HEWLETT-PACKARD AND THEIR COMPETITION IN THE MIDWEST

An Honors Thesis (ID 499)

By

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This paper discusses Hewlett-Packard Company and the competitors that HP faces in the Midwest - Digital Equipment Corporation, Burroughs, Prime, and International Business Machines Corporation. Also, I have touched on the effect that the Japanese will have on the American computer industry in the very near future. Within each section about the vendors, I discussed their product strategy, manufacturing strategy, marketing strategy, service strategy, and company philosophy.

Preparing my thesis has been very enjoyable and has been a learning experience as well. Many thanks to Mr. T.J. Ault for his guidance and undying encouragement.
The Hewlett-Packard Company is the largest manufacturer of electronic test and measurement instruments and the second leading producer of minicomputers. HP produces a broad range of electronic instruments and systems for measurement analysis and computation.

Business segment contributions in fiscal 1980 were:

<table>
<thead>
<tr>
<th>Segment</th>
<th>Sales</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Test &amp; Measurement Products</td>
<td>39%</td>
<td>44%</td>
</tr>
<tr>
<td>Electronic Data Products</td>
<td>49%</td>
<td>46%</td>
</tr>
<tr>
<td>Medical Electronic Equipment</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Analytical Instrumentation</td>
<td>5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Operations in Europe provided 37% of sales and 24% of operating income in fiscal 1980. Foreign activities outside Europe amounted to 14% and 9%, respectively.¹

THE BUSINESS OF HEWLETT-PACKARD

A more detailed look into the actual business which HP is involved with will enhance our understanding of the company. Hewlett-Packard is engaged worldwide in the design, manufacture, marketing, and servicing of a broad array of precision electronic instruments and systems for measurement, analysis, and computation. Its products, which number more than 4,000, are used in industry, business, engineering, science, education, and medicine.

Hewlett-Packard's electronic data products include business computers, scientific computers, desktop computers and instrument controllers, data terminals, printers, disc memories, personal scientific and financial calculators, and programmable calculators.

The test and measurement instruments of HP include voltmeters and multimeters which measure voltage, current, and resistance; counters which measure the frequency of an electrical signal;
oscilloscopes which measure electrical changes in relation to time; signal generators which provide the electrical stimulus for the testing of semiconductors and other components; specialized communications test equipment; and quartz and atomic frequency standards which are used in accurate time interval and time keeping applications. Systems that combine HP's computational and measurement products are used to determine the quality and performance of printed circuit boards, microwave components and transceivers, and to assist in developing software for microprocessors.

HP's electronic component products are included in this classification and consist principally of microwave semiconductor and optoelectronic devices (including light-emitting diodes). These products are primarily for sale to other manufacturers for incorporation into their electronic products and are also used in many HP products.

Medical electronic equipment which Hewlett-Packard manufactures includes instruments and systems which are used to acquire, display, record, store, and analyze bio-medical signals. This equipment, much of which is controlled using a computer, includes continuous monitoring systems for critical care patients, medical data management systems, fetal monitors, electrocardiographs and related interpretive and stress systems, pulmonary function analyzers, cardiac catheterization laboratory systems, blood gas measuring instruments, portable ultrasound and x-ray devices, cardiac defibrillators, and hospital supplies. These instruments and systems are generally installed at medium to large hospitals. Additionally, in February 1981, HP introduced a new computerized machine that
improves and simplifies measurements of the heart called the Page-Writer.

HP's analytical instrumentation products include gas and liquid chromatographs, mass spectrometers, and spectrophotometers. They are frequently combined with computers and calculators to provide fast and accurate analysis of chemical compounds. The analytic products are used in the chemical, energy, and pharmaceutical industries. They are also used in medicine, environmental monitoring and university research.

Around the world, Hewlett-Packard's measurement and computational products are at work in environments ranging from factories to research laboratories, from business offices to construction sites, from outer space to the ocean floor. A few examples:

Hewlett-Packard test and measuring instruments are used by electronic engineers in research labs and on test benches wherever precision electronic measurements are being made.

HP computers and computer systems are processing information, controlling equipment and processes, and solving problems in business, science, industry, and education worldwide.

In chemical laboratories in science and industry, HP computer-controlled chemical analysis systems are automatically identifying and measuring compounds with billionth of a gram resolution - in a fraction of the time it used to take with traditional methods.

Hewlett-Packard microwave and optoelectronic components are vital parts of electronic products, from television sets to satellites circling the earth.

Millions of Hewlett-Packard hand-held calculators are being used by scientists, engineers, businessmen, financial analysts, statisticians, and students.

In hospitals, HP's computerized arrhythmia detection systems are reliably monitoring heart patients 24 hours
a day and automatically detecting dangerous heartbeat irregularities so preventive treatment can begin before a crisis occurs.

HP's cesium beam clocks, which measure time with an accuracy equivalent to a one-second error in 45,000 years, are being used as primary time-keeping references throughout the world, contributing to space exploration, navigation, and astronomy.

COMPANY HISTORY

Bill Hewlett and Dave Packard both attended Stanford University as undergraduates. They became good friends late in their college careers and determined that they wanted very dearly to own their own business sometime. Dave Packard comments in an article which appeared in Measure how he determined what he would pursue upon graduation:

I guess the thing that finally determined the direction of my life is that Fred Terman (professor and friend) arranged during this course, for us to visit some of the electronics and radio firms in the area. Among them, Philo Farnsworth was developing one of his television tubes up in San Francisco. I remember seeing his laboratory. I was very intrigued to see what these people had been doing. And it was really as a result of those visits, and discussions with Fred Terman and Bill Hewlett toward the latter half of my senior year, that we decided that maybe we'd try and make a run for it ourselves. And Fred said that most of these electronics firms had been built up by people who hadn't had very much education. He suggested that it would be a great opportunity for someone who had a good theoretical background in the field to set up their own business.

Dave was offered a job in 1934 with General Electric; since there were very few jobs available at the time, he decided to take this opportunity. Then, in 1938, Fred Terman arranged an opportunity for Dave to return and start something with Bill. In addition, Terman arranged that Dave could get credit for working with General
Electric, and, with just one year of residence, Dave would get his Engineer's degree at Stanford. So Bill found a house on Addison Avenue in Palo Alto. They rented the lower floor where Dave and Lu (his wife) lived. There was a little building out in back where Bill lived, and a garage that they set up as a shop to work in.

Dave started developing a few things per specifications sent by Ed Porter who Hewlett and Packard worked with to design some control systems. Packard continues:

To do that we had to set up the shop in the garage and get some equipment. Then Bill got a job making diathermy equipment for a medical clinic, and Fred Terman helped us. He also got someone who wanted a control drive for a telescope, so we made that. Then we got a job putting in bowling-alley controls. We had a bad time with that because the pushbutton we got didn't work right, and I had to go up and make a lot of service calls. So we were pretty busy between trying to go to class and get some of these outside things going, and then do the work on this design project.

These were all just miscellaneous jobs we got to make a little money, with the thought that maybe one of them would develop into something that would be viable. Bill had developed an audio oscillator circuit in the lab at Stanford the Spring before I came out. And we'd talked about using that. As a matter of fact, Fred Terman arranged a deal with AT&T that paid for getting a patent on Bill's oscillator, in return for which they got some rights for it. We didn't have enough money to get a patent on the oscillator. We built a model of this, and Bill took it up to an I.R.E. (Institute of Radio Engineers) convention in Oregon in November 1938. This attracted enough attention that we decided maybe we'd make a run for it. So we then built up a model more carefully and wrote a set of specifications. I remember having this model in the living room at Christmas time because we were taking some pictures to send out. We got a list of prospective customers, some of them from other sources, and mailed out some letters. I don't remember how many letters we sent out. It couldn't have been more than 50. It was probably more like 25.
But, amazingly enough, in a couple of weeks we got some orders back with some checks in the mail.

Fred Terman discusses the audio oscillator:

With the oscillator, it was clear that they had something that would fly. You see, they built those first HP oscillators in Dave's garage, and sold them for $55, whereas competitive equipment cost $200 to $600. Very soon their confidence was justified by a large order. The sound engineer for Walt Disney's movie, "Fantasia," saw the oscillator, recognized it as good, and bought eight of them at one crack. This convinced the boys they were in business to stay!

MANAGEMENT APPROACHES

What makes for excellence in the management of a company? Is it the use of sophisticated management techniques such as zero-based budgeting, management by objectives, matrix organization, and sector, group, or portfolio management? Is it greater use of computers to control companies that continue to grow even larger in size and more diverse in activities? Is it a battalion of specialized MBAs, well-versed in the techniques of strategic planning?

Probably not. Although most well-run companies use a fair sampling of all of these tools, they do not use them as substitutes for the basics of good management. Indeed, McKinsey & Co., a management consultant concern, has studied management practices at 37 companies that are often used as examples of well-run organizations and has found that they have eight common attributes. None of those attributes depends on "modern" management tools or gimmicks. In fact, none of them requires high technology, and none of them costs a cent to implement. All that is needed is time, energy, and a willingness on the part of management to think rather than to make use of management formulas.
The outstanding performers work hard to keep things simple. They rely on simple organizational structures, simple strategies, simple goals, and simple communications. The eight attributes that characterize their managements are:

- A bias toward action.
- Simple form and lean staff.
- Continued contact with customers.
- Productivity improvement via people.
- Operational autonomy to encourage entrepreneurship.
- Stress on one key business value.
- Emphasis on doing what they know best.
- Simultaneous loose-tight controls.

Although none of these sounds startling or new, most are conspicuously absent in many companies today. Far too many managers have lost sight of the basics - service to customers, low-cost manufacturing, productivity improvement, innovation, and risk-taking. McKinsey's study focused on 10 well-managed companies, and one of those 10 was Hewlett-Packard.5

THE HP WAY

To understand why HP was chosen as one of 10 well-managed companies, we need only gain insight as to what the HP Way refers to, what it means at Hewlett-Packard, and how it is implemented. Because this concept is so all-encompassing, various ideas and thoughts will be presented in what may seem to be a very "haphazard" fashion.

Bill Hewlett comments:

What is the HP Way? I feel that in general terms it is the policies and actions that flow from the belief that men and women want to do a good job, a creative job, and that if they are provided the proper environment they will do so. But that's only part of it. Closely coupled with this is the HP tradition of treating each individual with consideration and respect, and
recognizing personal achievements. This sounds almost trite, but Dave and I honestly believe in this philosophy and have tried to operate the company along these lines since it first started.

One example of this confidence in and concern for people is shown by a very early decision that has had a profound effect on the company. The decision was that Bill and Dave did not want to be a "hire and fire" operation - a company that would seek large contracts, employ a great contract, and at its completion let these people go. There is nothing that is fundamentally wrong with this method of operation - much work can only be performed using this technique - it's just that HP did not want to operate in this mode.

There are a variety of corollaries to this policy. One is that employees should be in a position to benefit directly from the success of the organization. This led to the early introduction of a profit-sharing plan, and eventually to the employee stock purchase plan. A second corollary was that if an employee was worried about pressing problems at home, he could not be expected to concentrate fully on his job. This, and the fact that in the early days Dave and Bill were very closely associated with people throughout the company and thus had a chance to see firsthand the devastating effect of domestic tragedy, led, amongst other things, to the very early introduction of medical insurance for catastrophic illness.

As the company grew and it became evident that HP had to develop new levels of management, Bill and Dave applied their own concept of management-by-objective. When stripped down to its barest fundamentals, management-by-objective says that a
manager, a supervisor, a foreman given the proper support and guidance (that is, the objectives), is probably better able to make decisions about the problems he is directly concerned with than some executive way up the line — no matter how smart or able that executive may be. This system places great responsibility on the individual concerned, but it also makes him feel that he is really part of the company, and that he can have a direct effect on its performance.  

HP's management-by-objective was first introduced in 1957 when Hewlett and Packard held a management meeting to discuss their concern over the size of the company which had grown to 1500 employees.

An important result of this 1957 meeting was to break the R&D activity into four groups, a move that Vice President Bruce Wholey has called an acid test of management-by-objective. He recalls: "I'll never forget the sight of Packard walking past the microwave lab, not saying a thing. It must have been hard for them to pull out that way, but they stuck to it, even to the point of letting me run one project right into the ground ... A lot of companies never made it past that point — remaining small or changing their style — because top management didn't know how to let go."

A look at the corporate organization of Hewlett-Packard will help to better understand the HP implementation of management-by-objective. The overall corporate organization has been designed to let the divisions and groups concentrate on their primary product activities without each having to master and perform all of the tasks of administration necessary in doing business on a
worldwide basis.

In general, the organization structure outlines the normal and functional lines of responsibility and communication. However, Hewlett-Packard is not a military-type organization with rigid chain-of-command communications. In fact, direct and informal communications across lines and between levels is encouraged where useful and necessary.

**Product Divisions:** The fundamental responsibilities of a division are to develop, manufacture, and market products that make contributions in their market place by virtue of technological or economic advantages, and are profitable to the company. The responsibility of a division is worldwide for its product lines.

In carrying out its basic mission, an HP division conducts itself very much like an independent business. As such it is responsible for its own accounting, personnel activities, quality assurance, and support of its products in the field. A division also has important responsibilities in representing the company in its local community.

**Product Groups:** Each Hewlett-Packard product group comprises a number of product divisions having related product lines. The management of each group has overall responsibility for the operations and financial performance of its members. Further each group has worldwide responsibility for its manufacturing operations and sales/service forces. The groups are assisted in this role by the two headquarters (Europe and Intercontinental) and four U.S. regional managements which coordinate the management of the sales/service manufacturing forces in their areas. Groups also
provide a primary channel of communications between their members and the various corporate departments.

**Corporate Operations:** Corporate Operations management has day-to-day responsibility for the operations of the company. It is directly responsible to the president and chief executive officer for the performance of the various product groups, and provides a primary channel of communication between the groups and the president.

**Corporate Administration:** The principal responsibility of Corporate Administration is to insure that the Corporate Staff offices provide the specialized policies, expertise and resources to adequately support the divisions and troops on a worldwide basis.

**Corporate Research and Development:** HP Laboratories represents another vital segment of corporate activity. Its role is to research and develop the advanced technologies, materials, components, and theoretical analysis useful to the divisions in their product-development programs. Through its endeavors in advanced areas of science and technology, HP Labs also helps the company evaluate promising new areas of business.

**President:** The president and chief executive officer has operating responsibility for the overall performance and direction of the company, subject to the authority of the board of directors. Also, the president is directly responsible for the corporate development and planning functions and for HP Laboratories.

**Board of Directors and Chairman:** The board of directors and its chairman have ultimate responsibility for the legal and ethical
conduct of the company and its officers. It is the board's duty to protect and advance the interests of the stockholders, to foster a continuing concern for fairness in the company's relations with employees and to fulfill all requirements of the law in regard to the board's stewardship. The board has an important role in counseling management on general business matters, as well as in reviewing and evaluating the performance of management.

To assist in discharging these responsibilities, the board has formed various committees to oversee the company's activities and programs in such areas as employee benefits, compensation, financial auditing, and investment.

Executive Committee: The committee meets frequently for the purpose of setting and reviewing top-level policies, and making coordinated decisions on a wide range of current operations and activities. Members include the Executive Committee chairman, the chairman of the Board, the president, and the executive vice presidents of Operations and Administration. All are members of the Board of Directors.

Operations Council: The council is a coordinating body whose primary responsibilities are to turn policy decisions into corporate action, review operating policies on a broad basis, and bring appropriate matters to the attention of top management. Members include the president, executive vice presidents, product group general managers, the vice presidents of Marketing and International, and the managing director of Europe.

Looking further into management-by-objective HP-style, we see many examples of this methodology being implemented. One
example involves the development of some particular innovation discovered by an engineer at HP.

There are no resident inventors paid to sit in glorious isolation and dream up great ideas. "All engineers are resident inventors," observes Roger Smith (HP section manager).

When an idea occurs, Hewlett's 10 percent rule often comes into play. This allows the engineer to spend 10 percent of his time on an informal investigation. If, after one or two man-months, it still seems promising, he will ask Gordon or Smith to approve his embarking on the first phase in a three-phase sequence that, in perhaps 25 to 40 percent of the cases, will lead to a commercial product. This so-called investigation phase usually takes between three and nine months.

"We don't threaten the engineer with a schedule at that point," explains Gordon, "because that tends to constrain creativity. We let him free-wheel, look at a lot of alternatives."

The purpose of the investigation phase, essentially, is to establish the product concept and demonstrate its feasibility by ultimately applying such formal yardsticks as return on equity. "An unsuccessful product is more likely to be unsuccessful because we built the wrong product than because we engineered it poorly," HP's Gordon says.

The question of feasibility is thrashed out at a formal review meeting attended by section managers, the division manager, the engineering manager, and representatives from marketing and manufacturing. But no formal votes are taken, and neither is the decision left up to the division heads. Their signatures must
be obtained, of course, but after hearing presentations by the investigators and the marketing people - whom the principal investigator has necessarily involved in the study - and after pointed questioning from those in attendance, it is usually clear whether the project should proceed to Phase 2, development, or be redirected. Flat turndowns or vetoes from the top are said to be rare.  

Another illustration of the HP Way occurred in 1970. During that time, orders were coming in at a rate less than HP's production capability. HP was faced with the prospect of a 10 percent layoff - something HP had never done. Rather than a layoff, HP went to a schedule of working nine days out of every two weeks - a 10 percent cut in work schedule with a corresponding 10 percent cut in pay for all employees involved in this schedule. At the end of a six-month period, orders and employment were once again in balance and the company returned to a full work week. The net result of this program was that effectively all shared the burden of the recession; good people were not turned out on a very tough job market, and the company benefitted by having in place a highly qualified work force when business improved.

The dignity and worth of the individual is a very important part of the HP Way. With this in mind, many years ago HP did away with time clocks, and more recently HP introduced the flexible work hours program. Flexible, or gliding, time was originated within the company at the plant in Germany. Later it was tried for six months or so at the Waltham Division in Massachusetts, and then made available throughout much of the company. Again,
this is meant to be an expression of trust and confidence in HP people as well as providing them with an opportunity to adjust their work schedules to their personal lives.

Many new HP people as well as visitors often note and comment about another HP Way - that is, the informality and being on a first name basis. Both Dave and Bill believe that people operate more effectively and comfortably in a truly informal and personal name atmosphere. Hopefully, with increasing growth HP will be able to retain this "family" way of operating with the minimum of controls and the maximum of a friendly "help each other" attitude.

During the annual HP management meeting in 1975, the participants developed this list of concepts embodied in the HP Way and their importance to the individual:

- Belief in people; freedom.
- Respect and dignity; individual self-esteem.
- Recognition; sense of achievement; participation.
- Security; permanence; development of people.
- Insurance; personal worry protection.
- Share benefits and responsibility; help each other.
- MBO; decentralization.
- Informality; first name; open communication.
- A chance to learn by making mistakes.
- Training and education; counseling.
- Performance and enthusiasm.

Another aspect of the HP Way involves HP's concern for its communities and the welfare of the citizens of the communities. This is discussed in an article which appeared in Measure in November-December 1981:

HP's philanthropic activities stem from a citizenship objective which stresses the importance of being an economic, intellectual, and social asset to each community and nation in which we operate. Included
in those activities are gifts of time, expertise, equipment, and cash.

HP's corporate giving program is most definitely growing, both in terms of the total dollar value given and the percentage of the company's revenues that represents, says Emery. "The reasons for the increase are quite simple. We're becoming a highly visible company, and our reputation for citizenship is well known. Then, too, there's the recent trend away from seeing government as the source of all solutions to all problems. The result has been an avalanche of requests in the private sector.

"I think we can be rather proud of our record, although, of course, there is always the hope that we can do more. Last year, HP ranked 120th in the Fortune 500 in sales among U.S. companies. Yet we ranked something like 50th in regard to the dollar amount of our corporate giving. Our corporate giving for 1981 will be $5.2 million worldwide in cash and equipment. If we counted the market value of our equipment grants, the 1981 total would be closer to $10 million."

Having observed some instances which reflect the HP Way, one can readily understand why Ouchi often refers to HP in his book, Theory Z. To demonstrate this likeness further, we should examine the fundamental properties of the Japanese organization which Ouchi outlines.

Lifetime Employment......The most important characteristic of the Japanese organization is lifetime employment: Lifetime employment, more than being a single policy, is the rubric under which many facets of Japanese life and work are integrated.

Slow Evaluation and Promotion......Part of the complex of intertwined features of the Japanese organization are approaches to evaluation and promotion. Imagine a young man named Sugao, a graduate from the University of Tokoyo who has accepted a position at the fictitious Mitsubeni Bank, one of the major banks. For ten years, Sugao will receive exactly the same increases in pay as the other fifteen young men who have entered with him. Only
after ten years will anyone make a formal evaluation of Sugao or his peers; not until then will one person receive a larger promotion than another.

Non-specialized Career Paths.....A frequently overlooked but very important feature of Japanese organizations is their development of individual careers. By the time the employee reaches the peak of his career, he will be an expert in taking every function, every specialty, and every office of the firm and knitting them together into one integrated whole.

Decision Making.....Probably the best known feature of Japanese organizations is their participative approach to decision making. Decision making by consensus has been the subject of a great deal of research in Europe and the United States over the past twenty years, and the evidence strongly suggests that a consensus approach yields more creative decisions and more effective implementation than does individual decision making.

Collective Values.....Perhaps the most difficult aspect of the Japanese for Westerners to comprehend is the strong orientation to collective values, particularly a collective sense of responsibility. In the Japanese mind, collectivism is neither a corporate or individual goal to strive for nor a slogan to pursue. Rather, the nature of things operates so that nothing of consequence occurs as a result of an individual effort. Everything important in life happens as a result of teamwork or collective effort.

Wholistic Concern for People.....When economic and social life are integrated into a single whole, then relationships between
individuals become intimate. Rather than a connection through a single work relationship, individuals interconnect through multiple bonds. This one closely-knit relationship makes it impossible to escape the frustrations and tensions by spending time with another, completely unrelated group. Intimacy of this sort discourages selfish or dishonest action in the group, since abused relationships cannot be left behind. People who live in a company dormitory, play on a company baseball team, work together in five different committees, and know the situation will continue for the rest of their lives will develop a unique relationship. Values and beliefs become mutually compatible over a wide range of work and non-work related issues. Each person's true level of effort and of performance stands out, and the close relationship brings about a high level of subtlety in understanding of each other's needs and plans. This mixture of supports and restraints promotes mutual trust, since compatible goals and complete openness remove the fears of or desires for deception. Thus intimacy, trust, and understanding grow where individuals are linked to one another through multiple bonds in a wholistic relationship.

HF PRODUCTS TODAY AND IN THE FUTURE

On December 4, Hewlett-Packard Company introduced a $121,000 laser printer that, using microprocessors, can turn digital information into charts, tables, and business forms and send them to computers in remote locations.

At the same time, the $3.1 billion instrument and computer maker introduced a new series of more powerful minicomputers for
its growing base of business computers.

Then, in January, HP brought out a $2,250 desktop "personal" computer with programming aimed at business executives and technical professionals.

Is there a pattern in this flurry of new product introductions? Customers hope there is and competitors suspect so. HP appears to be making a significant move into the broad, potentially rich office automation market known as office of the future - an array of machines linked to computers through which a company can automate inventory-keeping, draw sales charts, or compile a P & L statement.12

John Young comments, "The office presents the next great opportunity for computers to multiply business productivity. Our strategy is to place computer power, in the form of interactive, information-processing networks, directly into the hands of all office professionals, secretaries, functional specialists and managers, as well as the EDP staff."

Along additional lines in the computer field, Computer Advances discusses HP's new products:

Reinforcing its commitment to a constantly expanding upgrade path for all HP3000 Business Computer users (and hence, preserving their investment in HP3000 software), Hewlett-Packard recently announced more than 20 new computer products.

More than just a shopping list of individual products however, this announcement included new ways to integrate an organization's total information assets through HP Information Productivity Networks, making not just individuals more productive, but the organization more effective as a whole.13

According to John Whitmarsh, the 1980s will bring a cautious business environment with considerable risks for minicomputer
manufacturers. Chief risks for HP are how to stem IBM's incursion into the small systems market and how to manage its own slower but still considerable growth rate.

Overall, HP thinks it is strongly positioned with a balance of business and technical computers and a reserve of new products on the drawing boards to satisfy the total computing needs of its customers in an uncertain economic climate.

By 1984, HP expects to sell computers with eight times the power of today's HP3000 for under $100,000. Today's HP3000 will list for about $10,000.

HP will introduce one new 3000 series computer each year for the next five years, and multiple 32-bit machines will be on the market before 1984.

Chief markets for HP's business and technical computers are medium- and large-scale manufacturing companies. Marketing and R&D are focused on this area, and the company says it will limit resources in other markets.

As HP computers become cheaper and more powerful, they will also become more friendly. Friendlier machines minimize customer investment in software, and make HP products more marketable, the company said.14

In 1980, 52% of HP's total orders, or $1.62 billion, came from international customers. Below, the geographical distribution of international orders is listed:

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<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>West Germany</td>
<td>16%</td>
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<tr>
<td>United Kingdom</td>
<td>12%</td>
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<tr>
<td>France</td>
<td>13%</td>
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<tr>
<td>Canada/Latin America</td>
<td>12%</td>
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Dave Packard, Bill Hewlett, and John Young comment specifically on HP's future in 1981:

Looking to 1981, continuing uncertainties in the world economies make it difficult to bring the outlook for our industry and our company into sharp focus, particularly in the near term. There is still some question as to whether a full economic recovery is underway in the U.S., and the international picture is even less clear.

We intend, therefore, to maintain the same cautious management posture that characterized our operations in 1980. Employment levels, expenses, and asset control will continue to receive considerable attention as we move through the year. In the months immediately ahead, the major emphasis will be directed toward improving our marketing efforts to try to bring current order levels more in line with production capacity.

While we are cautious, we are far from pessimistic. Our financial position is sound, we have a highly efficient workforce in place, and we have a number of promising new products coming from our laboratories. These are strong, positive factors that will allow us to take advantage of any significant improvements in the business climate as the year unfolds.
Digital Equipment manufactures, sells, and services computers and associated peripheral equipment, and related software and supplies. It is the largest producer of minicomputers and one of the largest computer manufacturers in the United States. Revenues in recent fiscal years were spread as follows:

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<td>Equipment sales</td>
<td>75%</td>
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<tr>
<td>Service and other</td>
<td>25%</td>
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International business accounted for 41% of revenues in fiscal 1981.

DEC's broad line of computers includes small microcomputers, minicomputers based on 12-bit (PDP-8), 16-bit (PDP-11) and 32-bit (VAX-11) architecture, and 36-bit large mainframe computers (DECSYSTEM-10 and DECSYSTEM-20). System prices range from less than $1,000 to as much as $1,350,000.

DEC also produces a wide variety of peripheral equipment, including magnetic storage devices, cathode ray tube display systems, terminals and line printers. Selected peripheral equipment of other manufacturers is also purchased by DEC for use with its own computer systems.

The service and other revenues category, which has been growing more rapidly than equipment sales in recent years, includes maintenance service, customer training, software revenues, replacement parts and, to a minor extent, equipment rentals. 16

THE PRODUCTS OF DEC

Digital Equipment Corporation manufactures highly interactive
computer systems which are approachable and easy to use. These products have helped shape Digital into an organization which stresses personal interaction in all aspects of its activities.17

The idea of personalized interactive computing isn't new. Digital pioneered the idea in 1960 with the introduction of the PDP-1, the first commercially available computer system to offer an interactive video display. That was the beginning of personal computing.

Subsequent products from Digital introduced techniques which today are important trends in computer use. The PDP-6 computer introduced in 1964 was the first interactive timesharing system. A year later, the PDP-8, the first minicomputer, made it possible to distribute computers throughout an organization, beginning a trend toward distributed computing which was furthered by the PDP-11 in 1969 and, more recently, Digital's VAX computers which were introduced in 1977. Each of these milestone computer architectures stressed personal interaction.

The PDP-6 evolved into the current family of DECsystem-10s and 20s, large timesharing systems that provide simultaneous personal access to a powerful computer for large numbers of users.

The PDP-8 was the industry's best selling computer for many years until it was surpassed by the PDP-11. More than 200,000 PDP-11s have been installed through the world to date.

Soon after its introduction four years ago, the VAX computer became the standard for scientific computers. The introduction this past year of the smaller, lower-priced VAX-11/750, plus enhancements to the powerful VAX software tools, have broadened
the popularity of these computers into the commercial and business environment as well. Digital's VAX computers are also widely used in computer-aided design and manufacturing applications. Discussions of discrete "office" systems versus "distributed" systems versus "central data processing" systems are giving way to discussions of computer needs in terms of total information management systems designed to increase the efficiency and creativity with which people use information throughout an organization. Computers have become vital tools in managing the accelerating rate of change which is profoundly affecting every organization, public and private, large and small.

To help fill these evolving needs, Digital offers the broadest range of computer products and services in the industry, ranging from microcomputers costing just a few hundred dollars to large timesharing systems costing $1 million or more.

The Office. The office is not a new market for computers. Today's office is the "office of the future" that was talked about just a few years ago. And so it is with current discussions. What is happening in the office today is not a revolution, but simply an orderly evolution to higher levels of efficiency and effectiveness in managing information as technology brings computing capability into the hands of more people at every level and in every segment of an organization.

In June 1981, Digital introduced the DECmate Work Processor, a low-cost multipurpose computer designed for small businesses, professionals and individual applications within large organizations.
The DECmate system provides broad functionality including a variety of office applications and data processing software, an enhanced version of Digital's word processing software, list processing and communications capabilities which allow the Work Processors to be linked to other Digital computers.

Shortly after the close of Fiscal 1981, Digital announced additional new capabilities designed to help organizations manage rapid change. These new capabilities integrate five different sets of products: (1) The new DECmate Work Processor; (2) office applications software for computer-based word processing, electronic mail and integrated on-line text-editing and typesetting; (3) information management systems that allow easy access to distributed data bases by anyone within an organization; (4) new networking and communications software; (5) new service and customer support programs designed to help reduce the cost of ownership of Digital's computer systems. 19

Graphics. With the growth in computer use has come an increased demand for the ability to display information in graphic presentations for business charts and graphs, computer-aided design and instruction, computerized typesetting and mathematical modeling.

In December 1980, Digital introduced a new terminal to provide versatile, low-cost graphics capabilities for VAX, PDP-11, and DECSYSTEM-20 computers. Called GIGI, for General Imaging Generator and Interpreter, it uses an LSI-11 microcomputer built into a keyboard which can be attached to a color or black-and-white television monitor. GIGI was designed initially
for the education market, but Digital expects that it will be used in many technical and commercial applications as well.

Distributed Processing and Networking. Placing computers throughout all areas of an organization and linking them together in networks is an accelerating trend among users in the industry today. The design of products to fill these needs has been a major focus of Digital's product development activity for many years.

Digital's networking capability, called DECnet, is a set of easy-to-use software tools first introduced in 1975. Since that time, the company has become a leading supplier of products which link Digital's computers to each other, to computers made by other manufacturers and to public communications networks.

During the past year, Digital's networking capability was significantly expanded with the introduction of DECnet Phase III, which provides enhanced communications and network management capabilities for VAX and PDP-11 computers.

Local-Area Networks. Specifications for a new local-area network were announced in October 1980, which were the result of a collaborative effort among Digital, Xerox Corporation, and Intel Corporation. Based on Ethernet technology, this specification has been accepted by a number of manufacturers of computers, semiconductors, and office equipment as a standard for building networks of computers within an office area or building. Digital is developing products for the future which will take advantage of this and other technologies.20
SOFTWARE - WHAT'S AVAILABLE?

Digital's computer systems range from microcomputers and individual work stations to large, powerful timesharing systems, and much attention has been paid to making them as compatible as possible with each other. This compatibility is designed to maximize the computer's ability to meet current user needs and to permit the easy addition of more computers as the user's needs grow in the future. And because of a high degree of software compatibility, not only system to system but across generations of Digital's computers, the user's investment in software is protected and can be built upon. DEC believes this to be a particularly important benefit to customers as the costs of software development continue to rise.

Specialized Software. Much of Digital's early development effort was directed toward hardware and software products that could serve as tools to help users generate their own solutions to problems. However, the rapid proliferation of computers distributed throughout an organization, driven by declining prices and increased functionality and ease of use, has caused computer users in increasing numbers to seek specialized solutions to their specific application problems.

During the past year, Digital responded with new software products designed to do specific jobs. For users of large systems, software is offered for word processing, graphics, and a number of industry specific programs to run on the VAX, PDP-11, and DEC DATASYSTEM computers. A number of application specific software packages are also now available for users of Digital's
small systems in several areas. These include the construction management industry, the dental and legal professions, and small business accounting.

Additional application software for all of Digital's computer systems is available through a new External Applications Software Library which was established in the past year. This library is composed of customer-developed programs which have been reviewed and distributed by Digital to be installed and supported by other customers who wish to use them.

Digital also has more than 2,000 Software Support professionals throughout its worldwide Customer Services organization to help customers develop specialized solutions to their software problems.

TECHNOLOGY - THE "BITS" OF IT ALL

Digital pursues technology that can be manufactured reliably in high volume and that will prove useful to customers by making it easier for them to interact with computers to get the job done.

During Fiscal 1981, Digital spent more than $250 million on research and engineering of products to meet the future needs of customers. The development effort of prior years yielded a number of significant products during the year.

VAX-11/750 and Gate-array Technology. The idea of personalized, interactive computing has guided Digital's product development from the beginning. It was the idea on which the company was founded, and it led them initially to the PDP-1; later, to the PDP-6, the PDP-8, the PDP-11, and most recently to VAX, and to all family members which evolved from these milestone computer architectures.
The VAX-11/780 computer introduced in 1977 quickly became the standard for 32-bit computers, not only because of its impressive power and addressing capability, but also because of the broad range of rich and powerful software available on VAX for technical, scientific, commercial and business applications.

During the past year, Digital introduced the second member of the VAX family. Called the VAX-11/750, this new computer provides 60 percent of the power of the 780 at about 40 percent of the cost. Also, as a result of the use of new gate-array circuits (developed at Digital's Semiconductor Technology Center in Hudson, Massachusetts), the 750 is just one third the size of the 780.

The VAX-11/750 has broadened the existing technical and commercial markets for VAX computers. It uses the same operating system software, the same languages and the same information management architecture as the 11/780. Hence, any program that will run on one VAX system will run on any other VAX system without change.

The PDP-11 Family. Still going strong 12 years after its introduction, Digital's PDP-11 computer continues to be the best selling 16-bit computer ever made. The family ranges from the LSI-11 microcomputer to the large and powerful PDP-11/70 which provides a direct upward migration path to the VAX family computers.

During Fiscal 1981, Digital introduced the newest member of the PDP-11 family, an entry-level computer called the 11/24. Designed for optimum compactness, the entire computer fits on a single 8 x 10 inch circuit board. The 11/24 system provides for storage of up to 1 million bytes of data, permitting the running
of a wide range of applications originally developed to run on larger, more expensive PDP-11 systems. During the fourth quarter of the fiscal year, they began volume shipments of the mid-range 11/44, which had been introduced in Fiscal 1980.

DECSYSTEM-10 and 20 Family. During the year, Digital shipped its first Symmetric Multiprocessing (SMP) mainframe system. In simple terms, SMP is a very large system employing two DECSYSTEM-1090 processors that work together cooperatively to support up to 175 active jobs and 512 dedicated terminals.

With SMP, terminals can be connected to either computer. This is more efficient than running the two processors independently because the workload is automatically balanced and data files and peripheral devices can be shared between the two computers. The DECSYSTEM-1090 SMP is the largest member of the DECSYSTEM-10 and -20 family of mainframe computers and is designed to permit direct access to personal computing capabilities to a large number of users simultaneously through timesharing terminals.

Mass Storage Systems. As computers become more functional and less expensive, their numbers continue to grow, creating greater demand for more low-cost data storage capabilities. During the past year, Digital introduced its first Winchester-type disk storage systems. These new products provide greater data storage systems. These new products enhanced reliability at lower cost. Large disk storage systems with capacity for 516 million bytes of data were introduced for use with VAX and large PDP-11 systems. New storage systems were also added for use with Digital's smaller computer systems.
INTERACTION WITH THE CUSTOMER - SERVICE

Digital believes that the highest degree of interaction in any of its activities needs to be in the area of customer service and support.

Because Digital has shipped more computers than any other manufacturer except one, its service resources must be deployed virtually everywhere, ready to be delivered promptly and effectively. Digital's customer support organization provides maintenance, training and consulting services from more than 400 locations worldwide.

The mission of Digital's customer support organization is to maximize computer availability to the customer and to minimize the cost of system ownership.

For Digital, minimizing the cost of system ownership means helping customers to reduce programming and training costs and helping to solve business problems while achieving the highest possible level of system utilization for the customer.

To implement this philosophy, the company has integrated maintenance, software and training services into a unified support organization that can interact with the customer on a day-to-day basis. This organization was expanded significantly during the past year and now includes more than 16,000 support personnel working in 38 countries on five continents.

In addition to its constant interaction with customers, Digital's support organization is heavily involved with the company's engineering and manufacturing organizations to ensure that the products Digital sells have maximum reliability and maintainability.
designed into them and that these features are carried through the manufacturing process.

At the individual account level, a maintenance expert and a software consultant join with a sales representative to form a team to ensure that customer needs are met. These account teams are, in turn, backed by network coordinators, education and training consultants and a variety of other support specialists.

Digital believes this team concept of customer support will become increasingly important as more and more users become involved with distributed computing, networking and office information systems.

Because the most important opinions of Digital's service capabilities are those of its customers, the company has, for the past eleven years, surveyed every customer under service contract. By giving customers this opportunity to evaluate the service they receive, we have been able to constantly improve the levels of service and evaluate the performance of the Digital support organizations involved.

Innovations in Service Delivery. Digital was the first computer manufacturer to offer comprehensive remote diagnostic services for both hardware and software problems. Computer-to-computer remote diagnosis via dial-up telephone connection saves time and money for both the company and the customer. It permits the prompt dispatch of service specialists with the appropriate skills who understand the problem before they arrive at the customer site, because the remote diagnosis has located the trouble. In most cases, the service specialist is able to bring the correct
replacement parts to correct the problem in one visit, thereby saving time and money for both the customer and Digital.

Digital was also the first manufacturer to offer a family of software support services, enabling customers to get more value from their systems. Today, the company has remote software telephone support centers serving customers in North America, Europe, Japan, and Australia. These centers complement the range of applications services provided by Digital's software specialists in the field.

During the past year, a new Customer Support Center was opened in Atlanta, Georgia to provide users of Digital's office systems with immediate answers to software, hardware and usage questions. The company's first "carry-in" service center for users of Digital's terminals will be opened during the first quarter of Fiscal 1982 at Lanham, Maryland, near Washington, D.C. Additional carry-in service centers are planned for the future.23

Educational Services. Another important component of Digital's customer support organization is Educational Services, which last year delivered more than 50,000 student weeks of classroom instruction from training centers around the world. Digital's training curriculum includes more than 300 different courses offered in 17 languages. In addition, self-paced courses, interactive computer-based instruction and classes at customer sites are also offered. With the opening last year of new centers in Vancouver, British Columbia and Helsinki, Finland, Digital now has 24 such centers, all of them located in or near major cities.

DECUS, the Digital Equipment Computer Users Society, is the
largest and most active computer users' society in the industry with 45,000 members worldwide. DECUS issues papers, supports publications, provides a forum for the exchange of ideas and holds meetings in which Digital people actively participate. DECUS also makes available to its members a software library containing more than 1,700 active programs.

Computer Special Systems. For those customers whose needs are not met by standard Digital systems, the company also maintains Computer Special Systems facilities in the United States, Canada, England, Germany, France, Sweden, Japan, and Australia. These centers provide customers with special hardware and software design, applications programming, systems engineering, and project management. This organization also has particular expertise in the development and implementation of computer networks.

Efficient Distribution Channels. Digital sells its products through a variety of distribution channels: direct to end users, through Original Equipment Manufacturer's (OEMs), through commercial and industrial distributors, through business equipment dealers, through a catalog and through Digital's retail stores.

Many of Digital's customers, particularly large organizations with many locations, are serviced directly by Digital's worldwide Sales organization, which is deployed throughout every major industrialized country of the world. Because Digital realized from the beginning that it couldn't possibly handle the countless special applications for its products, the company was early in recognizing that specialized companies closely allied with special fields could participate
heavily in Digital's growth and success. OEMs have, from the beginning, played a vital role in Digital's progress. The range of markets served by Digital's OEMs is far broader than the markets served directly by the company. In most cases, they are specialized markets which are understood in fine detail by the OEM.

There are essentially two types of OEMs. The first builds products such as test equipment, brain scanners, oil rigs or electronic displays such as stadium scoreboards in which the computer made by Digital is built into their product. The second type of OEM takes Digital's systems substantially as they are, and adds specialized application software needed by the customer for a specific job. The emphasis here is on understanding the special requirements of, and installing a computer system in the user's environment.

Digital's Authorized Distributor program was expanded during 1981. Under this program, selected OEMs serving commercial customers are permitted to use a special Digital logo in their promotion and to participate in a cooperative advertising program. Participants in this program represent a diverse geographical and specialty cross-section within the commercial market.

Digital also broadened its distribution program for microcomputer products during the year with the addition of authorized distributors in California, Ohio, and New York, who will provide off-the-shelf delivery of Digital's LSI-11/2 and 11/23 microcomputers through local and regional outlets.

Shortly after the close of the fiscal year, Digital announced
the DECdealer program, designed to broaden the sales outlets for the new DECmate Work Processors. This program involves independent office equipment dealers who will sell the new system, including printing terminals, word processing and accounting software, directly to end users.

The company sells from a comprehensive catalog which is distributed to more than 35,000 users of Digital's computers. These customers can order spare parts, supplies, media such as disks and tapes, and certain modules and terminals simply by dialing a special toll-free telephone number.

Digital also sells its products through a network of company-owned retail stores located in 25 major metropolitan areas. The objective of these stores is to sell small computer systems with standard software packages to businesses whose needs are met by these products. Customers with special needs are referred to the appropriate OEM or distributor.25

DIGITAL'S MANY ROLES

In the 1981 Annual Report, Digital addresses its interaction with various people:

While Digital cannot be all things to all people, the company recognizes that it has important obligations to many people who have reasonable expectations of the company which we must work hard to meet. Customers expect Digital to be a reliable supplier of high quality products and services. Our shareholders expect us to work hard to make their investments grow. Digital also feels a deep sense of responsibility to its employees and to the community at large, particularly to those communities in which the company maintains facilities and where it is expected to be a thoughtful neighbor and responsible citizen.
Where Digital's employees are concerned, Digital is very proud of the quality of its worldwide organization and the company strives to recognize the contributions of its employees by providing programs designed to enhance their effectiveness in the organization and to promote their individual development as well.

These programs include continuing education, personal skills workshops, job enlargement training, management development, tuition refunds and university courses at company facilities. All of these programs were expanded during the year to accommodate the steadily growing numbers of employees at all levels of the organization who seek both personal and professional growth.

Ensuring that all employees have equal opportunities for hiring and advancement is also a serious commitment at Digital and the company has continued to aggressively pursue affirmative action programs to attract and develop minority and female employees. An extensive in-company program of continuing education offers specialized job-related training, individual courses, and university-level programs leading to degrees. Further opportunities are available to employees through company-sponsored programs at scores of colleges and universities.

There was a significant increase during 1981 in the number of employees involved in Digital's tuition-refund program; student loans (which are also available to dependents of employees) and scholarships are offered as well to encourage even greater participation by Digital employees in programs of continuing education.
The company also increased its involvement with the outside community, recognizing the importance of promoting educational, civic, social, and cultural programs at the national, regional, and local levels. During 1981, Digital made gifts valued at almost $7 million to organizations in every area of the world where Digital does business.

Digital's involvement included scholarships to 138 college-bound high school seniors in Digital communities, plus dozens more scholarships to support technical and research activities, and education programs for minorities and women. Digital also supported a long list of activities which serve large segments of the community, both young and old, through schools, hospitals and clinics, public service agencies, cultural organizations, and groups. The company also matched dollar-for-dollar the personal gifts of its employees to these kinds of organizations. During the past year, Digital became an important underwriter of public television for the first time, providing major funding to the Boston Pops Orchestra summer series on the Public Broadcasting System television network.26
BURROUGHS CORPORATION
W. Michael Blumenthal, Chairman of the Board and C.E.O. of Burroughs Corporation comments on Burroughs and the computer industry:

Our industry is evolving under two powerful influences. To begin with, it is driven more and more by technological developments that encourage "distributed processing." Information-management functions, in other words, are "migrating" outward from the central computer into an array of terminals, printers, facsimile machines and other specialized devices connected into networks.

Second, our customers are demanding information systems that help provide total and industry-specific solutions to information-management problems. The strategic plan which we began implementing this year is in part a response to these two trends.

Mainframe computers remain central to distributed processing; they are therefore at the core of our plan. We are committed to satisfying our users' growing needs - and the needs of future Burroughs users as well - with the same cost-effective and technologically superior family of mainframes that has been the heart of our product line in the past. 27

It was once noted by a businessman that "every human being votes every time he makes a purchase. And every day is election day." Burroughs seems to take this observation seriously and has developed a campaign strategy to develop and market exactly the products that respond to the customers' needs. Because this is a continuing concern, Burroughs realizes that if the planners and engineers fail to think all the way through to the marketplace, then, no matter how sophisticated the technology, Burroughs cannot be successful.

People at Burroughs realize, though, that it is not enough to win votes; once in office, they must fulfill the promises they made. Actually, they are becoming, more and more, a market-driven company. Burroughs' intent is to know their customers' business - especially their information-management problems. That
knowledge makes it possible to supply not merely products, but industry-specific systems and services that solve these problems.

Evolutionary changes are under way in product management and Burroughs' two largest marketing groups to develop what Burroughs terms a full "line-of-business orientation." They have appointed industry specialists at the regional, district, subsidiary and branch levels. Burroughs also trains their salespeople in the background, problems, and information-management needs of specific industries. In addition, Burroughs offers customer councils, industry-related seminars, brochures and slide shows, and trade show exhibitions which are keyed to the businesses that attend the show. As a result of these programs, Burroughs hopes that their customers will find Burroughs more knowledgeable about what they do, more understanding of what they need, and more competent in providing it.

To assemble and test all the components of a system before delivery, Burroughs has 10 staging and distribution centers worldwide. These centers are assisted by a new on-line data base which expedites staging by keeping track of all system components in a particular locality; this enables them to apply equipment to an order much faster than before.

Burroughs has 32 customer service centers throughout the world. Each center not only answers every service call but also automatically monitors response and repair times.

Just as important as the way Burroughs people treat customers is the way Burroughs products treat them. In this area, Burroughs has a long-standing tradition of "user-friendliness" - of
machines whose architecture makes them easy to program and operate, of software designed with an appreciation of how human beings think and communicate.

Also, Burroughs is continuing to excel in the area of "user friendliness" with advances in "ergonomics" - the science of adapting machines to the human body. Today, ergonomic concerns are among the most important criteria in the development efforts at Burroughs. In fact, early in 1981, Burroughs established a human factors activity whose mission is to make Burroughs a leader in setting ergonomic standards. 28

BURROUGHS - THE PEOPLE WHO MAKE IT WORK

Burroughs realizes the importance of their employees, and the company makes a conscious effort to continually satisfy the employees. We can see this attitude when reading the 1981 Annual Report for Burroughs:

Even as we design and market products to augment the human mind, we never forget that it is the human mind itself that is integral to our success.

Here, too, we seek to build on strength. Our resources are impressive indeed, but they do not, we realize, either manage or renew themselves spontaneously. Accordingly, in 1981 we concentrated on improving both training and managerial decision-making at all levels within the Corporation. 29

Burroughs significantly expanded the company's programs for management training and development. These programs now extend to virtually all Burroughs managers worldwide - up to and including all vice presidents and a number of other senior executives.

To attain the success which Burroughs desires, they must
equip their people with the most advanced knowledge available. Burroughs' management development programs offer insight into such subjects as leadership, team-building, problem-solving, decision-making, communications, planning, and goal- and priority-setting. The programs employ a "building block" approach, in which each course builds on what was learned in the previous ones.

As training is just one part of the development equation at Burroughs, they've also begun to take a systematic approach to management succession planning in order to ensure an adequate reserve of talent for the future.

People at Burroughs realize that you need effective ways to best use the power of managers. One way they have tried to do that is to improve the decision-making process. Not all wisdom emanates from the executive office, and Burroughs translated that conviction into specific actions in 1981.30

Early in the year, a Policy Advisory Committee was created. Chaired by the Chief Executive Officer, it consists of 11 senior managers and nine middle managers from all over the Company. The middle managers are rotating members who serve 12-18 month terms. The idea is to get a broader segment of management involved in the review and formulation of policy, as well as to give senior managers the benefit of their junior colleagues' contact with the day-to-day problems and issues from which executives may all too often be isolated. But the learning flows the other way, too; the second, and equally important, role of the committee is to be a training-ground, where people who may well be the executives
of the future can gain valuable exposure to those already practiced in the art of shaping corporate policy.

Another way Burroughs tried to make the best use of their talent is to continue to decentralize decision-making. The company is too large and the industry too fast-moving to operate any other way. Burroughs has strengthened the management teams of the operating groups and divisions, and given them greater authority as well as responsibility. Giving more authority to people "down the line" also helps to cultivate that corps of seasoned executives needed, both now and in the future.

Disseminating authority also means involving people in decisions that affect the nature and performance of their jobs. It is this premise that is behind the new employee suggestion and quality circles programs that Burroughs is instituting at several of its plants. The suggestion program rewards employees for ideas that reduce costs, improve products or increase production. In the quality circles, employee volunteers meet weekly to identify, analyze and solve problems. The first-hand expertise that they bring to this task, supplemented by company training in statistics and data-gathering, will be an invaluable contribution to better quality and productivity for Burroughs.

The attitude of the company toward its employees is evident in this excerpt from the 1981 Annual Report:

The best people, with the best training, making the best decisions - that is the ideal we seek. And in our intensely competitive, highly intellectual and swiftly changing industry, we cannot be satisfied with anything less.
THE PRODUCTS OF BURROUGHS

What does Burroughs make? Not long ago, the question could have been answered rather simply by a list - a very long list - of hardware products, software programs, supplies and services.

Now it isn't quite that simple. Both the marketplace and the industry have changed. Customers require system solutions to their information management problems. They need ways to manage complex networks of computing devices; to store, manipulate and move the vast quantities of information vital to their particular businesses; to automate their offices for greater productivity.32

Mainframes are still the major elements in those system solutions, and a continuing and aggressive computer systems plan brought the September release of the B3955, an important new medium system.

The B3955 lends itself to modular expansion, which allows users to easily grow their systems as processing requirements grow - thus protecting their investments. Different processing tasks or high-volume, around-the-clock workloads are handled by the B3955's multi-processor architecture, enabling several systems to share resources and communication lines. Also, the B3955 does more than its predecessors while using less - 25 percent less power, 25 percent less air conditioning, and 47 percent less floor space.

Attempts to employ automation to bring greater productivity to the office date back to the early 1900s, but the goal is now more crucial than ever ... and new technology has made it more attainable.

Burroughs' OFIS 1 office information system, introduced in 1981, gives Burroughs a unique entry in this admittedly crowded
marketplace. The basis of that claim to distinction is their ability to combine various modular components into a system solution appropriate to the customer's needs.

The OFIS 1 system comprises a series of components for creating, editing, filing, and retrieving documents. It includes a broad line of graphic communications equipment to provide still another dimension - documenting sending via telephone lines. Most importantly, it addresses total office productivity by allowing managers and professionals to store, share and access the information upon which their executive tasks depend.

In addition, there were many other important releases in 1981. Included in these releases was the addition to the line of document-processing and -management systems of the B9195 which can process up to 2,600 documents a minute. In networking and communications, Burroughs introduced the CP3680 data processing system. The CP3680 is a powerful front-end processor that manages communications among the terminals and computers that make up an on-line network. There were also advances in industry-specific software (the Manufacturing System and the GLOBAL Wholesale Banking package) and hardware, microcircuitry and storage technology.

Through all these developments, Burroughs also searched for new opportunities ... and growing markets, of which small businesses are a prominent example.

Because Burroughs has a wide range of products from the B90 to the B1900, they are well-positioned to supply complete system solutions to the small businessman. As the price of computing power continues to spiral downward, even more small
businesses are finding not only that they need it but that they can afford it as well. So Burroughs is approaching this growing market with an important entry-level business system due to be released in 1982. The system is both powerful and compact. It's versatile. And it's user-installable.

Hence, according to the 1981 Annual Report:

What does Burroughs Corporation make? There really is a simple answer: in the 1980s, information itself has become a product ... and we create the tools by which it is gathered, stored and made useful to people.

THE TECHNOLOGY AT BURROUGHS

In the 30 years since the introduction of the modern commercial computer, the power of the earliest machines has been compressed onto a microcircuit chip that's only a quarter-of-an-inch square. We can only imagine what transformations the next 30 years will bring. Working to shape that future are Burroughs engineers, product planners and scientists. Their ingenuity has helped Burroughs build on their earlier successes. This year, Burroughs made organizational changes that will help convert their ideas into products for the marketplace of the 1980s and beyond.

Burroughs merged all their work in communications and system inter-operation into a new Communications and Networks Group. This group will be assisted by newly acquired Systems Research Incorporated, a supplier of advanced data communications equipment and software. In another organizational change, Burroughs consolidated all engineering, manufacturing and software operations for the document-management products into a new Document Information Systems Group.
In the manufacturing process, Burroughs consolidated operations, rearranged plants for greater efficiency and increased their use of computer-aided design. The aggregate savings in overhead enabled Burroughs to invest in new production equipment and techniques, which will mean economies of volume, greater profitability and lower costs to customers.

Burroughs has always had, as one publication recently put it, "a wealth of innovative ideas." To maintain this tradition, Burroughs spent about 14 percent more for research and development this year than they did last year. Although that investment was spread across the entire product line, two areas are of particular interest, because they represent important new directions for Burroughs' technology in the 1980s.

Tomorrow's information storage technology will rely not only on magnetic media, but also on tiny holes "burned" by a laser into a substance on a disk and read optically via another laser. One of these "optical disks," with about 100 times the capacity of current magnetic disks, can hold as much information as a stack of paper 300 feet high. Like tape, it's removable, not built-in; like magnetic disks, it allows random access. Burroughs currently has what they believe is a significant head start in the development of a "computer room capable" optical disk. It's a unique opportunity to lead the industry - and an opportunity which the scientists and engineers are assiduously working to exploit.

For the more immediate future, Burroughs has embarked on an all-encompassing plan to ensure they can deliver systems with strong
advantages in both price and performance. These systems will employ an advanced architecture, the building blocks of which will be proprietary VLSI (very large-scale integration) circuits and innovative subsystem packages that they are designing themselves.

The Micro Components Organization (MCO), in Rancho Bernardo, California, will play a central part in all of this. MCO is concentrating on the design, development, packaging and pilot production of the proprietary VLSI semiconductors. It will also be responsible for producing the packaged modules that will constitute subsystems, and, in some cases, complete computing "engines" for the next generation of Burroughs products.

ACQUISITIONS

The computer industry is changing so fast that no one company can move forward in all areas at the same time. As a result, the best strategy often is to move forward through acquisitions, adding other firms with strengths in particular product areas or markets.

This was exactly the case when Burroughs acquired Memorex Corporation and Systems Research Incorporated in 1981 and System Development Corporation in 1980 (SDC).

Memorex brings to Burroughs first-rate capability in computer storage devices, one of the fastest-growing areas of the computer industry. Incorporating high-capacity Memorex disk drives in their computer systems will mean significant increases in storage capacity for Burroughs users. Moreover, Memorex is a leader in the development of thin film technology which promises higher density, greater precision and lower cost in information storage.
Memorex is also valuable as an IBM-compatible manufacturer and an OEM. With more and more users linking the processing and communications devices of different manufacturers, Memorex's experience will help Burroughs develop products that interconnect and work jointly with those of other manufacturers.

The synergy between Burroughs and Memorex extends to marketing operations as well. The strong worldwide operations and customer base of Memorex provide expanded markets for all of Burroughs' products. In terms of benefits to Burroughs' customers, Memorex will help to provide a broader range of products, brought to market sooner and more economically - by the second largest information processing company in the world.35

It has been a full year since Burroughs acquired SDC (System Development Corporation). The company is a developer of electronic information-management systems, a designer of problem-solving software, and a supplier of data processing and communications services. The combined capabilities of SDC and Burroughs' Federal and Special Systems Group give Burroughs a particularly strong position in the government market.

During 1981, SDC made noteworthy contributions to Burroughs' progress in both products and sales. It provided the OFISfile, a major component of the OFIS 1 system. Regarded by industry analysts as a genuine breakthrough, the OFISfile can hold the information equivalent of 70,000 sheets of paper, and it allows retrieval of any document via simple English instructions. In July, SDC received a multi-year contract, worth $50 million in its first stage, to design, develop, and install a complete air
space management system - including radar and air traffic control features - for the government of Argentina.\textsuperscript{36}

As noted in the Annual Report for 1981:

To refer to an acquisition as "strategic" is to say that it is a move for which the time is right ... and one which furthers the good of both parties. In that sense, 1981 was indeed a year of strategic acquisitions for our Company.\textsuperscript{37}
From the early years, Prime Computer has been organized and managed as an emerging large organization. Product development has been concentrated within a family of general purpose computer systems that offer fundamental cost and performance advantages. The principal markets for these systems, experienced end users, have been identified and selectively approached. Internal growth of the Prime organization has been accommodated by application of Prime's own systems to increase productivity throughout the company. Manufacturing capacity has been expanded ahead of existing needs to ensure a smooth expansion of production volume. A financial strategy has been implemented to accommodate growth needs while minimizing equity dilution.

Prime has been structured with the recognition that growth ultimately is the product of people. As an organization grows, so must its people - both in numbers and skills. The high degree of motivation that supported growth must be maintained, even as large numbers of people are introduced. Prime's management, consequently, has worked to sustain throughout the company a shared vision of growth and its benefits.

In the most fundamental sense, growth at Prime is viewed as the process of evolving the company, its products and its methods - not as a series of radical transformations.38

PRIME - THE PRODUCT LINE

The first computer system built at Prime was used as an instrument in the manufacturing and testing process of the initial system offered for sale. This prototype and the first system
sold remain compatible with every Prime computer system ever built.

System compatibility - which means that any program run on a Prime system can be run on any larger Prime system, with response time the only variable - is an integral part of the company's growth strategy. Compatibility is founded on common operating software, which enables customers to upgrade performance to meet expanding needs while they preserve their often-significant investments in applications software. At Prime, the system hardware is designed around the software.

Prime's principal product line, the enhanced 50 Series systems, provides compatibility of hardware, software, and peripherals. PRIMOS operating software manages system resources and user activities. This capability allows users to concentrate their efforts directly on their application, rather than expend programming resources on system functions.

The 50 Series has been specifically developed to provide a broad range of multi-user and multi-functional capabilities in an interactive environment. These systems can be applied in a wide variety of business and technical situations, with use made easier through Prime's software flexibility and spectrum of industry standard languages. The customer can select languages that offer the most effective solutions, based on needs, programming experience, and existing applications software.

Prime was an innovator in delivering large, mainframe-like system performance at relatively low prices. Today, Prime's 50 Series continues that tradition with enhancements, extensions,
and compatible new models that increase the spectrum of potential uses as well as broaden the range of availability.

Within this product family, Prime meets varied customer needs for memory capacity and cost through specific system offerings. These range from the largest 850 System through the 750 and 550-II to the entry-level 250-II for end users. A 150-II model is produced for systems builders who add their own applications software.

All Prime 50 Series systems are designed with 32-bit architecture and high-capacity memory expandability. The first attribute is a broad measure of system capacity, with 32-bits placing Prime's systems on a par with those of most mainframe manufacturers. The second aspect - memory capacity - permits large problems to be solved as well as a diverse mixture of smaller ones.

These systems offer many specific features to make them more responsive to customer needs, such as error-correcting main memory, virtual memory management, and user-transparent data integrity protection.39

MARKET DEVELOPMENT AT PRIME

The purchase of a computer system is an important decision for any organization, involving not only the capabilities of the product but also confidence in the supplier and its channels of distribution.

Some years ago Prime developed a fundamental marketing strategy which continues today, adopting specific tactics to meet everchanging market needs. The strategy is based on three questions - "who", "what", and "how".

The "who" deals with the need to identify the most accessible prospective customers at any point in time, recognizing both Prime's
organizational size as well as specific customer needs. Today, the "who" has evolved to include small, medium and large organizations in all major world markets. Within these organizations, specific uses range from solving highly advanced technical problems to routine business transactions. Individual users span a wide spectrum of skills.

The "what" of marketing strategy is a response to the needs of this expanding group, an approach that can be summed up as an end-user market orientation. This orientation involves a great deal of contact with customers and sensitivity to their needs.

Prime's approach stands in contrast with more conventional marketing strategies of its principal competitors, which are organized to emphasize production in volume to systems builders. Prime elected to work directly with customers and tailor its products specifically for their applications.

At Prime, this has meant establishing and expanding a large marketing and field service organization, the "how" of Prime's marketing strategy. Evolving from a direct sales and support operation, Prime now has multiple channels of distribution appropriate for specific user needs and geographic locations. For small to medium size business users, Prime has developed a network of over 30 dealers, while in selected areas of the world the company uses distributors for its basic product line.

Prime has also entered into joint marketing agreements with numerous software firms, broadening the appeal of Prime's systems. In addition, Prime sells to system builders which in turn add specialized software for their own clientele.
At the end of 1980, Prime was represented worldwide in over 200 locations, with further expansion underway.

Marketing at Prime is more than selling. In the field, the number of support people, such as systems analysts and service engineers, is twice the number of sales personnel. A Prime marketing person functions essentially as an organizer of resources that can be brought to bear on individual customer concerns.

The field marketing network further serves as a contact point for observation of developing customer needs. Using its own computers as information processing tools, Prime's marketing management assimilates information on market conditions and works with manufacturing in planning build rates. Additional coordination with engineering aids in determining where product development resources will be concentrated.

Over the years, the development of the marketing network and enhancement of communications with the marketplace have transformed Prime's end-user market orientation from a concept to a fact. The company's reputation for customer satisfaction - based on computer user surveys - is among the highest in the computer industry. Today, Prime still concentrates on serving the experienced computer user. More and more though, these users are in large organizations as well as smaller ones. 40

PRIME'S COMPUTERS - A MULTIPURPOSE TOOL

The information network that feeds market data among Prime's engineering, manufacturing and marketing units is only one of many applications of computer technology at Prime. In its growth
strategy, Prime itself has been constructed as a computerized company. The highly computerized company provides multiple benefits aside from an obvious improvement in productivity. At Prime it yields valued insights into potential market needs, as well as permitting quick response to fast changing market conditions.

Five years ago, for instance, Prime was using its internal computer systems to establish a system of financial controls appropriate for an organization many times its size. Since then, the control system has been steadily enhanced.

Today, the capabilities of the business data system - one of three main internal computer networks - provide Prime's financial and operating management with access to overall weekly sales and profit margin information on a worldwide basis. This information is available just one day into the following week in a form suitable for analysis and planning.

The manufacturing operation at Prime is also a tribute to computer technology as a productivity tool. Manufacturing efficiency, together with high value added in the company's products, is a major factor in the company's ability to sustain acceptable gross margin on sales. In addition, production efficiency contributes to reduced needs for financing working capital, inventories and expenditures on fixed plant and equipment. The resulting efficient use of assets is an important contributor to corporate performance.

In the manufacturing process, the production of a specific system for an individual customer can be performed efficiently because of a sales order entry system that identifies all necessary components and manufacturing steps.
Overall materials management is made possible through a world-wide inventory system that matches parts on hand and on order with production needs. This system has routinely enabled the company to arrive at physical inventory counts that are within one-half of one percent of book amounts.

Quality assurance in manufacturing is also based on the internal computer network. Inspection and testing are tied into the system, with the company's own Program Auto Load system assuring that the correct revision of test software is used throughout the building process. This system also allows Prime to test multiple systems at any one time.

Further, the integration of manufacturing, engineering, and marketing computer systems enables Prime to provide its users with technological upgrades as a matter of course.

The flexibility provided by Prime's computers in manufacturing results in a short delivery cycle by industry standards. Prime systems are on line, in most cases, from 30 to 90 days after an order is received. This ability to produce to order means that customers benefit from the latest technological advances as they are integrated into the manufacturing process. Prime profits by economizing on finished goods inventories.

The use of computer capability at Prime has also affected the mix of people required to staff the company. Since routine and mundane functions can easily be handled by computers, the Prime organization emphasizes professionals and managers who use computer capabilities to leverage their talents. Prime's people are able to apply their energy and creativity to the
questions that demand human judgment and skills.

Prime Computer has been a pathfinder in areas of information processing that are increasingly applied by businesses, especially larger concerns with complex and often geographically dispersed operations. This experience is an essential part of the foundation for the company's growing sales of multiple systems to large corporations.

What is the potential scope of computer utilization by business worldwide? Today, the answer must be that it is unknown, but enormous. The price of computer capability is dropping. Alternative means of performing business functions using labor, capital and energy are susceptible to price inflation.

Given those trends, it is difficult to envision that major business enterprises can remain competitive without a comprehensive approach to computer technology - to apply that capability on a broad and coordinated scale throughout their operations.

For example, look at the way in which Prime approaches this situation. When making a decision whether to apply computer capability to a task, a fundamental question is whether benefits exceed costs. For Prime, the point at which the advantage occurs - economic crossover - occurs earlier than for most other companies. This is so because the price of a Prime system to Prime Computer is the cost of manufacture rather than the trade price. The predicted continuation of favorable cost trends for computer capability, however, indicates that other companies will reach similar economic crossovers in fairly short order.

Today, Prime's computer network impacts virtually every
aspect of the business. The internal linkage involves some 57 systems. It has enormous capability, more than could be built into any single mainframe. Measured by the industry standard of "millions of instructions per second", Prime alone may possess more electronic data processing capability today than existed in the entire world in 1960.41

PRODUCT DEVELOPMENT AT PRIME

One characteristic of the applications and markets that have opened up to Prime Computer has been that they are often identified or approached as a result of the company's efforts to increase operating efficiency. Some years ago, the computer industry was developing along two distinct paths. One was represented by the mainframe, which gave large operating capacity and allowed sharing of its overhead among multiple users. The second was the minicomputer, which was applied to a specific task such as operating a machine tool. One of Prime's specific advantages was that the company's systems offered the best of both - the multifunctionality of a mainframe with the size and cost of a minicomputer.

Prime's development has occurred at a time when a most significant trend in computer technology has become apparent - the ability to locate computer capability closer to the user. It is no longer necessary to locate computers in temperature and humidity controlled environments. Development of simple programming languages has reduced the expertise required for operation. Technology has miniaturized circuitry so that computers no longer need be encased in sizeable packages.
All this helps to make computer technology more accessible to a range of business operating environments. Prime's competitive edge is that it combines multifunctionality and ease of use with the ability to reduce overhead expenses that characterize mainframes.

Locating computer power closer to the user in complex businesses has created a high priority on communications. In Prime's case, the benefits derived from information systems that integrate individual departments such as marketing, manufacturing, engineering and finance could only be fully realized by a highly developed networking capability.

With this priority, Prime developed PRIMENET networking software as the centerpiece of its approach to distributed processing. This software package was put to use in Prime's internal computer network and tested for two and one-half years before it was offered in the market place. PRIMENET networking software provides low cost communication among systems through packet switching networks. Users can communicate program-to-program, program-to-terminal or program-to-file so that networks can be designed for efficient routing, rapid response time and optimal cost of transmission. PRIMENET facilities meet internationally recognized standards for packet switching networks supporting this form of inter-computer communication as carried on in the U.S., Canada, Great Britain, and France, with additional networks under development.

Other Prime software offered for distributed processing tasks includes packages that allow Prime systems to be configured with
IBM and other mainframes, for supplementing local processing power, or for expanding computer networks.

The development of software for distributed processing, which gives Prime systems an unparalleled capacity for coexistence with other makers' systems, is a clear example of the company's sensitivity to end user needs.

At Prime, the starting point for product development is the needs of its customers and prospects. Elsewhere in the industry, a more characteristic approach begins with the suppliers' technological and manufacturing capabilities - a strategy based on supplier resources. \(^{43}\)

PRIME RESEARCH AND DEVELOPMENT

Prime Computer invests approximately eight percent of its sales revenues in research and development, since the stakes in retaining product leadership are great. Overall, this is a conventional level of investment for the industry. Prime, however, pinpoints its efforts in processor, software, and system integration developments rather than diffuse its investments into peripheral equipment and other areas. As a result, Prime believes it invests a higher percentage of sales dollars in these three critical fields than its competitors.

Much of Prime's research and development is directed toward productivity improvement. In engineering, for example, Prime's management has taken every opportunity to leverage the talents of its people.

Talented engineers are a scarce resource today in the computer industry and it is vital that their abilities be put to their best uses.
One significant area of progress, again arising from Prime's own operations and computer capability, has been the design process applied to printed circuit boards that are integral to the company's central processing units. The use of computers is credited with a 90% reduction in the number of man-hours needed to design a board. Further improvements have been implemented that allow engineers to function as monitors in the design process while technicians perform the actual tasks.  

EMERGING MARKETS AT PRIME - COMPUTER-AIDED DESIGN

The more far-reaching result of board design and similar efforts to use talent effectively has been creation of an unusual computer-aided design (CAD) capability at Prime. This field, and its allied discipline, computer-aided manufacturing (CAM), are among the most promising - and relatively untapped markets for computer technology.

The CAD/CAM market, overall, has enormous potential. Design and manufacturing resources are basic ingredients in every finished good produced by industry. Where these products are intricate, where the manufacturing process is complex or where common standards must be maintained in diverse locations, the potential for productivity gains and quality improvements is great. Prime's own experience in electrical design and utilization of computers in the manufacturing process attests to that potential.

To cite one present-day CAD application in industry, Prime systems are used with compatible third-party software in ship design. A complex problem in shipbuilding is laying out the extensive electrical circuitry needed to operate the vessel. In
large tankers and freighters, miles of electrical cable may be involved. Use of CAD programs can assure that design objectives are met with the most efficient, least-cost cable layout and can also produce major savings in design time.

The CAD/CAM market is presently supplied, for the most part, by builders of free-standing systems that perform specific tasks. While these products offer marked improvements over more conventional methods in areas such as design and drafting, Prime's general purpose computer capability gives added value in tasks such as engineering analysis, simulation and report preparation that are equally vital for improved productivity.

While Prime has not announced specific CAD/CAM products as yet, the company's computer systems were chosen over several competing computer and CAD/CAM suppliers by Ford Motor Company for the initial phases of a CAD program that will develop and maintain design standards worldwide for that company's automotive products.

The force that is expected to drive growth in the market for CAD/CAM products is productivity - generally acknowledged as the major management challenge today.45

EMERGING MARKETS AT PRIME - OFFICE AUTOMATION

Improved productivity also offers the promise of another emerging field that may offer the greatest market potential ever available to the computer industry. That market today is defined by the catchall term "office automation". In light of the expenditure of $600-800 billion a year on office functions in the U.S. alone, that market has been estimated by consultants and
and investment analysts to total a potential $100 billion in sales through 1985. Such estimates are valuable primarily as a broad assessment, not as a precise judgment, because the office automation business is very much in a formative stage. At present, "office automation" is widely regarded as synonymous with word processing. Yet correspondence preparation accounts for only 20% of clerical staff time.

Prime Computer with its experience in managing internal communications networks and sophisticated management control systems, views office automation in a far broader context. Prime's strategy is to approach the office automation market with an emphasis on raising managerial productivity. Improved clerical effectiveness is a secondary benefit.

Prime's office automation products, introduced in April 1980, are designed to produce an integrated system. Capabilities include electronic mail, electronic filing, supporting systems that help professionals manage their time schedules and management information systems for planning and reporting. Word processing is a part of the system, enhanced with advanced text management that provides such extras as automatic proofreading and hyphenation plus foreign language translation.

One indication that businesses view improved office productivity in the same context as Prime Computer is the large number of major corporations with task forces dedicated to development of comprehensive office automation systems. A significant number have chosen Prime for pilot efforts. Already, orders beyond pilot programs have been booked in several instances.
Wall Street, plunged to a low of 17½, down from a 52-week high of 49½. Henson is taking control of the Natick (Mass.) company at a time when a decision has to be made on its strategic focus and the reallocation of resources. The choices that he makes in the next two years could well determine the company's fortunes over the next decade.
INTERNATIONAL BUSINESS MACHINES CORPORATION
IBM's operations, with very minor exceptions, are in the field of information handling systems, equipment and services to solve the increasingly complex problems of business, government, science, space exploration, defense, education, medicine, and many other areas of human activity. IBM's products include data processing machines and systems, telecommunications systems and products, information distributors, office systems, electric and electronic typewriters, copiers, dictation equipment, educational and testing materials, and related supplies and services. Most products are both leased and sold through IBM's worldwide marketing organizations. IBM is the largest manufacturer of data processing machines and systems in the information handling field which is comprised of many companies and is highly competitive.

IBM's business in the 124 countries which it serves outside the United States is conducted through IBM World Trade Americas/Far East Corporation and IBM World Trade Europe/Middle East/Africa Corporation, wholly owned subsidiaries of IBM World Trade Corporation, a wholly owned subsidiary.

To conduct its business throughout the world, IBM is organized into a variety of groups, divisions, and wholly owned subsidiaries.

DATA PROCESSING MARKETING GROUP

Data Processing Division. DPD has marketing responsibility within the United States and its territories for IBM's information-handling systems, equipment, computer programming, systems engineering, education, and other related services to customers who require larger centralized systems as well as customers who
require distributed processing systems.

Federal Systems Division. FSD provides information-handling and control systems to the Federal government for seaborne, spaceborne, airborne, and ground-based environments. In addition, FSD participates in applied research and exploratory development.

Field Engineering Division. FED provides maintenance and related services for products developed and manufactured by or for the DP Products Group and marketed by the Data Processing Division. FED also provides support for specified IBM program offerings, maintenance marketing support, and central programming service for assigned products.

DATA PROCESSING PRODUCT GROUP

Data Systems Division. DSD has worldwide development responsibility for large, complex computing systems, with primary emphasis on high-performance products and associated programming. DSD is also responsible for U.S. manufacturing for those systems.

General Products Division. GPD has worldwide development and U.S. manufacturing responsibility for high-performance storage systems, including tape units, disk products, mass storage systems, non-impact system printers, program products, and hardware related programming.

General Technology Division. GTD has worldwide development and U.S. manufacturing responsibility for the semiconductor component technology used in nearly all of IBM's products and systems.

System Communications Division. SCD has worldwide development and U.S. manufacturing responsibility for information-handling
systems and products that serve a wide range of end-users. These include distributed data processing systems, industry systems for supermarkets and other retail stores, display terminal products, telecommunications systems, and related technologies and programming.

System Products Division. SPD has worldwide development and U.S. manufacturing responsibility for intermediate-range processors and related programming, finance and manufacturing industry products, impact printer products and semiconductor packaging. 48

GENERAL BUSINESS GROUP

General Systems Division. GSD has worldwide market requirements responsibility and U.S. marketing and field administration responsibility for low-to-moderate-price information-handling systems. This responsibility also includes systems-related programming. GSD also develops and markets application programs for assigned products. 49

Information Systems Division. ISD has worldwide product management and development and U.S. manufacturing responsibility for low-to-moderate-price information handling systems including systems-related programming, electric and electronic typewriters, copiers, information distributors, and other office products and related supplies. The division also has worldwide product management and development responsibility for magnetic media typewriters, information processing workstations, dictation equipment, direct-impression composing products and most related supplies. 50

Office Products Division. OPD has worldwide market requirements responsibility and U.S. marketing and field administration
responsibility for electric and electronic typewriters, office systems, information distributors, copiers, magnetic media typewriters, dictation equipment, direct-impression composing products and related supplies.51

General Business Group/International Division. The International Division has marketing, service, manufacturing and overall performance responsibility for general systems and office products operations in 20 countries in Europe, the Americas, and the Far East.

Information Records Division. IRD has U.S. marketing responsibility for magnetic media and disk storage products. In addition, IRD has U.S. manufacturing and marketing responsibility for data processing cards, ribbons, and other consumable products used in information-handling machines. The division also has worldwide development and manufacturing responsibility and U.S. marketing responsibility for biomedical devices and supplies.

Customer Service Division. CSD was established in the United States to improve flexibility and productivity through consolidation of customer engineering services formerly provided by General System and Office Products Division.

Other Divisions.

Real Estate and Construction Division. This division manages the selection and acquisition of sites, the design and construction of buildings, and the purchase or lease of facilities for all IBM operations in the United States. It also has responsibility for assessing real estate projects outside the United States as well as IBM's worldwide energy and environmental programs. This
division also provides facility services to selected headquarters locations.

Research Division. This division brings scientific understanding to bear on areas of company interest through basic research and the development of technologies of potential long-range importance.52

SUBSIDIARIES

IBM Instruments, Inc. IBM Instruments, Inc. has responsibility for IBM's efforts in the analytical instrument field, including the marketing and servicing of selected products in the United States.

Science Research Associates, Inc. This subsidiary has worldwide development, production, and marketing responsibility for a wide range of educational materials, computer courseware, and services for elementary and secondary schools and colleges, as well as testing and education materials for business.

IBM World Trade Americas/Far East Corporation. This subsidiary has a territory which extends across four continents; it is responsible for IBM operations in 44 countries, including Australia, Brazil, Canada, and Japan.

IBM World Trade Europe/Middle East/Africa Corporation. Through its subsidiary, IBM Europe, located in Paris, this subsidiary is responsible for IBM operations in 80 countries.

IBM World Trade Corporation. This subsidiary provides designated support to World Trade organizational units.

IBM Credit Corporation. This subsidiary provides additional flexibility in company financing and a more efficient single
management focus on financing of the installment payment agreement offered by various U.S. marketing divisions.

Satellite Business Systems, the partnership formed by subsidiaries of The Aetna Casualty and Surety Company, COMSAT General Corporation, and IBM, began to offer commercial services in 1981.

During 1980, IBM and SBS conducted operational field tests of the equipment to be used in SBS's tariffed offerings. The tests provided experience in installing and operating the complex new equipment needed to provide high-speed digital communications services.

Satellite Business System's first satellite was launched from Cape Canaveral, Florida on November 15, 1980. The telecommunications venture, which is financed equally by IBM, Communications Satellite Corporation, and Aetna Casualty and Surety Company started operating with three customers initially. The cost of the launch was $23,000,000, apart from $20,000,000 for the satellite itself. November 15, 1980 was the fourth date set for the launch, the other three having come and gone because of technical problems at the National Aeronautics and Space Administration which handled the launch.

A joint venture to develop, manufacture and market video discs and video disc players has been formed by IBM and MCA Inc. The two companies are equal owners of the newly organized Disco-Vision Associates. By blending complementary technical and marketing skills, the new organization provides an opportunity to
broaden the use of video disc technology in the home entertainment and industrial education and information fields. The video disc technology permits high-density storage of images and sound on a plastic disc. A disc player optically scans the recorded information to play out the picture and sound on a television set.53

As mentioned earlier, IBM is primarily involved in information-handling systems, equipment, and services.

To get an indication of the distribution of sales, we can look at the figures for 1980 as published in Standard NYSE Stock Reports:

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<tr>
<td>Data processing</td>
<td>82%</td>
<td>91%</td>
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<td>Office products</td>
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Outright sales provided 42% of revenues in 1980, rentals 41%, and services 17%. Operations outside of the U.S. contributed 53% of both revenues and earnings.54

In looking to the future, Frank T. Cary (Chairman of the Board) and John R. Opel (President and Chief Executive Officer) comment on IBM's plans:

Looking ahead, we see many indications that the growth of IBM's business will remain strong. The information processing industry is the most dynamic in the world today. As more of the world industrializes, the uses of computers and office products continue to multiply. In the face of higher costs and rising international competition, business, science and government have a need to raise productivity. And productivity is what information products are designed to improve.

Economic uncertainties such as inflation, the high cost of capital, trade barriers and other factors make the demand for information products hard to predict over the short term. However, the basic trends are very favorable. No limit is in sight to the world demand for information products. Each
area of our business is a significant growth opportunity. IBM believes that the major part of their growth will continue to come in data processing and office products. Not only does IBM expect growth in traditional computer systems with their associated files, displays and printers. In addition, they expect an important expansion in applications that use communications to tie together parts of enterprise. For example, a large manufacturer may have its plants, laboratories, and offices linked to a central computing installation. Such a system might include hundreds of smaller systems - i.e. the IBM 4331 and Series/1 computers and the IBM 8100 information system - together with a variety of terminals and word processing products. For these customers, including those with installations around the world, IBM has the capabilities required to put all the pieces together.

Another major growth area is the sale of information products to small businesses and individual users. IBM studies indicate that only a small percentage of those who can economically justify a computer actually have installations today.

Additionally, as word processing and text processing continue to expand in many countries, IBM expects a rising demand for office products as well as for data processing products that help handle such applications.

In all these areas of IBM's business, the company is finding a significant market elasticity. As technical innovation lowers the price of information processing, the lower price attracts new users. It also produces greater use by present customers and stimulates the development of entirely new applications.
To ensure superior products, IBM is investing heavily in the several dozen key technologies that drive the information processing industry ahead. IBM's emphasis is not only on speed, capacity, and performance, but also on making products easier to use. Recent product development includes improvements in software so that users of IBM machines will require less training in data processing.56

Presently, IBM is placing a high priority on designing and building quality into every product - doing the work right the first time. In addition, IBM is developing new machine features and software to make the products easier to install and service including new diagnostic methods that help assure maximum availability of products to customers.

Recent product introductions at IBM include:
-IBM's most powerful computer - the advanced-circuitry IBM 3081 - as well as new models of other large and intermediate-size processors that together offer customers lower data processing costs over a broad range of computing capabilities.57

- Smaller computers such as the IBM System/38 with power and performance that in the 1960s were available only in large-scale systems.

-The IBM 3380 disk file which can store 2.5 billion characters of information and read or write data at 3 million characters a second.58

-The IBM Displaywriter and other office systems, copiers, and typewriters with many features that improve productivity for users ranging from individuals to large corporations.
The IBM holographic supermarket terminal, the IBM 5280 "intelligent" terminal system, and other new products designed to help individual users meet specific needs. Such products open up many productive ways for customers to process information at plants, stores, and offices as well as at a central computer site.59

-A variety of new program products that make the computer easier to use and also adapt to the needs of particular industries.

IBM's goal is to be the most efficient designer and manufacturer, the most efficient marketer and the most efficient servicer of information products.

IBM is finding ways to manufacture products at very high volumes while meeting quality standards and also lowering the production costs. For example, IBM is now producing computer disk units at the rate of tens of thousands a year and terminals and office products at the rate of hundreds of thousands annually.

In marketing, IBM is lowering selling costs through opening retail centers for office products and small computers; through business computer centers, where customers can see small systems demonstrated and make purchases; and through greater direct mail and telephone selling of office products, small computers and terminals.60 As noted, the company has opened a series of "business computer centers" to attract the owners of small businesses, and its new personal computers will be sold through Computerland retail stores and a new chain of specialty stores being opened by Sears, Roebuck, and Company. Aided by a massive advertising program, IBM could soon be selling as many as 350,000 personal computers a year.61
Also, to improve service productivity, IBM is extending the toll-free, 24-hour telephone service to include large-system customers who have programming questions.

In 1980, IBM completed more than 4 million square feet of manufacturing and laboratory space company-wide. More than twice that square footage was under construction in eight countries at the end of the year.

To provide more room for marketing operations, IBM added over 1 million square feet through leasing and construction of office space worldwide. An additional 3 million square feet were being built at year end.

In the years ahead, IBM believes that their growth will come from expanding opportunities in such fields as telecommunications, biomedical systems, analytical instruments, educational systems and video disc technology as well as from opportunities that are being explored in home and industrial markets.

Underlying these product efforts is IBM's continuing research in the area of pure science - laboratory work looking into new technologies and theoretical concepts that might one day find application in the products and systems.

Cary and Opel commend on the legal situations at IBM:

In January, 1981, we settled the antitrust lawsuit brought by Greyhound Computer Corporation in 1969. Both sides recognized that substantial additional expense would be necessary to resolve the matter in the courts. Accordingly, we have paid Greyhound a portion of its legal expenses in the amount of $17.7 million.

With this settlement, all of the private antitrust suits that have been active have now been disposed of either by settlement or by judgment in IBM's favor, although appeals by losing plaintiffs are still pending in three cases.
The significance of the settlement is certainly not trivial. While new competition would have eventually sprouted as a consequence of exploding technological progress, IBM's lack of aggression during the lawsuit accelerated the process. "I'm glad the suit was brought," says Marvin Kosters, head of the American Enterprise Institute's regulatory analysis group, "and I'm glad it's being dropped. The computer industry appeared threatened in the late 1960s, and it is good to force dominant companies to be extremely careful about what they do ... but it is bad to punish successful companies merely because they are a success."
"THE JAPANESE EFFECT"
For several years now, it has become increasingly clear that one of Japan's primary export thrusts in the 1980s would be in information processing. That would mean, of course, a head-on confrontation with the U.S. computer makers who dominate the world markets. Now, in one of the boldest moves yet in that direction, Fujitsu Ltd., Japan's largest computer maker, is forming a joint-venture company with TRW Inc. to invade the U.S. - by far the largest market for such products.

Such moves are essential for the Japanese to make. "They have a goal of being a major world force in computers, and to do that they've got to be in the U.S. market," declares Luciano J. Casanova, vice-president for joint ventures at Sperry Corporation's Univac Division, a major U.S. computer maker.

But so far, moving into the U.S. computer market has proven to be much tougher for the Japanese than it was for them to win their battles over the U.S. steel, auto, and consumer electronics industries. There are two major reasons; the Japanese lack the distribution networks that U.S. companies have laboriously built up, and they do not have the knowhow in software to satisfy U.S. customers.

For the past few years, Japanese computer makers have done little more than export private-label products to U.S. computer companies. Now several of these Japanese companies are starting to build up their own U.S. marketing organizations. But Fujitsu's move amounts to the first full-scale invasion by a Japanese computer maker.

After three years of negotiations, Fujitsu on May 7, 1980
announced a joint venture with TRW that initially spells serious competition for U.S. builders of small- and medium-size computers. But the fight could soon spread to the larger mainframe computers as well. Initially, the partners will invest $100 million between them to get TRW-Fujitsu Company off the ground. The Japanese company will own 51% of the new Los Angeles-based marketing company while TRW will hold the remaining 49%.

Not surprisingly, American computer makers take a dim view of joining forces with the Japanese in the U.S. "It would be foolish to help them get their foot in the door," declares Univac's Casanova. Even some Japanese companies are skeptical about the TRW-Fujitsu strategy. Nippon Electric Company (NEC), for example, has been pursuing a less ambitious, go-it-alone approach since 1977, when it set up a marketing venture in Lexington, Mass. "It will take us longer," admits John C. Cooper, marketing director of NEC Information Systems, Inc. "But it's safer in the long run because we control our own destiny."

Fujitsu will name six of TRW-Fujitsu's 11 directors and will own a majority of the venture so it can qualify for Japanese export financing and tax breaks. But TRW will run the company. TRW's existing banking and retailing customer base will be the initial marketing targets, with the venture expanding steadily into general-purpose computing markets. Ultimately the partners expect to assemble Japanese hardware in the U.S. under the TRW-Fujitsu name.

In response to recent moves by the Japanese to open their computer markets to the outside world, most major U.S. computer
makers are expanding operations in that country. While it appears to some experts that the U.S. companies are far too optimistic, the industry seems determined to increase its share of the world's second largest market, a share that slipped in recent years as the Japanese went all out to develop their own computer industry.

U.S. computer makers say they cannot afford to ignore the $4.5 billion Japanese market, now growing at 15% a year. The U.S. share of this market amounts to only about 45%, substantially less than its dominant 82% share of the world marketplace, according to International Data Corporation. The U.S. companies believe that they can increase their share because of what happened at the recent meetings on the General Agreement on Tariffs and Trade (GATT).

For one thing, the Japanese opened up their government market — amounting to 15% of the nation's overall computer business. In January, all government purchases of data-processing products worth more than $190,000 will be cleared for bidding by all interested suppliers. "It should be relatively easy to sell competitive products to the Japanese government under the new code," says one U.S. trade official in Tokyo. The Japanese also agreed to cut their tariffs on computer equipment imports. For computers, the duties will drop to 4.9% by 1987 from 9.8% today, and for peripheral equipment such as memory systems and printers, they will fall to 6% from 16.1% over the same period.

One U.S. strategy is to go after the scientific markets such as nuclear energy engineering and weather forecasting, which require the "number crunching" power of the largest computers,
virtually a U.S. monopoly. "It's a market opportunity that can't be addressed by the Japanese in the short term," claims David F. Gregg, president of Control Data Japan Ltd., a CDC subsidiary.

More than a few industry watchers question whether the U.S. companies are being realistic about this market. They point out, for example, that even IBM has seen its share of the Japanese market decline in recent years. Last year, for example, IBM's revenues rose by a paltry 2.8% while its archrival, Fujitsu Ltd., increased its computer revenues by 8%, pushing it past IBM as Japan's largest computer company.

In addition, the Ministry of International Trade and Industry (MITI) is still subtly encouraging Japanese industry to "buy Japanese" whenever possible. Although the agency officially nullified the government's "buy Japanese" computer policy in 1978, Yoichi Ishikawa, deputy director for MITI's Electronics and Electrical Machinery Division admits the agency has continued to recommend that government agencies buy Japanese data-processing gear. "MITI still thinks having our own computer industry and technology is important because of the many economic ramifications," he says.

Another reason U.S. computer companies could find it difficult to increase their Japanese market share is that the Japanese computer makers have been catching up technologically. U.S. companies may be working harder in Japan for more than just the local market, though. The biggest untapped market of all is China, and that will require the same kind of character processing that the U.S. companies are developing for Japan. Nippon Data
General already is selling a few of its small business computers to China, and Sperry says that it will market Nippon Univac's Kanji system in China. And both the new Burroughs and NCR engineering centers will develop products for China as well as Japan. Burroughs, in fact, already is teaching Chinese technicians to install its computers.65

Japan's drive to increase its world market share in computers "has been an uphill battle because IBM has such a significant market share," says Bob L.S. Ching, vice-president of Boston Consulting Group Inc. in Japan. Japanese computer companies hold only 10% to 15% of the worldwide computer market compared with estimates of 50% for IBM. Japanese exports of computers pale beside those of autos, consumer electronics, and semiconductors. In 1979, for example, only 7.2% of the computers produced in Japan were exported compared with 50% of all automobiles produced.

Exports by Japan's computer makers are growing 20% to 25% annually, and by 1990, MITI has set as a national goal to win a worldwide market share of 30% and a U.S. market share of 18%.

The strategy for achieving these goals is elegantly simple. In addition to the U.S. market, which cannot be ignored because of its size, the Japanese are targeting less developed countries and smaller computer markets that have high growth potential. As these markets expand, the Japanese hope to entrench themselves and be in position to grab any new business. IBM also is in many of these markets, but the Japanese are willing to buy market share to boot the computer giant out.66

During the latter half of the 1970s, Japanese computer
makers spent nearly all of their human and financial resources in an effort to catch up with U.S. computer technology. The huge commitment has paid off. Today, Japanese hardware is certainly as good as any coming from the United States, but the Japanese are still behind the U.S. in producing software. Japan's computer makers will be busy during the first half of the 1980s attempting to bridge the software gap. U.S. computer executives say that writing software is more akin to producing a work of art than to building a machine, and they predict tough times ahead for the Japanese.

While the Japanese are far behind their U.S. counterparts in developing software for defense and aero-space-related software, the gap in the commercial sector may be much smaller than U.S. executives claim. "We have the most advanced systems in the world for applications like airline reservations and electronic banking," claims Katsumi Fujiki, executive managing director at Hitachi Ltd.

To encourage software developments for the commercial market, Japan's MITI is providing the country's leading computer makers with $150 million over the next three years to create new operating systems software. This is at the heart of the computer, and it oversees all computer functions. In addition, MITI has pledged $30 million in research and development funds to independent software houses for the creation of new applications software packages, and it is offering such incentives as a 40% tax deferral on software revenues for the first four years of a program's life.
U.S. software executives question whether Japanese programmers can produce for the U.S. market, given the cultural difference between the two societies. But Japanese executives are quick to point out that in consumer electronics, automobiles, and other product areas, Japanese companies have been able to design their wares successfully for the U.S. market. Besides, asks William H. Totten (a principal at K.K. Ashisuto), "if we can sell software developed for the American market in Japan, why can't the Japanese sell software in the U.S.?” He adds, "People say that the Japanese have problems developing software, but that is wishful thinking."

Whatever the case may be with respect to software, we must keep in mind that the Japanese computer manufacturers are making a serious move to enter the world market in the computer industry. And only time will tell how the U.S. will react to this move and how successful the reaction will be.
WHY BUY HP?
Having discussed HP, DEC, Burroughs, Prime, and IBM, it is important now to consider what prompts someone to purchase an HP machine over any of the others. (I have chosen not to address this question where the Japanese firms are concerned; they are a potential threat to the entire American computer industry, but they haven't yet really exerted themselves into the marketplace.) In addition, most of my discussion will deal with the companies in general, and I haven't specified particular system numbers in most instances - though some specific numbers are mentioned.

WHY HP?

In looking at reasons that one should buy from HP, we could (and will) look at what Hewlett-Packard sights as reasons to buy HP, but that rarely gives the full picture. So, we should also look at those reasons given by customers who chose HP over the other available systems:

- The local HP sales office treated the customer very much like a major account.

- HP complied with the requirements of the customer's specifications.

- HP responded to an RFQ by providing detailed plans customized to meet the demands of the customer's distributed manufacturing sites.

- Another key factor mentioned was the ability of HP to provide the customer with service and support of their diverse locations.

- HP offered a wide range of processing power with its 3000 family which could meet the needs of the customer's large and small plants with the same compatible MPE operating system.

In contrast to HP, the other vendors were unable to offer as much flexibility. Some lost because they proposed the wrong
system. Others lost because their reputation for service and support was wanting.68

Another instance where HP was chosen over other vendors (Prime in particular) provides us with additional benefits of buying from Hewlett-Packard:

- Manufacturing software available on the HP3000.
- MPE's (operating system) friendliness.
- Integration between HP data communications and data management software.
- HP's multinational support network.
- Two well-timed, well-executed factory visits.
- Two visits to the software supplier.
- HP's Manufacturing Productivity Network strategy.
- The salesman had a detailed understanding of the customer's needs and organizational dynamics.69

Also, Hewlett-Packard provides a single vendor solution; this means more than just convenience. It means a more cost efficient and performance proven solution as well ... particularly when that single vendor is Hewlett-Packard. We can see that this is true by looking at system design. All hardware, software, and peripheral interfaces are standard. In addition, all components have been designed and tested to work together. Just as importantly, using HP as a single vendor provides you with a single source of system responsibility for everything from ordering to servicing. That can save you valuable time and dollars.

At Hewlett-Packard, high technology means more than just being state-of-the-art. HP doesn't believe in "me too" product development; they feel that this approach is unhealthy for HP and
for the customer. HP is a technology-driven company. Eleven technology centers throughout the world are developing the building blocks for future products, much as they have with previous breakthroughs such as CMOS/SOS, distributed networking, and transparent FORTRAN access to two megabytes of memory. Nearly 10% of every HP sales dollar is reinvested in Research and Development, assuring the customer a continual flow of practical but innovative tools.

Hewlett-Packard offers service and support through a worldwide service organization of 140 offices in 36 countries. Guaranteed response times, comprehensive services, complete customer training, and a "work-to-completion" commitment are the critical elements in our service and support leadership.

Hewlett-Packard treats support as a product. The customer buys it. As much or as little as is needed. Support levels range from on-call support seven days a week, 24 hours a day, to a service where support is provided through a network of HP field repair centers, located regionally throughout the world. So the customer doesn't have to pay for services that he doesn't need, or duplicate capabilities he already has in-house. Some of the field engineering and maintenance services are: Field Engineering Services, Field Maintenance Programs, Time and Material Service, Out-Of-Coverage Service.

Field Engineering Services: These include site planning, environmental and installation services. This ensures that the HP computer system is installed properly at an acceptable, designated site.
Field Maintenance Programs: Hardware maintenance agreement programs are available that offer a variety of maintenance services at different levels of support and cost. All offer a 90-day short-term option that OEMs will find especially useful in providing warranty services to end-users at fixed prices. Benefits common to all programs are:

- A known, monthly (and therefore budgetable) maintenance cost
- Work continues until the job is completed - without additional charges
- All costs for parts and labor are included
- A Customer Engineer is specifically assigned to the customer account

Time and Material Service: If there is an in-house maintenance program, the customer may use Time and Materials Services to supplement his capabilities in work overload or emergency situations. T & M services are provided on a per-call basis from 8:00AM to 5:00 PM during the normal work week, excluding HP holidays; charges for travel, labor and parts are specified for each service.

Out-Of-Coverage Service: This service provides 24-hour per day, seven day a week access to the HP Computer Support Organization via telephone access or on-site response outside the period of coverage specified by the normal hardware maintenance program. This service also may be used to augment Time and Material Services.

As with hardware, HP offers several levels of software support, so the customer gets and pays for only what he needs. Software support programs are: Customer Support Services, Soft-
ware Subscription Service, Document Distribution Services.

Customer Support Services (CSS): This is the standard software support plan, providing the highest level of support available from Hewlett-Packard. CSS offers the customer an intimate support relationship with HP. Its benefits include:

- Delivery and right to use software and firmware updates
- Software status bulletin (a periodically-published description of "bug" reports)
- Software problem reporting (a bug-reporting system featuring prompt HP replies)
- Communicator (a technical publication with timely articles about HP systems)
- Reference manual updates
- Phone-In Consulting Service (PICS), a quick way to get help from HP on tough problems
- On-site systems engineering assistance (when required, an HP Systems Engineer will respond to resolve problems)
- Account-responsible Systems Engineers (it's an SE's business to know the software end of the customer's business and help make the customer successful)

Software Subscription Service: (SSS) For the experienced user who doesn't need the assistance of HP's system engineering resources, Hewlett-Packard offers the Software Subscription Service. SSS provides all of the CSS benefits except phone-in consulting, on-site systems engineering assistance, and account-responsible Systems Engineers, at a substantially lower cost.

Document Distribution Services (DDS): Two basic Document Distribution Services are available. These services are especially appropriate for users with large programming staffs who need to keep informed of software problems and continually update their
documentation. The two services are:

- Software Notification Service, including the software Status Bulletin and Communicator.
- Manual Update Service, including the latest revision to reference manuals, mailed automatically.

Hewlett-Packard offers two warranty plans. The standard plan provides a full 90-day warranty with on-site services for all systems and accessories. Site preparation and installation services are included with every system purchased, at no extra cost. For computers purchased as components, the 90-day warranty also applies, with on-site service available if the customer pays for travel. Maintenance response time varies from 4 hours to 3 days, depending on the distance from the nearest HP service center and the type of maintenance service involved.

A second plan is specifically designed for the large-volume OEM. HP allows this customer to waive the service and installation provisions of the warranty on HP systems in exchange for an additional five percent purchase discount. With this agreement, the 90-day warranty remains in effect, but product service is provided at HP facilities.

Hewlett-Packard will generally be able to quote a delivery time in weeks - not months or years. Most HP computer products can be shipped within eight to ten weeks of the day they receive an order. In addition, many computer supplies and some smaller products can be ordered through our Computer Supplies Operation, which features a toll-free number and 24-hour turn-around on all orders.

A critical element in the HP/customer relationship is
communication. Thus, HP encourages the users to visit our computer manufacturing facilities on a regular basis. In addition to providing an opportunity to exchange information and ideas, Account Reviews provide the customer with an opportunity to meet the people who design and build HP systems. 70

HP versus ....

In looking at HP systems (particularly the HP3000) as compared to systems from other vendors, we also note many benefits offered by HP.

HP3000 versus IBM System/38. What IBM doesn't have and HP does better: Disadvantages of the IBM.

- No peer to peer data communications
- Only RPGIII and COBOL
- Usually longer delivery
- No RJE, MRJE to mainframes
- Slightly higher purchase price with less performance
- No compatibility with S/3, S/32, S/34
- Reportedly limited number of terminals usable
- Limited number of reference accounts
- Limited application software available

HP3000 versus IBM 4300 Series. Problems with the 4300 Series include:

- Expensive to maintain system software
- Complex, not user-oriented
- Higher price
HP3000 versus Prime 50 Series. Prime falls short in the following areas:

- References
- No battery back-up
- No total solution
- Spotty quality of manuals
- Limit of 63 concurrent jobs
- All training in Massachusetts or San Francisco
- COBOL performance is not as good as FORTRAN
- Poor RPG 71

WHAT HP OFFERS THAT MANY OTHERS DON'T.....

According to Paul Thomas, Account Systems Engineer for Hewlett-Packard Company, there are a variety of reasons to go with Hewlett-Packard over other vendors in the computer industry. To begin, HP offers a one-vendor solution; the company stands behind its products. In fact, HP repairs every product sold by the company. HP also manufactures their own peripherals. Paul also comments that HP's support organization is outstanding; the services are comprehensive and offered worldwide.

In addition, Hewlett-Packard offers more software that is supported by the vendor than other companies, even IBM. HP products last longer than most other products on the market and are much more reliable than the products of their competitors. Likewise, HP offers extensive product training for the products in a variety of locations that are readily accessible to customers.

Hewlett-Packard's manuals are very understandable; they are written with the user in mind. Furthermore, updates for the
manuals are sent promptly to those users requesting this service. Unlike other computer vendors, HP doesn't take an order for a product before it is ready to be introduced; on the other hand, IBM will take orders for a product still on the drawing board 2 or 3 years in advance.

Paul also noted that Hewlett-Packard is not living on borrowed money; HP is a "pay-as-you-go" organization which provides a very firm financial base for the company. Also, because HP is essentially a privately-owned company, decisions are made conscientiously. 72

Obviously there are many reasons to "buy HP"; however, it is very important to realize that HP will not sell a computer to a customer where the machine doesn't fit the application. Extensive research is done by the salesmen when initially approaching a potential account; they will be honest and tell you if HP can satisfy your needs as a customer. And, as far as I'm concerned, that's also a reason to buy Hewlett-Packard equipment with confidence.


21. Ibid.
22. Ibid.
23. Ibid.
24. Ibid.
25. Ibid.
26. Ibid.
28. Ibid.
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56. Ibid.


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70. "15 reasons why Hewlett-Packard should be your OEM real-time computer vendor," Hewlett-Packard Company, February 1982.


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