in Loop Nine.

The competitors have a similar growth loop in operation that can act to stifle or encourage the development of the MBC dealer sales channel. Loop Eleven in Figure 5.8 describes this force. As the sales of competitive products begin to rise, the fraction of total contribution that can be traced to MBC products begins to fall. Dealers, noticing this trend in relative contribution, may reevaluate their decision to carry the MBC computer line. Some will abandon the MBC dealer program in favor of competitive lines. The number of dealers carrying the MBC line will fall, thereby reducing MBC market presence. This drop in MBC market presence will result in an increase in the fraction of total sales capacity allocated to competitor lines which in turn increases the sales of competitors' computers, reinforcing the decline of the MBC dealer channel.

The health of the MBC retail sales channel is determined in large part by the struggle for dominance between the two forces described by Loops Nine and Eleven. If Loop Nine is dominant, the MBC retail channel grows nicely. The leveling

of the growth of the retail channel, and its ultimate decline, however, occur when dominance shifts from Loop Nine to Loop Eleven.

This shift in loop dominance, and the accompanying leveling and decline of the MBC retail sales channel is inevitable given the characteristics of the MBC product. The early maturation of the MBC line in retail stores, caused by the complexity of the MBC machine and the longer sales cycle that accompanies that complexity, ensures that the relative contribution the MBC line will fall. This drop in relative contribution is all that is needed to shift dominance from Loop Nine to Loop Eleven and begin the leveling and decline of the MBC retail sales channel.

The stunted growth of the MBC retail network is caused by store crowding, and the way salesmen act to alleviate crowding pressures. As will be discussed later in this Chapter, small or incremental additions to retail store capacity would be of little value to MBC. To encourage growth of MBC sales and the MBC dealer network, computer retailers would/ have to expand so rapidly that crowding is no longer a problem.

Retailer expansion on the scale necessary to improve the success of the MBC product and retail channel is highly unlikely for several reasons. First, personnel shortages will restrain expansion. As Chapter Three detailed, computer

retailers are having trouble hiring both skilled salespeople and skilled managers. Our model accurately represents the computer retailer's plight in that salesperson time is the scarce resource that is allocated among manufacturers. Second, while computer retailers may expand, their rate of expansion is likely to be too slow to help the MBC product. The retailer and MBC probably have different desired rates of expansion. While MBC would like a rapid rate of expansion to benefit their product, the retailer's expectations are more moderate. Without the same stake in the success of the MBC product that MBC has, the retailer is unlikely to want to expand his store capacity more rapidly than the apparent demand for that capacity. Finally, computer retail stores may not be able to expand rapidly enough to help MBC. Hiring an additional salesman will expand sales capacity, but it will also increase sales. These increased sales will generally produce increased marketing budgets, which in turn increase the crowding in the store. Therefore, many attempts at store capacity expansion are unlikely to benefit MBC.

#### 5.2.1.4 A TEST OF THE IMPORTANCE OF PRODUCT CHARACTERISTICS

The importance of the effect a product can have on the development of a sales channel cannot be underestimated. An appropriate match between the characteristics of the product offered, competitive products, and the limitations of the channel can spell the difference between a very successful

channel development program and a mildly successful one.

Figure 5.9 shows the growth of the MBC dealer network when the relative disadvantage of the MBC line in terms of complexity and sales cycle length has been neutralized. The development of the MBC retail sales channel is affected markedly by these changes in product characteristics. Not only does the channel develop more quickly, but 400 more dealers are recruited and retained than in the base run.

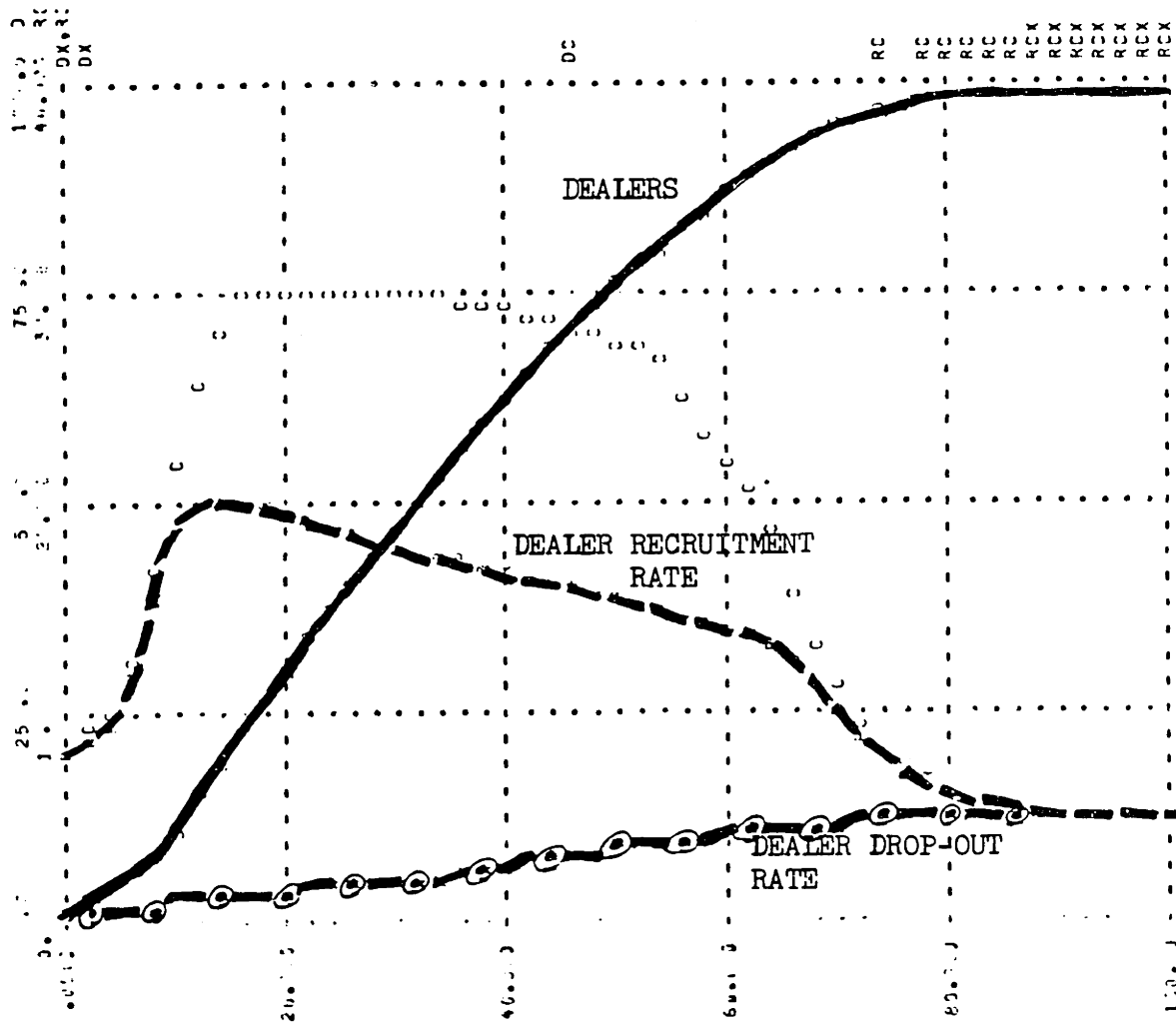


Figure 5.9



#### 5.2.1.5 CONCLUSIONS

Given that the capacity of any computer dealership is finite, MBC sales per dealership will eventually mature. Growth in total MBC sales through the retail sales channel can only be accomplished in the long term through the addition of dealers carrying the MBC line of computers. As such, an understanding of the dynamics of the development of the MBC retail channel, and the way the characteristics of the product offered through the retail sales channel affect the development of the sales channel, ultimately translates into an understanding of how sales growth is generated for MBC.

#### 5.2.2 SERVICE REQUIREMENTS, COMPETITION, AND CHANNEL DEVELOPMENT

In a very real sense, contained within a successful computer dealership are the seeds of stagnation. As computer stores become the point of entry into the computer world for a larger and larger population, the level of computer sophistication of that population is bound to fall. The burden of educating the public about computers has fallen on the computer retailer. The unsophisticated public, while with one hand creating the need for computer retailing, ensures stagnant long term performance of computer retailers with the other. With each computer sold through a retail store goes

the promise, either explicit or implicit, that the retailer is willing to see the buyer through the transition from computer illiterate to computer literate. Fulfilling these promises takes time and effort away from selling additional machines, and the failure to fulfill these promises creates unsatisfied customers and tarnishes a dealer's reputation.

The behavior of service requirements in the MBC retail sales channel model is displayed in Figure 5.10. The service burden, caused by sales of both MBC and competitor computers, rises steadily as sales increase. Early on, the computer retail store is not too busy, and the salespeople have time to serve both new customers and old ones. Quickly, however, the burden of previous sales gets too heavy for the dealership, and salesmen decide, in spite of rising demand, that they will allocate no more of their time to serving old customers. About this time, the rate of increase in the service burden begins to slow as the sales rates for both the MBC and competitor computers taper off.

This growth pattern of the service burden is caused by the interactions between available sales capacity and sales rates. These interactions are explained in Figure 5.11. Service requirements restrain the growth of sales of computers in retail stores as argued by Loops Twelve and Thirteen. In Loop Twelve, service demands directly reduce sales by reducing sales capacity. Increases in retail sales directly increase

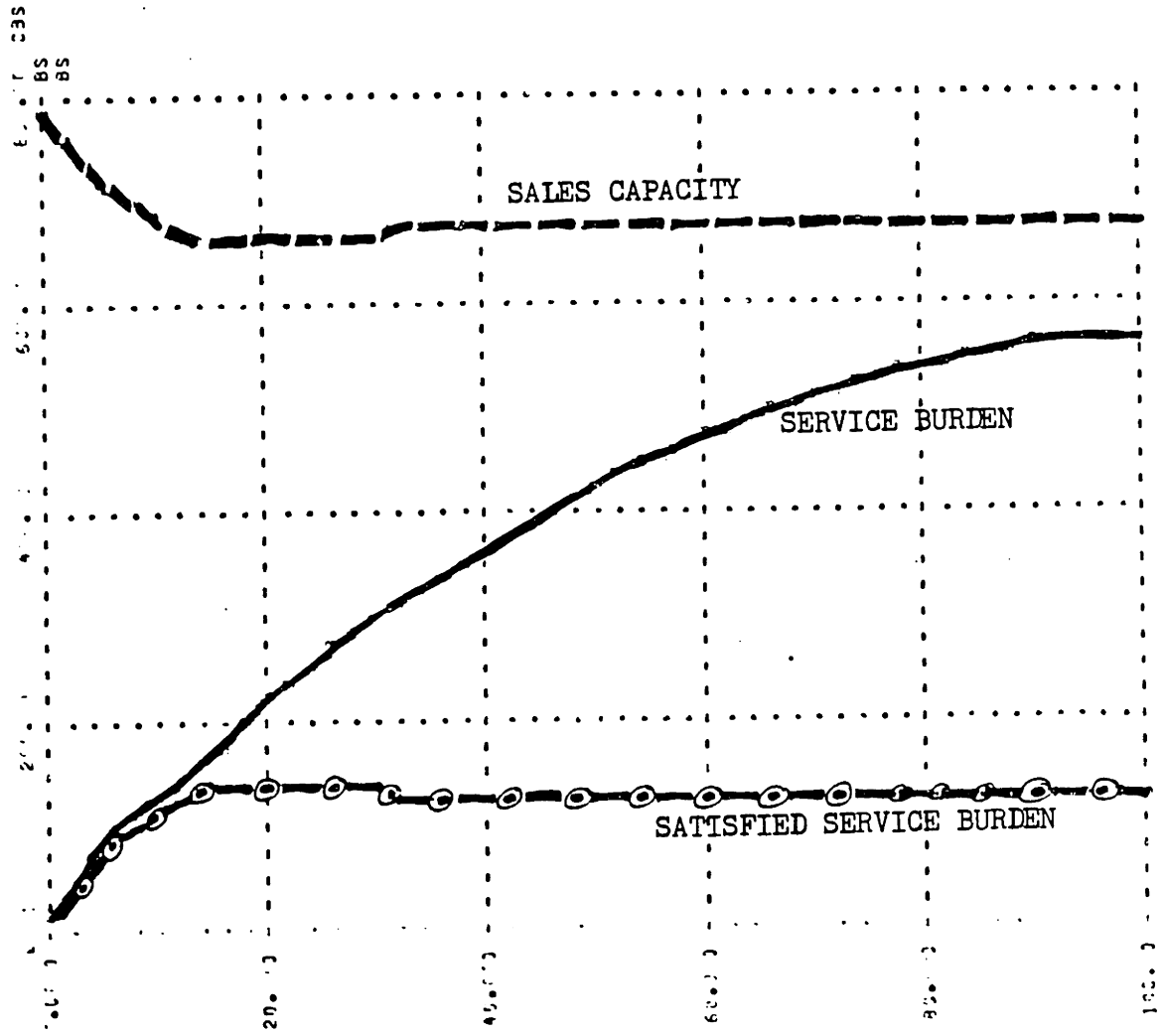


Figure 5.10

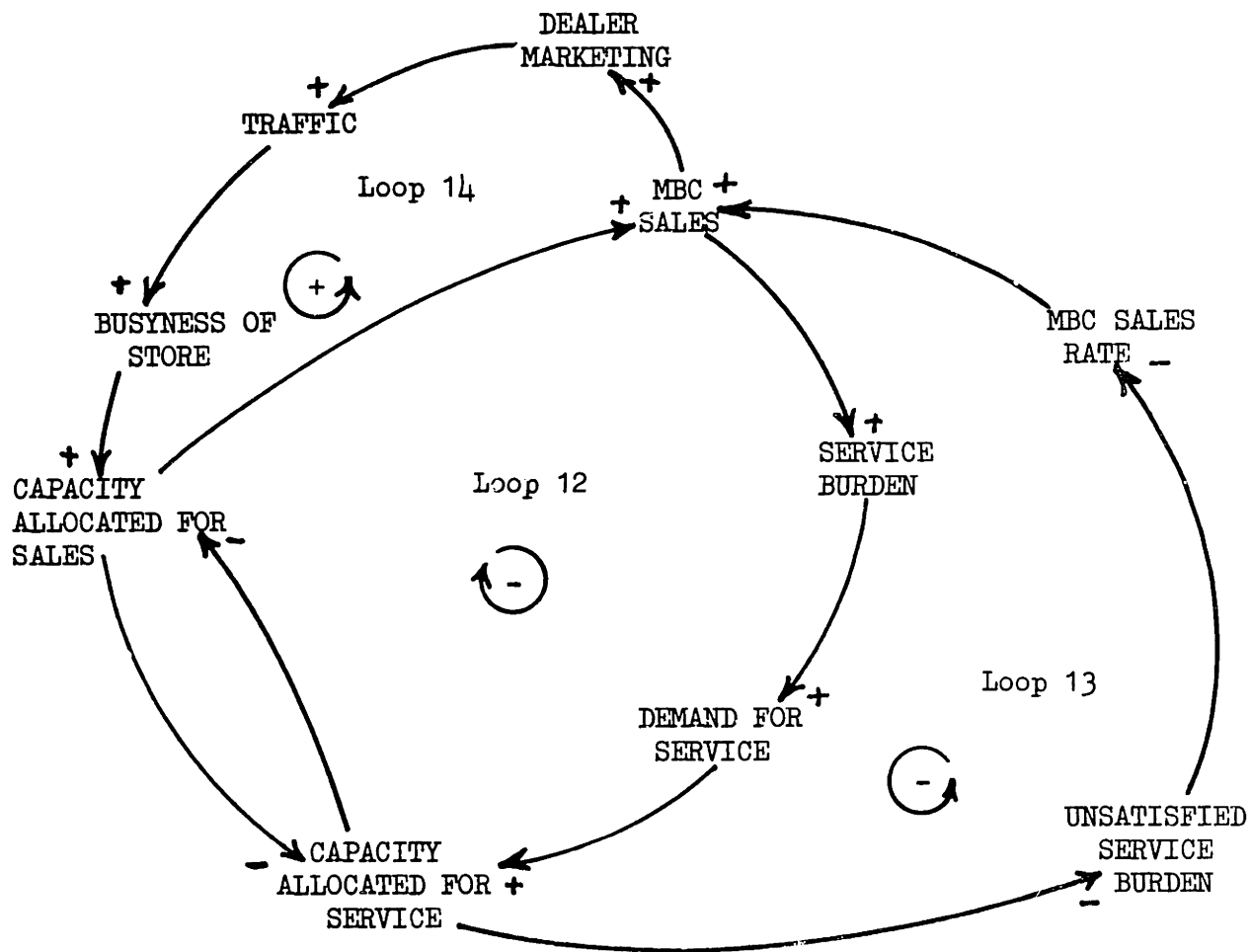


Figure 5.11

the demand for service by customers of the retail store. This increase in demand for service prompts salesmen to allocate some of their time away from retail sales and toward serving the dealers current customers. With less time for selling, retail sales grow less quickly, and a natural check on the growth of the service burden develops. An additional check on the growth of service burden is described by Loop Thirteen. Increases in a computer retailer's sales provide more money for dealer marketing of the retail store, which in turn increases store traffic and the salesperson's perception of the level of activity in the store. The busier the store becomes, the greater the salesperson's incentive to spend time selling rather than servicing. The result is a rising service burden that creates dissatisfied customers. Over time, as the level of dissatisfaction with a computer retailer grows, the dealers reputation in the community will fall, and his sales will be adversely affected, once again checking the growth of his service burden.

Although both Loops Twelve and Thirteen act to check the growth of a computer retail store through rising service burden, they are not equally effective or desirable restraints on growth. Loop Twelve generally operates in the early stages of the life of a computer retail store and can restrain growth only to a point. Eventually, the computer retailer will be unable to satisfy all of his service burden, and will refuse to allocate additional sales time to service. Having made the

decision to sell rather than service, the retailer's service burden rises until his reputation as a consultative and caring dealer is damaged. The restraints on growth imposed by Loop Thirteen are much more permanent than the restraints imposed by Loop Twelve.

The service burden that accompanies retail computer sales holds several important implications for MBC and their development of a retail sales channel. First, the service burden means that retail sales hit their ceiling earlier than would be expected in the absence of the service burden because service diverts the salespersons' time away from selling. Second, rising service burden is especially damaging to complex, multiuser products such as those sold by MBC. The MBC product sells best when the computer retail store is operating without the time constraints imposed by service. Unfortunately, the MBC product is most likely to be sold in dealerships where time constraints will develop. Because the MBC product is more complex, MBC dealers must be dedicated to consultative selling and service. It is precisely these computer retail stores, through their commitment to service, that become pressured as their sales increase. Finally, the rising service burden affects the development of the entire dealer network. By restraining the growth of the MBC line, and creating the constrained conditions that guarantee the poor performance of the MBC line relative to competitor lines, service requirements hamper the development of the dealer

network. In addition, a rising unsatisfied service burden negatively affects the presence of MBC in the marketplace, further limiting the development of the MBC retail sales channel

### 5.3 POLICY DEVELOPMENT AND TESTING

The behavior of the MBC computer retail network as described in Sections 5.2.1 and 5.2.2 suggest that MBC may be able to intervene in the development of the retail network and influence the growth of the network to their advantage. This section describes and tests intervention policies suggested by the analysis presented above.

#### 5.3.1 POLICIES AFFECTING MBC SALES CYCLE LENGTH

One of the primary influences on the behavior of the MBC retail network model is the length of the MBC sales cycle relative to the length of the competitors' sales cycles. Having determined the importance of the length of the sales cycle in the development of the MBC retail channel, it seems only natural to believe that both sales and the number of dealers can be increased by shortening the MBC sales cycle relative to the competitors' sales cycle.

There are several policies and programs that MBC could

implement that may reduce the retail sales cycle of the MBC product. For example, MBC could improve and increase dealer training in the MBC computer. A salesman that is more knowledgeable about the MBC product will probably be better able to demonstrate its value to a specific businessman more quickly. In addition to training in the MBC product, MBC could encourage salesman training in vertical markets. A salesman familiar with the operations of a doctor's office, for example, will be able to demonstrate and sell the benefits of an MBC computer more quickly than a salesman only familiar with the operations of small businesses in general. Along related lines, MBC could develop improved selling and demonstration techniques aimed at displaying the unique features of the machine as quickly as possible. Demonstration software that is menu-driven may allow the prospective buyer to become familiar with the computer without the aid of the salesman, for example.

In addition to reducing the sales cycle, MBC can encourage dealers to use their selling time more efficiently. Seminar selling, for example, may be a particularly useful technique, especially for the MBC machine aimed at vertical markets. By making a sales pitch to a number of businessmen engaged in similar enterprises at the same time, the computer retailer may be able to reduce the average time spent on each MBC sales pitch.



Finally, MBC may be able to transfer some of the sales burden from the retailer to the manufacturer. By developing cooperative direct mail programs, educational seminars, and targeted and detailed corporate advertising campaigns, MBC may be able to affect the average level of sophistication of MBC prospects, thereby reducing the MBC sales cycle.

By whatever device, a reduction in the MBC sales cycle relative to that of its competition has a positive effect on both the development of the MBC retail network and the sales rate in each dealership. Figure 5.12 displays the growth of the MBC retail network assuming a shorter MBC sales cycle. Figure 5.13 displays the MBC and competitor sales rates per dealership over time, assuming a shorter sales cycle for MBC. Table 5.2 compares the numerical growth in both sales and dealers to the base run of the model.

The reduction of the MBC sales cycle significantly increases the number of dealers carrying the MBC line of computers. In addition, dealers are recruited more quickly, on average, than under the base run. The primary force behind the increased growth of the dealer network is improved profitability of the MBC line of computers relative to the competitors' offerings. These forces are described in Loops Nine and Ten in Figure 5.8. The reduction in the MBC sales cycle increases the MBC sales rate, thereby increasing the contribution of MBC products. This rise in MBC contribution

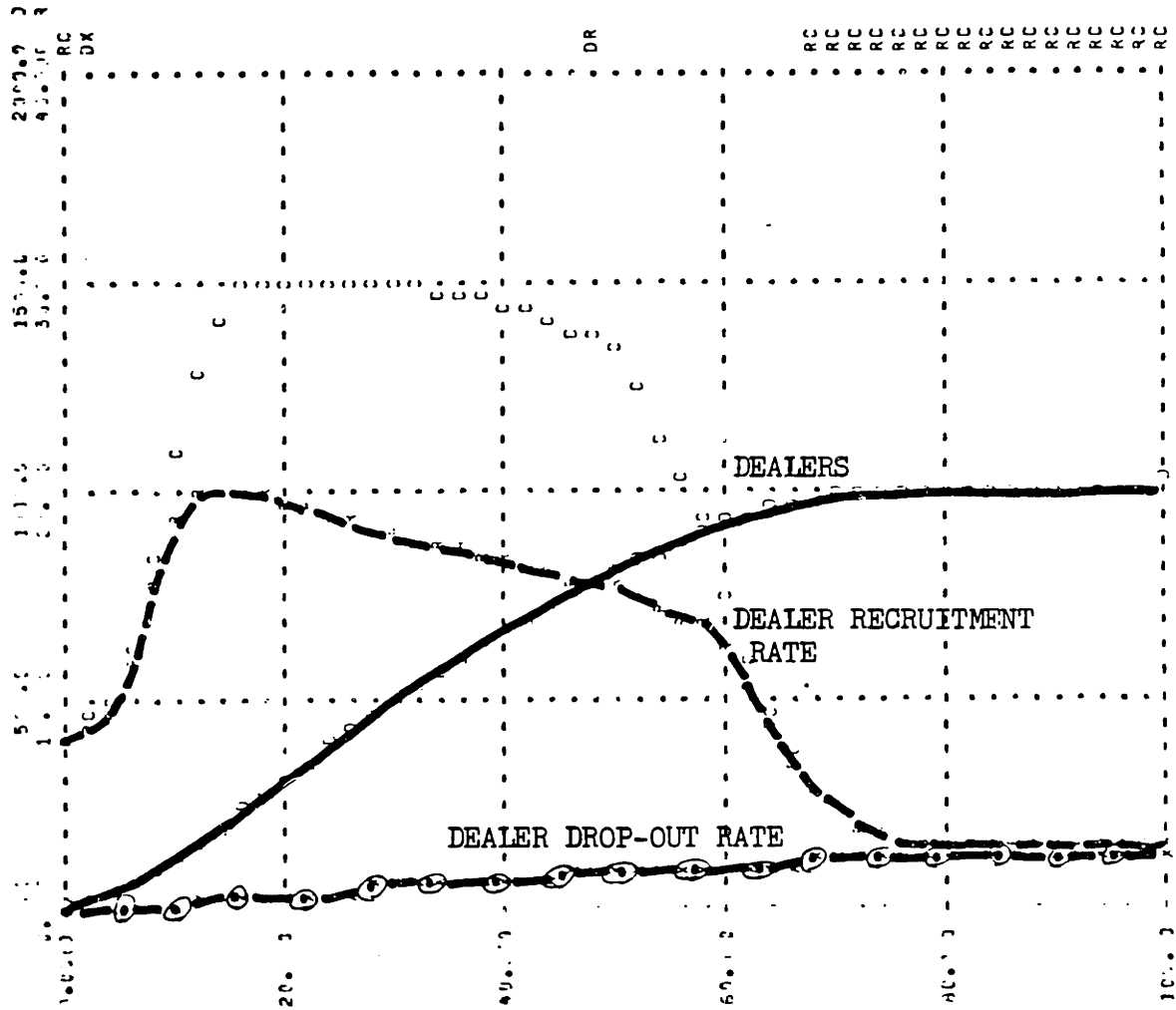


Figure 5.12

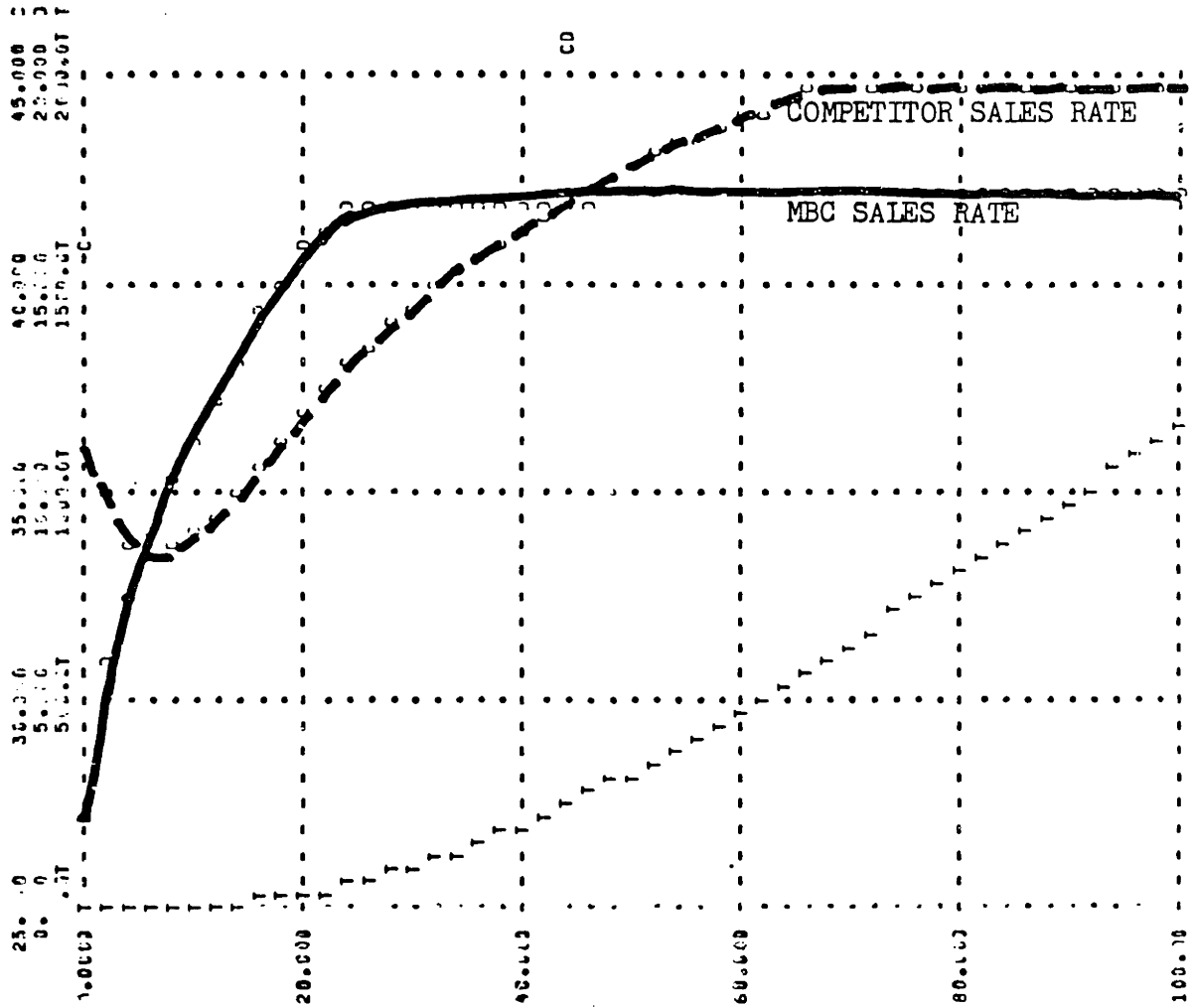


Figure 5.13

	BASE RUN CONDITIONS	EXPERIMENTAL CONDITIONS	PERCENT CHANGE
DEALERS	638	984	54%
MBC SALES/PERIOD	4.75	9.5	100%
COMPETITOR SALES/PERIOD	76	55.6	-27%

## ANALYSIS OF POLICIES TO SHORTEN SALES CYCLE

TABLE 5.2

fewer dealers drop the MSC line and the level of dealers increases over the level in the base run.

Instrumental in the improvement of the MBC dealer network is the increase in MBC sales that results from the drop in the length of the MBC sales cycle. There are two reasons MBC sales increase after a reduction in the MBC sales cycle. First, more computers are sold with the same salesman effort if the sales cycle is shortened. Second, a shorter sales cycle means that MBC will receive a greater share of the salesman's time. The pressures to divert time from the MBC computer and toward competitors' products, as described in Loops Five and Six in Figure 5.3, is reduced as a result of the drop in MBC sales cycle length. In summary, salesmen are not only more productive with the time they allocate to MBC, but are willing to allocate more time to MBC as the MBC sales cycle is shortened.

Not only are more MBC computers sold in each store when the sales cycle is shortened, but the peak of sales is reached sooner than it would have been reached otherwise. The rate of growth in MBC sales is accelerated because, as a result of the shorter sales cycle, the salesman is willing to devote a larger share of his time to selling the MBC computer early in the life of the retail store. But because the salesman devotes a larger share of his time to the MBC computer, and the MBC computer still has a longer sales cycle than the competitors', the computer dealership reaches the limits of its capacity sooner than it would have had the MBC machine had a longer sales cycle.

Policies that can reduce the sales cycle of the MBC computer should be of great value to MBC. Both the number of dealers carrying the computer and the sales per dealership are increased as a result of the drop in sales cycle length. Therefore, total sales of the MBC computer through the retail channel should be significantly greater. In addition, sales grow at a faster rate when the MBC sales cycle is reduced. Finally, the growth in MBC sales comes at the expense of the competitors. Note that the competitor sales rates displayed in Table 5.2 are significantly lower when that MBC sales cycle is shortened than they are under the base run

### 5.3.2 POLICIES AFFECTING MBC'S SERVICE BURDEN

In addition to suggesting policies to shorten the MBC sales cycle, the analysis of the base runs of the MBC retail channel also suggests that policies designed to reduce the MBC service burden may improve the performance of the MBC computer in the retail sales channel. This section discusses several ways the MBC service burden could be reduced, and the effect a reduction of the service burden would have on the sales of the MBC computer and the development of the MBC retail sales channel.

There are several ways the MBC service burden could be reduced. For example, MBC could remove some of the service burden from the retailer and transfer it to the manufacturer. By providing corporate owned service outlets, or toll-free telephone hotlines for users with questions or problems, MBC could shoulder some of the burden of servicing new owners of the MBC computers. MBC could develop user training programs designed to reduce the confusion of customers once they had purchased the machine. MBC could improve the documentation that accompanies the computer upon sale, and encourage software vendors to make program documentation as complete and understandable as possible.

The dealer can also take steps to reduce the service

burden the MBC computer places on his staff. Service burden creates a problem for the computer retailer because it diverts his sales staff's time away from selling to new customers toward serving old customers. If a dealer were to hire additional staff whose sole purpose was to service current customers, the computer retailer would have effectively eliminated the service burden problem. Service personnel would be dedicated to service, and sales personnel would be dedicated to sales, and no diversion of time could take place.

The effects of a reduction in the MBC service burden per sale are shown in Figures 5.14 and 5.15. Figure 5.14 displays the effect of a 50 percent reduction in the MBC service burden per sale on the development of the dealer network. Figure 5.15 shows the effect of a 50 percent reduction in the MBC service burden per sale on MBC sales per dealer. Table 5.3 displays the numerical values describing the growth of the dealer network and the MBC sales rate under both the base run and the reduced service burden assumptions.

As is clear from Table 5.3, the reduction in service burden per MBC sale does not appreciably affect either the development of the MBC dealer channel or the sales rate per MBC dealer. After examining this result in light of the discussion of the base run of the MBC retail sales channel model, this result is not surprising. By reducing the service burden per sale, more capacity is released from service use

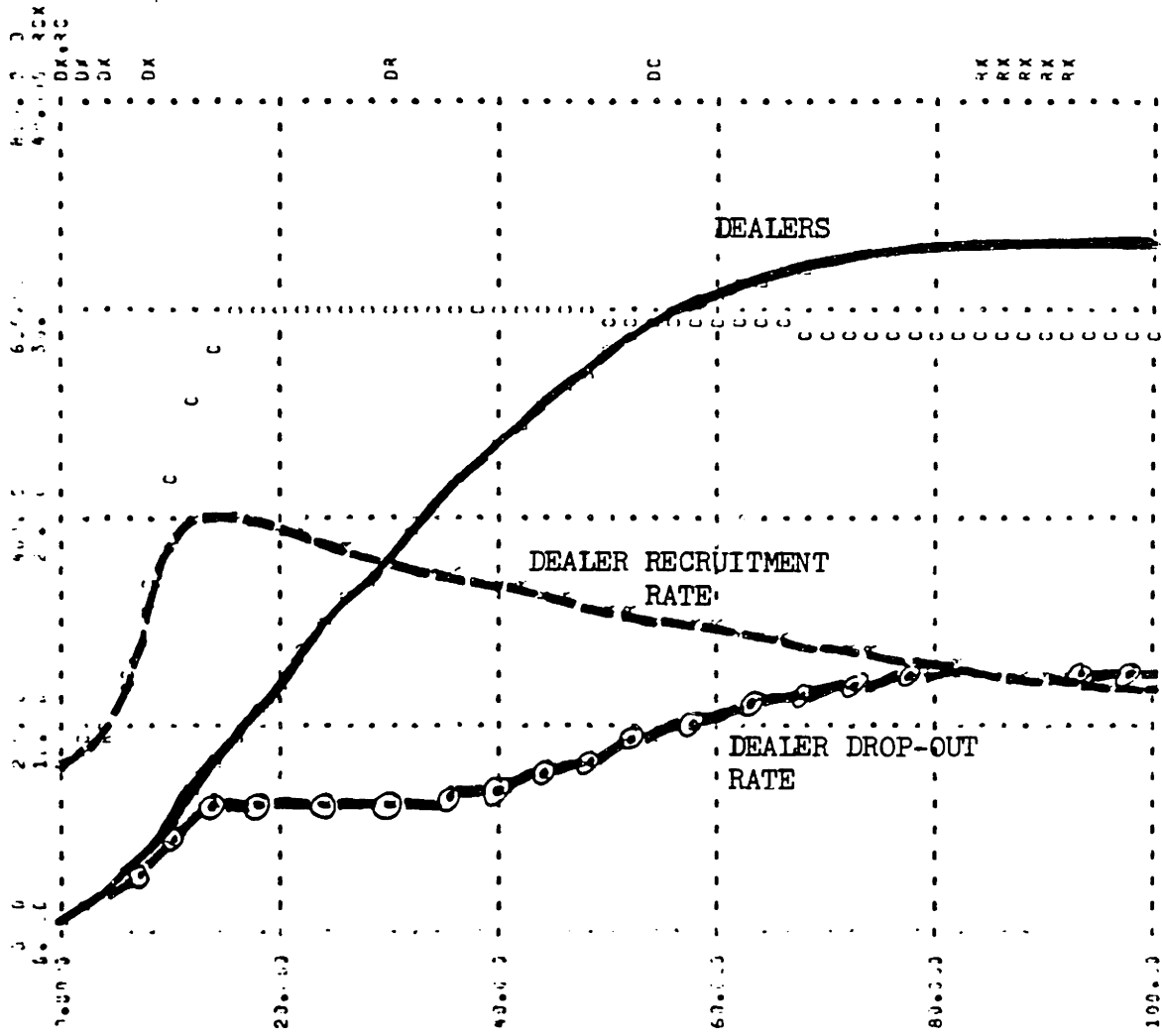


Figure 5.14



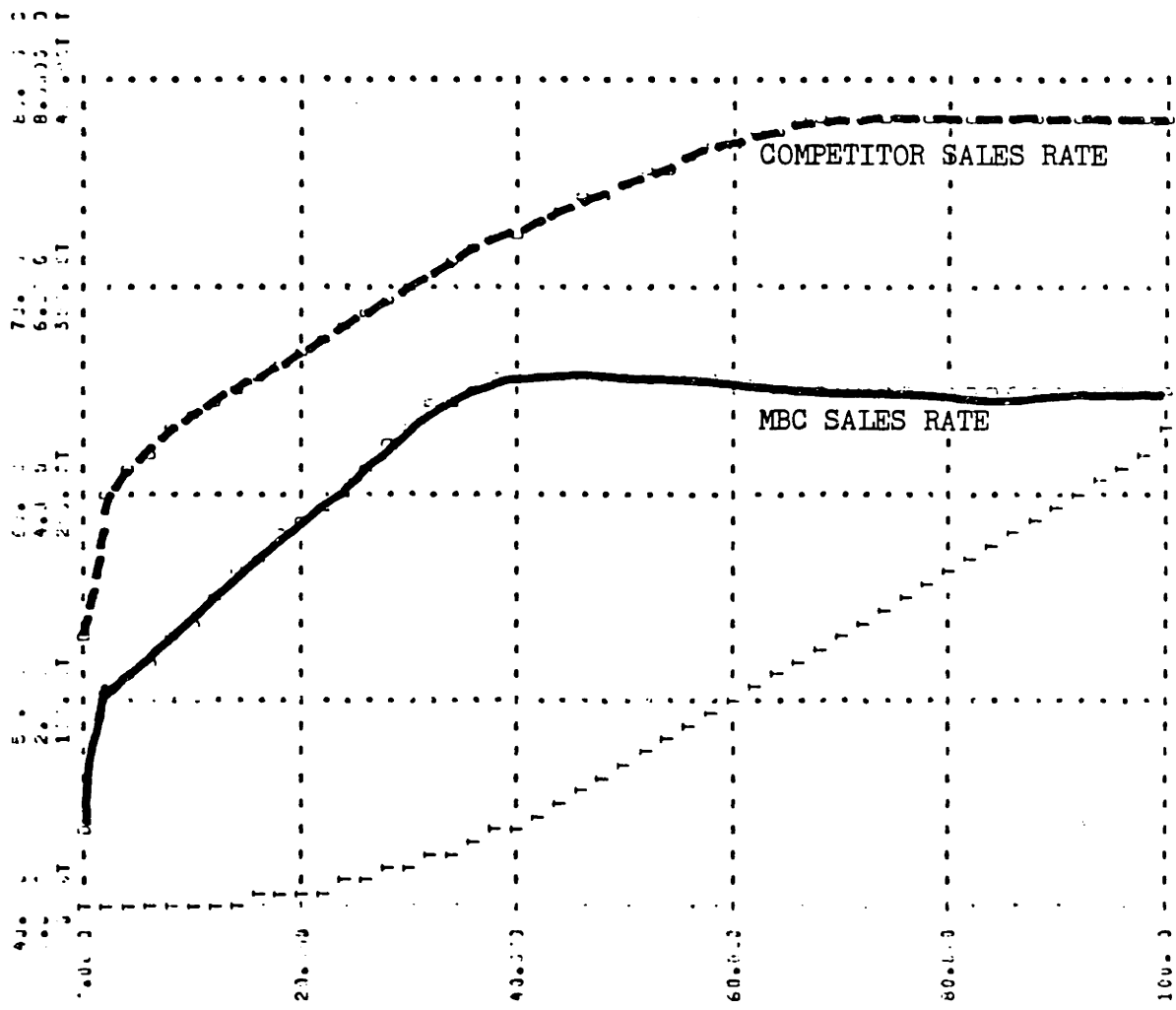


Figure 5.15

	BASE RUN CONDITIONS	EXPERIMENTAL CONDITIONS	PERCENT CHANGE
DEALERS	638	662	4%
MBC SALES/PERIOD	4.75	5.125	8%
COMPETITOR SALES/PERIOD	76	78.125	3%

## ANALYSIS OF POLICIES TO REDUCE SERVICE BURDEN

TABLE 5.3

and put to work selling. Although salesmen spend more time selling and less time servicing, most of the sales capacity freed by a reduction in service burden per MBC sale is used selling competitors' computers instead of selling MBC's computers. The inequitable distribution of additional sales capacity between MBC and its competitors results from the longer sales cycle of the MBC product. Service burden becomes a problem for the dealer only as the availability of time for both selling and servicing becomes tight. But when salesmen become strapped for time, their natural incentive is to divert more time to selling the competitors' computers rather than MBC's computers because the competitor computer has a shorter sales cycle than the MBC computer.

In short, policies undertaken by MBC to reduce their service burden per sale may be counterproductive. Although there is a small increase in both the number of dealers and the level of sales per dealer, the benefit may be small relative to the costs of developing and implementing policies to reduce the MBC service burden. The bulk of the benefit

from MBC policies to reduce their service burden flows not to MBC, but to their competitors. Therefore, efforts to reduce MBC service burden per sale are of little value to MBC unless those efforts are accompanied by policies designed to reduce the MBC sales cycle, as well.

## 6 CONCLUSIONS

In the introductory chapter of this thesis we discussed the broad objectives of our investigation into the development of MBC's retail channel for multiuser microcomputers. Through the development of a system dynamics model of MBC's retail channel, we hoped to gain an understanding of the working of computer retail channels, and ways to influence the development and operation of computer retail channels. Specifically, we outlined two paths to the development of this understanding: assumption development and testing, and policy development and testing.

In this chapter we will discuss our progress toward our broad objectives. In addition, we provide examples of how our retail channel model can be used to explore management issues beyond the immediate boundaries of the model. Finally, we discuss how system dynamics simulation models can improve the mental models managers use in their day-to-day decision making.

### 6.1 SUMMARY AND CONCLUSIONS

Our development of a model of MBC's retail sales channel serves several purposes. First, the model is a framework for thinking about the structure and behavior of MBC's retail

sales channel. Our explicit representation of the actors and decisions involved in a retail channel can focus discussion on issues central to channel development and performance.

Second, the model's behavior can generate insight into the workings of a retail channel for multiuser microcomputers. At the very least, the model behavior can serve as a springboard for the discussion of several issues: the appropriateness of a multiuser product in a channel dominated by single user products, the burden service places on dealers, and the effectiveness of policies aimed at reducing the service burden. At its best, our model of MBC's retail channel can provide a useful tool for policy experimentation. Our investigation of policies aimed at reducing sales cycle length and service burden illustrate how the model can be used to test policies.

Although our investigation of policies influencing the development and operation of the MBC retail channel was not exhaustive, it was illustrative of the role of system dynamics models in marketing channel policy development and testing. Many of the models used by marketing managers are optimization models, designed to test channel efficiency. Our system dynamics model is aimed at developing a realistic representation of the behavior of a computer retail channel. In addition, it is probably more flexible than many models currently in use by channel managers. As such, we believe that system dynamics models can be used to test a variety of

policies under consideration by channel managers.

It is our hope that MBC will adopt our model of their retail sales channel, and continue to use it to test policies of interest and generate insight. Although the model is doubtlessly incomplete, we believe that it provides the basis for discussion of policies governing not only the retail sales channel, but other marketing channels as well.

## 6.2 EXPANDED USE OF THE RETAIL CHANNEL MODEL

In addition to the formal modeling effort and policy testing, our study of the dealer channel developed knowledge that allows us to comment on issues beyond the direct scope of the model. For example, we developed an appreciation of the issues surrounding the interactions among MBC's marketing channels, and the timing of MBC's decision to develop a retail channel. Our ability to comment on channel interactions and timing stems directly from the understanding we gained by constructing and analyzing the MBC model.

### 6.2.1 CHANNEL INTERACTIONS: AN EXAMPLE

MBC has considered making their low end computer available for sale through both their retail channel and their IEDs. Currently, their low end product is not available through IEDs because MBC fears that unhealthy price

competition could break out between their dealers and IEDs.

A decision to make their low end model available through IEDs could be damaging to both the sales of the low end product and the MBC retail network. IEDs tend to sell their computers without frills. No service, consultation, customization, or education is available through an IED. Yet an IED usually sells computers for less than a computer retailer can sell them. If MBC were to make their low end product available through IEDs, those small businessmen who are familiar with computers would flock to the IED because of the IEDs lower prices. With no need for service, customization, or hand-holding, the computer literate members of the small business community would probably be unwilling to pay the computer retailer's mark-up -- a mark-up that goes to provide services for the computer illiterate. As the computer literate segments of the dealer's customer population migrated to the IED, the retailer would be left with an increasingly unsophisticated customer base. Fewer and fewer of the dealer's customers would have any knowledge of computing as they entered his store.

This change in the nature of the computer retailer's customer base severely affects both the sales of the MBC computer through the retail channel and the development of the retail channel itself. A decline in the sophistication of the retailer's customer base means that the length of the sales

cycle will increase. But because the MBC product is more complex than competitors' products, it will probably bear a disproportionate share of the increase in sales cycle length. The effects of increases in sales cycle length were clearly outlined in Chapter 5. Increases in the length of the average sales pitch reduce the store's capacity in customers. In turn, the busyness of the store increases, and as a result, salesmen are less willing to allocate sales capacity to the MBC product. In addition, disproportionate increases in the MBC sales cycle acts independently to increase the length of the average sales pitch, once again increasing the level of activity in the store and reducing the salesman's willingness to spend time selling the MBC computer. Both of these effects act to reduce the sales of the dealership and of the MBC product. Stifled sales of the MBC product create disenchantment with the MBC product line among MBC dealers, and the rate at which dealers abandon the MBC line increases.

In addition to increasing the length of the average sales pitch, the drop in the sophistication of the retailer's customer base will affect the amount of time the retailer must devote to post-sale service. As computers are sold to less sophisticated customers, each customer will require more attention from the retailer to get his system in operation. The average service burden from both an MBC sale will increase, increasing the time salesmen must spend servicing customers and decreasing the time available for selling new



equipment. This reduction in selling time will create time pressure on salesman, and as a result, salesmen will be more willing to allocate their limited sales capacity to the competitor rather than to MBC. Once again, the result will be stagnated MBC sales, and retarded growth of the dealer network.

### 6.2.2 TIMING OF CHANNEL DEVELOPMENT

Our model of the retail channel can also be used to address the issue of the timing of the entry of MBC in to the retail computer market. Although our model of the retail channel does not squarely address the issue of timing, it nevertheless generates insights into the operation of computer retailing that allow us to speak to the issue of timing of entry.

If MBC believes that it must enter the retail computer market with a multiuser system, it is probably best that they enter as quickly as possible. As computer stores mature and become busy, multiuser systems are slighted by salesmen in favor of the easier-to-sell single user systems. The busier a store becomes, the more difficult it is for the MBC computer to gain attention. If the MBC multiuser computer were to be introduced in to an environment where the salesmen had little incentive to pay attention to it, the computer would not sell well.

A slow start for the MBC computer is damaging to the entire retail network for several reasons. First, early success with the MBC computer breeds later success. As salesmen sell the MBC computer, they gain additional experience, and are better able to succeed in later sales pitches. In addition, as MBC computers are sold, more and more software packages are made available for it, thereby making the computer attractive to more and more businessmen. Finally, each MBC computer sold creates word-of-mouth advertising that influences the probability of sale. If the MBC computer were to be placed in to a computer store where the salesmen were too busy to pay attention to it, many of these effects would never take hold. Therefore, the successful launch of the MBC retail program is instrumental in its later success. Second, poor performance of the MBC computer in retail stores breeds poor performance of the retail network as a whole. If the MBC computer never takes off initially, more and more dealers will become disappointed with the product and drop the line.

This discussion of the effect of allowing IEDs to serve the same markets served by retailers, and of the timing of MBC's development of the retail network illustrate the power of simulation models. Simulation models, by refining managerial thinking, improve understanding of the system. Used in combination with managerial analysis, formal simulation models are powerful tools for managers.

### 6.3 SYSTEM DYNAMICS MODELS AND THE IMPROVEMENT OF MENTAL MODELS

When dealing with complex business problems, most managers develop mental models of the systems with which they are dealing. These models are often composed of and form the basis of the assumptions on which managers operate. Frequently, however, these intuitive models are oversimplified from a strictly rational point of view.

The body of literature from the Carnegie School addresses the nature of managerial models and decision making. Work by Simon, Cyert, March, and Williamson stresses the point that humans are severely limited in their decision making and computing powers. As such, managers tend to rely on heuristic decision techniques to simplify complex decisions. In addition, managers factor their decisions into manageable units, and rely on incomplete and local sources of information to serve as a surrogate for expanded decision making and computing powers.

System dynamics models are a way to expand and refine a manager's mental models beyond the limitations of managerial thinking as discussed by the Carnegie school. The development of a system dynamics model makes managers aware of both the way they make decisions and the implications of those

decisions. System dynamics models seek to represent managerial decision making from a descriptive rather than a normative viewpoint. That is, system dynamics models address the way managers really make decisions as opposed to how they should make decisions. Therefore, system dynamics models implicitly represent the views of the Carnegie School with respect to managerial decision making. System dynamics models of decision making frequently make use of rules of thumb and limited, imperfect, and distorted sources of information. <sup>1</sup> By becoming involved in the development of a system dynamics model, a practicing manager is forced to think critically about his decision making processes. Rules of thumb, information sources, and assumptions about the operation of the system are all made explicit in the process of developing a system dynamics model. The simulation model itself identifies the outcomes of continued reliance on current decision making techniques. Investigation of the model output forces discussion of the representation of the decision making processes and the effects of continued reliance on current practices. The result of the model building process is a better understanding of the system being modeled, the manager's ability to influence the system, and the mental models of the system with which the manager currently tests his actions.

Through the development of the MBC retail channel model,

we developed and refined our mental models of MBC's computer retail channel. These improved mental models have been used to address managerial issues beyond the direct scope of the model. Without the understanding that we developed as a result of our model-based approach, we believe that our ability to analyze and gain insight into these complex issues would be severely limited.

6.4 NOTE

1. For an excellent discussion of the linkages between system dynamics and the Carnegie School and their treatment of human decision-making, see John D.W. Morecroft, "System Dynamics: Portraying Bounded Rationality," Omega, vol 11, 1983, 131-142.

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APPENDIX: DOCUMENTED DYNAMO MODEL

PAGE 1 DEALER RECRUITMENT THU, MAY 24 1984  
 D.K-D,JFDT\*(DDR,JK-DDR,JK) L,1  
 D-10 TCSR,R,32/IBNIS,A,55/CHIS,A,57/IBIS,A,78  
 - DEALERS (DEALERS) <1>  
 DDR - DEALER RECRUITMENT RATE (DEALERS/MONTH) <6>  
 DDR - DEALER DROP OUT RATE (DEALERS/MONTH) <2>

PAGE 2 DROP-OUT RATE THU, MAY 24 1984  
 DDR,KL=D,K/ATMBD,K R,2 >D,L,1/XD,L,11  
 DDR - DEALER DROP OUT RATE (DEALERS/MONTH) <2>  
 D - DEALERS (DEALERS) <1>  
 ATMBD - AVERAGE TENURE AS A MBC DEALER (MONTHS) <3>  
 ATMBD,K=NTMBD\*ECTMBD,K A,3 >DDR,R,2  
 NTMBD=170 C,3,1 >ATMBD,A,3  
 ATMBD - AVERAGE TENURE AS A MBC DEALER (MONTHS) <3>  
 NTMBD - NORMAL TIME AS A MBC DEALER <3>  
 ECTMBD - EFFECT OF CONTRIBUTION ON TENURE AS A MBC DEALER <4>

ECTMBD=TABLE(TECTMB,PRC,K,0,1,1) A,4 >ATMBD,A,3  
 TECTMB=.035/.14/.7/1.3/2.2/2.75/2.9/2.98/3/3 T,4,1 >ECTMBD,A,4  
 ECTMBD - EFFECT OF CONTRIBUTION ON TENURE AS A MBC DEALER <4>  
 TECTMB - TABLE FOR EFFECT OF CONTRIBUTION ON TENURE AS A  
 MBC DEALER (DIMENSIONLESS) <4>  
 PRC - PERCEIVED RELATIVE CONTRIBUTION (DIMENSIONLESS) <5>  
 PRC,K=SMOOTH((CHBL,K/PDC,K),TSRC) A,5 >ECTMBD,A,4/FMMU,A,101  
 TSRC=3 C,5,1 >PRC,A,5  
 PRC - PERCEIVED RELATIVE CONTRIBUTION (DIMENSIONLESS) <5>  
 CHBL - CONTRIBUTION FROM THE MBC LINE (DOLLARS/MONTH) <5>  
 PDC - PERCEIVED DEALER CONTRIBUTION (DOLLARS/MONTH) <6>  
 TSRC - TIME TO SMOOTH RELATIVE CONTRIBUTION (MONTHS) <5>

PAGE 3 RECRUITMENT RATE THU, MAY 24 1984

DRR.NL=DRRC.N\*DRRCU.K R.6 >D.L,1/PD,L,15

DRR - DEALER RECRUITMENT RATE (DEALERS/MONTH) <6>  
 DRRC - DEALER RECRUITMENT RATE CAPACITY (DEALERS/MONTH) <7>  
 DRRCU - DEALER RECRUITMENT RATE CAPACITY UTILIZATION (DIMENSIONLESS) <12>

DRRC.N=DRRC.N\*EDND.K A.7 >DRR,R,6/RTD,BD,A,13

DRRC - DEALER RECRUITMENT RATE CAPACITY (DEALERS/MONTH) <7>  
 DRRCU - DEALER RECRUITMENT RATE CAPACITY FROM EXPERIENCE (DEALERS/MONTH) <9>  
 EDND - EFFECT FROM DESIRED NUMBER OF DEALERS (0-1) <8>

EDND.N=TABLE(TEDND,(DND-D.K),0,1000,100) A.8 >DRRC,A,7  
 TEDND=.1/.65/.9/.95/.98/1/1/1/1/1 T.8.1 >EDND,A,8  
 DND=1000 C.8.2 >EDND,A,8

EDND - EFFECT FROM DESIRED NUMBER OF DEALERS (0-1) <8>  
 DND - DESIRED NUMBER OF DEALERS (DEALERS) <8>  
 D - DEALERS (DEALERS) <1>

DRRC.N=TABLE(TDRRC,TDXD.N,0,250,50) A.9 >DRRC,A,7  
 TDRRC=8/10/18/25/28/30 T.9.1 >DRRC,A,9

DRRC - DEALER RECRUITMENT RATE CAPACITY FROM EXPERIENCE (DEALERS/MONTH) <9>  
 TDXD - TOTAL DEALERS AND X-DEALERS (DEALERS) <10>

TDXD.N=D.N+XD.N A.10 >DRRC,A,9

TDXD - TOTAL DEALERS AND X-DEALERS (DEALERS) <10>  
 D - DEALERS (DEALERS) <1>  
 XD - X-DEALERS (DEALERS THAT HAVE DROPPED OUT) (DEALERS) <11>

XD.N=DDR.JK\*DT+XD.J L.11 >TDXD,A,10  
 XD=0 M.11.1

XD - X-DEALERS (DEALERS THAT HAVE DROPPED OUT) (DEALERS) <11>  
 DDR - DEALER DROP OUT RATE (DEALERS/MONTH) <2>

DRRCU.N=TABLE(TDRRCU,RTD,BD,0,3,5) A.12 >DRR,R,6  
 TDRRCU=0/.5/.85/.92/.96/.98/1 T.12.1 >DRRCU,A,12

DRRCU - DEALER RECRUITMENT RATE CAPACITY UTILIZATION (DIMENSIONLESS) <12>  
 TDRRCU - TABLE FOR DEALER RECRUITMENT RATE CAPACITY UTILIZATION (DIMENSIONLESS) <12>  
 RTD,BD - RELATIVE DEMAND TO BECOME A DEALER (DIMENSIONLESS) <13>

RTD,BD.N=RTD,BD.N/DRRC.N A.13 >DRRCU,A,12

RTD,BD - RELATIVE DEMAND TO BECOME A DEALER (DIMENSIONLESS) <13>  
 RTD,BD - DEMAND TO BECOME A DEALER (DEALERS/MONTH) <14>  
 DRRC - DEALER RECRUITMENT RATE CAPACITY (DEALERS/MONTH) <7>

PAGE 4 DEMAND TO BE DEALERS THU, MAY 24 19U4

DTBD,N=PD,N/TRD,N  
 DTBD - DEMAND TO BECOME A DEALER (DEALERS/MONTH) <14> A,14 >KDTBD,A,13  
 PD - POTENTIAL DEALERS (DEALERS) <15>  
 TRD - TIME TO RECRUIT DEALERS (MONTHS) <17>

PD,N=PD,J+DT\*(DCR,JK-IRR,JK)  
 PD=1000 L,15 >DTBD,A,14  
 N,15.1

PD - POTENTIAL DEALERS (DEALERS) <15>  
 DCR - POTENTIAL DEALER CREATION RATE (DEALERS/MONTH) <16>  
 DRR - DEALER RECRUITMENT\_RATE (DEALERS/MONTH) <6>

DCR,KL=NDCR R,16 >PD,L,15  
 NDCR=10 C,16.1 >DCR,R,16

DCR - POTENTIAL DEALER CREATION RATE (DEALERS/MONTH) <16>  
 NDCR - NORMAL DEALER CREATION RATE (DEALERS/MONTH) <16>

TRD=NTRD,N\*EPTRD,N  
 NTRD=42 A,17 >DTRD,A,14  
 C,17.1 >TRD,A,17

TRD - TIME TO RECRUIT DEALERS (MONTHS) <17>  
 NTRD - NORMAL TIME TO RECRUIT DEALERS (MONTHS) <17>  
 EPTRD - EFFECT OF PRESENCE ON TIME TO RECRUIT DEALERS (DIMENSIONLESS) <18>

EPTRD,K=TABLE(TEPTRD,MBMF,K,0,2,3,.46)  
 TEPTRD=1/.95/.81/.62/.4/.3 A,18 >TRD,A,17  
 T,18.1 >EPTRD,A,18

EPTRD - EFFECT OF PRESENCE ON TIME TO RECRUIT DEALERS (DIMENSIONLESS) <18>  
 TEPTRD - TABLE FOR EFFECT OF PRESENCE ON TIME TO RECRUIT DEALERS <18>  
 MBMF - MBC MARKET PRESENCE (MILLIONS OF BUSINESSES AWARE) <19>

PAGE 5 MARKET PRESENCE THU, MAY 24 1984  
L,19 >EPTRO,A,18/MBMFD,R,20/ENBHF,A,102  
N,19.1

MBMP,K=MBMP,J+DT\*(MBMFCR,JK-MBMPDR,JK)  
MBMP=.15  
MBMP - MBC MARKET PRESENCE (MILLIONS OF BUSINESSES  
AWARE) <19>  
MBMFCR - MBC MARKET PRESENCE CREATION RATE (MILLIONS OF  
BUSINESSES PER MONTH) <21>  
MBMFD - MBC MARKET PRESENCE DECAY RATE (MILLIONS OF  
BUSINESSES PER MONTH) <20>

MBMPDR,KL=MBMP,K/TFMB  
TFMB=12  
MBMFD - MBC MARKET PRESENCE DECAY RATE (MILLIONS OF  
BUSINESSES PER MONTH) <20>  
MBMP - MBC MARKET PRESENCE (MILLIONS OF BUSINESSES  
AWARE) <19>  
TFMB - TIME TO FORGET MBC (MONTHS) <20>

MBMFCR,KL=MBMFCR+MFD,K+MFS,K-MPUC,K+ECAMP,K  
MBMFCR=.009  
MBMFCR - MBC MARKET PRESENCE CREATION RATE (MILLIONS OF  
BUSINESSES PER MONTH) <21>  
MBMFCR - NORMAL MARKET PRESENCE CREATION RATE (BUSINESSES/  
MONTH) <21>  
MFD - MARKET PRESENCE FROM DEALERS (MILLIONS OF  
BUSINESSES PER MONTH) <22>  
MFS - MARKET PRESENCE FROM SALES (MILLIONS OF  
BUSINESSES PER MONTH) <24>  
MPUC - MARKET PRESENCE FROM UNSATISFIED MBC CUSTOMERS  
<23>  
ECAMP - EFFECT OF CORPORATE ADVERTISING ON MARKET  
PRESENCE (MILLIONS OF BUSINESSES PER MONTH) <25>

MFD,N=D,K\*AD  
AD=.000004  
MFD - MARKET PRESENCE FROM DEALERS (MILLIONS OF  
BUSINESSES PER MONTH) <22>  
D - DEALERS (DEALERS) <1>  
AD - AVERAGE AWARENESS PER DEALER (MILLION OF  
BUSINESSES PER MONTH PER DEALER) <22>

MPUC,N=UMBC,N\*AS  
AS=.00000036  
MPUC - MARKET PRESENCE FROM UNSATISFIED MBC CUSTOMERS  
<23>  
UMBC - UNSATISFIED MBC CUSTOMERS (CUSTOMERS) <51>  
AS - AWARENESS PER UNSATISFIED SALE (BUSINESSES) <23>

MFS,K=TBNIS,K\*ANS+TBNIS,K\*ANS  
ANS=.00000018  
MFS=.00000006  
MFS - MARKET PRESENCE FROM SALES (MILLIONS OF  
BUSINESSES PER MONTH) <24>  
TBNIS - TOTAL MBC NEW INSTALLED SALES (UNITS) <27>  
ANS - AWARENESS PER NEW SALE (BUSINESSES) <24>  
TBNIS - TOTAL MBC MATURE INSTALLED SALES <30>  
ANS - AWARENESS PER MATURE SALE (BUSINESSES) <24>

MFS,N=UMBC,N\*AS  
AS=.00000036  
MFS - MARKET PRESENCE FROM UNSATISFIED MBC CUSTOMERS  
<23>  
UMBC - UNSATISFIED MBC CUSTOMERS (CUSTOMERS) <51>  
AS - AWARENESS PER UNSATISFIED SALE (BUSINESSES) <23>

MFS,K=TBNIS,K\*ANS+TBNIS,K\*ANS  
ANS=.00000018  
MFS=.00000006  
MFS - MARKET PRESENCE FROM SALES (MILLIONS OF  
BUSINESSES PER MONTH) <24>  
TBNIS - TOTAL MBC NEW INSTALLED SALES (UNITS) <27>  
ANS - AWARENESS PER NEW SALE (BUSINESSES) <24>  
TBNIS - TOTAL MBC MATURE INSTALLED SALES <30>  
ANS - AWARENESS PER MATURE SALE (BUSINESSES) <24>

MFS,N=UMBC,N\*AS  
AS=.00000036  
MFS - MARKET PRESENCE FROM UNSATISFIED MBC CUSTOMERS  
<23>  
UMBC - UNSATISFIED MBC CUSTOMERS (CUSTOMERS) <51>  
AS - AWARENESS PER UNSATISFIED SALE (BUSINESSES) <23>

PAGE 6 MARKET PRESENCE THU, MAY 24 1984

A,25 MBMFCR,R,21  
T,25.1 ECAMP,A,25  
C,25.2 ECAMP,A,25

ECAMP,N=TABLE(TECAMP,CADV,0,1.6,.4)  
TECAMP=07.001/.003/.004/.0045  
CADV=1

ECAMP - EFFECT OF CORPORATE ADVERTISING ON MARKET PRESENCE (MILLIONS OF BUSINESSES PER MONTH) (25)  
TECAMP - TABLE FOR EFFECT OF CORPORATE ADVERTISING ON MARKET PRESENCE (DIMENSIONLESS) (25)  
CADV - CORPORATE ADVERTISING (MILLIONS OF DOLLARS PER MONTH) (25)

PAGE 7 TOTAL INSTALLED SALES THU, MAY 24 1984

THBIS.N=THBIS.N+THBIS.K  
 THBIS - TOTAL HBC INSTALLED SALES (UNITS) <26>  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBIS - TOTAL HBC MATURE INSTALLED SALES <30>  
 THBIS.K=THBIS.J+(THBIS.K-THBISR.JK)\*DT  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>

THBIS.L=THBIS.L+THBIS.A,24/THBIS.A,26/THBMSR.R,29/UMBC.A,51/THBIS.A,55  
 THBIS=0  
 THBIS - TOTAL HBC NEW INSTALLED SALES (UNITS) <27>  
 THBISR - TOTAL HBC SALES RATE (UNITS/MONTH) <28>  
 THBMSR - TOTAL HBC SALES MATURING RATE (UNITS/MONTH) <29>



\*\*\* AVERAGE INDIVIDUAL DEALER ACTIVITY \*\*\*

PAGE B SALES RATES THU, MAY 24 1964

HBSR.NL=(MBSR.K/(HMBSP.K/HMBSF.K))\*SCU.K R,35 >TBSR,R,28/DC,A,62/CHML,A,63/HBI,L,83/AMBSR,A,87

HBSR=1 N,35.1

- HBSR - HBC SALES RATE PER AVERAGE DEALER (UNITS/MONTH) <35>
- HMBSP - HBC SALES CAPACITY (HOURS/MONTH) <37>
- HMBSF - HOURS PER HBC SALES FITCH (HOURS) <39>
- HBSF - HBC SALES FITCH SUCCESS FRACTION (FRACTION) <95>
- SCU - SALES CAPACITY UTILIZATION (FRACTION) <41>

CSR.NL=(CSC.K/(HCSF.K/CSF.K))\*SCU.K R,36 >TCSR,R,32/DC,A,62/CCL,A,64/CI,L,88/ACSR,A,91

CSR=50 N,36.1

- CSR - COMPETITOR SALES RATE (UNITS PER MONTH) <36>
- CSC - COMPETITOR SALES CAPACITY (HOURS PER MONTH) <38>
- HCSF - HOURS PER COMPETITIVE SALES FITCH (HOURS) <40>
- CSF - COMPETITOR SALES FITCH SUCCESS FRACTION (FRACTION) <93>
- SCU - SALES CAPACITY UTILIZATION (FRACTION) <41>

MBSR.K=SRAF.K\*CAF.K A,37 >MBSR,R,35

- MBSR - MBS SALES CAPACITY (HOURS/MONTH) <37>
- SRAF - SALES CAPACITY (HOURS PER MONTH) <45>
- CAF - CAPACITY ALLOCATION FRACTION (FRACTION) <65>

CSC.K=SRAF.K\*(1-CAF.K) A,38 >CSR,R,36

- CSC - COMPETITOR SALES CAPACITY (HOURS PER MONTH) <38>
- SRAF - SALES CAPACITY (HOURS PER MONTH) <45>
- CAF - CAPACITY ALLOCATION FRACTION (FRACTION) <65>

HMBSP.K=NHMBSP N,39.1 >MBSR,R,35/AMBSF,A,14

- HMBSP - HOURS PER HBC SALES FITCH (HOURS) <39>
- NHMBSP - NORMAL HOURS PER HBC SALES FITCH (HOURS) <39>

HCSF.K=NHCSF A,40 >CSR,R,36/AMBSF,A,14

- HCSF - HOURS PER COMPETITIVE SALES FITCH (HOURS) <40>
- NHCSF - NORMAL HOURS PER COMPETITIVE SALES FITCH (HOURS) <40>

PAGE 9 SALES CAPACITY UTILIZATION THU, MAY 24 1984

SCU,K=TABLE(TSCU,BUSY,K,0,2,25)  
 TSCU=0,25/.97,75/.97,95/.98/.99/1  
 SCU - SALES CAPACITY UTILIZATION (FRACTION) <41>  
 TSCU - TABLE FOR SALES CAPACITY UTILIZATION <41>  
 .BUSY - BUSYNESS (DIMENSIONLESS) <42>  
 BUSY,K=T,N/ECCAP,K  
 .BUSY - BUSYNESS (DIMENSIONLESS) <42>  
 T - TRAFFIC (PEOPLE PER MONTH) <58>  
 ECCAP - EFFECTIVE CUSTOMER SALES CAPACITY (CUSTOMERS) <43>  
 ECCAP,K=SCAP,K/AHFSP,K  
 ECCAP - EFFECTIVE CUSTOMER SALES CAPACITY (CUSTOMERS) <43>  
 .SCAP - SALES CAPACITY (HOURS PER MONTH) <45>  
 AHFSP - AVERAGE HOURS PER SALES FITCH (HOURS PER SALE) <44>  
 AHFSP,K=(CAF,K\*HMBSP,K)+((1-CAF,K)\*HCSF,K)  
 AHFSP - AVERAGE HOURS PER SALES FITCH (HOURS PER SALE) <44>  
 CAF - CAPACITY ALLOCATION FRACTION (FRACTION) <65>  
 HMBSP - HOURS PER MBC SALES FITCH (HOURS) <39>  
 HCSF - HOURS PER COMPETITIVE SALES FITCH (HOURS) <40>

A,41  
T,41.1  
>MBCR,R,35/CSR,R,36  
>SCU,A,41

A,42  
>SCU,A,41/SMBUSY,A,50/EB,A,70

A,43  
>BUSY,A,42

A,44  
>ECCAP,A,43

PAGE 10 SALES CAPACITY THU, MAY 24 1984  
 SCAF,K=N=NSCAF-SSBUR,K A,45 MBSC,A,37/CSC,A,38/ECCAF,A,43  
 NSCAF=800 C,45.1 SCAF,A,45/MCAS,A,48  
 SCAF - SALES CAPACITY (HOURS PER MONTH) <45>  
 NSCAF - NORMAL SALES CAPACITY (HOURS PER MONTH) <45>  
 SSBUR - SATISFIED SERVICE BURDEN (HOURS/MONTH) <46>  
 SSBUR,K=MCAS,K\*SERVU,K A,46 SCAF,A,45/USBUR,A,52  
 SSBUR - SATISFIED SERVICE BURDEN (HOURS/MONTH) <46>  
 MCAS - MAXIMUM CAPACITY ALLOCATED FOR SERVICE (HOURS/MONTH) <48>  
 SERVU - SERVICE CAPACITY UTILIZED (0-1) <47>  
 SERVU,K=TABLET(SERVU,(SERBUR,K/MCAS,K),0,3,1) A,47 SSSBUR,A,46  
 T(SERVU=07.97.97/1 T,47.1 SERVU,A,47  
 SERVU - SERVICE CAPACITY UTILIZED (0-1) <47>  
 T(SERVU - TABLE FOR SERVICE CAPACITY UTILIZATION (0-1) <47>  
 SERBUR - TOTAL SERVICE BURDEN FROM SALES FOR EACH DEALER (HOURS/MONTH) <53>  
 MCAS - MAXIMUM CAPACITY ALLOCATED FOR SERVICE (HOURS/MONTH) <48>  
 MCAS,K=NSCAP\*ERSE,K A,48 SSSBUR,A,46/SERVU,A,47  
 NSCAP=800 N,48.1  
 MCAS - MAXIMUM CAPACITY ALLOCATED FOR SERVICE (HOURS/MONTH) <48>  
 NSCAF - NORMAL SALES CAPACITY (HOURS PER MONTH) <45>  
 EBSER - EFFECT OF BUSYNESS ON SERVICE ALLOCATED (0-1) <49>  
 EBSER,K=TABLET(EBSER,SMBUSY,K,0,2,.25) A,49 MICAS,A,48  
 T(EBSER=1.75/5.3/15.17.05/.05/.05 T,49.1 EBSER,A,49  
 EBSER - EFFECT OF BUSYNESS ON SERVICE ALLOCATED (0-1) <49>  
 TEBSER - TABLE FUNCTION FOR EFFECT OF BUSYNESS ON SERVICE ALLOCATED (0-1) <49>  
 SMBUSY - SMOOTHED BUSYNESS (DIMENSIONLESS) <50>  
 SMBUSY,K=SMOOTH(BUSY,K,T,SBUSY) A,50 EBSER,A,49  
 T(SBUSY=1 C,50.1 SMBUSY,A,50  
 SMBUSY - SMOOTHED BUSYNESS (DIMENSIONLESS) <50>  
 BUSY - BUSYNESS (DIMENSIONLESS) <42>  
 T(SBUSY - TIME TO SMOOTH BUSYNESS (MONTHS) <50>

THU, MAY 24, 1964

PAGE 11 SERVICE

UMBC,K=USBUR,K/SERBUR,K/ATMBNIS,K  
 UMBC - UNSATISFIED MBC CUSTOMERS (CUSTOMERS) <51>  
 USBUR - UNSATISFIED SERVICE BURDEN (HOURS/MONTH) <52>  
 SERBUR - TOTAL SERVICE BURDEN FROM SALES FOR EACH DEALER (HOURS/MONTH) <53>  
 TMBNIS - TOTAL MBC NEW INSTALLED SALES (UNITS) <27>  
 A,51 >MFUC,A,23  
 A,52 >UMBC,A,51  
 USBUR,K=SERBUR,K-SSBUR,K  
 USBUR - UNSATISFIED SERVICE BURDEN (HOURS/MONTH) <52>  
 SERBUR - TOTAL SERVICE BURDEN FROM SALES FOR EACH DEALER (HOURS/MONTH) <53>  
 SSBUR - SATISFIED SERVICE BURDEN (HOURS/MONTH) <46>  
 A,53 >SERVU,A,47/UMBC,A,51/USBUR,A,52  
 SERBUR,K=SBMBS,K+SBCS,K  
 SERBUR - TOTAL SERVICE BURDEN FROM SALES FOR EACH DEALER (HOURS/MONTH) <53>  
 SBMBS - SERVICE BURDEN FROM MBC SALES FOR EACH DEALER (HOURS/MONTH) <54>  
 SBCS - SERVICE BURDEN FROM COMPETITOR SALES FOR EACH DEALER (HOURS/MONTH) <56>  
 A,54 >SERBUR,A,53  
 C,54,1 >SBMBS,A,54  
 SBMBS,K=MBNIS,K\*SBFMB  
 SBFMBS=2  
 SBMBS - SERVICE BURDEN FROM MBC SALES FOR EACH DEALER (HOURS/MONTH) <54>  
 MBNIS - AVERAGE MBC NEW INSTALLED SALES PER DEALER (UNITS) <55>  
 SBFMBS - SERVICE BURDEN PER MBC SALE (HOURS/UNIT) <54>  
 A,55 >SERBUR,A,53  
 MBNIS,K=THBNIS,K/D,K  
 MBNIS - AVERAGE MBC NEW INSTALLED SALES PER DEALER (UNITS) <55>  
 THBNIS - TOTAL MBC NEW INSTALLED SALES (UNITS) <27>  
 D - DEALERS (DEALERS) <1>  
 A,56 >SERBUR,A,53  
 C,56,1 >SBCS,A,56  
 SBCS,K=CNIS,K\*SBFCS  
 SBFCS=5  
 SBCS - SERVICE BURDEN FROM COMPETITOR SALES FOR EACH DEALER (HOURS/MONTH) <56>  
 CNIS - COMPETITOR NEW INSTALLED SALES PER DEALER (UNITS) <57>  
 SBFCS - SERVICE BURDEN PER COMPETITOR SALE (HOURS/UNIT) <56>  
 A,57 >SBCS,A,56  
 CNIS,K=TCNIS,K/D,K  
 CNIS - COMPETITOR NEW INSTALLED SALES PER DEALER (UNITS) <57>  
 TCNIS - TOTAL COMPETITOR NEW INSTALLED SALES (UNITS) <31>  
 D - DEALERS (DEALERS) <1>

PAGE 12 DEALER MARKETING & TRAFFIC THU, MAY 24 1961

T,N,NT,EDH,K NT=200 T=58 C=58.1 BUSY,A,42 T=4,58

- T - TRAFFIC (PEOPLE PER MONTH) <58>
- NT - NORMAL TRAFFIC (PEOPLE PER MONTH) <58>
- EDH - EFFECT OF DEALER MARKETING ON TRAFFIC (DIMENSIONLESS) <59>

EDH,K-TABLE(TEDH,DM,K,0,5000,1250) A,59 T=4,58 T=59.1 EDH,A,59

- TEDH-1,1,05,1,2/1,53/1,4 - EFFECT OF DEALER MARKETING ON TRAFFIC (DIMENSIONLESS) <59>
- TEDH - TABLE FOR EFFECT OF DEALER MARKETING (DIMENSIONLESS) <59>
- DM - DEALER MARKETING (DOLLARS) <60>

DM,K-FDC,K\*FAM DM=0 FAM=.05 A,60 N,60.1 C,60.2 EDH,A,59 DM,A,60

- DM - DEALER MARKETING (DOLLARS) <60>
- FDC - PERCEIVED DEALER CONTRIBUTION (DOLLARS/MONTH) <61>
- FAM - FRACTION ALLOCATED TO MARKETING (FRACTION) <60>

PAGE 15 CONTRIBUTION THU, MAY 24 1994

FDC.N-SMOOTH(DC.N,TSDC) A,61 >FRC,A,5,DM,A,50

FDC - PERCEIVED DEALER CONTRIBUTION (DOLLARS/MONTH)

DC <61>

IC - DOLLAR CONTRIBUTION (DOLLARS PER MONTH) <62>

TSDC - TIME TO SMOOTH DOLLAR CONTRIBUTION (MONTHS) <62>

DC.N=HBSR.JK\*MBM.K+CSR.JK\*CH.K A,62 >FDC,A,61

TSDC-6 C,62,1 >FDC,A,61

DC - DOLLAR CONTRIBUTION (DOLLARS PER MONTH) <62>

MBSR - MBC SALES RATE PER AVERAGE DEALER (UNITS/MONTH) <35>

MBM - MBC MARGIN PER SALE (DOLLARS PER SALE) <69>

CSR - COMPETITOR SALES RATE (UNITS PER MONTH) <36>

CH - COMPETITOR MARGIN PER SALE (DOLLARS PER SALE) <68>

TSDC - TIME TO SMOOTH DOLLAR CONTRIBUTION (MONTHS) <62>

CHBL.N=HBSR.JK\*MBM.K A,63 >FRC,A,5

CHBL - CONTRIBUTION FROM THE MBC LINE (DOLLARS/MONTH) <63>

MBSR - MBC SALES RATE PER AVERAGE DEALER (UNITS/MONTH) <35>

MBM - MBC MARGIN PER SALE (DOLLARS PER SALE) <69>

CCL.N=CSR.JK\*CH.K A,64

CCL - CONTRIBUTION FROM COMPETITOR LINE (DOLLARS PER HOUR) <64>

CSR - COMPETITOR SALES RATE (UNITS PER MONTH) <36>

CH - COMPETITOR MARGIN PER SALE (DOLLARS PER SALE) <68>

Portions of the text  
on the following page(s)  
are not legible in the  
original.

PAGE 14 SALES CAPACITY ALLOCATION THU, MAY 24 1964

CAF.K=SMOOTH(ICAF,K,TSICAF) >MBSC,A,37/CSC,A,38/AHPSF,A,44  
 CAF=.1 A:65  
 TSICAF=1 N:65.1  
 CAF - CAPACITY ALLOCATION FRACTION (FRACTION) <65> C:65.2  
 TSICAF - TIME TO SMOOTH INPUTS TO SALES CAPACITY ALLOCATION (MONTHS) <65> >CAF,A,65

ICAF.K=NCAF#CAM,K#EB,K#EIP,K#ERPS,K A:66  
 NCAF=.25 C:66.1 >ICAF,A,66

NCAF - NORMAL FRACTION OF CAPACITY ALLOCATED TO SELL  
 CAM (0-1) <66>  
 CAM - CAPACITY ALLOCATED DUE TO MARGINS (FRACTION) <67>  
 EB - EFFECT OF BUSYNESS ON CAF (DIMENSIONLESS) <70>  
 EIP - EFFECT OF INVENTORY PRESSURES (DIMENSIONLESS) <71>  
 ERPS - EFFECT OF RELATIVE PROBABILITY OF SALE (DIMENSIONLESS) <74>

CAM.K=TABLE(TCAM,MBM,K/CM,K)1,6,3,2,.2) A:67 >ICAF,A,66  
 TCAM=.55/.68/.85/.97/1.03/1.15/1.25/1.43/1.45 T:67.1 >CAM,A,67  
 CAM - CAPACITY ALLOCATED DUE TO MARGINS (FRACTION) <67>  
 TCAM - TABLE FOR CAPACITY ALLOCATED DUE TO MARGINS (DIMENSIONLESS) <67>  
 MBM - MBC MARGIN PER SALE (DOLLARS PER SALE) <69>  
 CM - COMPETITOR MARGIN PER SALE (DOLLARS PER SALE) <68>

CM.K=CPFC#CMPC A:68 >DC,A,62/CCL,A,64/CAM,A,67  
 CPFC=3500 C:68.1 >CH,A,68/CPC,A,81  
 CMPC=.22 C:68.2 >CH,A,68/CPC,A,81  
 CM - COMPETITOR MARGIN PER SALE (DOLLARS PER SALE) <68>  
 CPFC - PRICE PER COMPETITOR COMPUTER (DOLLARS) <68>  
 CMPC - MARGIN PER COMPETITOR COMPUTER (DOLLARS) <68>

MBM.K=MBPFC#MBMFC A:69 >DC,A,62/CMBL,A,63/CAM,A,67  
 MBPFC=6000 C:69.1 >MBM,A,69/MBCFC,A,77  
 MBMFC=.3 C:69.2 >MBM,A,69/MBCFC,A,77  
 MBM - MBC MARGIN PER SALE (DOLLARS PER SALE) <69>  
 MBPFC - PRICE PER MBC COMPUTER (DOLLARS) <69>  
 MBMFC - MARGIN PER MBC COMPUTER (FRACTION) <69>  
 EB.K=TABLE(TEB,BUSY,K,0,2,.25) A:70 >ICAF,A,66  
 TEB=1/1/1/.97/.95/.98/.98/.53/.5 T:70.1 >EB,A,70  
 EB - EFFECT OF BUSYNESS ON CAF (DIMENSIONLESS) <70>  
 TEB - TABLE FOR EFFECT OF BUSYNESS (DIMENSIONLESS) <70>  
 BUSY - BUSYNESS (DIMENSIONLESS) <42>

EIP.K=TABLE(EIP,RICC,K,0,1,.25) A:71 >ICAF,A,66  
 TEIP=.65,1.0/1.1,1.13/1.15 T:71.1 >EIP,A,71  
 EIP - EFFECT OF INVENTORY PRESSURES (DIMENSIONLESS) <71>  
 TEIP - TABLE FOR EFFECT OF INVENTORY PRESSURE (DIMENSIONLESS) <71>  
 RICC - RELATIVE INVENTORY PRESSURE COSTS



PAGE 15 SALES CAPACITY ALLOCATION THU, MAY 24 1984

TICC,N=CCI,N+CHBI,N  
TICC - TOTAL INVENTORY CARRYING COSTS (DOLLARS PER MONTH) <72> A,72 >RICC,A,73

CCI - COST OF CARRYING COMPETITOR INVENTORY (DOLLARS PER MONTH) <72>

CHBI - COST OF CARRYING NBC INVENTORY (DOLLARS/MONTH) <72>

RICC,N=CHBI,N/TICC,K  
RICC - RELATIVE INVENTORY CARRYING COSTS (DIMENSIONLESS) <73> A,73 >EIP,A,71

CHBI - COST OF CARRYING NBC INVENTORY (DOLLARS/MONTH) <72>

TICC - TOTAL INVENTORY CARRYING COSTS (DOLLARS PER MONTH) <72>

ERFS,N=TABLE(TERFS,(MBSF,K/CSF,K),3,1,3,1)  
TERFS=.67/.73/1/1.27/1.33/1.38/1.4/1.42/1.44/1.45/1.45  
ERFS - EFFECT OF RELATIVE PROBABILITY OF SALE (DIMENSIONLESS) <74> A,74 >ICAF,A,66  
T,74,1 >ERFS,A,74

TERFS - TABLE FOR EFFECT OF RELATIVE PROBABILITY OF SALE (DIMENSIONLESS) <74>

MBSF - NBC SALES FITCH SUCCESS FRACTION (FRACTION) <95>

CSF - COMPETITOR SALES FITCH SUCCESS FRACTION (FRACTION) <93>



PAGE 17 NB INVENTORY CONTROL THU, MAY 24, 1984  
 MBI,K=MBI.J+DT\*(MBOR.K-MBSR.JK) L,83 >CCMBI,A,76/AAMBI,A,78/CFMBI,A,85  
 N,83.1  
 MBI-4 - HBC INVENTORY (UNITS) <83>  
 MBOR - HBC ORDER RATE (UNITS/MONTH) <84>  
 MBSR - HBC SALES RATE PER AVERAGE DEALER (UNITS/MONTH) <85>  
 MBOR,KL=ANBSR,K+CFMBI,K  
 MBOR - HBC ORDER RATE (UNITS/MONTH) <84>  
 ANBSR - AVERAGE HBC SALES RATE (UNITS PER MONTH) <87>  
 CFMBI - CORRECTION FOR HBC INVENTORY (UNITS) <85>  
 CFMBI,K=(DMBI,K-MBI,K)/TCI  
 TCI=2  
 CFMBI - CORRECTION FOR HBC INVENTORY (UNITS) <85>  
 DMBI - DESIRED HBC INVENTORY (UNITS) <86>  
 MBI - HBC INVENTORY (UNITS) <83>  
 TCI - TIME TO CORRECT INVENTORY (MONTHS) <85>  
 DMBI,K=ANBSR,K\*DIC  
 DIC=1.5  
 DMBI - DESIRED HBC INVENTORY (UNITS) <86>  
 ANBSR - AVERAGE HBC SALES RATE (UNITS PER MONTH) <87>  
 DIC - DESIRED INVENTORY COVERAGE (MONTHS) <86>  
 ANBSR,K=SMOOTH(MBSR,K,TSSR)  
 TSSR=2  
 ANBSR - AVERAGE HBC SALES RATE (UNITS PER MONTH) <87>  
 MBSR - HBC SALES RATE PER AVERAGE DEALER (UNITS/MONTH) <85>  
 TSSR - TIME TO SMOOTH SALES RATE (MONTHS) <87>

PAGE 10      COMPETITOR INVENTORY CONTROL      THU, MAY 24 1984

CI,N=CI,JHDT\*(COR,JK-CSR,JK)      L,88      > CCI,A,80/AACI,A,82/CFCI,A,90  
 CI=75      N,88.1

CI      - COMPETITOR INVENTORY (UNITS) <88>  
 COK      - COMPETITOR ORDER RATE (UNITS PER MONTH) <89>  
 CSR      - COMPETITOR SALES RATE (UNITS PER MONTH) <36>

COR,KL=ACSR,KICFCI,K      R,89      > CI,L,88

COR      - COMPETITOR ORDER RATE (UNITS PER MONTH) <89>  
 ACSR      - AVERAGE COMPETITOR SALES RATE (UNITS PER MONTH) <91>

CFCI      - CORRECTION FOR COMPETITOR INVENTORY (UNITS) <90>

CFCI,K=(DCI,K-CI,K)/TCI      A,90      > COR,R,89

CFCI      - CORRECTION FOR COMPETITOR INVENTORY (UNITS) <90>  
 DCI      - DESIRED COMPETITOR INVENTORY (UNITS) <92>  
 CI      - COMPETITOR INVENTORY (UNITS) <88>  
 TCI      - TIME TO CORRECT INVENTORY (MONTHS) <85>

ACSR,K=SMOOTH(CSR,JK,TSSR)      A,91      > AACI,A,82/COR,R,89/DCI,A,92

ACSR      - AVERAGE COMPETITOR SALES RATE (UNITS PER MONTH) <91>  
 CSR      - COMPETITOR SALES RATE (UNITS PER MONTH) <36>  
 TSSR      - TIME TO SMOOTH SALES RATE (MONTHS) <87>

DCI,K=ACSR,K\*DIC      A,92      > CFCI,A,90

DCI      - DESIRED COMPETITOR INVENTORY (UNITS) <92>  
 ACSR      - AVERAGE COMPETITOR SALES RATE (UNITS PER MONTH) <91>  
 DIC      - DESIRED INVENTORY COVERAGE (MONTHS) <86>

PAGE 19 COMPETITOR SALES FITCH SUCCESS FRACTION THU, MAY 24 1984

CSF,K=NCSF#ECSM,K A,93 >CSR,R,36/ERFS,A,74  
 NCSF=.2 C,93.1 >CSF,A,93

CSF - COMPETITOR SALES FITCH SUCCESS FRACTION  
 (FRACTION) <93>

NCSF - NORMAL COMPETITOR SUCCESS FRACTION (FRACTION)  
 <93>

ECSM - EFFECT OF COMPETITOR SOFTWARE ON COMPETITOR  
 SUCCESS FRACTION (DIMENSIONLESS) <94>

ECSM,K=TABLE(TECSM,CSM,K,100,200,20) A,94 >CSF,A,93  
 TECSM=1/1.07/1.13/1.18/1.22/1.25 L,94.1 >ECSM,A,94

ECSM - EFFECT OF COMPETITOR SOFTWARE ON COMPETITOR  
 SUCCESS FRACTION (DIMENSIONLESS) <94>

TECSM - TABLE FOR EFFECT OF COMPETITOR SOFTWARE ON  
 COMPETITOR SUCCESS FRACTION (DIMENSIONLESS) <94>

CSM - COMPETITOR SOFTWARE (KLOGRAMS) <106>

PAGE 20 MBS SALES FITCH SUCCESS FRACTION THU, MAY 24 1984

MBSF,K=NMBSF#ENUSE,K#EMBSM,K#EMUM,K#EMRMP,K A,95 >MESR,R,35/ERFS,A,74  
 NMBSF=.1 C,95.1 >MUSF,A,95

MBSF - MBS SALES FITCH SUCCESS FRACTION (FRACTION) <95>

NMBSF - NORMAL MBS SUCCESS FRACTION (FRACTION) <95>

ENUSE - EFFECT OF MULTIUSER SELLING EXPERIENCE ON MBSF  
 (DIMENSIONLESS) <94>

EMBSM - EFFECT OF MBS SOFTWARE ON MBSF (DIMENSIONLESS)  
 <99>

EMUM - EFFECT OF MULTIUSER MARKETING (DIMENSIONLESS)  
 <100>

EMRMP - EFFECT OF MBS MARKET PRESENCE ON MBSF  
 (DIMENSIONLESS) <102>

PAGE 21 EFFECT OF MULTIUSER SELLING EXPERIENCE ANDTHU, MAY 24 1984

EMUSE,K=TABLE(THUSE,AMUSE,K,0,100,20) A,96 >MBSF,A,95  
 THUSE=.97/1.05/1.15/1.23/1.28/1.3 T,96.1 >EMUSE,A,96

EMUSE - EFFECT OF MULTIUSER SELLING EXPERIENCE ON MBSF

(DIMENSIONLESS) <96>

THUSE - TABLE FOR EFFECT OF MULTIUSER SELLING EXPERIENCE

(DIMENSIONLESS) <96>

AMUSE - AVERAGE MULTIUSER EXPERIENCE (SALES PER DEALER)

<97>

AMUSE,K=MBSIS,K

AMUSE - AVERAGE MULTIUSER EXPERIENCE (SALES PER DEALER)

<97>

MBSIS - AVERAGE MBS INSTALLED SALES PER DEALER (UNITS)

<98>

MBSIS,K=TMBSIS,K/D,K

MBSIS=0

MBSIS - AVERAGE MBS INSTALLED SALES PER DEALER (UNITS)

<98>

TMBSIS - TOTAL MBS INSTALLED SALES (UNITS) <26>

D - DEALERS (DEALERS) <1>

EMBSW,K=TABLE(TEMBSW,MBSW,K,20,70,10)

TEMBSW=1/1.07/1.13/1.18/1.22/1.25

EMBSW - EFFECT OF MBS SOFTWARE ON MBSF (DIMENSIONLESS)

<99>

TEMBSW - TABLE FOR EFFECT OF MBS SOFTWARE (DIMENSIONLESS)

<99>

MBSW - MBS SOFTWARE (PROGRAMS) <103>

A,97 >EMUSE,A,96

A,98 >AMUSE,A,97  
 N,98.1

A,99 >MBSF,A,95  
 T,99.1 >EMBSW,A,99

PAGE 22 EFFECTS OF MARKETING AND MARKET PRESENCE... THU, MAY 24, 1984

ENUH,K=TABLE(TEHUM,FMMU,K,0,1,1,2) >MBSF,A,95  
 TEHUM=1/1.15/1.25/1.33/1.38/1.4 T,100.1 >ENUH,A,100  
 ENUH - EFFECT OF MULTIUSER MARKETING (DIMENSIONLESS)

TEHUM - TABLE FOR EFFECT OF MULTIUSER MARKETING  
 (DIMENSIONLESS) <100>  
 FMMU - FRACTION OF MARKETING AIMED AT MULTIUSERS  
 (FRACTION) <101>

FMMU,K=TABLE(TFMMU,PRC,K,0,1,1,2) >EMUH,A,100  
 TFMMU=.05/7.3/77.95/1/1 T,101.1 >EMMU,A,101

FMMU - FRACTION OF MARKETING AIMED AT MULTIUSERS  
 (FRACTION) <101>  
 TFMMU - TABLE FOR FRACTION OF MARKETING TARGETED AT  
 MULTIUSERS (DIMENSIONLESS) <101>  
 PRC - PERCEIVED RELATIVE CONTRIBUTION (DIMENSIONLESS)  
 <5>

EMBMP,K=TABLE(TEHBMF,EMBMP,K,0,2,3,4,6) >MBSF,A,95  
 TEHBMF=1/1.005/1.025/1.075/1.095/1.1 T,102.1 >EMBMP,A,102

EMBMP - EFFECT OF NBC MARKET PRESENCE ON NBSF  
 (DIMENSIONLESS) <102>  
 TEHBMF - TABLE FOR EFFECT OF NBC MARKET PRESENCE  
 (DIMENSIONLESS) <102>  
 EMBMP - NBC MARKET PRESENCE (MILLIONS OF BUSINESSES  
 SHARE) <19>

PAGE 23. SOFTWARE THU, MAY 24, 1984

HBSW.K=HBSW.J+DT\*(HBSWCR.JK) L,103 >EBSW,A,99  
MBSW=20 H,103.1

HBSW - NBC SOFTWARE (PROGRAMS) <103>  
HBSWCR - NBC SOFTWARE CREATION RATE (PROGRAMS PER MONTH)  
<104>

HBSWCR.KL=HBSWCR\*EBSW.K R,104 >HBSW,L,103  
HBSWCR=1 C,104.1 >MBSWCR,R,104

HBSWCR - NBC SOFTWARE CREATION RATE (PROGRAMS PER MONTH)  
<104>

NBSWCR - NORMAL NBC SOFTWARE CREATION RATE (PROGRAMS PER  
MONTH) <104>

EBSSW - EFFECT OF TOTAL NBC SALES ON SOFTWARE CREATION  
RATE (DIMENSIONLESS) <105>

EIBSSW.K=TABLE(TBSSW,TBIS.K,0,60000,15000) A,105 >MBSWCR,R,104  
TBSSW=1/2.5/3.5/3.8/4 L,105.1 >EBSW,A,99

EBSSW - EFFECT OF TOTAL NBC SALES ON SOFTWARE CREATION  
RATE (DIMENSIONLESS) <105>

TBSSW - TABLE FOR EFFECT OF NBC SALES ON SOFTWARE  
(DIMENSIONLESS) <105>

TBIS - TOTAL NBC INSTALLED SALES (UNITS) <26>

CSW.K=CSW.J+DT\*(CSWCR.JK) L,106 >ECSW,A,94  
CSW=100 N,106.1

CSW - COMPETITOR SOFTWARE (PROGRAMS) <106>  
CSWCR - COMPETITOR SOFTWARE CREATION RATE (PROGRAMS PER  
MONTH) <107>

CSWCR.KL=NCSWCR R,107 >CSW,L,106  
NCSWCR=1.5 C,107.1 >CSWCR,R,107

CSWCR - COMPETITOR SOFTWARE CREATION RATE (PROGRAMS PER  
MONTH) <107>

NCSWCR - NORMAL COMPETITOR SOFTWARE CREATION RATE  
(PROGRAMS/MONTH) <107>

SFEC DT=.5/LENGTH=100/PLTFER=2 108



## LIST OF VARIABLES

SYMBOL	T	WHR-ONF	DEFINITION
HCBI	H	82	AVERAGE AGE OF COMPETITOR INVENTORY (MONTHS) (82)
HCBI	H	78	AVERAGE AGE OF HBC INVENTORY (MONTHS) (78)
HCSR	H	91	AVERAGE COMPETITOR SALES RATE (UNITS PER MONTH) (91)
AD	C	21.1	AVERAGE AWARENESS PER DEALER (MILLION OF BUSINESSES PER MONTH PER DEALER) (22)
HHFSF	H	44	AVERAGE HOURS PER SALES PITCH (HOURS PER SALE) (44)
HHBSR	H	87	AVERAGE HBC SALES RATE (UNITS PER MONTH) (87)
HNS	C	24.1	AWARENESS PER MATURE SALE (BUSINESSES) (24)
HNUSE	H	97	AVERAGE MULTIUSER EXPERIENCE (SALES PER DEALER) (97)
HNS	C	24.1	AWARENESS PER NEW SALE (BUSINESSES) (24)
ATM	C	29.1	AVERAGE TIME FOR SALES TO MATURE (MONTHS) (29)
ATMBD	A	3	AVERAGE TENURE AS A HBC DEALER (MONTHS) (3)
AUS	C	25.1	AWARENESS PER UNSATISFIED SALE (BUSINESSES) (25)
BUSY	H	42	BUSINESS (DIMENSIONLESS) (42)
CADV	C	25.1	CORPORATE ADVERTISING (MILLIONS OF DOLLARS PER MONTH) (25)
CAF	A	85	CAPACITY ALLOCATION FRACTION (FRACTION) (85)
CAF	N	85.1	
CAH	H	87	CAPACITY ALLOCATED DUE TO MARGINS (FRACTION) (87)
CCCI	H	80	CALCULATED COST OF COMPETITOR INVENTORY PER DEALER (DOLLARS) (80)
CCI	A	79	COST OF CARRYING COMPETITOR INVENTORY (DOLLARS PER MONTH) (79)
CDL	A	84	CONTRIBUTION FROM COMPETITOR LINE (DOLLARS PER HOUR) (84)
CCMBI	A	78	CALCULATED COST OF HBC INVENTORY PER DEALER (DOLLARS) (78)
CCPF	C	80.1	COMPETITOR INVENTORY CARRYING COST PER MONTH (FRACTION) (80)
CFCI	H	90	CORRECTION FOR COMPETITOR INVENTORY (UNITS) (90)
CFHBI	H	85	CORRECTION FOR HBC INVENTORY (UNITS) (85)
CI	L	88	COMPETITOR INVENTORY (UNITS) (88)
CI	H	88.1	
CM	H	86	COMPETITOR MARGIN PER SALE (DOLLARS PER SALE) (86)
CMBI	H	75	COST OF CARRYING HBC INVENTORY (DOLLARS/MONTH) (75)
CMBL	A	83	CONTRIBUTION FROM THE HBC LINE (DOLLARS/MONTH) (83)
CMPC	C	88.2	MARGIN PER COMPETITOR COMPUTER (DOLLARS) (88)
CMIC	H	87	COMPETITOR NEW INSTALLED SALES PER DEALER (UNITS) (87)
CCR	R	89	COMPETITOR ORDER RATE (UNITS PER MONTH) (89)
CFC	A	81	COST OF A COMPETITOR COMPUTER (DOLLARS) (81)
CFPC	C	88.1	PRICE PER COMPETITOR COMPUTER (DOLLARS) (88)
CC	H	80	COMPETITOR SALES CAPACITY (HOURS PER MONTH) (80)
CSF	H	70	COMPETITOR SALES PITCH SUCCESS FRACTION (FRACTION) (70)
CCM	R	88	COMPETITOR ORDER RATE (UNITS PER MONTH) (88)
CCM	H	88.1	

CSW	L	106	COMPETITOR SOFTWARE (PROGRAMS) (106)
	N	106.1	
CSWCR	R	107	COMPETITOR SOFTWARE CREATION RATE (PROGRAMS PER MONTH) (107)
D	L	1	DEALERS (DEALERS) (1)
	N	1.1	
DC	A	62	DOLLAR CONTRIBUTION (DOLLARS PER MONTH) (62)
DCI	H	72	DESIRED COMPETITOR INVENTORY (UNITS) (72)
DCR	R	18	POTENTIAL DEALER CREATION RATE (DEALERS/MONTH) (18)
DDR	R	2	DEALER DROP OUT RATE (DEALERS/MONTH) (2)
DIC	C	85.1	DESIRED INVENTORY COVERAGE (MONTHS) (85)
DM	A	80	DEALER MARKETING (DOLLARS) (80)
	N	80.1	
DMBI	H	86	DESIRED NBC INVENTORY (UNITS) (86)
DND	C	8.2	DESIRED NUMBER OF DEALERS (DEALERS) (8)
DRR	R	8	DEALER RECRUITMENT RATE (DEALERS/MONTH) (8)
DRRC	A	7	DEALER RECRUITMENT RATE CAPACITY (DEALERS/MONTH) (7)
DRRCE	A	9	DEALER RECRUITMENT RATE CAPACITY FROM EXPERIENCE (DEALERS/MONTH) (9)
DRRCU	A	12	DEALER RECRUITMENT RATE CAPACITY UTILIZATION (DIMENSIONLESS) (12)
DT	C	108	
DTAD	A	14	DEMAND TO BECOME A DEALER (DEALERS/MONTH) (14)
EE	A	70	EFFECT OF BUSINESS ON CAP (DIMENSIONLESS) (70)
EESR	A	49	EFFECT OF BUSINESS ON SERVICE ALLOCATED TO-1) (49)
ECAF	A	20	EFFECT OF CORPORATE ADVERTISING ON MARKET PRESENCE (MILLIONS OF BUSINESSES PER MONTH) (20)
ECCAF	A	40	EFFECTIVE CUSTOMER SALES CAPACITY (CUSTOMERS) (40)
ECSW	H	94	EFFECT OF COMPETITOR SOFTWARE ON COMPETITOR SUCCESS FRACTION (DIMENSIONLESS) (94)
ECTHDD	A	4	EFFECT OF CONTRIBUTION ON TENURE AS A NBC DEALER (4)
EDM	A	01	EFFECT OF DEALER MARKETING ON TRAFFIC (DIMENSIONLESS) (01)
EDND	H	8	EFFECT FROM DESIRED NUMBER OF DEALERS (0-1) (8)
EIP	A	71	EFFECT OF INVENTORY PRESSURES (DIMENSIONLESS) (71)
ENRNF	H	102	EFFECT OF NBC MARKET PRESENCE ON NBSF (DIMENSIONLESS) (102)
ENBSW	A	100	EFFECT OF TOTAL NBC SALES ON SOFTWARE CREATION RATE (DIMENSIONLESS) (100)
ENBSW	A	99	EFFECT OF NBC SOFTWARE ON NBSF (DIMENSIONLESS) (99)
ENUM	A	100	EFFECT OF MULTIUSER MARKETING (DIMENSIONLESS) (100)
ENUSE	H	96	EFFECT OF MULTIUSER SELLING EXPERIENCE ON NBSF (DIMENSIONLESS) (96)
ETRA	A	17	EFFECT OF PRESENCE ON TIME TO RECRUIT DEALERS (DIMENSIONLESS) (17)
ERPL	A	74	EFFECT OF RELATIVE PROBABILITY OF SALE (DIMENSIONLESS) (74)
ERM	C	30.2	PROBATION ALLOCATED TO MARKETING ATTEMPTS (30)

FMND	A	101	FRACTION OF MARKETING AIMED AT MULTIUSERS (FRACTION) <101>
HCSP	H	40	HOURS PER COMPETITIVE SALES PITCH (HOURS) <40>
HMBSF	H	37	HOURS PER MBO SALES PITCH (HOURS) <37>
ICAF	N	88	
LENGTH	C	100	
MBCF	C	78.1	MBC INVENTORY CARRYING COST PER MONTH (FRACTION) <78>
MBCFC	A	77	MBC COST PER COMPUTER (DOLLARS) <77>
MBI	L	83	MBC INVENTORY (UNITS) <83>
	N	85.1	
MBS	A	98	AVERAGE MBC INSTALLED SALES PER DEALER (UNITS) <98>
	N	95.1	
MBS	A	89	MBC MARGIN PER SALE (DOLLARS PER SALE) <89>
MBSF	L	19	MBC MARKET PRESENCE (MILLIONS OF BUSINESSES AWAKE) <19>
	N	19.1	
MBSFC	C	69.2	MARGIN PER MBC COMPUTER (FRACTION) <69>
MBSFCR	R	21	MBC MARKET PRESENCE CREATION RATE (MILLIONS OF BUSINESSES PER MONTH) <21>
MBSFDR	R	20	MBC MARKET PRESENCE DECAY RATE (MILLIONS OF BUSINESSES PER MONTH) <20>
MBSIS	A	55	AVERAGE MBC NEW INSTALLED SALES PER DEALER (UNITS) <55>
MBSR	R	84	MBC ORDER RATE (UNITS/MONTH) <84>
MBSFC	C	69.1	PRICE PER MBC COMPUTER (DOLLARS) <69>
MBS	A	37	MBC SALES CAPACITY (HOURS/MONTH) <37>
MBSF	A	95	MBC SALES PITCH SUCCESS FRACTION (FRACTION) <95>
MBSR	R	35	MBC SALES RATE PER AVERAGE DEALER (UNITS/MONTH) <35>
	N	35.1	
MBSW	L	103	MBC SOFTWARE (PROGRAMS) <103>
	N	103.1	
MBSWCR	R	104	MBC SOFTWARE CREATION RATE (PROGRAMS PER MONTH) <104>
MCS	A	48	MAXIMUM CAPACITY ALLOCATED FOR SERVICE (HOURS, MONTH) <48>
	N	48.1	
MFD	A	22	MARKET PRESENCE FROM DEALERS (MILLIONS OF BUSINESSES PER MONTH) <22>
MFS	A	24	MARKET PRESENCE FROM SALES (MILLIONS OF BUSINESSES PER MONTH) <24>
MFC	A	23	MARKET PRESENCE FROM UNSATISFIED MBC CUSTOMERS <23>
MCAF	C	88.1	NORMAL FRACTION OF CAPACITY ALLOCATED TO SELL MBC (0-1) <88>
MCSF	C	93.1	NORMAL COMPETITOR SUCCESS FRACTION (FRACTION) <93>
MCSWCR	C	107.1	NORMAL COMPETITOR SOFTWARE CREATION RATE (PROGRAMS/MONTH) <107>
MDCR	C	18.1	NORMAL DEALER CREATION RATE (DEALERS/MONTH) <18>
MHCSP	C	40.1	NORMAL HOURS PER COMPETITOR SALES PITCH (HOURS) <40>
NHMBSF	C	39.1	NORMAL HOURS PER MBC SALES PITCH (HOURS) <39>
NMBSF	C	95.1	NORMAL MBC SUCCESS FRACTION (FRACTION) <95>
NMBSWCR	C	104.1	NORMAL MBC SOFTWARE CREATION RATE (PROGRAMS PER MONTH) <104>
NMBSFCR	C	21.1	NORMAL MARKET PRESENCE CREATION RATE (BUSINESSES, MONTH) <21>

NSCAP	C	45.1	NORMAL SALES CAPACITY (HOURS PER MONTH) (45)
NT	C	55.1	NORMAL TRAFFIC (PEOPLE PER MONTH) (55)
NTTBD	C	5.1	NORMAL TIME AS A NEW DEALER (5)
NTTD	C	17.1	NORMAL TIME TO RECRUIT DEALERS (MONTHS) (17)
PD	L	15	POTENTIAL DEALERS (DEALERS) (15)
	R	25.1	
PDC	H	5	PERCEIVED DEALER CONTRIBUTION (DOLLARS/MONTH) (5)
PLTFER	C	100	
PRC	A	5	PERCEIVED RELATIVE CONTRIBUTION (DIMENSIONLESS) (5)
RDTBD	A	15	RELATIVE DEMAND TO BECOME A DEALER (DIMENSIONLESS) (15)
RICC	A	75	RELATIVE INVENTORY CARRYING COSTS (DIMENSIONLESS) (75)
SECS	A	55	SERVICE BURDEN FROM COMPETITOR SALES FOR EACH DEALER (HOURS/MONTH) (55)
SBMBC	A	54	SERVICE BURDEN FROM MBC SALES FOR EACH DEALER (HOURS/MONTH) (54)
SBPCS	C	56.1	SERVICE BURDEN PER COMPETITOR SALE (HOURS/UNIT) (56)
SEPMBS	C	54.1	SERVICE BURDEN PER MBC SALE (HOURS/UNIT) (54)
SCAP	A	45	SALES CAPACITY (HOURS PER MONTH) (45)
SCU	A	41	SALES CAPACITY UTILIZATION (FRACTION) (41)
SERBUR	H	55	TOTAL SERVICE BURDEN FROM SALES FOR EACH DEALER (HOURS/MONTH) (55)
SERVC	H	47	SERVICE CAPACITY UTILIZED (0-1) (47)
SMBUSY	A	50	SMOOTHER BUSINESS (DIMENSIONLESS) (50)
SSBUR	A	46	SATISFIED SERVICE BURDEN (HOURS/MONTH) (46)
T	A	38	TRAFFIC (PEOPLE PER MONTH) (38)
TCAP	T	67.1	TABLE FOR CAPACITY ALLOCATED DUE TO MARGINS (DIMENSIONLESS) (67)
TCI	C	65.1	TIME TO CORRECT INVENTORY (MONTHS) (65)
TCNIS	L	34	TOTAL COMPETITOR MATURE INSTALLED SALES (34)
	R	34.1	
TCNIS	L	31	TOTAL COMPETITOR NEW INSTALLED SALES (UNITS) (31)
	R	31.1	
TCNR	R	35	TOTAL COMPETITOR SALES MATURING RATE (UNITS/MONTH) (35)
TCR	R	52	TOTAL COMPETITOR SALES RATE (UNITS/MONTH) (52)
TDRACE	T	9.1	
TDRACO	T	12.1	TABLE FOR DEALER RECRUITMENT RATE CAPACITY UTILIZATION (DIMENSIONLESS) (12)
TDXD	A	10	TOTAL DEALERS AND X-DEALERS (DEALERS) (10)
TEB	T	70.1	TABLE FOR EFFECT OF BUSINESS (DIMENSIONLESS) (70)
TEBER	T	49.1	TABLE FUNCTION FOR EFFECT OF BUSINESS ON SERVICE (ALLOCATED 0-1) (49)
TECAF	T	25.1	TABLE FOR EFFECT OF CORPORATE ADVERTISING ON MARKET PRESENCE (DIMENSIONLESS) (25)
TECSW	T	94.1	TABLE FOR EFFECT OF COMPETITOR SOFTWARE ON COMPETITOR SUCCESS FRACTION (DIMENSIONLESS) (94)
TECTVE	T	4.1	TABLE FOR EFFECT OF CONTRIBUTION ON TENURE AS A NEW DEALER (DIMENSIONLESS) (4)
TEIN	T	57.1	TABLE FOR EFFECT OF DEALER MARKETING (DIMENSIONLESS) (57)

TEIND	T	5.1	
TEIF	T	71.1	TABLE FOR EFFECT OF INVENTORY PRESSURE (DIMENSIONLESS) (71)
TEHBF	T	102.1	TABLE FOR EFFECT OF HBC MARKET PRESENCE (DIMENSIONLESS) (102)
TEHBSW	T	99.1	TABLE FOR EFFECT OF HBC SOFTWARE (DIMENSIONLESS) (99)
TEHUM	T	100.1	TABLE FOR EFFECT OF MULTIUSER MARKETING (DIMENSIONLESS) (100)
TEFTRD	T	18.1	TABLE FOR EFFECT OF PRESENCE ON TIME TO RECRUIT DEALERS (18)
TERFS	T	74.1	TABLE FOR EFFECT OF RELATIVE PROBABILITY OF SALE (DIMENSIONLESS) (74)
TFRB	C	20.1	TIME TO FORGET HBC (MONTHS) (20)
TFHBU	T	101.1	TABLE FOR FRACTION OF MARKETING TARGETED AT MULTIUSERS (DIMENSIONLESS) (101)
TICC	H	72	TOTAL INVENTORY CARRYING COSTS (DOLLARS PER MONTH) (72)
TIBIS	H	26	TOTAL HBC INSTALLED SALES (UNITS) (26)
TIBNIS	L	30	TOTAL HBC MATURE INSTALLED SALES (30)
	N	30.1	
TIBNIS	L	27	TOTAL HBC NEW INSTALLED SALES (UNITS) (27)
	N	27.1	
TIBSMR	R	29	TOTAL HBC SALES MATURING RATE (UNITS/MONTH) (29)
TIBSR	R	25	TOTAL HBC SALES RATE (UNITS/MONTH) (25)
TIBSSW	T	103.1	TABLE FOR EFFECT OF HBC SALES ON SOFTWARE (DIMENSIONLESS) (103)
TIOSE	T	98.1	TABLE FOR EFFECT OF MULTIUSER SELLING EXPERIENCE (DIMENSIONLESS) (98)
TID	H	17	TIME TO RECRUIT DEALERS (MONTHS) (17)
TIBBUS	C	50.1	TIME TO SMOOTH BUSINESS (MONTHS) (50)
TSCU	T	41.1	TABLE FOR SALES CAPACITY UTILIZATION (41)
TSDC	C	82.1	TIME TO SMOOTH DOLLAR CONTRIBUTION (MONTHS) (82)
TSERVU	T	47.1	TABLE FOR SERVICE CAPACITY UTILIZATION (0-1) (47)
TBICAF	C	45.1	TIME TO SMOOTH INPUTS TO SALES CAPACITY ALLOCATION (MONTHS) (45)
TSRC	C	83.1	TIME TO SMOOTH RELATIVE CONTRIBUTION (MONTHS) (83)
TSSR	C	87.1	TIME TO SMOOTH SALES RATE (MONTHS) (87)
UNBC	H	51	UNSATISFIED HBC CUSTOMERS (CUSTOMERS) (51)
USBUR	H	52	UNSATISFIED SERVICE BURDEN (HOURS/MONTH) (52)
XD	L	11	X-DEALERS (DEALERS THAT HAVE DROPPED OUT)
	N	11.1	(DEALERS) (11)

## WHERE-USED LIST

SYMBOL	WHERE-USED
AACI	CCCI, A, 80
AAMBI	CCMBI, A, 76
ACSR	AACI, A, 82/COR, R, 89/DCI, A, 92
AD	MFI, A, 22
AHPSP	ECCAF, A, 43
AMBSR	AAMBI, A, 78/MBOR, R, 84/DMBI, A, 86
AMS	MFS, A, 24
AMUSE	EMUSE, A, 96
ANS	MFS, A, 24
ATM	TMBSMR, R, 29/TCSMR, R, 33
ATMBD	DDR, R, 2
AUS	MPUC, A, 23
BUSY	SCU, A, 41/SMBUSY, A, 50/EB, A, 70
CADV	ECAMP, A, 25
CAF	MBSC, A, 37/CSC, A, 38/AHPSP, A, 44
CAM	ICAF, A, 66
CCCI	CCI, A, 79
CCI	TICC, A, 72
CCMBI	CMBI, A, 75
CCFP	CCCI, A, 80
CFCI	COR, R, 89
CFMBI	MBOR, R, 84
CI	CCCI, A, 80/AACI, A, 82/CFCI, A, 90
CLIP	CMBI, A, 75/CCI, A, 79
CM	DC, A, 62/CCL, A, 64/CAM, A, 67
CMBI	TICC, A, 72/RICC, A, 73
CHBL	FRC, A, 5
CHFC	CM, A, 68/CPC, A, 81
CNIS	SBCS, A, 56
COR	CI, L, 88
CPC	CCCI, A, 80
CPFC	CM, A, 68/CPC, A, 81
CSC	CSR, R, 36
CSF	CSR, R, 36/ERFS, A, 74
CSR	TCSR, R, 32/DC, A, 62/CCL, A, 64/CI, L, 88/ACSR, A, 91
CSW	ECSW, A, 94
CSWCR	CSW, L, 106
D	DDR, R, 2/EDND, A, 8/TDXD, A, 10/MFD, A, 22/TMBSR, R, 28/TCSR, R, 32/ MBNIS, A, 55/CNIS, A, 57/MBIS, A, 98
DC	FDC, A, 61
DCI	CFCI, A, 90
DCR	FD, L, 15
DDR	D, L, 1/XD, L, 11
DIC	DMBI, A, 36/DCI, A, 92
DM	EDM, A, 59
DMBI	CFMBI, A, 85
DND	EDND, A, 8
DRR	D, L, 1/PD, L, 15
DRRC	DRR, R, 6/RDTBD, A, 13
DRRCE	DRRC, A, 7
DRRCU	DRR, R, 6
DTBD	RDTBD, A, 13
EE	ICAF, A, 66
ERSER	ICAF, A, 46

ECAMP	MBMPCR,R,21
ECCAP	BUSY,A,42
ECSW	CSF,A,93
ECTMBD	ATMBD,A,3
EDM	T,A,58
EDND	DRRC,A,7
EIP	ICAF,A,66
EMBMP	MBSF,A,95
EMBSSW	MBSWCR,R,104
EMBSW	MBSF,A,95
EMUM	MBSF,A,95
EMUSE	MBSF,A,95
EPTRD	TRD,A,17
ERPS	ICAF,A,66
FAM	DM,A,60
FMMU	EMUM,A,100
HCSP	CSR,R,36/AHFSP,A,44
HMBSF	MBSR,R,35/AHFSP,A,44
ICAF	CAF,A,65
MBCP	CCMBI,A,76
MBCPC	CCMBI,A,76
MBI	CCMBI,A,76/AAMBI,A,78/CFMBI,A,85
MBIS	AMUSE,A,97
MBM	DC,A,62/CMBL,A,63/CAM,A,67
MBMP	EPTRD,A,18/MBMFDR,R,20/EMBMP,A,102
MBMPC	MBM,A,69/MBCPC,A,77
MBMPCR	MBMP,L,19
MBMFDR	MBMP,L,19
MBNIS	SBMBS,A,54
MBOR	MBI,L,83
MBPPC	MBM,A,69/MBCPC,A,77
MBSC	MBSR,R,35
MBSF	MBSR,R,35/ERPS,A,74
MBSR	TMBSR,R,28/DC,A,62/CMBL,A,63/MBI,L,83/AMBSR,A,87
MBSW	EMBSW,A,99
MBSWCR	MBSW,L,103
MCAS	SSBUR,A,46/SERVU,A,47
MPD	MBMPCR,R,21
MPS	MBMPCR,R,21
MPJC	MBMPCR,R,21
NCAF	ICAF,A,66
NCSF	CSF,A,93
NCSWCR	CSWCR,R,107
NDCR	DCR,R,16
NHCSF	HCSF,A,40
NHMBSF	HMBSF,A,39
NMBSF	MBSF,A,95
NMBSWR	MBSWCR,R,104
NMPCR	MBMPCR,R,21
NSCAP	SCAP,A,45/MCAS,A,48
NT	T,A,58
NTMBD	ATMBD,A,3
NTRD	TRD,A,17
FD	DTBD,A,14
FDC	PRC,A,5/DM,A,60
FRC	ECTMBD,A,4/FMMU,A,101
RDTRD	DRRCU,A,12
RICC	EIP,A,71

SDCS SERBUR,A,53  
 SBMS SERBUR,A,53  
 SBPCS SECS,A,56  
 SBPHBS SBMS,A,54  
 SCAP HBSC,A,37/CSC,A,38/ECCAF,A,43  
 SCU HBSSR,R,35/CSR,R,36  
 SERBUR SERVU,A,47/UMBC,A,51/USBUR,A,52  
 SERVU SSER,A,46  
 SREUSY EBSER,A,49  
 SMOOTH PRO,A,5/SMBUSY,A,50/PIC,A,61/CAF,A,85/AMBSR,A,87/ACSR,A,91  
 SCAP,A,40/USBUR,A,52  
 T BUS,A,42  
 TABLE ECTMBD,A,4/EDND,A,6/DRRCE,A,9/DRRCU,A,12/EPTRD,A,18/ECAMP,A,25/  
 SCU,A,41/SERVU,A,47/EBSER,A,49/EDM,A,59/CAM,A,67/EB,A,70/  
 EIF,A,71/ERFS,A,74/ECSW,A,94/ENUSE,A,96/EMBSW,A,99/ENUM,A,100/  
 FFINU,A,101/ENBMP,A,102/ENBSSW,A,105  
 TCM CA,A,67  
 TCI CFHBI,A,85/CFCI,A,90  
 TCNIS TCSMR,R,33/ONIS,A,57  
 TCSMR TCNIS,L,31/TCMIS,L,34  
 TCSR TCNIS,L,31  
 TDRRCE DRRCE,A,9  
 TDRRCU DRRCU,A,12  
 TDXD DRRCE,A,9  
 TEB EB,A,70  
 TEBSER EBSER,A,49  
 TECAMP ECAMP,A,25  
 TECSW ECSW,A,94  
 TECTMB ECTMBD,A,4  
 TEDM ED,A,59  
 TEDND EDND,A,6  
 TEIF EIF,A,71  
 TENBMP ENBMP,A,102  
 TENBSSW ENBSSW,A,99  
 TENUM ENUM,A,100  
 TEPTRD EPTRD,A,18  
 TERFS ERFS,A,74  
 TFB HBHFD,R,20  
 TFINU FFINU,A,101  
 TICC RICC,A,73  
 TMBIS MBIS,A,98/ENBSSW,A,105  
 TMBNIS MBS,A,24/TMBIS,A,26  
 TMBNIS MBS,A,24/TMBIS,A,26/TMBSMR,R,29/UMBC,A,51/MBNIS,A,55  
 TMBSMR TMBNIS,L,27/TMBNIS,L,30  
 TMBSR TMBNIS,L,27  
 TMBSSW ENBSSW,A,105  
 TNUSE ENUSE,A,96  
 TRD JTED,A,14  
 TSBUS SMBUS,A,50  
 TSCU SCU,A,41  
 TSDC FDC,A,81  
 TSERVU SERVU,A,47  
 TSDCAF CAF,A,85  
 TSDC FDC,A,81  
 TSSB HBSSR,A,35/EBSER,A,49  
 TSSC FDC,A,81  
 TSSSR UMBC,A,51  
 TSD TDXD,A,10



## NBC RETAIL CHANNEL DEVELOPMENT MODEL

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*
*   DEALER RECRUITMENT
L  I,K=D,JDFT*(DRR,JK-DER,JK)
N  D=10
*   DROP-OUT RATE
R  DRF,KL=D,K/ATXBD,K
A  ATXBD,K=N*THDBA*EOTHEB,K
C  ATXBD=170
A  EOTHEB=TABLE(TEOTHEB,PRC,K,0,1,1,1)
T  TEOTHEB=.005/.14/.7/1.5/2.2/2.75/2.9/2.95/3/3
A  PRC,K=SMOOTH*(CHSL,K/PDC,K),TDRD)
C  TDRD=5
*   RECRUITMENT RATE
R  DRRC,KL=DRRC,K*DRRC0,K
A  DRRC0,K=DRRC0,K*EDND,K
A  EDND,K=TABLE(TEEDND,(DND-D,K),0,1000,100)
T  TEEDND=.1/.35/.9/.95/.98/1/1/1/1/1/1
C  DND=1000
A  DRRC0,K=TABLE(TDRRC0,TDND,K,0,200,30)
T  TDRRC0=5/10/15/25,25/30
A  TDND,K=D,K*1.5,1
L  AD,K=DDR,JK*DTDRK,D
N  AD=0
A  DRRCU,K=TABLE(TDRRCU,RETDB,0,5,10)
T  TDRRCU=0/.5/.55/.92/.96/.98/1
A  RETDB,K=DTDB,K/DRRC,K
*   DEMAND TO BE DEALERS
A  DTDB,K=FD,K/TRD,K
L  FD,K=FL,JDFT*(DER,JK-DAR,JK)
N  FD=1000
R  DDR,KL=NDOR
C  NDOR=10
A  TRD=NTRD,K*EPTTRD,K
C  NTRD=42
A  EPTTRD,K=TABLE(TEPTTRD,HEMP,K,0,2,3,45)
T  TEPTTRD=1/.95/.91/.82/.4/.5
*   MARKET PRESENCE
L  HEMP,K=HEMP,JDFT*(HEMPCR,JK-HEMPDR,JK)
N  HEMP=15
R  HEMPCR,KL=HEMP,K*TFMB
C  TFMB=12
R  HEMPCR,KL=HEMPDR,HEMP,K-HEMPDR,HEMP,K
C  HEMPCR=100
A  HEMPCR,K=0.00000000
C  HEMPCR=100000000
A  HEMPCR,K=HEMPDR,HEMP,K*HEMPDR,HEMP,K
C  HEMPCR=100000000
C  HEMPCR=100000000
A  HEMPCR,K=HEMPDR,HEMP,K*HEMPDR,HEMP,K
C  HEMPCR=100000000
C  HEMPCR=100000000
A  HEMPCR,K=HEMPDR,HEMP,K*HEMPDR,HEMP,K
T  HEMPCR=0/.001/1000/1000/1000
C  HEMPCR=1

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\* TOTAL INSTALLED SALES  
A  $TMBIS,K=TMENIS,K+TMBHIS,K$   
L  $TMENIS,K=TMENIS,J*(THEBR,JK+TMBSNR,JK)*DT$   
N  $TMENIS=0$   
R  $TMBSNR,KL=HBSR,JK*DB,K$   
K  $TMBSNR,KL=TMENIS,K/ATH$   
C  $DT=1$   
L  $TMENIS,K=TMENIS,J*(THEBR,JK+DT)$   
R  $TMENIS=0$   
L  $TENIS,K=TONIS,J*(TCBR,JK+TBSNR,JK)*DT$   
R  $TENIS=200$   
L  $TCBR,KL=CBR,JK*DB,K$   
K  $TBSNR,KL=TONIS,K/ATH$   
L  $TONIS,K=TONIS,J*(TCBR,JK+DT)$   
R  $TONIS=400$   
NOTE  
NOTE \*\*\* FINANCE INDIVIDUAL DEALER ACTIVITY \*\*\*  
NOTE  
\* SALES RATES  
R  $HBSR,KL=(HBSO,K)*(HBSDF,K)/HBSF,K)*4500,K$   
N  $HBSR=1$   
R  $CBR,KL=(CSO,K)*(CSDP,K)/CBF,K)*4500,K$   
N  $CBR=50$   
A  $HBSO,K=BSDF,K*CAF,K$   
A  $CSO,K=SDCF,K*(1+CAF,K)$   
A  $HBSDF,K=HMSDF$   
C  $HMSDF=8$   
L  $HSDP,K=HMSDF$   
C  $HSDP=1+C$   
\* SALES CAPACITY UTILIZATION  
A  $BUSY,K=TABLE(TBUSY,BSBY,K),0,2,7,25)$   
T  $TBUSY=0,7,25,5,75,77,75,75,75,77,1$   
H  $BUSY,K=T,K/EDCAP,K$   
A  $EDCAP,K=SCAP,K/ANFDF,K$   
A  $ANFDF,K=(CAF,K*HMSDF,K)+(1+CAF,K)*HBSDF,K)$   
\* SALES CAPACITY  
A  $SCAP,K=RECAP+BSBR,K$   
C  $RECAP=500$   
H  $BSBR,K=HCHS,K*BSERVU,K$   
A  $BSERVU,K=TABLE(TSERVU,(SERBLR,K,TIME,K),0,0,1)$   
T  $TSERVU=0,7,7,77,1$   
H  $HCHS,K=RECAP+BSBR,K$   
C  $HCHS=500$   
R  $EDSER,K=TABLE(TESER,EDSER,K),0,2,7,25)$   
T  $TESER=1,75,75,5,75,75,75,75,75$   
A  $EDBUSY,K=SMOOTH(BUSY,K,TESER,K)$   
C  $TBUSY=1$

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* SERVICE
A CHIC,K=(USBUR,K)/SERBUR,K)*THENTB,K
A USBUR,K=SERBUR,K-SSBUR,K
A SERBUR,K=SBMBB,K*SEBCC,K
A SBMBB,K=MBNBIB,K*SBFBIB
C SBFBIB=.2
A MBNBIB,K=TBMBB,K/VB,K
A SBFBIB,K=CHIC,K*SBFBIB
C SBFBIB=.5
A CHIB,K=TCNB,K/VB,K
* DEALER MARKETING & TRAFFIC
A T,K=RT*EDB,K
C RT=200
A EDB,K=TABLE(TEDB,DB,K,0,5000,1250)
T TEDB=1/1+.05/1+.02/1+.03/1+.4
A DB,K=FBDB,K*FMB
A MB=0
C FMB=.05
* CONTRIBUTION
A PIC,K=SBICOT*(DB,K)/TEBB
A BDB,K=KBBB,BRBBB,K*YBBB,ORBBB,K
C TBBB=.5
A ORBBB,K=BBB,BRBBB,K
A BDB,K=BBB,BRBBB,K
* SALES CAPACITY ALLOCATION
A CAP,K=SBICOT*(ICAP,K)/TBICAP
A ICAP=.1
C TBICAP=.1
A ICAP,K=RCAP*OCAP,K*EBB,K*TEIF,K*SERPB,K
C RCAP=.25
A OCAP,K=TABLE(TCAP,OCAP,K,0,1,1,1,1,2,2,2)
T TCAP=.55/.65/.65/.77/1.05/1.25/1.25/1.15/1.45
A OCAP,K=CFPC*CMPC
C CFPC=3500
C CMPC=.22
A MBN,K=HBFFC*HBFFC
C HBFFC=8000
C HBNFB=.5
A LB,K=TABLE(TEB,BUST,K,0,2,25)
T TEB=1/1/1/1/.77/.85/.85/.85/.55/1.5
A EBF,K=TABLE(TEB,RTDB,K,0,19,25)
T TEB=.55/1.0/1.1/1.15/1.15
A TDC,K=CC1,K*YCHB,K
A EBF,K=CHB1,K*EBC1,K
A EBF,K=TABLE(TERP,TEBP,0,30,1,1,1,1,1,1,1,1,1,1)
T TERP=.87/.75/1.1/1.2/1.2/1.35/1.45/1.45/1.1/1.1/1.1/1.1

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* INVENTORY GUEST
A DBI,K=CLIF(CDBI,K/1/DBI,K/0)
A CDBI,K=(AMBI,K-2)*MBCP/MBI,K/MBCFC
C MBCF=.05
A MBCFC,K=(1-MBCF)*MBCFC
A AMBI,K=MBI,K/AMBS,K/CR
A DCI,K=CLIF(CDCI,K/3/DCI,K/0)
A CDCI,K=(ACCI,K-1)*DCPF/DCI,K/ACFC
C DCPF=.02
A CFC,K=(1-CMFC)*DCFC
A ACCI,K=CI,K/ACSR,K
* NB INVENTORY CONTROL
L MBI,K=MBI,K*DT*(MBSR,K-MBSR,K)
N DT=.4
R MBSR,KL=MBSR,K+CFMBI,K
A CFMBI,K=(DBI,K-MBI,K)/TDC
C TDC=2
A MBI,K=AMBSR,K*DIC
C DIC=1.5
A AMBSR,K=SMOOTH(MBSR,K)/TBSR)
C TBSR=1
* COMPETITOR INVENTORY CONTROL
L CI,K=CI,K*DT*(CCR,K-CR,K)
N CI=75
R CCR,KL=MCSR,K+CFDI,K
A CFDI,K=(DCI,K-CI,K)/TDCI
R MCSR,K=SMOOTH(CSR,K)/TBSR)
A DCI,K=MCSR,K*DIC
* COMPETITOR SALES PITCH SUCCESS FRACTION
A CSF,K=MCSF*ECSSW,K
C MCSF=.2
A ECSSW,K=TABLE(TECSSW)CSW,K/100/20)
T TECSSW=1/1.07/1.15/1.18/1.22/1.25
* NB SALES PITCH SUCCESS FRACTION
A MBSF,K=MBSF*EMDIF,K*EMDIF,K*EMDIF,K*EMDIF,K
C MBSF=.1
* EFFECT OF MULTISSER SELLING EXPERIENCE AND SOFTWARE
A EMUSE,K=TABLE(EMUSE)AMUSE,K/100/20)
T EMUSE=.9/1.08/1.15/1.22/1.25
A AMUSE,K=MBIS,K
A MBIS,K=THBIS,K/TB*K
N TBIS=0
A EMBSW,K=TABLE(EMBSW)MBSW,K/100/20/10)
T EMBSW=1/1.07/1.15/1.18/1.22/1.25
* EFFECTS OF MARKETING AND MARKET PRESENCE
A EMON,K=TABLE(EMON)FMON,K/10/1/2)
T FMON=1/1.10/1.20/1.30/1.35/1.4
A FMON,K=TABLE(FMON)FAC,K/10/1/2)
T FAC=.05/1.3/1.7/1.75/1/1
A EMDIF,K=TABLE(EMDIF)MDIF,K/10/1/3/1/3)
T EMDIF=1/1.00/1.02/1.07/1.10/1.11

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*      SOFTWARE
L  HBSSW,K=HBSSW,JFDT&(HBSWCR,JK)
N  HBSSW=20
R  HBSWCR,KL=HBSWCR+HBSSW,K
C  HBSWCR=1
A  ENR HBSSW,K=TABLE(THEBSSW/TABLE,K/0,60000,10000)
T  THEBSSW=1/2,5/3,5/3,5/3
L  CSW,K=CSW,JFDT*(CSWCR,JK)
N  CSW=100
R  CSWCR,KL=NCMWCR
C  HCSWCR=1.5
SPEC  IT=.5/LENGTH=100/PLTFER=2

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