THE STRATEGIC EVOLUTION OF THE PERSONAL COMPUTER INDUSTRY

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Abstract

This study investigates the strategic evolution of the personal computer industry, looking specifically at the strategic forces that define the structure of the industry. The analysis uses a series of case studies of the major competitors in this industry. Using information on each company's marketing, manufacturing and corporate strategies and industry-wide data, generalizations about the industry's structure and conduct are made. Changes in the structure that have occurred as the industry evolved are discussed.

The structure of the personal computer industry can be characterized by an intense rivalry among competitors, a very powerful distributor network, a seemingly unstable supplier market which is currently in balance and increasing barriers to entry. There is no threat of substitute products from outside sources at the present time. The industry has changed from one that is technology driven to one that is market driven.

Three factors for competing in this market stand out: distribution, low cost production and software availability. Strategic sub-groups of firms competing along similar dimensions have developed with each sub-group requiring different tactics and strategies for success.

Thesis Supervisor: Zenon S. Zannetos
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Chapter 1

Introduction

At any point in time, various forces act upon an industry to help define its structure. These forces change as the industry evolves, emphasizing one set of characteristics for successful competition at one time and another set at a later date. This thesis investigates the evolution of the personal computer industry, looking specifically at the strategic forces that define the structure of the industry.

The analysis takes the form of a series of mini-case studies of the major competitors in this industry. For each company reviewed, its marketing, manufacturing and overall corporate strategies are described. Target market segments that are served by each company are also identified. From these cases and some industry-wide data, generalizations about the industry's structure are made. This analysis also serves to define strategic sub-groups that operate within the industry as well. The changes that have occurred as the industry evolves are also discussed.

The framework for the analysis is described in Chapter 2. The description of the major competitors is provided in Chapter 3. Using the format described in Chapter 2, the analysis of the structure of the personal computer industry

is provided in Chapter 4. Chapter 5 concludes with a description of the strategic groups that operate within the industry and discusses trends for the possible different futures of the microcomputer industry.

In the remainder of this chapter, a definition of microcomputers as used in this analysis is provided, along with some industry statistics about the size and form of the industry.

This analysis deals with the personal computer sub-set of microcomputers. Personal computers can be defined by the size, cost and features offered on a system. In general, the salient characteristic of the personal computer is that it is a computer which is used as a personal workstation. It consists of a microprocessor that permits the basic operations, an input mechanism (keyboard), and a display terminal (usually a CRT or a TV hook-up). In addition, it may have a modem, to offer a communications link to data networks or other systems; an output printer, either dot matrix or letter quality; and some external storage capability, typically hard or floppy disk or cassette tapes. The prices can range from just about $100 for an extremely limited computer to about $5000 for a system equipped with all the options. The prices for use by the large corporations can be as high as $10,000 per personal computer.

Background

The microcomputer industry has grown from a few companies operating in 1977 to about 150 companies competing in a market that represented over $2 billion in U.S. sales in 1982 and $6.1 billion in worldwide sales.[1] Projections for revenues for personal computer sales in 1985 range anywhere from $4 billion to $8 billion representing between 2 and 3 million units sold in 1985.[2] International Data Corporation estimates that the market will grow by 35 percent annually through 1986. Industry analysts also project that the business segment will be the fastest growing segment for the next few years. The basic system sales to large organizations may amount to $1.6 billion by 1985 according to International Resource Development, not including the cost of related peripheral equipment. Other analysts envision the home users market taking off in the mid-eighties. One estimate places the installed base of personal computers in use by 1990 in 66 million households.[3] In any event, the market is currently growing into a billion dollar industry over the next few years.

Market shares for the major competitors in this industry are shown in Table 1. Most notable in this table is the shifting that has occurred over time in the market shares among competitors. The original personal computer manufacturers did not last through 1978 after the entry of

Table 1

Market Share Estimates

Company	1976	1978	1980	1982
MITS	25%			
Imsai	17%			
Processor Technology	8%			
Apple	10%	27%	26%	
Commodore	12%	20%	12%	
NEC	5%	11%		
Radio Shack-Tandy	50%	21%	10%	
Hewlett-Packard	9%	7%		
IBM	17%			
Others	50%	28%	18%	17%

Source: 1976,1978 from Personal Computer Classnotes, Hoo-min Toong; figures based on unit sales.
1980,1982 from Dataquest Inc.; Business Week, "Can John Young Redesign Hewlett-Packard?" December 6, 1982: 72. Figures based on dollar sales.

Apple and Tandy into the personal computer market in 1977. These companies still play major roles in the industry along with other competitors such as IBM and DEC. A more detailed discussion of the major competitors and the shift in market share that has occurred as the industry evolves will be provided later.

User Segments

The market for personal computers can be divided into five different types of users--home consumers, professionals, small businesses, large businesses and educational users-- although an absolute distinction is hard to make. One estimate of the relative size of user markets by unit sales and sales revenue are shown below using a somewhat different grouping:

1982 Sales

	unit	revenue
Business	55%	65%
Home	26%	15%
Science	15%	16%
Education	4%	4%

Projected 1985 Sales

Business	51%	69%
Home	31%	13%
Science	15%	16%
Education	3%	2%

Source: Stanford Research International, Personal Computers: Strategies for Success, 1982.

The home users are classified as purchasing systems costing from $50 to roughly $600 in price. They use them for entertainment as well as information storage and

retrieval and educational purposes. The companies serving this market in the past have been Timex, Atari, Commodore, Texas Instruments and Tandy, and other lesser known companies. Their market shares for the computers for the home market shipped in 1982 are as follows:

Atari	13%
TI	17%
Commodore	22%
Sinclair	35%
Other	13%

Source: International Data Corporation, Fortune, May 16, 1983: 25.

The professional user typically conducts financial planning, word processing and analytical problem solving in addition to information retrieval and storage activities on the personal computers. The most prevalent application purchased is word processing, accompanying up to 64 percent of the industry's machines purchased, although it ranks first in applications used in only 17 percent of the cases.[4] These generally range in price from $1000 at the low end to about $3000 for a system. The professional user will also want peripheral printing and graphics capability. As a subset of this user group, the scientists and engineers want systems that perform specialized functions. Examples of systems oriented toward the professional user are the Apple II series, the IBM PC, and Tandy's more advanced computers in its TRS-80 series. Market share estimates for the computers in this category shipped in 1982 are:

Tandy	13%
IBM	26%
Apple	13%
Other	28%

Source: International Data Corporation, Fortune, May 16, 1983: 25.

Other companies such as Osborne or Commodore participate in special niches of this market, Osborne offering a low cost portable and Commodore a low cost system with advanced graphic capabilities. The users in this group include both the individual professional working at home or in a small office and the small business as well. The small business user would additionally require some of the accounting software available for the machines.

Another group of users is the large business or corporate accounts. In addition to the functions listed above for the small business or professional user, this group requires some form of communication mechanism to interface either with other personal computers or with the office's mainframe or minicomputers. Prices for these systems range from about $5000 to $10000 or higher depending upon the extras. The large corporations would typically require computers with high quality printers, modems and large memory capacity. Systems for the corporate customer have been developed by Apple, IBM, DEC, HP, Wang, Xerox and Altos, to name some of the major competitors.

The educational uses of personal computers has become more widespread, with computers being used in elementary through high schools as an instructing tool although not without initial problems. Universities have also acquired personal computers for instruction and drill sessions as well as computational use by students. (Faculty use would fall under the previous grouping of professionals; administrative use would be grouped under business uses.) This group of users appears particularly attractive to the computer manufacturer, with Apple, Commodore, Tandy and others offering reduced prices or donations of equipment to this market segment. The importance of this sector will be discussed later in this paper.

These user groups are important to a discussion of the evolution of the microcomputer industry for a few reasons. First, they serve as one manner by which to segment the market. Second, the user markets change over time, making it important to follow which market is growing or stabilizing in order to properly target a company's effort. The evolution of the industry has reflected the change in primary user markets.

Chapter 2

Structure of the Analysis

This section provides the basic structure for the analysis of the personal computer industry which follows in subsequent chapters. The structure and conduct of an industry results from the interaction of several forces which together determine the nature of competition and the market. As these forces change over time, the nature of competition changes and so the industry evolves.

One theory, that of the product life cycle, which can be applied to a product class such as personal computers, holds that the industry would progress through four stages of evolution. These are introduction, growth, maturity and decline.[5] The life cycle follows an "S-shaped" curve. Each of these stages can be characterized by various proper actions regarding general marketing strategy, including level of advertising, promotion and distribution; the manufacturing strategy such as the size of the plant; product modification as well as expected profit levels and margins. This theory has its share of criticism. One problem relates to that of a self-fulfilling prophecy, such that if a product is believed to be entering the decline stage and therefore promotion and advertising are withdrawn, then the product may in fact decline because of

that action.[6] Action of this type by management of a company may be extremely harmful. The product life cycle theory should not be applied so rigidly, noticing that the actual shape of the curve can change by a company's actions. Another criticism is that all products or industries do not have to go through all of the stages, nor do all stages have to last the same length of time. For these reasons it is extremely difficult to tell which stage the industry is operating at any point in time.

Philip Kotler, believing that the product life cycle model is static, has complemented this theory with a theory of market dynamics that holds that an industry evolves through five basic stages.[7] Market crystallization occurs in response to an unsatisfied need, supplying a product which generally serves the entire market. The market expansion occurs as competitors enter. As they more selectively serve a market segment, the market fragmentation stage occurs. This is usually followed by reconsolidation caused by a product innovation. The reconsolidation and fragmentation stages can recycle several times as an innovation takes over the market but then other competitors incorporate the innovation. The market may terminate if a completely superior product is found.

The literature on industrial organization concerns itself with the organization of producers in a market and

the resulting market performance. In this sense, market performance relates to the "proper" allocation of resources to satisfy market demands. The framework offered by the industrial organization field for analyzing industries is incorporated into this analysis.

F.M. Scherer's framework for industrial organization, based largely on the model developed in the 1930's by Edward S. Mason, relates basic conditions operating on the supply and demand for a product or firm to the market structure, then market conduct and finally to market performance.[8] His work concentrates on the causal flow where conditions determine the structure which in turn determine conduct and performance. Feedback mechanisms also exist which permit conduct to influence structure and the basic conditions.

Richard Caves' work on the structure of industries has identified six main elements of great significance:

- o seller concentration
- o product differentiation
- o barriers to entry of new firms
- o buyers concentration
- o height of fixed costs
- o growth rate of market demand [9]

He emphasizes the importance of the first three factors to define market structure. For the personal computer industry it appears buyer concentration and growth of

market demand become important to the discussion of industry evolution.

In his book Competitive Strategy-Techniques for Analyzing Industries and Competitors, Michael E. Porter offers another framework for considering the evolutionary process for an industry based on the literature of industrial organization. Porter stated that an industry's initial structure is based on economic and technical factors of the industry, the specific attributes of the early companies and the constraints imposed by the small size of the industry.[10] The initial structure is characterized by five basic forces: the threat of potential entrants, the power of the buyers, the power of the suppliers, the intensity of the rivalry among existing competitors and the threat of substitute products. The evolutionary processes work to push the industry toward its potential structure although a range of potential future structures are feasible. Investment decisions by individual firms, whether for R&D, marketing or manufacturing, also play an important role in the evolutionary path for the entire industry. Porter has compiled a list of several evolutionary processes --forces that create incentives or pressures for change. These are as follows:

- o long run changes in growth
- o changes in buyer segments served

- o buyers' learning;
- o reduction of uncertainty;
- o diffusion of proprietary knowledge;
- o accumulation of experience;
- o expansion (or contraction) in scale;
- o changes in input and currency costs;
- o product innovation;
- o marketing innovation;
- o process innovation;
- o structural change in adjacent industries;
- o government policy change;
- o entries and exits.[11]

The framework for analysis suggested by Porter's work will be used as the basis for describing the strategic evolution of the microcomputer industry. The works of Caves, Scherer and other industrial organization specialists were also used to shape the analysis. The different processes that are relevant to the personal computer industry will be addressed in a subsequent chapter. The strategic response to these process changes and the resulting industry structure will also be discussed.

The interaction of these five forces determines the market structure, conduct, performance and profitability of the industry. Not all forces, however, are of equal consequence in determining the form of an industry. Over

time the forces that are indeed important change as it evolves, although not necessarily following any pre-set order. A factor that is important at one point in time need not be as vital for successful competition within the industry at a later point. Each of the 5 forces that determine industry structure will be briefly described in the following paragraphs.

Threat of Entry-The threat of new entrants into an industry depends on the size of the barriers to entry and the expected reaction from existing participants. Porter describes 6 categories of possible barriers:[12]

- o economies of scales,
- o product differentiation,
- o size of capital requirements,
- o switching costs,
- o access to distribution channels, and
- o cost disadvantage independent of size.

It is important to remember that these conditions change over time.

It should also be noted that the barriers discussed here include Bain's three generic entry barriers: economies of scale, product differentiation and pure cost advantage.[13] As such, his theory is incorporated into this analysis.

Intensity of Rivalry among Competitors-Generally, rivalry among competitors can be considered intense if the

industry is characterized as having a few or several of the following characteristics: highly concentrated, experiencing slow growth, high fixed costs, high exit barriers, lack of differentiation, lack of switching costs, capacity augmented in large sections, diverse competitors or high strategic stakes. Intense competition along several lines such as price or advertising can have overall dysfunctional effects on the entire industry, although it may have positive impacts on the consumer in the form of lower prices.

Substitute Products-The pressure from substitute products results if the substitutes offer a better price/performance ratio than does the industry's product. This factor is more of an overall industry concern, where an effort on the part of all the competitors to form a front against the substitute product's entry can be more successful than just one firm's actions. The industry product should be differentiated from and superior to the substitute product for industry longevity. For personal computers the threat comes from calculators and minicomputers and office automation equipment.

Bargaining Power of the Buyers-The power of buyers is high if the industry is concentrated, they purchase large amounts relative to sellers output, the products are standardized or undifferentiated, there are few switching costs for the buyer, the buyers are price sensitive and

there is a threat of backward integration by the buyer groups. The buyers' power is important from the industry's point of view in that their additional profits due to power come at the expense of the industry's profitability. In the personal computer industry, the buyers have significant power over some of the industry's firms.

Supplier Power-The bargaining power of the supplier lies with their ability to raise input prices or reduce the quality of the input materials. Similar to buyers, their power is high if they are concentrated, sell to various industries, pose a threat of integrating forward into the industry, have differentiated products or require high switching costs. It appears that suppliers do not have much power over the industry competitors for personal computers.

These five forces interact to yield various strategies on the part of competitors in the industry. Each company tends to position itself so that it can exert an influence over the industry in some form. Porter has categorized three generic strategies for competing in any industry: a cost leadership strategy, a strategy of differentiation or a strategy focused in terms of market segment or geography. Return on investment can be high at either low or high market shares, but Porter cautions about being "stuck in the middle." Note also that the strategic advantage of one position may erode with the evolution of the industry.

The different strategies can co-exist within an industry. As companies develop their specific strategies, they tend to compete with smaller subsets of companies following similar strategies. These subsets are referred to as strategic groups and basically represent those companies that compete along the same dimensions. Even within the three generic strategies, several options exist for firms competing. These include specialization, brand identification, quality, technological leadership, channel selection, vertical integration, service, price and cost. The strategic groups can be thought of as acting as smaller industries which have constructed mobility barriers between the different groups. In addition, they can face different forces in terms of the bargaining power of both the buyers and suppliers, the intensity of rivalry both within and between the groups and the threat of different substitutes. For example, in the home users market for personal computers, home video games or hand held calculators may be the substitutes facing a strategic group targeting that segment. Alternatively, a substitute for a personal computer used by a large business is more likely to be a minicomputer. As with the other forces acting upon the industry, the strategic groups can change as an industry evolves.

Chapter 3

Major Competitors

The discussion in the previous section showed that there is no single path by which an industry evolves. Instead, following some broad structural guidelines, an industry's evolution depends largely upon the actions of the individual firms participating in the industry, their investment decisions, marketing strategies, manufacturing strategies and R&D policies to name a few. Also important is the individual firm's origins. Prior to discussing the specific firms competing in the industry, an overview of the early history of the industry is provided.

Early History-The personal computer industry was conceived with the development of the 4-bit microprocessor chip by the Intel Corporation in 1971.[15] The chip is the backbone to the personal computer, providing the central processing unit of the computer on a silicon chip measuring one-quarter inch on a side. By 1974, MITS, Inc. developed the first generation personal computer, the Altair 8800, which was sold in either kit form for about $400 or fully assembled for just over $600. Hobbyists were its primary market. Other companies such as the Imsai Manufacturing Corporation and Processor Technology offered similar kits. By 1976 these three companies comprised about one-half of

the market. The early kits did not have any input keyboards, nor did they have output terminals. Their orientation was toward hobbyists having electronics backgrounds as well as some knowledge of hardware. The performance of the personal computer was a function of how well the consumer soldered and assembled the parts and debugged the machine.

The next generation of personal computers were fully assembled, plug-in units having input and output devices. These were first marketed by Tandy Corporation and Apple Computer and still directed toward the hobbyist/home user, although the user did not need to be familiar with electronics. With the availability of these units, the personal computer industry was born.

It is not surprising that by 1978 the original three major competitors in the personal computer kit market had failed. The industry was in fact different from the one in which they had been operating, requiring different manufacturing and marketing skills and more financial resources. The discussion of the industry's evolution will proceed using the industry as it appeared in 1977 through the present time.

Another factor of importance to the rise of the industry is the sequence of changes that occurred in the related software industry. In order to sell assembled systems, an operating system which is the program that

controls how the different components work together, was necessary. CP/M, Control Program for Microcomputers, was developed by Digital Research in 1976.[16] In order to have non-technical users program the computer, a high level language was developed by 1976 for the personal computer called Microsoft Basic. A third component of this supporting software industry was a distribution network for applications programs which led to the rise of software "publishers." Applications programs are those sets of instructions that tell the computer how to execute specific tasks. By October 1979, VisiCalc was developed which was a major step in applications software, providing basic spreadsheet, "what if" calculations for the non-technical user. These basic advances helped to pave the way for the growth of the personal computer industry.

Origins of Competitors- The firms that participated in the industry in the past and those that are still competing emerged from several sources. The original participants were either start-ups such as Apple or were established companies that expanded into the personal computer industry from some form of consumer electronics background, as did Tandy Corporation/Radio Shack and Commodore. By 1978 the industry was fairly concentrated with Apple, Commodore and Tandy comprising almost 75 percent of the industry. As of 1982, these companies comprised just under 50 percent of the market. Between these time periods, several start-up

companies entered as did other established firms.

During a period of industry emergence, entry is relatively easy. There is generally a low cost of entry, low level of brand identification, input supplies are still available, and in the case of personal computers, venture capital was available for financing. As the industry emerges the nature of competition changes. This attracts different types of entrants. Start-ups can still succeed if they have capital available and either serve a particular niche, have a better product, have a marketing innovation or lower costs. Osborne was able to enter this market as a start-up selling a low cost portable computer. Several of the companies which entered the market as start-up firms, such as Vector Graphic and North Star are running into some difficulty competing and some have already folded as did Friday Computers, Inc.[17]

As the industry evolves and makes its presence as an established industry known, major corporations are more likely to enter. In the personal computer market, this trend was evident especially for major computer producers in the mainframe and minicomputer markets. Specifically, IBM entered in 1981 lending more legitimacy to the industry. Other computer manufacturers who entered included Digital Equipment Corporation, Data General and Hewlett-Packard, out of necessity due to a declining minicomputer market in part brought on by the personal

computer manufacturers. These companies can enter without severe retaliation on the part of existing companies because of their brand images, large financial resources, related technology and an industry shift toward the business market. Office automation companies such as Xerox and Wang extended their lines to include personal computers, targeted more for the larger corporate accounts.

Not all major corporate entries succeed, however. One example is M/A-Com's entry through acquisition in 1980 of Ohio Scientific Inc., a personal computer manufacturer. M/A-Com underestimated the level of competition and the financial resources needed to compete successfully in this market.[18]

One last category of company origins should be discussed. As a subset of start-ups, spin-offs are relatively widespread in emerging industries. During this time period, spin-offs occurred due largely to employees of personal computer makers realizing the financial rewards possible from equity participation in a personal computer company. Having experience with that industry through their current employment and possibly having proprietary knowledge of the manufacturing or marketing processes or of the product itself, employees start up their own firms and compete with their former employers, usually along a new strategic path.

The remainder of this chapter deals with the major

U.S. companies operating in this industry. For each major competitor, a description of its background, its marketing and manufacturing strategies and its general policy by which it competes is addressed. This is followed in the next chapter by a description of the strategic groups within the industry and the structure of the industry.

Company Descriptions

Apple Computer

Apple Computer Inc. was one of the first companies to successfully market a fully assembled personal computer on a large scale basis in 1977. Its history and reactions reflect much of the manner by which the industry has evolved. Apple represents a start-up company having its origins in a California garage by engineers Steven Jobs (Chairman) and Steven Wozniak (former Hewlett-Packard executive). The Apple was initially sold to hobbyists but with the production of the Apple II rapidly spread to a professional market. Its current markets include business and professional, educational, scientific and home users, having the largest share of the professional users market. Apple has been successful in going from nothing to a company with 1982 sales of almost $600 million.[19] The company went public in 1980. Apple's success lies in part due to its ability to "demystify" the computer for consumers.

Apple has concentrated heavily on the development of software as a factor of success in the microcomputer industry, encouraging independent developers to produce applications. In addition, the distribution network for the Apple computers is of major significance to a strong competitive advantage. Although Apple has been very successful in achieving a large library of software consisting of 16000 programs, it has encountered some problems with the network of dealers. It depends upon independent dealers (over 3000 in 1982) to sell its machines, but has run into some disagreements concerning the practice of discounting by these dealers.[20] Due to its dependence on independent dealers, Apple has arranged financial assistance programs, good credit terms and sales training programs to enhance the desirability of carrying Apple Computers. Apple has discontinued mail order sales because of the lack of after sales service and support that prevails in this channel. Markkula, President and CEO, at one point ruled out the possibility of either opening up a chain of Apple computer stores or of hiring a direct sales force.[21] This attitude, however, has changed with Apple now looking at vertical market development and staffing a group to focus on marketing to particular groups. It has started to train national account dealers to develop large corporate accounts as well.[22] Even more indicative of the future is Apple's recent announcement of the selection of a

new president experienced in a market driven company.

Overall, Apple's objective is to be a leader and innovator in the market, offering superior quality products that have particular value to the users. The company has engaged in aggressive marketing, advertising and promotional campaigns to increase public awareness of personal computers in general and Apple's in particular. It has attempted to reduce costs through manufacturing changes and technological improvements, managing to double the productivity of the Apple II during 1982. Apple has also initiated a delivery program where inventory arrives "just in time" to be used, effectively reducing costs of inventory, storage and handling.[23]

Apple's management also plays an important role for it as a competitor. Poor management control was the prime reason for problems associated with the Apple III. It was released too quickly in 1980, with several technical flaws that forced its recall and re-engineering.[24] The fast growth experienced by the company has led to little control and a seemingly chaotic atmosphere. The company has been reorganized to reflect a more decentralized managerial structure. The problem with the Apple III, however, made them lose time and face and allowed other competitors to gain a stronghold in the market.

Apple's latest product LISA, is targeted for use in larger offices, carrying a price tag of $10,000. Its

features include extensive graphics and a device called a "mouse" which permits the user to point to and manipulate data thereby providing a user friendly interface. Its primary edge is that it takes only 30 minutes to learn how to use LISA and is lower priced than similar units. It is for this latest product that Apple requires development of a national account sales force.

The development of LISA represents a change from hardware emphasis to an increasing importance of software development. As an example, software for LISA took 200 man years to develop; software development time for Apple II was 2 man years and for the Apple III was 25 man years.[25] This clearly shows a change in focus and employee utilization.

Overall, Apple's strategy has been very successful but is primarily based upon early entry. Another start-up company could not enter with that strategy now. The technical and managerial problems it faced in the past seem to have taught the company some lessons concerning managerial controls and marketing. Such problems in the current market would have more severe ramifications for a company.

As the industry evolves, Apple's advantage of software availability lessens relative to new competitors. For future success, Apple must continue to innovate. One major issue facing Apple in the future will be the direction for

new products-- whether a more business or consumer orientation will be assumed or even a more complete line of Apples stretching into low priced consumer markets as well. By introducing the LISA computer, Apple made a choice to enter the business market where it perceived higher margins and a larger market.[26] It basically entered a new market with a new product, facing new competitors; a combination in which it is difficult to succeed quickly.

Digital Equipment Corporation

The Digital Equipment Corporation is a relatively new entrant into the microcomputer market, introducing its line of desk top personal computers in May 1982. DEC, a major manufacturer of minicomputers in the 1970's, expanded into the areas of office automation, small business systems as well as professional personal computing due in part to the change in the market for minicomputers. The profitability of DEC remained high in 1982, despite the state of the economy.

DEC's marketing strategy for personal computers was to develop a line of computers that could serve users' short and long term needs. In its planning, Digital looked thoroughly at the current use and expected future applications of microcomputers and sought ways to make them both easier to learn and easier to use.[27] Due to DEC's late entry to this market, current uses could be observed.

Digital entered the market with three different personal computers to account for the range of needs identified in their earlier research. Each of the three computers had different microprocessor chips but used the same modular components and packaging. This would permit economies of scale in production and design.

DEC's line was aimed to fill a large range of needs, although generally focused toward the professional market. One computer was designed to run industry standard software while being more powerful and faster, due to dual processors, than other systems of the same type.[28] The second was developed around a PDP-11 processor enabling it to interact with larger minicomputers in offices. The third was to be the foundation for the total office system offering specialized software. DEC has marketed its personal computer through its sales staff and through its retail outlets.

A classified software program was initiated by DEC to facilitate the development of applications software for DEC's new personal computer line.[29] This system permits outside development of software, but maintains a degree of quality control through the Digital Software Seal.

Quality has long been a goal reflected in DEC's operations. In addition, its basic overall strategy is that of a low-cost producer; its size permits a cost advantage through both economies of scale and experience

curve effects. This situation also permits prices to be set initially low (lower than costs) expecting costs to decline at a later date, yielding profits. This would not allow other less efficient producers to enter at a higher price which reflect the actual costs they incur. It has achieved backward integration into the production of the microprocessor chips it uses.

Part of Digital's overall success has been its management style. It is organized as 18 separate business units, permitting more efficient operations.[30] The company pays particular attention to human resource management, keeping its engineers in touch with academia, and providing courses for its management staff. This permits the company to be in tune with the latest technological advances and as a result has had a high success rate for new product development in the past.

The strategy it follows is also used by other minicomputer manufacturers. Low-cost production coupled with a complete business line and staff to market the products should permit success.

Commodore International Corporation

Commodore entered the personal computer market in 1977 competing initially in the home video game market to "move computer literacy into the home" according to Commodore's President H.E. James Finke. [31] It has expanded its line

to focus on the consumer computer market. Most of its sales in 1981 were outside the U.S. (60 percent) although Commodore has re-targeted its effort toward the U.S. market. It operates as a low cost producer having a fully integrated manufacturing operation, where it produces its own microprocessor. It asks a low price for a machine that is quite powerful by industry standards.

Commodore's marketing practices in the U.S. have left it somewhat at odds with the U.S. computer distributors, as it favored European dealers for supplying product, parts and service during 1981. Commodore has expanded its distribution networks, looking toward such computer stores as ComputerLand and MicroAge as well as mass merchandisers and discounters as Sears.[32]

Commodore held the number two slot in terms of market share as measured by revenue in 1980 and ranked third in 1982. It still continues to compete aggressively on price. Commodore is developing a new plug-in attachment that will make one of its models compatible with Apple's software, breaking down that mobility barrier in the industry. The Commodore 64 was aimed directly at the Apple II market and will probably prove successful if it does achieve compatibility with Apple software.

Success of this strategy relates somewhat to early entry, as was the case with Apple, but also depends upon the high degree of backward integration. This permits

guaranteed supplies, low costs and therefore high price/performance ratios. Its initial problems with distribution have been resolved and its problem with a lack of software is currently being addressed. Commodore will retain a presence in the industry, although its position will be reduced from what it was in the past.

Hewlett-Packard

Hewlett-Packard (HP), a designer and manufacturer of precision electronics instruments and systems for measurement, analysis and computation, entered the market for personal computers relatively late in January 1981. Although as a product the personal computer was similar to HP's other high-technology lines, it differed significantly from a marketing viewpoint. The company, which was traditionally organized to support an engineering, entrepreneurial staff, was entering an area where marketing was of significant importance. This aspect was reflected both in its products and its organizational structure.

As a result of entering the personal computer market, in March 1983 the computer group was reorganized to consolidate the research and development, production and marketing of their hand held calculators, and personal and portable computer divisions.[33] This change should result in higher performance and lower costs.

The product and related peripherals being offered

differ from HP's usual lines in that HP does not usually provide applications support to the extent that the personal computer market demands. As a response to this, HP has set up an applications development division. In addition, the company will have to compete more on price while maintaining its competitive edge for quality goods in order to gain market share. In the personal computer market, share is important from the point of view of the dealers being willing to carry a company's line and in software developers being willing to develop applications for a company's product. Although HP has not competed to win market share in its other product lines, its marketing strategy has changed somewhat in this market to be more competitive on price and gain share. HP also looked to reduce costs through sharing components and automating production throughout divisions.[34] It appears that the company has changed its strategy from a passive one where a "good product priced properly" will generate volume to a more aggressive one of competing along price as well.[35]

Success in the personal computer market rests with HP's ability to operate with its changed organizational structure and marketing strategy. Still, HP competes on technology, performance, reliability and service to some extent. The company has targeted the manufacturing sector with which it has dealt in the minicomputer market, as a particular niche in addition to its orientation to

scientists. HP does not carry any debt but instead finances from within. Due to this it must enter markets offering a quick return on investment for continued growth.

International Business Machines (IBM)

IBM, the long-time giant in mainframe computers, entered the personal computer market in August 1982 with its PC model. Priced at $1500 for the basic unit, it was aimed to compete against Apple and Tandy. By 1982 it had captured 17 percent of the market in terms of sales revenue, and is now selling about 20,000 units per month in 1983.[36] Much of its initial success can be attributed to its excellent reputation, brand loyalty, the familiarity of its keyboard and its skillful introduction which included high levels of advertising and an 800 number Hot-line.

IBM's product is directed at the business and professional segments of the market. It is marketing the personal computer through its own product centers, through Sears and ComputerLand retail stores and to large education and business users through a special marketing team.[37] It also sells through catalogues and mail orders. The PC has been used in the home market, accounting for 15 percent of the units being used for non-game purposes.[38]

In addition to new distribution and marketing outlets for IBM, the PC has resulted in other changes in IBM's usual operating manner. Although traditionally a company

that produces components in-house, the PC uses an Intel chip, non-IBM hardware including a Japanese printer and a Taiwanese CRT monitor, and non-IBM software, choosing to to pay royalties to its employees and independent developers for software applications.[39]

IBM's strategy generally includes low cost production and low cost distribution. Low cost production will be achieved through shared components such as keyboards and memory devices in its computers permitting economies of scale. Efficiency is seen as one of the important characteristics of this market. It targets high growth markets such as the personal computer market and has reorganized its management structure into fewer product groups. A corporate management committee (CMC) controls such decisions as pricing to limit competition between product groups and coordinate products. IBM's CEO, John Opel, has a strong marketing background and as such does not let IBM forget about the importance of marketing and in particular customer service. Whether this last attribute is carried through to its personal computer home user market is yet to be seen. Some complaints have been placed against the IBM PC including that relating to a scarcity and lack of sophistication of programs available for the IBM system.[40]

Within the next six months, IBM will introduce a product called "Peanut" to compete in the lower priced

market ($600-750) to be sold through mass merchandisers.[41] This would have it compete against Commodore, Texas Instruments and Atari. Its entry would try to induce a home computer for "less frivolous" uses than games, such as for education or lighting control.[42] Other extensions speculated at this time include an updated PC II, with an improved color monitor and a hard disk drive, and "Rover," an add-on to one of IBM's dumb terminals, turning it into a personal computer that could communicate with IBM mainframes.

The success of IBM's strategy is due largely to the fact that it is IBM. Its reputation allowed it to enter late and build distribution channels quickly. To compete effectively, it altered many of its past strategies concerning distributors and suppliers to correspond with the demands of the market. One other advantage that IBM has is its personal computer's potential to tie into IBM mainframes. IBM entered with a product offering no real distinguishing features except its name; another company would not be as successful with this type of strategy.

Tandy Corporation

The Tandy Corporation, a major manufacturer and distributor of electronics equipment to individual consumers, was one of the early entrants into the personal computer market. Tandy/Radio Shack originally sold microcomputers to the

hobbyist. As the market for microcomputers has expanded, Tandy's sales have increased, although its relative market share has declined (from 21 percent of total sales revenue in 1980 to 10 percent in 1982 according to Dataquest).[43] Despite the increasing competition, forcing a decline in prices, Tandy has followed a policy of maintaining reasonable margins on their computers.[44] The company operates with high manufacturing efficiencies controlling 50 percent of their total manufacturing costs.

Tandy's major advantage, along with being early to market, is its experience in retailing and its network of consumer stores. The company has approximately 5500 stores, 3000 dealer franchises and roughly 500 computer center stores worldwide.[45] The company instituted a marketing concept of computer departments in about 700 Radio Shack stores.[46] These departments are staffed with specially trained computer marketing representatives and have shown to be successful. The company controls 100 percent of the distribution of its microcomputers, allowing tight controls and consistent pricing activities between outlets.[47] Discounting, which has become widespread with other manufacturers products due to independent retailers, is avoided since the corporate office sets the prices.

Tandy's operations are being effected to some extent by the competition's actions. The move toward standardized software and an abundance of that software, has led Tandy

into the licensing of software. In addition, the stores now provide service and training for their products.

Although it offers an extensive line of computers ranging from hand held to large microcomputers designed for businesses, its major market has been in the consumer group, serving the home market. Analysts question its ability to really break into the business market. The high end of its line is aimed at large businesses, a growing segment of the industry. Radio Shack, however, has an image problem with purchasing agents or MIS directors. To counteract this problem, Tandy has started a national field sales force to actively market their computers to mid-sized businesses. Interestingly many of their initial staff of 25 previously worked in mainframe computer sales for Honeywell.[48] Appearance changes to enhance the appeal of the computer to businesses were made, providing a cream colored computer to replace its gray system. In addition to having a good product, Tandy must overcome the image of a consumer products oriented company and show that it can compete in a business environment, providing service and software support as well.

Its strategy, which was initially successful due to early entry and a broad distribution network, alone is not enough in the current market. Its share is declining and will probably continue to decline in the future. Tandy 's ability to expand into the business market is questionable.

Lower prices in the industry conflicts with a goal of high margins in their retail outlets.

Texas Instruments

Texas Instruments (TI) is an active participant in the market for consumer use of personal computer, holding approximately 27 percent of this market in 1981.[49] TI competes against Apple, Commodore and Atari in this market, although does not offer as powerful computers as the others at this time. The TI 99/4A home computer and related peripherals were successful products for TI during 1982.[50] Due most probably to increasing competition, TI offered a $100 rebate on its unit, bringing the base price down to as low as $150 when coupled with other store specific promotions. This helped to expand the size of the market for personal computers, offering a home product at a relatively low cost. In fact, demand exceeded production capacity at TI for the 99/4A in the fourth quarter of 1982.[51]

TI is competing in the personal computer market as it does in its other markets --primarily as a low cost producer providing low priced products. TI has stressed several key thrusts toward successfully competing in a market. High volume production provides a means to move quickly down the experience curve cutting costs of production along the way. In addition, experience with

other similar products allows shared experience to help lower costs more quickly. Being first to market also helps in this endeavor. Although not first to market with a microcomputer, TI was an early entrant with high volume sales.

TI competes aggressively on price, using a design-to-cost method which incorporates expected future price and performance levels as a parameter in the design of a product.[52] The technique usually entails a pricing policy that initially provides lower margins with the expectation that costs will eventually decline, raising the margins but capturing early market share. Costs are also controlled at the distribution level.

These key thrusts typically permit TI to capture a large market share. In a fast growing market such as personal computers, TI has typically kept capacity ahead of demand. As mentioned earlier, demand exceeded production capacity for its personal computer in 1982.

Texas Instruments has a very structured hierarchy of corporate goals and business objectives, and a system of objectives, strategies and tactics (OST) for its operations. Among its goals are increased productivity and reduced costs. These are carried out in part through an organizational operation that motivates its employees to innovate. Despite this structure and support system, TI does not appear to be completely overcoming its image as a

manufacturer of calculators and games not computers. In addition, although TI offers a low-priced computer, it is not the lowest price computer on the market.

Xerox Corporation

The Xerox Corporation only recently entered the personal computer market with its line of number 820 computers. Due to increased competition in office equipment and a weakened economy, Xerox's profitability declined by 29 percent in 1982.[53] The introduction of personal computers and related peripheral equipment was one way by which Xerox would attempt to confront the growing competition.

Among Xerox's objectives is leadership in the office equipment and information industries, and cost-effectiveness in all aspects of its operations. In addition to their goals for product leadership in copying and electronic printing, Xerox aspires to leadership in office workstations and office information systems. These objectives illustrate why Xerox entered the personal computer industry and to some extent, how it will compete in that industry.

Xerox's microcomputers are aimed at the business user, corresponding to the development of office work stations. A recent change in the sales organization helps to facilitate the sale of personal computers to businesses.

The sales organization has been retrained to sell the entire line of Xerox products, including the personal computers, making the total office system more feasible. The computers are also available through authorized dealers of office equipment. Furthermore, Xerox has switched to a concept of strategic business units for the development of new products.

Xerox's entry into the microcomputer industry appears to be a logical course to follow. The technology is not completely new to Xerox as their duplicating machines are equipped with microprocessors. Their existing large R&D facility also permits a relatively low marginal cost of developing the product. The sales staff already have made contacts with businesses through their copying equipment which may serve to help or hinder the success of the product. Since the image of Xerox is as the leader in duplicating equipment, it may be hard to associate computers with "Xerox machines." Their advertising is attacking this image of producing only copiers head on. Their business relation with their current clients should, however, give them an opportunity to show their new skills. Xerox can also rely on their service record as an advantage to purchasing their equipment. It must be emphasized that they are battling against IBM in many of these companies which already use IBM computers and are used to IBM's service as well. Overall, success of the strategy by Xerox

relates to entry into an industry with similar markets and technologies.

Osborne

Osborne Computer corporation was formed to produce and successfully market the first portable personal computer, making it available in July 1981. The basic corporate strategy was to develop a low cost computer, (costing $1795 at a time when similar performance computers sold for $2500), that could fit into a brief case. Osborne's strategy requires low cost production, keeping low overhead while achieving economies of scale. This is done by using standard industry components in its computers and putting price before aesthetics and unnecessary extra features.[54] Software costs are kept low by relying completely on industry software, getting special discounts from major software companies in exchange for equity share of Osborne.[55] This permits inclusion of otherwise costly software with the basic Osborne portable unit. It was the software that also provided some credibility to the product. The product is sold through several retail outlets including ComputerLand. The competition for portable computers has been increasing with companies offering larger screens, lower prices and similar software but in a more compact form. Still the margins associated with selling Osborne's are at 30 percent, typically double

the levels some other companies are achieving.[56]

The success of Osborne Computer, getting $100 million in revenue in 1982, has been largely due to the attitude of Adam Osborne. He considers himself an entrepreneur and will get out of the company's operations and concentrate on new products in early 1983 as the industry matures. Osborne Corporation went public in March 1983. Being first to market with a product that served a particular need was its key to success.

Atari

Atari, a division of Warner Communications, was an early participant in the personal computer market primarily through its success as a manufacturer and distributor of home video games. Atari has replaced its computers at the low end of the price scale. Its identity as a personal computer has been clouded somewhat by its success as a game producer. During 1981, Atari held approximately 10% of the market for consumer personal computers (Future Computing, Inc. estimate) and 13% during 1982 (International Data Corporation estimate). Overall, its share and relative presence in the total industry has been declining with the growth of the market for professional computers and entrants such as IBM, DEC and HP.

Warner Communications is dedicated to achieving success in this industry. To draw on its installed base of

10 million Atari 2600 home video games, Atari has recently unveiled an attachment to convert it into a home computer.[57] This should be available on the market in the second half of 1983. It also introduced the Atari 1200XL which has a 64K memory, in line with Commodore's and other competitors' models.

As part of its manufacturing policy, Atari has moved all its production "off shore" to reduce costs and increase capacity.[58] Its marketing strategy relies on extensive retail outlets to sell its products, totalling 15,000 in 1982, of which one-half are department and mass market stores. This permits it to target sales to the appropriate consumer market. It has also encouraged software development by third parties. Another interesting strategy is in the organization of the Atari Computer Camps to instruct children in computer programming, using Atari equipment, of course.[59] Atari has entered the international market where its sales were capacity constrained. Following these strategies Atari expects to achieve profitability from its home computer division in 1983.

Its ability to draw upon the installed base of home video games gives it a particular advantage. Its strategy in this market is consistent with its previous strategy, targeting home users in other products. Atari would not be successful at entering the large business market, nor does it have current plans to do so.

Other Competitors

With over 150 competitors, a detailed description of each cannot be provided. What has been attempted is a description of the major participants in this market and other companies that fill particular niches of significance permitting successful operations. This discussion is appropriate for determining how the industry is operating. A few other companies that will permit a more full characterization of the industry will be discussed in the next few paragraphs.

Timex-Timex is also a major player in the low price consumer market. The Sinclair 1000 was considered unique when first introduced in July 1982. Of particular importance was its price set at $99.95 and its distribution network, which included the 100,000 retail outlets that carried Timex watches.[60] In the current market, the 12 ounce Timex-Sinclair can be bought for as little as $50. Clearly not as powerful as other computers, the Sinclair filled a low-priced niche, making computers readily available for less than $100.

Franklin-Franklin Computer Company deserves mention for the policy it is following. It is manufacturing and marketing the Ace 1000, an Apple compatible computer. It carries a price that is 20 percent lower than Apple's and offers high dealer margins. These two aspects of the Ace

make it competitive in a market that would otherwise not readily accept an entrant in 1981. Franklin Computer purchases the processor chips and drive mechanism and subcontracts the final assembly of the units.[61] Initially dealers would not handle the Ace, so Franklin pursued the mail order houses, taking advantage of the break between Apple and this line of distribution in early 1982. Apple has brought suit against Franklin for patent infringement. As prices for Apple computers fall, Franklin's sales will suffer.

Japanese Competitors

Although the number of Japanese competitors has been increasing, the most significant force in the U.S. market has been Nippon Electric Corporation (NEC). Ranking fifth in terms of market share as represented by revenue in 1980, NEC has moved into fourth place, holding 11 percent of the total worldwide market for personal computers in 1982 (Dataquest, Inc. data). Their computers are imported through a NEC subsidiary that markets them in the U.S.using a direct sales force and retailers. Japanese personal computers do not yet play a significant role in the U.S. market, but are considered a real threat for entry in the near future. In addition to NEC, Matsushita, Sony, Fujitsu, Toshiba and Hitachi are offering a full range of personal computers. Sharp, Casio and Sanyo are offering

the less expensive, less powerful home computers.[62] Over 12 Japanese companies are shipping computers to the U.S. The entry of consumer electronics firms into this market represents a significant move in Japan.

Foreign analysts predict that Japanese personal computers could represent 20 percent of the U.S. market by the end of 1983. McKinsey's Tokyo Office predicts that the Japanese will eventually take over the personal computer manufacturing operations, either as original equipment manufacturers for different computers on the market now or under their own brand names, following the experience of the calculator and video tape recorder businesses.[63] It appears that this would happen only if the personal computer becomes a more standardized item, not depending upon particular software development. If the product does achieve standardization, Japanese producers may be likely to excel in mass manufacturing more efficiently as they have done with other electronic products.[64]

Chapter 4

Structure of the Personal Computer Industry

Several factors stand out as particularly important to most firms' competitive strategy. Although these factors change over time, at any one point in time they define the basic attributes of the structure of the industry. These will be discussed in terms of the five forces that determine the industry conduct and structure using Porter's framework. Two basic time periods will be addressed: the market's emergence stage and its current growth stage.

Certain evolutionary processes have an effect on the industry structure over these time periods. The long run changes in growth effect the intensity of the rivalry within the industry, with the intensity growing as the market matures. The buyer markets tend to change as well, as more segments are served and the segments have more knowledge of the products. Changes in the input costs and the input products affect the power of the suppliers.

Several processes interact to produce conflicting effects on the barriers to entry. The product and process innovations which accompany industry evolution tend to increase the barriers to entry. In contrast, it is easier for established companies to enter after the uncertainty of the industry's survival and its associated risk have been

reduced. It is also easier to enter once standards have been set and the proprietary knowledge has been diffused. Barriers to start-up companies increase since financial resources are not readily available and they can not benefit from accumulated experience.

What is clear from this is that several processes are interacting over time, producing conflicting forces in the industry structure at some times. This chapter addresses the forces of the industry and its resulting structure.

Threat of Entrants

As mentioned in Chapter 2, a barrier to entry permits established firms to raise prices above costs by limiting the number of new entrants. In its emergence stage, the personal computer industry was openly threatened by new entrants as are many emerging industries. Barriers to entry at this stage were relatively low: The cost disadvantage facing an entrant was lower; there was uncertainty as to the best route to follow; and products were not that well differentiated, not having developed brand images yet. At this stage some mobility barriers did arise. Between the three major competitors-- Apple, Commodore and Tandy-- Tandy by far had the advantage in terms of distribution. By having its own existing network of retail outlets, Tandy was immediately integrated forward into the buyers market. The other competitors had to find distributors willing to sell their products. Although some

retailers were trying to fill their shelves, the entire distribution network was much more limited in the 1970's. A new entrant would not be at a significant disadvantage to the existing companies.

Product Differentiation-This factor is of major concern to the firms in the personal computer industry. It is in this manner that many of the existing firms actually compete, trying to distinguish their product from another company's product. The differentiation can be along the lines of added features, software availability, graphics capability, peripheral equipment, quality or service. This is coupled with the need for a brand image to explain why a company such as IBM, well known for computers can enter and compete so successfully. It also explains why another company such as Atari, famous for home video games, and Xerox, known for copiers, would have trouble building up the appropriate brand image of computers.

Overall product differentiation may serve as a barrier to entry into a strategic group that competes along that dimension. It may, however, make it easier for a new firm to enter into an unserved market by offering a differentiated product that fills the need. Osborne's success in marketing a low cost portable personal computer can serve as an example of a differentiated product succeeding in the market.

Related to this is the issue of brand proliferation

where firms widen the lines they offer. For instance, IBM has plans for a smaller computer aimed at the home user and Apple has entered the large business market. This type of strategy makes it more difficult for a new company to enter the market. It would appear that existing firms rely on a combination of innovation and market research to anticipate potential positions of future entrants and fill the void before a new company does this is both a defensive and an offensive strategy on the part of the existing companies.

Economies of Scale-As the industry grows, economies of scale are playing a more important role as a barrier to entry. Due to the intensity of the competition, an entrant must be prepared to produce a large quantity to achieve low cost production. This will induce retaliation from the current competitors. If, however, entry was made at a small scale, the entrant would suffer from a cost disadvantage. In either case, the entrant is at a disadvantage to the current competitors. In addition, a minimum level of advertising and promotion of the new personal computer is required, below which level the program's effectiveness will be limited. Lack of financial resources to achieve this level will also put the entrant at a disadvantage. In addition, the cost outlay for advertising and promotion of the new personal computer is also substantial. Since advertising is important to this industry, lack of finances to achieve a sufficient level

will result in ineffective advertising and lack of awareness for the company's product.

Capital Requirements-The position of this category as an entry barrier shifts greatly as the industry evolves. Initially, it was difficult for companies to find capital for financing endeavors in an unknown industry. As the accelerating growth occurred and the future potential of personal computers was realized, venture capital was relatively easy to be found. At this time venture capital was becoming more difficult to find as the capital requirements increase and some personal computer manufacturers are failing. This serves to increase the barrier to entry associated with capital requirements.

Large sums of money are in fact needed to compete in this industry. Advertising and promotion expenses, R&D and now software development takes significant financial backing. Many of the personal computer manufacturers that are units of large companies use the financial resources of the parent company. Some of these firms only use equity financing for their facilities and expansion. Clearly, the role of capital in this industry as an entry barrier has increased as the industry has evolved.

Access to Distribution Channels-This factor is an important barrier to entry to the personal computer industry. As will be explained later, the power of the distributors is relatively high. A new entrant is not

guaranteed access to the conventional distribution channels because of the large number and variety of personal computers already on the market. At this point in the market's evolution, access to distribution channels is largely blockaded. Mail order houses may be more willing to take on a new company's product, provided the product offers some particular benefit not served by a current line already carried and offers good margins to the distributor. This is one way through which the Franklin Computer company has been able to sell its Apple-compatible machines. The barrier erected by the blocked access to distributors can also be lowered or removed if the product is so unique that it serves a wide need not currently served.

Cost Disadvantages-Cost disadvantages independent from those associated with economies of scale also currently serve as a barrier to entry. License fees must be paid to use industry standard software such as CP/M. Proprietary technology and patents can serve as cost barriers, the latter requiring licensing payments.

Another group of cost barriers result from the experience curve effect. This effect, as described by Abernathy and Wayne, states that the costs of production will be lowered by some fixed percentage for each doubling of output.[65] As the existing companies produce more, their ability to produce in a more cost effective manner increases. The new entrant would be less likely to achieve

the same low cost production. Again a few exceptions exist. If the company operates with a similar technology or similar market, the experience gained in that effort would be transferable, not resulting in a cost disadvantage to the new company. This is typically what is happening with the entrance of computer manufacturers and electronics companies. Another exception results if a new process innovation changes the production function so drastically that it is in the best interest of existing companies to adopt that change. If this does occur, the existing firm is in no better position than the entrant. In fact, such a drastic shift may leave the competing firm in a worse position as it may have capital equipment that has become worthless or an underutilized or inefficient labor force that it must maintain due to union contracts. A situation like this could arise in the personal computer industry if modular component manufacturing is replaced by console production.

Another cost disadvantage is the additional expenditure that a new company must incur to achieve the same effectiveness level from advertising. This occurs because the existing firms already have brand recognition which the entrant must develop through increased expenditures.

Overall, as the industry evolves, the cost disadvantages coming from these areas escalate in size and

can become a barrier to entry. In the emergence stage, cost disadvantage did not present such barriers to entry.

Software-The high cost of software development has made software serve as a barrier to entry. A new firm considering entry must either license rights to existing software or incur significant software development costs. If the company does incorporate the industry's standard operating system, it would not find many independent programmers willing to develop applications software for the company. Software was not a significant factor for barring entry in the early emergence stage of the industry. Its importance has increased as the hardware has become more of a commodity-like product. At this stage in the industry's evolution, it is assumed that the hardware in a personal computer works and that all basically function equally well. What serves to differentiate the products, in part, is the operating system and the software that is available for that system.

The 8-bit professional personal computers have predominantly adopted CP/M as the de facto standard. To this extent, Commodore has announced an attachment that will permit CP/M software to be run on its Commodore 64 computer. In this sense software, from the point of view of a potential entrant to the low cost professional market, has become a given cost. License fees must be paid for the use of the operating systems, these fees will guarantee the

availability of programmers for applications development.

On the 16-bit personal computers, three alternative operating systems exist-- CP/M, MS-DOS (used by IBM) and Unix (developed by Xerox to handle several users interacting in a system network).[66] Currently, all three are competing for the industry standard. Firms are hedging by producing several systems that use the three different operating systems until a standard is found. Apple's and Tandy's proprietary operating systems will probably survive as the industry matures because of the size of their installed base.

To further differentiate its products through software, TI has attempted to obtain sole rights to the applications written for it while paying royalties to the programmers.[67] Typically, applications are programmed for several machines by changing the commands to coincide with a particular operating system. This then eliminates the software advantage one company's machine has over another. The proposed TI system has been met with some resistance by independent programming houses and so the future of this type of system is not known. In any event, software will play an important role in the industry.

Software can be thought of as a product that is complementary to the personal computer. Another product which complements the industry is the information network systems that are being developed by some of the

manufacturers as well as other companies in the information industries. Availability of compatible networks and physical connections become more important within the industry as it grows.

Bargaining Power of the Buyers

The buyers, as defined as the distributors or retailers in this market, play an important role in determining the structure of the industry. Although its role has changed as different markets become prominent, the power of the distribution channels cannot be ignored in the current market. In order to understand how the distribution channels operate, the end user target markets must be identified. These will be paired with the distribution mechanism that is used in the industry for that group.

As discussed previously, the users can be divided into somewhat distinct categories: home consumers, professional users, small businesses, corporations and educational institutions. Home consumers are primarily served by the mass merchandising and department stores such as Sears. The computers sold to this segment are typically the low-cost computers, that offer the dealers relatively low margins. Due to the low margins, the special personal computer stores do not handle the low end since it is not worth the sales effort for the profit margin offered. A low cost item requires high volume sales, achievable

primarily through mass merchandisers. The merchandisers will carry only a few of the best known brands, typically Atari, Commodore and Texas Instruments to assure high volume sales. In mass merchandising outlets, products must sell themselves since the store salespersons are not specially trained and therefore have only minimal knowledge of the products. As the prices of the computers have declined and unit sales increased, the number of stores carrying computers has increased.

The professional user group and the small business users rely on similar channels for their purchases of personal computers. The group is predominantly served by the personal computer retail chain stores and manufacturer-owned retail stores. Since only one or two personal computers are purchased at a time, it would not be profitable for a manufacturer to train a personal sales force at this level.

The computer store, either independent or chain, serves a function much like the stereo or camera store; it sells several different brands, covering a variety of user needs in the professional and small business market. Neither the very low nor very high end personal computers would be carried in one of these stores. Since this user segment comprises a large and growing portion of the market the distributors serving this market have amassed a significant amount of power. These retailers currently

sell approximately 60 percent of the computers priced at about $3000 and could grow to 75 percent according to Future Computing Inc.[68] According to a LINK Resources survey, purchases of personal computers by the home or professional user segment are made as follows:

computer stores	27%
manufacturer stores	21%
electronics stores	21%
direct mail	14%
retail outlets	12%
toy stores	5%

Source: International Data Corporation, Fortune, May 16, 1983: 25.

It is estimated that a consumer spends about seven hours and three to four different trips to computer stores before deciding which computer to purchase.[69] This again points to the power of the buyer in this industry. Porter's theory concerning the sale of non-convenience goods, suggests that power accrues to the retailers for those goods that do not sell themselves, but are rather sold by the salesperson in the store. It is therefore in the interest of the manufacturer to get its product on the shelves in these computer chain stores and provide adequate training so the sales people will be able to properly sell the product. Industry consultants have stressed the importance of having the sales help speak the business language, not necessarily the technical language.[70]

Manufacturers have also opened retail stores to service these same markets. IBM, DEC and Xerox operate such stores in an attempt to achieve the dealers profit but, more importantly, to push their product. In a store with several brands the consumer has a choice, however, in a manufacturer-owned store, the salesmen are only out to sell one brand. It is earlier advertising and brand recognition that brings the customer into the company store.

This user segment may also use office equipment stores and systems houses for their purchases. The figures below represent the distribution channels for personal computers costing at least $1000 and are used by businesses.

Computer stores	50%
Direct from manufacturer	14%
Systems Houses	13%
Mail order	9%
Industrial Distributors	7%
Office equipment dealers	7%

Source: Future Computing Inc., "IBM's Microcomputers Gaining Primacy," Wall Street Journal, January 13, 1983.

One factor that is of concern to the computer manufacturer is who actually purchases the machine. For a small business, or a large business buying a few personal computers, it is probably the business manager or the end user, not the manager of the Information Systems

Department(IS). Selling to an end user is different from selling to the manager of IS, as each is concerned with different aspects of the alternatives available.

International Data Corporation estimates that MIS departments have been authorizing lower proportions of the expenditures on computers. In 1977, MIS authorized 88 percent of the acquisitions for all computers in terms of dollar value, compared with only 65 percent in 1982. IDC expects it to drop to 65 percent in 1985.[71] From the point of view of the business, both IS and the end user should be involved in the selection process to arrive at the best solution.

Large corporate sales are being made more frequently now through national sales forces. Whereas a few years ago a company buying a few hundred personal computers would make its best deal with a computer store, now these accounts are being pursued by the in-house manufacturer sales force. The major manufacturers such as IBM, Tandy, Apple and DEC have started to train sales forces to act much as they have for selling their minicomputers in many cases. This change has developed as the market has gone from one of hobbyists and individual professionals to one of business users. These staffs sell either the higher end of the manufacturers line or a package of products that enable interaction with existing computers or form the basis of an office automation effort. They are selling to

the IS manager, not the end users. Many of the manufacturers already have contacts in these organizations either with current word processing equipment, computers or photocopiers, and are competing to get the account for personal computers. The user segment now wants the personal computer to be able to interact with the databases in its minicomputer or mainframe computer and would tend to favor a computer that does just that. This would give the edge to the manufacturer that has the previous computing contract with that company. This factor, which can be thought of as a high switching cost from one manufacturer to the next, gives the manufacturer some power over the buyer in this segment. This is not an overwhelming edge, however, since as the industry becomes standardized interfaces will be available between more machines.

The educational buyer segment which includes the elementary schools, high schools and universities, are also served directly by the manufacturer. As mentioned earlier they are being particularly targeted by many of the computer manufacturers in the hope that what a student learns to use, he will eventually purchase. The time needed to learn a new system can be thought of as a switching cost for the buyer. Due to this situation, excellent deals are being made with this segment. It is definitely a buyers market in that regard. In this effort, several companies have offered two computers for the price

of one, excellent discounts and even donations of equipment. Apple has filed for a special tax break in exchange for donating an Apple computer to every public school in the country. From this type of competitive action it is clear that a foothold in the educational use segment is beneficial. The manufacturers believe that the students will buy the systems that they learn to use. In addition, The software purchases alone that follow the initial hardware purchase or gift to the school is quite profitable to the manufacturer.

A few other distribution channels that serve particular needs across user groups should be mentioned. Mail order houses serve the needs of the price sensitive portion of the market. This group is willing to trade service off for price as are the consumers who purchase from the mass merchandisers, although there is the reputation of the store backing the latter. Another specialized outlet has been the consumer electronic store, primarily dominated in the personal computer market by Tandy's systems in their own and franchised stores. Value added houses are those distributors that buy manufacturers personal computers and peripherals and package them in a form the consumer wants. One major type is the original equipment manufacturer (OEM) that purchases the microcomputer and adds value by packaging it in a system for a particular application. This would typically apply

to scientific or industrial applications. Other value added houses package hardware and software for specific business applications to sell as turnkey systems.

As can be seen from the previous discussion, the distribution channels used by a company differ by the target market served. A company will use several channels as needed to serve potential customers across the segments. The large manufacturers with their own stores and sales staffs have not relied solely on these channels but have expanded into the computer store outlets as well. The importance of a given channel of distribution has changed as the industry has developed. The power of the particular distributor has also changed.

Within the home market, computers have to sell themselves, because they offer only low margins. Here the manufacturer has some power over the distributors, providing promotions and advertising to help a product sell. The distributors for the professional and small business markets have power over the computer manufacturer. The retailer salesperson pushes the product for the manufacturer and so it is important that the manufacturer have a good relationship with the distributor. The distributor has no loyalty to a manufacturer; they will carry what is selling. The manufacturer resumes control over sales for the large corporate accounts.

As the market changes, so will the power structure for

the distributors. At the current time the distributors do exert a level of control over the manufacturer that they did not have when the industry was just emerging. Already there is some conflict between the different distribution channels.

One problem is the emergence of the discounters or the "gray market" for personal computers.[72] Retailers are selling some personal computers at discounts which are not authorized by the producer. Typically, selling only through authorized stores keeps prices high. Since the retailer receives discounts from the manufacturer for volume purchases, the store will purchase high volumes and then re-sell the "extra" computers to the discount houses on the gray market without the knowledge of the manufacturer, a practice called transshipping. These discount houses do not offer service, however, so the computers would have to be serviced through other retailers. The full-price retail stores lose sales as a result and have higher service requirements. The manufacturers are concerned about the pressure placed on reducing prices for their own and their competitors' products through these actions. Some manufacturers have tried to dissuade transshipments through different incentive programs but still practice volume discounts. Similar problems have arisen with dealers re-selling goods to mail order houses which again sell at discounts. The

action of the dealers have been in conflict in some instances, in effect weakening their collective power over the industry. The trade-off between service and low costs exists in the distribution channels.

As the pricing becomes more competitive and official dealer prices are lowered, discount stores and mail order houses will lose some of their attraction. The marginal difference between the prices in the full-priced and discount stores will lessen. The tradeoff will then be between only a slightly better price and lower service levels.

Substitutes

The threat of substitute products to the personal computer ranges from the hand held calculator and home video game in the home user market to minicomputers and word processors in the business segment. As the personal computer industry grows the threats posed by these substitute goods appear to decline due to excellent price/performance ratios over the last few years. The personal computer had become more a threat to these other products than do the other products serve as threats to personal computers. Personal computers can replace home video game purchases by offering both games and computational ability. The game market has rebeled, however, with Atari manufacturing an attachment to convert its home video game console into a personal computer.

Coleco also produces a home video game that is expandable into a personal computer and other home video game companies are threatening to do likewise.

Since the personal computer industry is still in its infancy, great changes in the equipment offered and technology are still being made. The threat of substitutes may be more real from the point of view of the industry itself making obsolete the products it is currently producing. In fact, this has already been happening. The 20 pound portable computer introduced by Osborne is being replaced by relatively powerful, very lightweight, small machines produced by Tandy, Epson and Japanese companies.[73] Tandy's new portable computer weighs under 1 pound and is the size of a notebook. Apple's IIe model forced sales on its Apple II plus and Apple III to fall, requiring Apple to offer price reductions to lower inventory. The new line of computers that use a pointer called a "mouse" to input instructions may replace the current generation of computers. Although Apple's LISA was initially priced for businesses at $10,000, it has been reported that a consumer version priced at $1000 is being developed and tested.

The threat of these types of substitutes is large. As the industry evolves, drastic changes in the form of the product can be expected. These innovations are made by the current manufacturers, which on the surface may appear self-defeating. The literature on management of innovation

reveals that companies that do not innovate in such an industry will be left behind. The argument takes the form of a price/performance curve of the new technology or product being above the existing one.[74] A company that pursues process improvements to the "old" product may find itself off of the operating price-performance curve as the industry evolves. The personal computer industry is in such a state at this point with significant product as well as process changes being made very rapidly.

The threat of outside substitutes may be lower than expected because of the entry of many of these manufacturers that produce the substitutes into the personal computer market. Many of the minicomputer and mainframe manufacturers have entered the market. This reduces the threat of an improved minicomputer overtaking the personal computer market. Over time, as the industry grows and matures, the threat of substitutes will probably increase.

Power of the Suppliers

As the industry has evolved from one where personal computer manufacturers assembled machines to one where they manufacture some parts themselves, the power of the suppliers has deteriorated. Still many of the component parts are bought from suppliers by these manufacturers. As discussed earlier, IBM is an excellent example of a firm purchasing components from different vendors for direct

inclusion in their personal computer systems. Although IBM purchases some microprocessor chips from Intel, it has tried to reduce Intel's power over its supply by purchasing a 12 percent minority interest in the company to enhance its research and development and probably achieve a priority allocation of chips.[75] IBM also purchases chips from other manufacturers and produces them in house as well. Commodore and DEC also follow policies of producing their own chips.

In addition to other input materials for their personal computers, many companies purchase components--keyboards, display terminals, printers and other peripheral equipment--from various vendors. As assemblers of personal computers, the companies offer different "bundles" of component products to consumers. Many sell unbundled systems as well, offering for example, a personal computer without a display terminal or printer. This opens a market for the supplier to sell its printer directly to the distributor for resale to consumers.

Products that are bundled and sold as a system result in reduced margins for input vendors as compared to their margins if sold to distributors. This, however, is offset by the volume sales and contract guarantees that go along with the manufacturer purchase. Suppliers can also sell components to distributors for use with other manufacturer's systems.

In a market where input supplies represent a large portion of the cost to the manufacturer (almost 40 percent on a high cost or low cost system and about 25 percent on a mid-range system)[76] and a vital component for high volume production, the suppliers could wield significant power. The power, however, has been checked in several ways by the personal computer manufacturers. Companies such as IBM have spread out their purchases among several suppliers so as not to depend solely on one vendor for an input part. IBM does purchase component parts, such as printers, from single sources. Apple uses negotiating skills with multiple third party sources for its supplies. HP, on the other hand, looks for long term contracts with a major supplier to ensure quality control. As was seen in other areas of the market structure, no one strategy is necessarily correct, with different techniques used by the competitors.

As the industry becomes standardized, more suppliers are entering the market with compatible machines, making the suppliers market less concentrated. In addition, many input parts and components are purchased from different types of vendors, such as semiconductor manufacturers, or CRT display manufacturers, serving to fragment the supplier market. Although component parts may represent 40 percent of manufacturing cost, that 40 percent is not in the hands of any one supplier. The degree of vertical integration in

an industry also effects the power structure of the supplier market. Two alternative actions by the manufacturer are possible. These are to create a threat of backward integration and to partially integrate backward. The companies have generally followed these steps by either acquiring suppliers or expanding operations internally to produce the product. The manufacturers' forward integration into the distribution end of the market also serves as a threat of more complete vertical integration to the suppliers.

The suppliers have achieved a level of power through the threat of forward integration into the production of personal computers themselves. Epson, initially a producer of printers, has integrated forward to produce a personal computer as well. Many computer manufacturers had their origins in the semiconductor industry. What keeps the industry in balance at this point is that cooperation is a mutually beneficial situation.

The role of the suppliers has changed as the industry evolves, becoming less concentrated and losing some of their power, while still commanding a certain degree of bargaining power. Their role may change again if the industry evolves into one where units are sold as complete "all-in-one" machines or "consoles" rather than as components. According to Computer Devices, Inc. the trend is toward development of compact units containing a

computer, keyboard, external memory, video display and printer, eliminating unsightly connecting cable.[77] This type of system is still very hard to produce since cost-effective printers and CRT's are still bulky. Smaller floppy disks called micro disks, are available but cannot be considered standard as of yet. If this trend is realized, the supplier market will change in that components will not be sold directly through distributors. The products supplied and perhaps the vendors will also change if the standard personal computer is redesigned.

Intensity of Rivalry Between Companies

The intensity of competition has changed in this industry as it has grown. Although many of the conditions for rivalry do not exist, such as slow growth and high switching costs, those that do exist have caused the industry to be engaged in intense rivalry. This rivalry has taken the form of competitive pricing especially in the home and professional user markets, high levels of advertising, several new product introductions, and is now spreading into enhanced service offerings. Competition along these lines implies that hardware technology has stabilized temporarily.

The intensity of the competition is due largely to the number and diversity of competitors. Over 150 manufacturers of personal computers are trying to capture a portion of the market. Different strategies are being

followed which create conflicts within the industry. This has led to the formation of various strategic groups so that firms compete actively within and between groups.

The literature on industrial organization presents two points of view about the role of strategic groups within an industry.[78] One view holds that the existence of such groups implies an unstable market which is evolving toward a more uniform competitive strategy. The other suggests that different strategic groups can co-exist in an industry and have both be profitable. It would appear that in the personal computer industry strategic groups exist. As the industry evolves, some of the barriers and differences between these groups are breaking down. A distinction does still exist, however, and will probably continue. A summary of the strategic groups is provided below.

Analysis of Strategic Groups

The salient characteristics of the major competitors discussed in Chapter 3 are displayed in Table 2. The strategic grouping can be thought of as a continuum with some companies serving a broad spectrum of segments.

Within the home consumer market, Commodore, Atari, TI, and Tandy form the basis for a strategic group. This group is characterized by price competition, large distribution networks, low levels of service and support and limited software availability. Within this group, strategies differ by the degree and direction of integration.

Table 2

Summary of Competition

	Apple	Commodore	DEC
Company	Publicly traded	Canadian	Major mini-computer co.
User Segments	Professional business education	home and professional	business education
Distribution channels	independent retailers comp. chain	mass merch. mail order comp. stores	manufacturer-owned stores comp.stores
National sales force	yes	no	yes
Software availability	large amount	limited	growing
Service & Support level	medium	low	high
level of integration	low	backward integration	forward and backward
Brand Image	high level of awareness	linked with games	known for minis
Competes by:	innovation	price	quality, service, low cost production
issues	initial control problem	problem with distribution	late entry SBU's

Summary of Competition

	TI	Atari	Xerox
company	electronics company	owned by Warner	office eq. & copiers
User Segment	home users professional	home users	businesses
Distribution	mass merch.	mass merch.	co. owned
channels	comp.stores mail order	15000+ retail outlets carry	stores, office equipment dlrs
National Sales Force	no	no	yes
Software availability	low	significant for games	low
service & support	low	low	high
level of integration	backward	low	forward, some backward
Brand image	calculators and games	home video games	copier co. image
Competes by:	low price, low cost, high volume	low price low cost high volume	product
Issues	OST system, trying to enter small business mkt	seeking cost controls	restructured into SBU for personal computers

Summary of Competition

	HP	IBM	Tandy
Company	precision electronics	mainframe producer	consumer electronics
User Segments	scientists, business, manufacturing	professional, business, education	home, small business professional
Distribution Channels	computer stores	computer and mfr-owned stores	8000 Radio Shack outlets
National Sales Force	yes	yes	started for business mkt
Software availability	applications division, specialized	large; pays royalties to programmers	large number of applications
Service & Support	high	high	high
Level of integration	backward	some backward forward	high forward integration
Brand image	quality instruments	synonymous with computers	consumer oriented
Competes by:	quality, high price	image, low cost producer	controls mfg costs
Issues	reorganized, usually does not compete by price	new strategy for pc ind.	problems with image to deal with businesses

Summary of Competition

	Osborne	Japanese
Company	recently went public	entering with large backing
User Segments	professional, business	home users businesses
Distribution channels	comp. stores, mail order	low dist. mass merch. eventually
National Sales Force	no	no
Software Availability	licenses software	depends on US software developers
Service & Support	low	low
Level of integration	low	high level of backward
Brand Image	business portables	low costs, good quality
Competes by:	niche	low price, low cost prodn.
Issues	increasing competition, entrepreneur	joint ventures with US, prob. with software

Sources: This table represents a summary of the information presented in Chapter 3 and therefore uses the same references noted in that section. 1982 Annual Reports, 10K-Forms and company brochures were the primary sources in many cases.

Price competition has been most evident in the home user market. Most manufacturers have responded to price cuts with rebate offers. TI offered a $100 rebate at the end of 1982 and again in 1983 for its low cost product. By the summer of 1983, it is expected that TI's 99/4A model will sell for only $100. Commodore's VIC 20 now sells for about $150 and Atari's 400 model sells for $200. Commodore has just initiated a $100 rebate for purchasing its 64 model and sending in an old home video game or computer (including the Timex Sinclair which retails for only $50).[79] This creates a very unstable situation which industry analysts expect may result in a price war by the summer. It appears that the manufacturers are trying to take advantage of the interdependent demands between the software, hardware and peripherals for personal computers by pricing close to marginal cost for a basic unit and earning profits on peripherals and software.

Promotional schemes have also become widespread. Commodore is running a promotion with General Mills in Canada by enclosing a coupon for a free computer in 125 out of 2.5 million boxes of cereal and a promotion in the U.S. with Alpo dog food.[80] Another promotion offers a chance to win a computer for opening a bank account. These are aimed at the home user market.

The keys to successful competition within this market appear to be high volume, low cost production and broad

distribution networks. Significant advertising and promotions are also necessary. Pricing near or at marginal cost for the basic unit will induce a consumer to purchase a company's product. They will then be forced to purchase compatible peripherals. The rise of compatible equipment produced by other manufacturers has effected the profits associated with the peripherals.

Entry by a start-up company into this strategic group would not be profitable at this stage. The entrant would be at a disadvantage, having higher production costs due to a lack of experience, no brand recognition and difficulty finding distribution channels. Entry by an existing corporation into a related market would be feasible, yet the higher profits and easier entry in a different strategic group would be more attractive to them.

The next strategic group serves the professional market. Companies in this segment overlap partially with those serving the home user market and the large businesses. Companies in the professional market include Apple, IBM, Osborne, Commodore, Tandy and TI. The latter three companies are competing more on the basis of price whereas the other companies stress a price/performance ratio. Software becomes very important in this strategic group. The major distribution channel is the computer store, where a professional can review several types of machines and compare their features. Companies such as

Osborne serve a particular niche within this market.

Prices are also becoming more competitive on the professional user models. The downward pressure is a result of manufacturing cost improvements, the rise of a discount "gray market" and the entry of companies making "copies" of the brand-name products. Apple has lowered the price of its Apple III model by $800; IBM's system price was recently lowered by 15 percent.[81] Firms are also introducing products with higher price/performance ratios which has effectively forced the lowering of prices. The manufacturers are reacting to this situation very cautiously, trying to avoid the instability and declining profitability associated with the home personal computer market.

As the market expands to include small businesses, manufacturers such as IBM, Apple, DEC and HP compete along the lines of quality, performance, service and support. Companies tend to be more vertically integrated. Manufacturer owned stores become typical for the major competitors, showing an entire line of personal computers to a business customer. This is in contrast to the retail stores where one company's professional computer is compared with another company's.

Within this market, successful competition requires a differentiated product offering a favorable price/performance ratio. Forward integration is important

since the decision to purchase a particular brand is made at the store. A high level of R&D is necessary to permit product innovation. This strategic group must also realize the importance of marketing for successful competition.

Within the strategic group oriented toward large corporate sales, quality, performance and service become even more important attributes. The issue of compatibility with other computers and word processors arises in this market. The distribution channel most frequently used is the national account sales force. The competitors tend also to be well established firms with large financial resource backing from their corporations.

Price competition is not yet evident in this market segment as there are more features to compare on theses systems which allows companies to differentiate their products. Offsetting this, however, is the fact that purchasers at this level invest significant time into the decision as to which personal computer to buy, effectively eliminating the barrier developed by the information requirements.

Successful competition in this strategic group requires a strong service and support network. The capability for interacting with other office equipment to create a total office system must exist. Performance takes priority over price in this group.

The different characteristics between these groups

serve as mobility barriers within the industry. Successfully competing in one sector does not guarantee that the same method will work in another segment of the market. Some companies have tried to expand operations into several segments. Apple and IBM are examples of companies serving the professional and business markets and are now preparing to enter the consumer market with the "Macintosh" and "Peanut" models respectively. So far, their expansions have been successful, however, they also change their strategies as they change their target markets.

Market Conduct

Despite these differences between strategic groups, several generalized statements can be made about the characteristics of the personal computer industry and the strategies for competing in it as it evolves. As competition increases, a trend toward low cost production arises. Companies have tried several different strategies by which to achieve this low cost production: To name just a few of the strategies, HP has initiated modular interchangeable units for its line of personal computers to take advantage of economies of scale and the experience curve; Atari has moved its production out of the U.S. to achieve lower labor costs and greater capacity; and Tandy has instituted some manufacturing changes to increase its efficiency. Regardless of the sector served, low cost

production is important to successful competition.

Aggressive advertising is another way in which the industry competes. The major companies compete for prime time television commercials, and advertise heavily in newspapers, widely read magazines such as Time and Newsweek, and in trade and business magazines. Advertising has been used to inform consumers about the usefulness of personal computers creating general awareness for the industry and to build up brand loyalty for the specific product. It serves as a mechanism to attain product differentiation.

New product introductions have also contributed to the intense rivalry in the industry. Firms in this industry must continue to innovate or else find themselves with obsolete products, low sales and low market share. The mere announcement of a proposed new product also adds to the rivalry in the market.

Market signals are important in setting the competitive framework for the personal computer industry. Announcements about new products are made months in advance in an attempt to get consumers to wait for the company's new product. These types of announcements can serve to confuse the consumer to some extent and to preempt sales and slow purchases. It also can harm the manufacturer to the extent that the announcement slows sales for its other products. Word of Apple's Macintosh, which is supposed to

be a $1000 professional users version of the $10,000 Lisa Model, may be delaying purchases of other personal computers by some professionals until it is on the market.[82] Macintosh is not even officially announced but has been "leaked-out" adequately. The announcements also serve as signals to the financial markets.

One other key to competing in any segment has been the software. Software in the 8-bit professional market has stabilized with CP/M compatible software presiding. The standardization of the operating system has led to a proliferation of applications programs. Any competitor not offering a wide variety of software will lose particular segments to other companies.

Some of the suits being brought against competitors demonstrate the intensity of the rivalry. The suits serve as warnings to other competitors to dissuade them from entering into an action that may infringe on patent rights. In any case, it serves as an expense to the manufacturer as they may result in time consuming procedures that may be better resolved with a direct cash settlement. One example is Apple's law suit against Franklin Computer for making a computer that is Apple-compatible, which Apple claims involves copyright infringement. Franklin's price is much lower than Apple's, cutting into Apple's sales and profits. In this case, Apple did not get an injunction against Franklin. Apple also attempted to persuade the U.S.

International Trade Commission to bar the imports of Apple counterfeits into the U.S. from Asia.[83]

As the industry grows and products provide similar performance levels, manufacturers have started to compete by offering service. IBM has opened more than 100 service centers where consumers can bring their personal computer for quick, low cost service.[84] Alternatively customers can arrange to have courier pick-up and delivery service. The service offered by the computer stores and authorized independent dealers offsets the price reductions offered by the mail order and discount houses.

As the industry matures the channels along which the rivalry occurs will shift as they have as the industry has grown. The expectation would be for greater price competition, fewer new product introductions and more competition in service at some point in the future.

The intensity of the rivalry has also changed as the industry evolves toward a more consolidated industry. The industry which was relatively concentrated in 1977 with Apple, Commodore and Tandy representing approximately 75 percent of market share, moved toward an industry fragmented into different strategic sub-groups as more companies entered and the market grew. At this stage many companies started to try different strategies with no single strategy predominating. The trend is toward concentration again as market leaders appear and compete in

several strategic groups, offering wider product lines and serving several user groups. One condition which enhances the consolidation of the industry is that the software industry has been removed from the personal computer manufacturing industry. Software, which remains a highly fragmented, cottage industry, was a force deterring the consolidation of the personal computer industry. As software becomes a distinct industry, the hardware becomes more of a commodity product.

The trend toward consolidation also results from the need for companies to achieve a minimum efficient scale in order to compete and to benefit from the learning curve effect. These are necessary conditions for low cost production.

Conflict may arise within a company that has achieved a high degree of vertical integration. Tandy's strong retailing division, depends upon high margins and hence high prices for more profits.[85] Its manufacturing policy on the other hand, would require high volume and economies of scale, favoring low prices. The industry's actions about price will eventually decide how Tandy can compete. If industry prices fall, Tandy will have to follow suit.

Another vital factor is the orientation of a company to the market. The industry has become market driven, bringing a level of significance to the company's distribution network and advertising and promotional

strategies that they did not previously have in the high-technology companies. This is illustrated particularly well by Apple's recent announcement of a new president formerly with PepsiCo, an industry that is clearly market driven. Industry analysts generally agree that to compete successfully in the personal computer industry as it grows, is to understand marketing and the need to properly package the product that the R&D staff has developed. The evolution from a technology oriented to a market oriented industry has been very rapid. Firms that do not properly differentiate themselves through marketing techniques will be at a great disadvantage and will probably not survive the industry shakeout that will occur as the industry matures.

Market Performance

This section will briefly touch on some of the issues for market performance. It does not attempt to address the issue of optimal resource allocation but rather presents some thoughts concerning the efficiency of the market's operation given the allocation of resources.

The overall performance of the personal computer industry appears to be efficient, with the intense rivalry between competitors. Initially firms were earning excess profits but as the competition increased, those profit levels have dropped. It is difficult to estimate the profitability of the industry since many of the major

competitors are divisions of corporations and as such do not provide data on their personal computer operations alone. In any case, manufacturers have enjoyed substantial profits over a time when the economy has been in a general downturn.

The efficiency in the market is reflected in the rapid pace of technological change that has occurred. The market is characterized by high levels of R&D and both process and product innovations. Some inefficiencies may occur due to delayed announcements or alternatively early information concerning these product innovations. Delayed announcements cause buyers to purchase nearly outdated inventory; advance announcements cause consumers to wait for a company's product.

There has also been rapid improvements in the price/performance ratios of the personal computers, resulting from both reduced prices and higher performance. The quality of the products has been improving as well. As hardware is becoming more of a commodity-like product, software serves to differentiate the companies. Occasionally, companies have had problems with their products, however, these incidents have served to enhance the quality of the other products with firms trying to avoid expensive recalls and negative brand images for the company's entire line. Since the market is divided into different user segments, with different price elasticities,

the potential for price discrimination by market segment exists. It is expected that the large businesses would have the most inelastic demand curve, and therefore would be charging a higher price per measure of performance. Due to the extent of differentiation in the market, it is not possible to directly compare the product lines for a manufacturer in this manner. It cannot be determined if the value of the extra feature is actually worth less than the price charged.

The product differentiation in this market has made it costly for the consumer to acquire information and directly compare systems. This serves as an inefficiency in the marketplace since perfect information is not readily available. The price may not reflect the true value.

To summarize, the structure of the industry has evolved into one characterized by an intense rivalry among competitors, a very powerful distribution channel, a seemingly unstable supplier market which is currently in balance, no real threat of substitute products from outside sources and a situation of increasing barriers to entry into the industry. The industry has changed from a technology-driven industry to a market-driven industry. Emphasis by the manufacturer is for low cost production, high levels of advertising and numerous distribution channels.

Chapter 5

The Future of the Personal Computer Industry.

As the personal computer industry evolves into a mature industry, the strategic forces that shape its structure will change. According to Porter's theories, the relative power of the buyers should increase further; new products will typically be harder to introduce; competition intensifies and is more likely to be along costs and service; and profitability should decline.[86] The exact structure of the personal computer industry is impossible to predict, however, some specific changes can be expected.

The number of competitors will fall from the 150 companies trying for a piece of the market to a much smaller number. One industry analyst places the industry at a dozen vendors by 1986.[87] Another analyst suggests a company needs a market share equaling 15 percent and at least $100 million in revenues to survive.[88] This implies six major companies and a few minor competitors will comprise the industry. The industry which looked like a sure success for any entrant has changed drastically.

New companies are having difficulty breaking into the market. Some companies are following the traditional strategy for selling a computer, ignoring mass advertising

and promotions, and instead emphasizing trade shows, press articles and word of mouth.[89] Others cannot get the space on the dealers shelves. The expense of advertising and marketing will contribute to the industry's consolidation.

Stanford Research Institute's analysis states there are four different schools of thought within the industry concerning how to succeed in this market: serve all market segments, tailor the systems to particular industries, make specialized products and prepare to serve the home market which has not yet opened.[90] All of these strategies are currently being pursued by different companies; which one or ones will dominate is uncertain. What is needed in any case is a combination of quality engineering, marketing savvy, production knowledge, and business skills.

Some trends for the future include product innovations which make the personal computer more user friendly. This will permit greater entry into the home user market. Apple's "mouse" technology application is a step toward this end. Another product innovation for which prototypes are being developed and tested are voice controlled instructions. Consumers are also demanding integrative mechanisms between the different software packages so that the user can easily interface between the graphics, the databases and the analytical and word processor routines. Process innovations to lower manufacturing costs are also likely to occur.

Another area of uncertainty surrounds the role of the Japanese in this market. If standardization continues it is expected that the Japanese will enter with lower-cost manufacturing. The problems surrounding their entry into the U.S. market relate to their new marketing techniques and poor software development. As a solution, it is expected that joint ventures between U.S. and Japanese companies will occur. Such discussions are currently underway between IBM and Matsushita to produce low cost products as the Japanese did with consumer electronic products.[91]

A final trend is toward production of units consumers want as opposed to marketing what technology has developed. The market will not bear products that do not serve users needs as well as other products. It will become more of a buyers market as the industry evolves.

To conclude, the personal computer industry has evolved very rapidly, leading to significant structural shifts in the market. The industry is characterized currently as supporting intense rivalry between competitors, significant buyer power and reduced threats from new entrants. Three factors of competing in this market stand out: distribution, low cost production, and software development. Strategic sub-groups have developed which require different tactics and strategies on the part of firms for success within the guidelines set above. The

future form of the industry is uncertain. Expectations are toward a more consolidated industry having much fewer competitors with an increased role of the Japanese. It is also expected that the market performance will be efficient as the industry evolves.

Footnotes

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2-Predicasts Forecasts, 1982 Cumulative Edition, Cleveland, Ohio:Predicasts Inc. 1982, p. B-409.

3-"Atari's Bet on Home Computers," Business Week, June 15, 1981, p. 114.

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