MICRO - MAINFRAME : PERSONAL

COMPUTER MARKET OPPORTUNITIES

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Many of INPUT's professional staff members have nearly 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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MICRO-MAINFRAME: PERSONAL COMPUTER MARKET OPPORTUNITIES

MICRO-MAINFRAME: PERSONAL
COMPUTER MARKET OPPORTUNITIES

CONTENTS

INPUT
M-CPM-100

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MICRO-MAINFRAME: COMPUTER MARKET OPPORTUNITIES

EXHIBITS

INPUT

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I INTRODUCTION

I INTRODUCTION

A. BACKGROUND

- The micro-mainframe issue is one that scored high in INPUT's 1983 client poll. Since then, interest has continued to climb, assisted by a barrage of vendor announcements.

- However, the profusion of announcements of products (and some pseudo-products) has made it in some ways more difficult to identify and understand the real issues. Most current vendor products and corporate plans are preliminary, where they are not primitive.

- INPUT believes that the group of issues united under the banner "micro-mainframe" could produce a discontinuity in data processing at least as large as that produced by the introduction of the System/360. With this view, the micro-mainframe question becomes much more than a question of, for example, screen versus file transfer.

- INPUT intends that the studies contained in this series of reports (see section C of this chapter) be useful planning documents over a three- to five-year planning horizon, although the reports do not neglect current issues or technical detail.

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- The study generally assumes that the micro-mainframe world is an IBM world (or an IBM-compatible world, which in many ways is the same thing). This has obviously been true for some time at the mainframe level and the issue will not be belabored here.

  - At the micro level this assumption is still somewhat debatable; for example, Apple's Macintosh and ATT's recently announced computer series may still provide a basis for corporate micro-mainframe strategies. However, two key points should be made:

    - IBM's current interconnect strategy will provide an underlying environment for Information Systems (IS), end users, and vendors, as shown in Exhibit I-I.

    - Equally important is the view held by IS departments. The non-IBM-compatible share of corporate micros is expected by IS management to be very low compared to IBM and IBM-compatibles, as shown in Exhibit I-2.

  - This does not mean that there is not and will not be a place for innovative micro hardware in large enterprises. However, from the standpoint of micro-mainframe connectivity, such devices will have to look like comparable IBM-compatible equipment in order to be easily used and accepted; or at least they must be transparent to IBM networks.

B. METHODOLOGY

- The research for this report was conducted in parallel with that for three related reports (see next section). A large project team spent over four months researching and analyzing information in this rapidly changing area. The research consisted of the following major activities:

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EXHIBIT I-1

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IBM'S PC COMMUNICATIONS FRAMEWORK

Other	Data Base	Infor-mation Center	PROFS		DISOSS	Infor-mation Center	Data Base	Other
	VM					MVS/VSE		

| 4300 | | 4300 | 5520 | 8100 | S/36 | S/38 | S/1 | PC Cluster |

PC	PC	PC	PC	PC	PC	PC	PC
3270-PC	3270-PC	3270-PC	3270-PC	5291	5291	3101	PCjr.
DWS	DWS	PCXT/370	DWS	5292	5292	DWS	DWS
317X/3180	317X/3180	5253	317X/3180	3180	3180		
327X/3290	327X/3180	6670	327X/3290	5250	5250		
5080	5080		6775	6670	6670		
PCXT/370	Scanmaster		3104				
S9000	4250/6670		3640				
3101			6670				
4250/6670							

Source: IBM

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EXHIBIT I-2

CORPORATE MICRO GROWTH, 1984-1986

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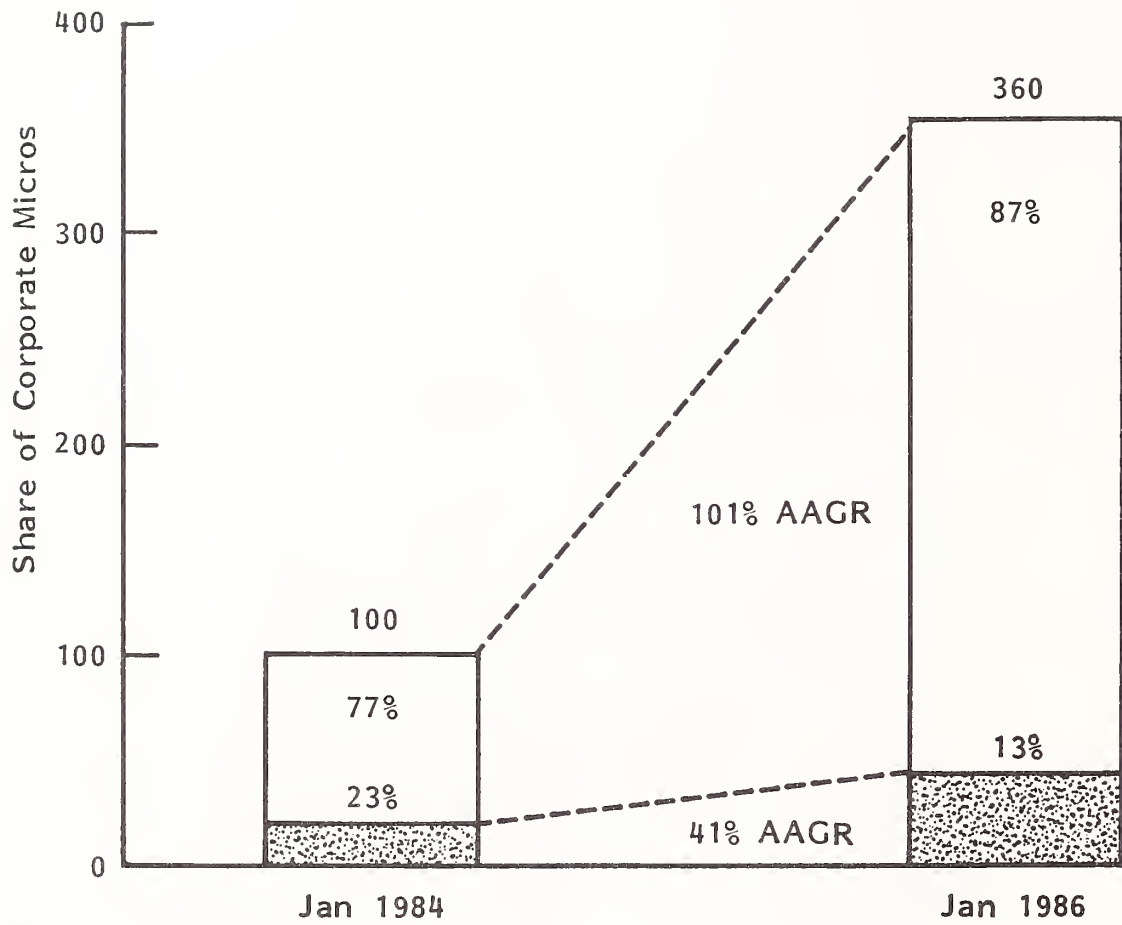
- Client interviews.

- Corporate interviews, case studies, and consulting.

- Vendor interviews, case studies, and consulting.

- Product and service analyses.

- **Client interviews.**

  - INPUT clients were sampled in December and January to ascertain their areas of special interest and to learn of their experiences, problems, and needs.

- **Corporate interviews.**

  - Seventy-eight structured interviews were conducted with IS management at large companies in February and March of 1984.

    . The questionnaire used is in Appendix A.

    . Company sizes and industries are shown in Appendix B.

  - These interviews were unusual, owing to the fact that they were much longer than typical interviews (i.e., averaging 45 minutes to over an hour); respondents were highly motivated and forthcoming.

  - In addition, INPUT had the opportunity to review over 20 companies in depth. Some of the experiences of these companies are described in the reports in detail; other information was used to inform our analysis and recommendations.

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- In the past nine months, INPUT has conducted a number of consulting studies that bear on the micro-mainframe issue. Five of these studies have specifically addressed micro-mainframe issues from the corporate standpoint, and the knowledge gained is included in this report.

- Vendor interviews.

  - Structured interviews were conducted with vendor personnel from 20 companies in February and March. The questionnaire used is shown in Appendix C.

  - In addition, more than 30 other people from vendor organizations were interviewed in particular issue areas.

  - Vendors, too, were highly interested in the topic and were quite forth-coming. A number of interviews were multihour in length. Those interviewed ranged from senior technical staff to company presidents. The companies included small innovative software firms and very large hardware companies.

  - INPUT's recent consulting studies have included four that address vendor micro-mainframe issues. Although no proprietary information from these engagements was used directly for these public studies, these engagements provided INPUT with an in-depth sensitivity to vendor requirements.

- Product and service analysis.

  - INPUT has collected and analyzed information on several hundred products and services in the micro-mainframe area.

  - Unfortunately, some of the information obtained at the beginning of the study is already obsolete. INPUT estimates that micro-mainframe

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technical and product information has a half-life of about six months. Several products will probably be formally available a short time after the release of this report. The rate of new product introduction has been very high, and INPUT expects it to continue; for example, there are high-speed micro-mainframe links from LAN vendors, and Cullinet has a micro-mainframe intelligent link.

- In general, micro-mainframe products are evolving very quickly. Consequently, extensive detailed product comparisons will soon be out of date.

- Therefore, INPUT has used specific products largely to illustrate more basic issues. INPUT's goal has been to make this a study that would require only marginal updating for it to remain a useful planning tool a year from now.

● Some of the survey's quantitative results would have appeared surprising, even dubious, to the INPUT micro-mainframe project team had it not been for other micro-mainframe-related studies that INPUT has conducted in the past six months.

- Several of these other studies included in-depth (i.e., one to two hours), face-to-face interviews conducted with:

  • Over 50 IS managers and planners.

  • Over 25 people in end-user management (up to the executive vice president level in multibillion-dollar organizations).

- These other studies are very supportive of the projections contained here and, from the standpoint of end-user motivations and plans, may even go beyond some of the findings here.

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- Although the companies interviewed for this report were selected randomly, in a sense the respondents were not. But respondent self-selection has worked to the study's benefit, in INPUT's opinion.

    - Respondents were in IS executive or planning management, and the job titles have the usual distribution for this type of study.

    - However, in arranging interviews, INPUT was usually (and properly) directed to the person that was most knowledgeable on micro-mainframe issues in that organization.

    - This person was almost always ahead of the rest of the organization in information and, more importantly, in insight. These respondents often know where their IS organizations are going before most others in the organization have even begun to consider the issues.

    - Fortunately, this brings the results of the survey much more in synch with end-user directions and motivation. (For obvious reasons, it is very important to understand where end users are going.)

C. RELATED INPUT REPORTS

- This report is being issued in conjunction with three other reports in a micro-mainframe series of reports, as shown in Exhibit I-3. These reports are:

    - End-User Micro-Mainframe Needs

        . This report is part of the Information Systems Program (ISP), utilized by IS management.

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EXHIBIT I-3

MICRO-MAINFRAME REPORT RELATIONSHIPS

Program:	ISP	MAPS

Audience: IS Managers   Information
              and Planners   Service Vendors

Reports: End-User   Personal Computer
              Issues - - - - - ->   Impact

              Telecommunications   Remote Processing and
              Planning - - - - - -> Turnkey Strategies

Close Relationship ——————————>

Provides Deeper
  Understanding - - - - - - ->

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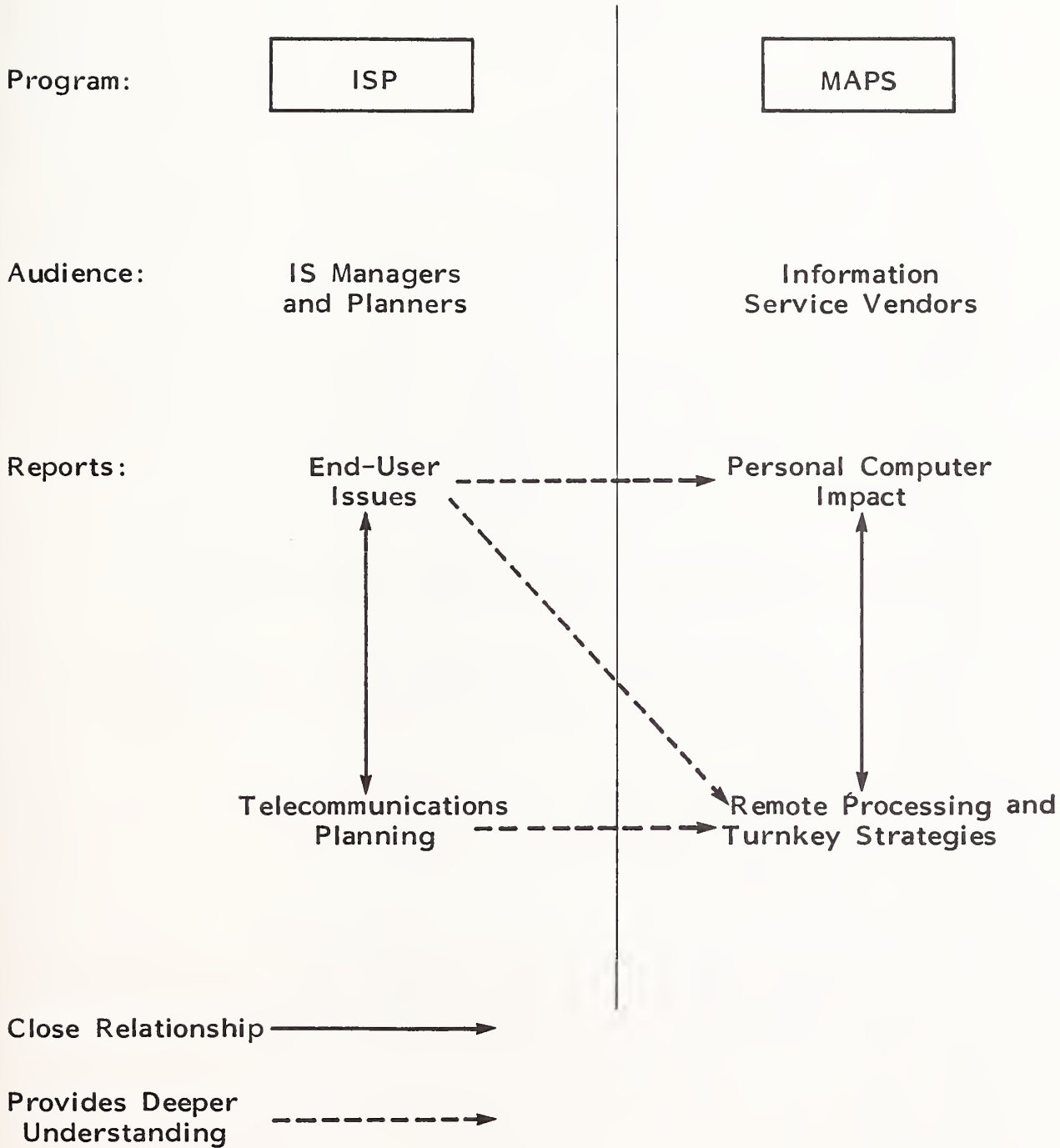
- This study addresses the current and future impact that the micro-mainframe phenomenon will have on end users and, in turn, on IS departments.

- The report focuses on developing opportunities and problem areas and on determining how IS can meet them.

- <u>Micro-Mainframe: Communications Issues</u>

  - This report is part of the Information System Program (ISP), utilized by IS management.

  - This study addresses current developments in micro-mainframe communications as well as future trends.

  - The micro promises to have a significant impact on communications. This report analyzes positive and negative effects of anticipated changes and provides strategies for dealing with them.

- <u>Micro-to-Mainframe: Processing and Turnkey Strategies</u>

  - This report is part of the Market Analysis and Planning Service (MAPS) program that is utilized by information service vendors.

  - This study analyzes micro/mainframe developments from the standpoint of their effect on traditional RCS and turnkey services.

  - The report provides market forecasts and strategies for adapting to a rapidly changing set of customer needs.

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II EXECUTIVE SUMMARY

II   EXECUTIVE SUMMARY

- This executive summary is designed in a presentation format in order to:

    - Help the busy reader quickly review key research findings.

    - Provide an executive presentation and script that facilitates group communications.

- The key points of the entire report are summarized in Exhibit II-I through II-7. On the left-hand page facing each exhibit is a script explaining the exhibit's contents.

INPUT

A.   MICRO-MAINFRAME APPLICATIONS GROWTH: 1984-1988

- INPUT expects that micro-mainframe applications used by major corporations will grow at an average annual rate of approximately 50-75% between now and 1988. Perhaps as many as a third of all applications in 1988 will be micro-mainframe applications. These will definitely not be limited to the relatively trivial download of information for spreadsheet analysis that predominates today.   Rather, many micro-mainframe applications will be part of key production systems that are now host-based.

- One of the striking things revealed in this study is that not only do end users see a need for "heavy-duty" micro-mainframe production systems, but IS managers (for the most part) also see such a need. This view by IS management could mean a real breakthrough, especially since IS was not enthusiastic at the start of the build-up of standalone micros.

- INPUT expects the growth curve to peak at about 1990, reflecting:

    - A slowing down of the rate of conversions from traditional systems to micro-mainframe systems. This rate will probably be artificially high in the late 1980s, since some systems are converted earlier than they would have been without the micro-mainframe phenomenon.

    - A ceiling (at approximately the 50% level) will be reached where traditional host-based systems or standalone micro systems continue to be acquired. In these cases micro-mainframe systems may not be required, the corporation will be resistant to the concept, a traditional product will be successfully sold, or a micro-mainframe product will be technically infeasible.

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EXHIBIT II-1

MICRO-MAINFRAME
APPLICATIONS GROWTH: 1984-1988

- 13 -
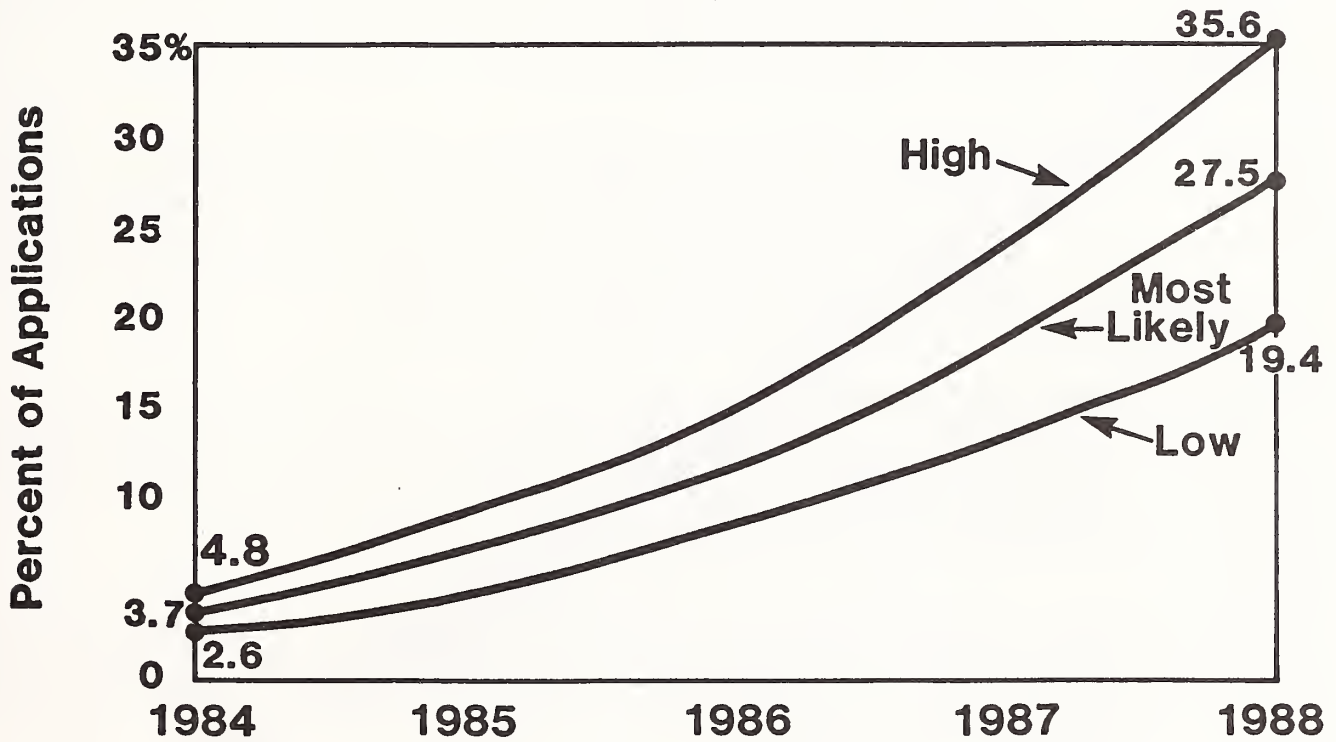
B. MICRO-MAINFRAME IMPACT ON SOFTWARE PRODUCT REVENUES

- INPUT expects that by 1988, between one-fifth and one-third of software product sales, by then over $30 billion annually, will come from products that address micro-mainframe needs.

    - Much of this market will be a "replacement" market, in which buyers will select micro-mainframe applications rather than conventional (mini or mainframe only) products.

    - However, there is a good chance that micro-mainframe needs will expand the size of the entire market, at least for a while, as corporate buyers scrap a conventional system before they otherwise might and replace it with a micro-mainframe system.

- INPUT expects that the micro-mainframe portion of the software products market will continue to expand until it accounts for about half of the software product market in the 1990s.

- Vendors should be able to sell to the micro-mainframe portion of the market at least as well as they are able to sell to the separate mainframe and micro software markets now.

    - Over half of currently implemented micro-mainframe applications have used vendor-supplied products or services.

    - The expected proportion increases to over 80% for applications in the concept or planning stage.

- One dark spot for vendors is that corporations are positive only toward specific products and services. Toward vendors in general or toward specific kinds of vendors (software companies, etc.), corporations are lukewarm at best; obviously, a selling job is required here.

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EXHIBIT II-2

MICRO-MAINFRAME IMPACT ON SOFTWARE PRODUCT REVENUES

Software Product Sales

Key:

1983 Annual
Report Forecast →

Minimum Expected
(Replacement)

High Range (Potentially
Additive to Previous
Forecasts)

Most Likely (i.e.,
Replacement)

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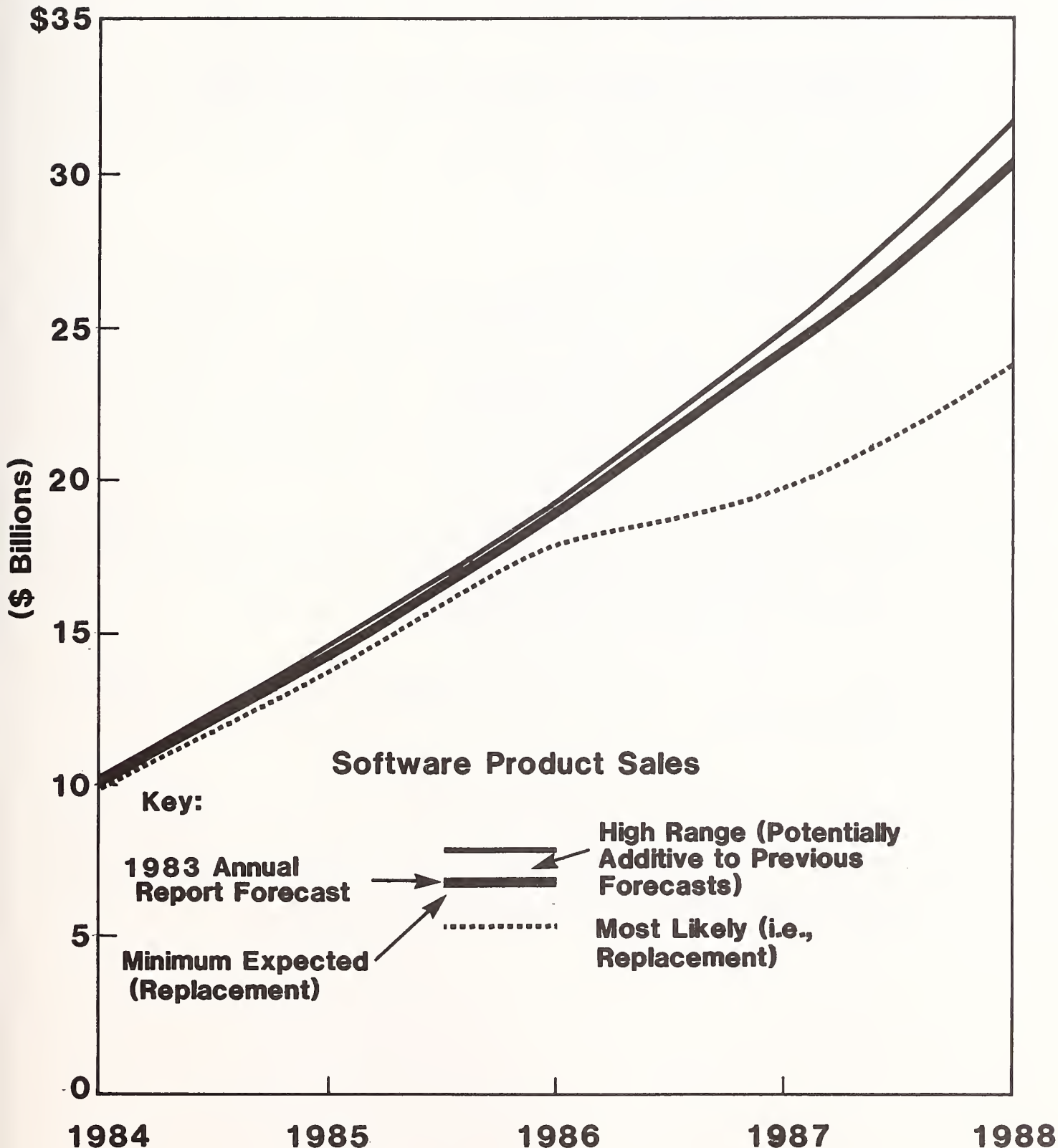
C. MAJOR FACTORS AFFECTING MICRO-MAINFRAME GROWTH

- The micro-mainframe market is still in an immature stage. Many factors could influence a higher or lower growth rate.

- The objective need will vary widely from company to company and by functions and departments within companies. However, there are certainly many cases in which operating units could perform better with systems that were at least partially responsive to end-user needs.

- End users and IS will be the driving force behind "heavy-duty" micro-mainframe applications. For a mixture of reasons, many IS organizations may be cool at first to micro-mainframe applications that, for example, interface directly with key production applications. This will be a critical area for software vendors since, unlike RCS vendors, the IS department will continue to be the chief client and can, at the least, always be a blocking force.

- Early success is important for both clients and vendors when dealing with novel products in novel environments. Consequently, vendors (and clients) must set cautious goals for both achievements and schedules.

- Linked to this is the need to produce acceptable solutions, which might not represent technical wizardry but will meet initial requirements.

- Similarly, retrofitted mainframe packages for use in a micro-mainframe environment would be a logical further extension of this. Ironically, some packages that are now considered somewhat passé by the marketplace could be best suited because of their basically batch orientation.

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EXHIBIT II-3

MAJOR FACTORS AFFECTING MICRO-MAINFRAME GROWTH

- Need

- End-User Influence

- IS Acceptance

- Established Successes

- Acceptable Solutions

- Retrofitted Packages

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D.   CONNECTIVITY: THE WEAK LINK

- Current connectivity products are, as some vendors candidly admit, at an early stage of functionality. Although they are enormously superior to the earlier stage (when reports were rekeyed manually), they do not have the characteristics that would allow shared functionality in a production environment.

- Some of these major missing links are:

    - Control over data concurrency: This is how central and local data can be kept synchronized. There will also be two classes of local data-- purely local data, and that shared with the central processor. Local-only data must be managed so that it does not inadvertently duplicate shared data.

    - Processor task allocation: This is more of a design problem than an operations problem. The segmentation of processing tasks (and associated data between the host and the micro) will be extremely difficult to analyze. Making modifications could become an order of magnitude more difficult still.

    - Security: This is an area that most of the micro world is blissfully unaware of. Simply establishing the same level of mainframe system security will be difficult. Meeting the more demanding needs of a dispersed environment will be significantly more difficult.

- The ultimate missing link is what might be termed "interactive transparency," whereby a micro-mainframe system, from an applications standpoint, can be designed and operated like a mainframe-based system, yet have the local control and flexibility of a micro system. This is at least five (probably ten) years away, except in specialized custom applications.

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EXHIBIT II-4

CONNECTIVITY:
THE WEAK LINK

Traditional Mainframe Software — Connectivity Software — Micro Software

Product Gap

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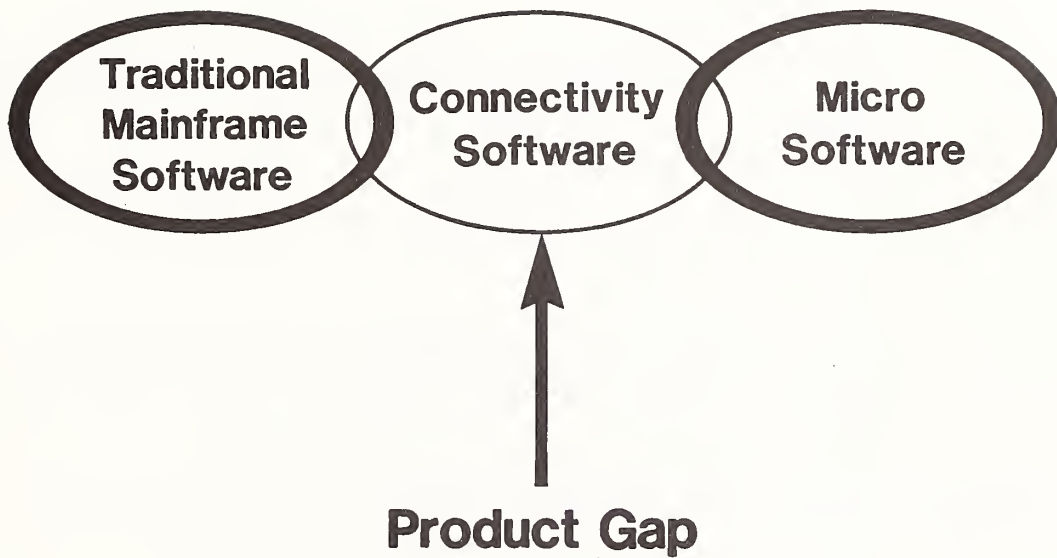
E.   POTENTIAL STRATEGIC CONFLICT BETWEEN INTEGRATED AND MICRO-MAINFRAME APPLICATIONS

- Integrated software packages on the mainframe and especially the micro levels are growing in popularity.

    - Integrated mainframe environments use a data base manager as the central core. This assists in eliminating data redundancy, sharing data between applications, and keeping different applications synchronized.

    - Most micro software companies and many mainframe software vendors offer their version of an integrated analytic environment, almost always including spreadsheet, word processing, and graphics capabilities. They frequently offer additional capabilities such as data base management, modeling, and asynchronous communications.

    - Often these are common commands across applications, functions, and common internal processing modules. They make the packages easier to use and the changes faster and less expensive for the vendor.

- The components within the integrated environment are tightly coupled, making the entire environment more complex. This complexity is supportable in a well-designed integrated environment since the complexity will be balanced by the advantages. However, the complexity of these integrated environments becomes a disadvantage when having to link to another processing environment, especially if it is also an integrated environment.

- Micro-mainframe applications will require less tightly coupled environments. This could send some system designers back to their drafting boards.

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EXHIBIT II-5

POTENTIAL STRATEGIC CONFLICT BETWEEN INTEGRATED AND MICRO-MAINFRAME APPLICATIONS

- **Integrated Applications**

  - **Mainframe DBMS**

  - **PC Analytic Tools**

- **Micro-Mainframe Shared Functionality**

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F. GENERAL STRATEGIES

- Vendors that want to be successful in the micro-mainframe market must make choices. For example, they have to choose between being an applications-oriented vendor and providing the systems support foundation. This choice, analogous to those facing software companies today, will be even harder to make because the micro-mainframe market will be increasingly end-user and application driven.

- There will always be room for niche specialists, both for particular applications and for specialized technical tools. They must, however, understand their niches better than anyone else. The danger in being so specialized is that a "better mousetrap" can have a serious business impact.

- The technical aspects of micro-mainframe connectivity should not be ignored; the boundaries of the "adequate" olution will be constantly expanding.

- Above all, vendors should market their capabilities. This is the most serious short-term problem in the marketplace: potential customers do not understand what services vendors supply. The gap is caused by two things:

  - The confusing mass of first generation downloaders and communications packages.

  - Vendors' belief that corporations are less inclined to use vendors than the customers in fact are.

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EXHIBIT II-6

GENERAL STRATEGIES

- **Choose: Connectivity Foundation versus Connectivity Applications (or Both)**

- **Allied Choice: Software Conglomerate or Niche Specialist**

- **Start to Close Connectivity Gap**

- **Market Capabilities**

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G.   SOFTWARE STRATEGIES

- Micro-mainframe connectivity software will be the key to success in the micro-mainframe market. Software vendors are the logical suppliers. Independent mainframe software vendors have taken the lead, since they understand the market's needs somewhat better. Also, the micro software vendors are virtually all too small and too narrowly focused.

- Micro and mainframe software vendors will be increasingly forced together to share knowledge and products. This is very desirable for mainframe software vendors. It will become a critical need for all micro software vendors that want to address the corporate market in the future.

- Although software is the driving force, it need not be supplied and or marketed only by the independent software vendors. If the software vendors falter, others can take their place, including RCS firms, professional services firms (especially those with strong data base design skills), turnkey vendors, and do-it-yourself efforts (i.e., in-house developers).

- Hardware vendors, especially IBM, are the single biggest alternative source of supply for micro-mainframe functionality.

    - IBM, of course, is in a class of its own. If IBM produces a creditable micro-mainframe connectivity product before others have become firmly established, then, as in the PC market, all the rules will have changed.

    - The emphasis will then change from innovation to adaptation. Success for independents would still be possible, but in a much more constrained environment.

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EXHIBIT II-7

SOFTWARE STRATEGIES

- **Software = Driving Force**

- **Partners Needed**

- **If Independent Software Firms Do Not Supply Connectivity**

  - **Other Service Vendors Will**

  - **Hardware Companies May Dominate**

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III THE CHANGING APPLICATIONS ENVIRONMENT

III   THE CHANGING APPLICATIONS ENVIRONMENT

- Before going on to analyze specifically vendor-related issues, it is important that established vendors (as well as prospective vendors) wishing to deal with the evolving micro-mainframe market understand what basic forces are driving it.

- This chapter will lay the groundwork in two ways.

  - The first section will summarize general micro-mainframe plans from the IS and end-user perspectives as identified in INPUT's primary research.

  - The second section will show how micro-mainframe applications will mirror the changes going on in a particular industry segment, manufacturing.

A.   GENERAL MICRO-MAINFRAME PLANS

- The key issue from a corporate standpoint is the type of micro-mainframe (M-M) applications expected to be used in the future.

  - Relatively simple analytic applications (e.g., based on data downloaded to spreadsheets) now predominate.

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-       However, in the future, M-M applications will cover the full range of data processing activities and will be quite complex and powerful.

•   These additional M-M concepts include the following:

-       Micro-mainframe applications will have shared functionality, a view that corporations subscribe to even more than vendors do, as shown in Exhibit III-1. Shared functionality is a key concept that will be returned to again and again in this study.

-       This view toward shared functionality is widely held by corporations, as shown in Exhibit III-2.

-       Micro-mainframe applications will include many key applications; i.e., they will be:

    •   Important.

    •   Large.

    •   Production/operation oriented.

    •   Replacements for critical host-based applications.

-       Corporations expect interactive linkage, as shown in Exhibit III-3.

    •   These expectations are at the outer edge of feasibility, as shown in Exhibit III-4, and will remain so for at least three to five years, since user needs demand generalized, interactive transfer of data elements.

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EXHIBIT III-1

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MICRO-MAINFRAME APPLICATION DEFINITION
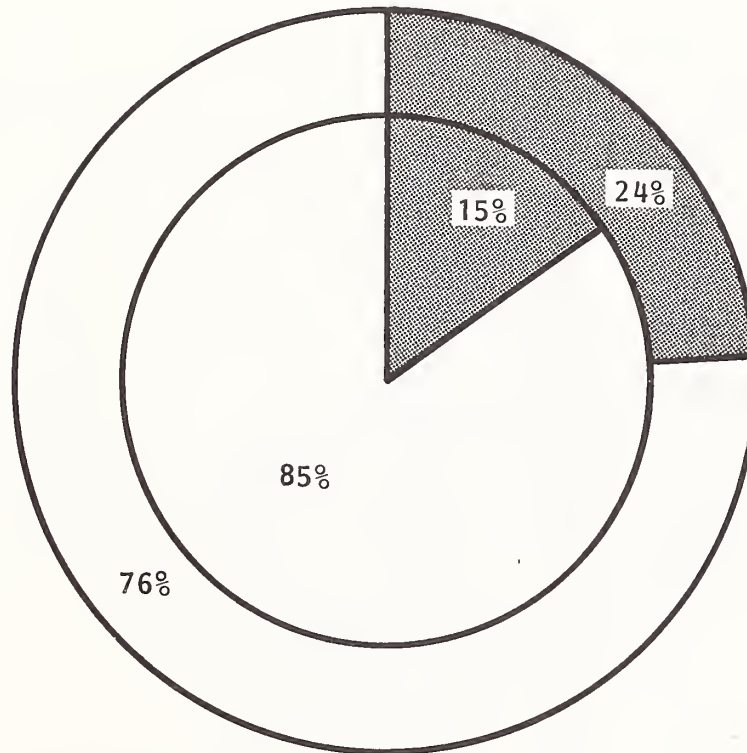
Definition:

"Mainframe host and micro must utilize processing or data from each other."

Inner Circle - Corporation

Outer Circle - Vendors

▨ Disagreement With Definition

☐ Agreement With Definition

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EXHIBIT III-2

CORPORATE EXPECTATION OF EXTENSIVE
HOST-MICRO SHARED FUNCTIONALITY APPLICATION

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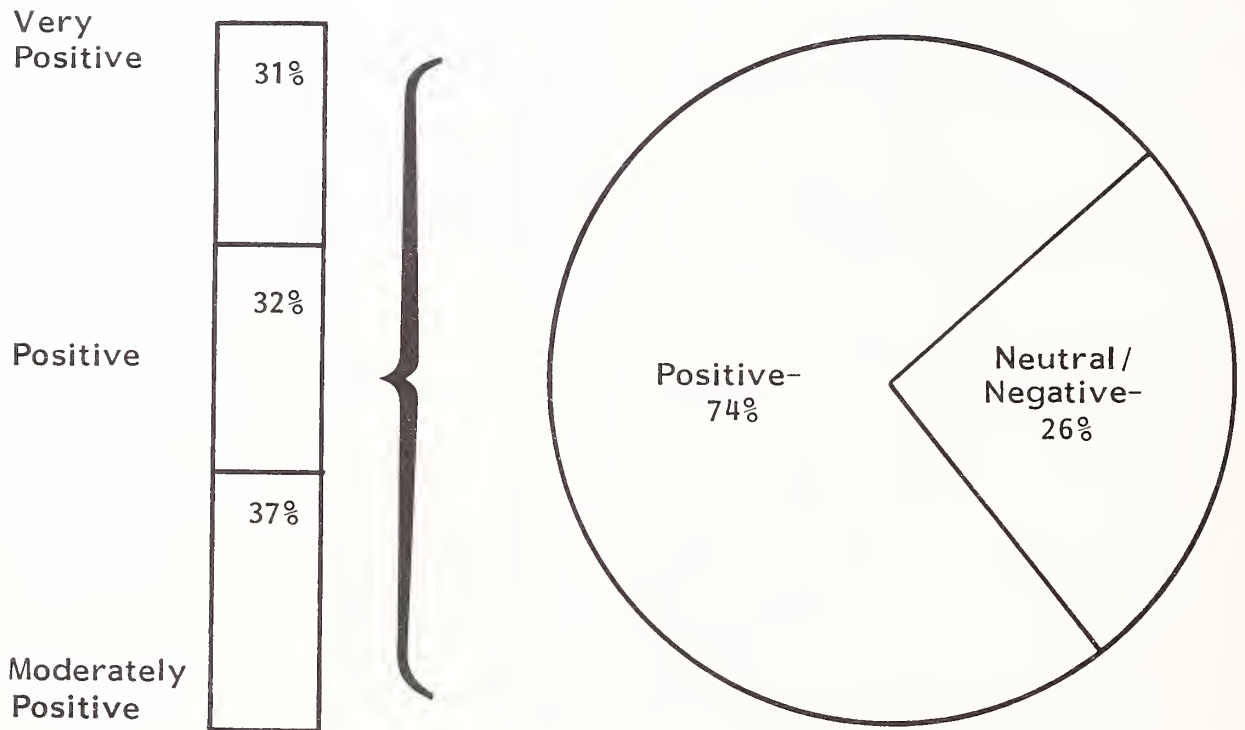
EXHIBIT III-3

TYPES OF MICRO-MAINFRAME LINKAGES
FORESEEN BY CORPORATIONS
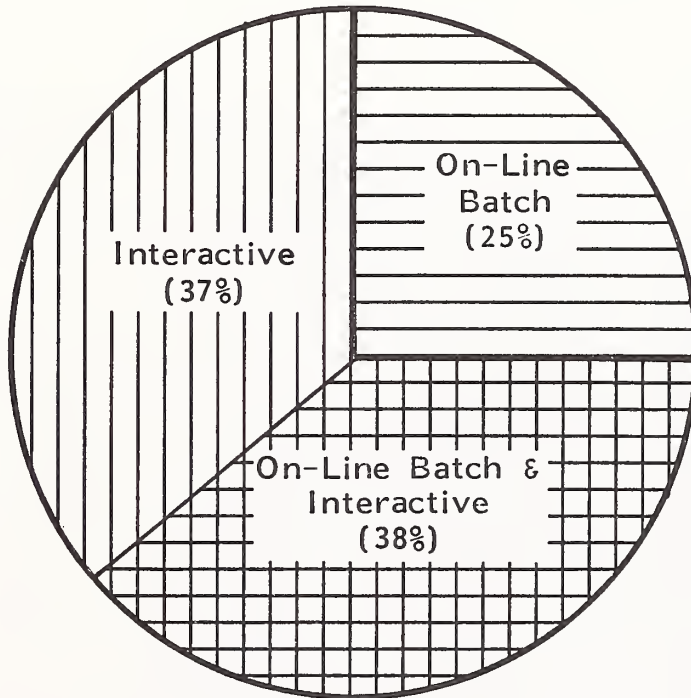
Percent of Linkage Types

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EXHIBIT III-4

MICRO-MAINFRAME LINKAGE ALTERNATIVES

* Corporate Respondents' Target

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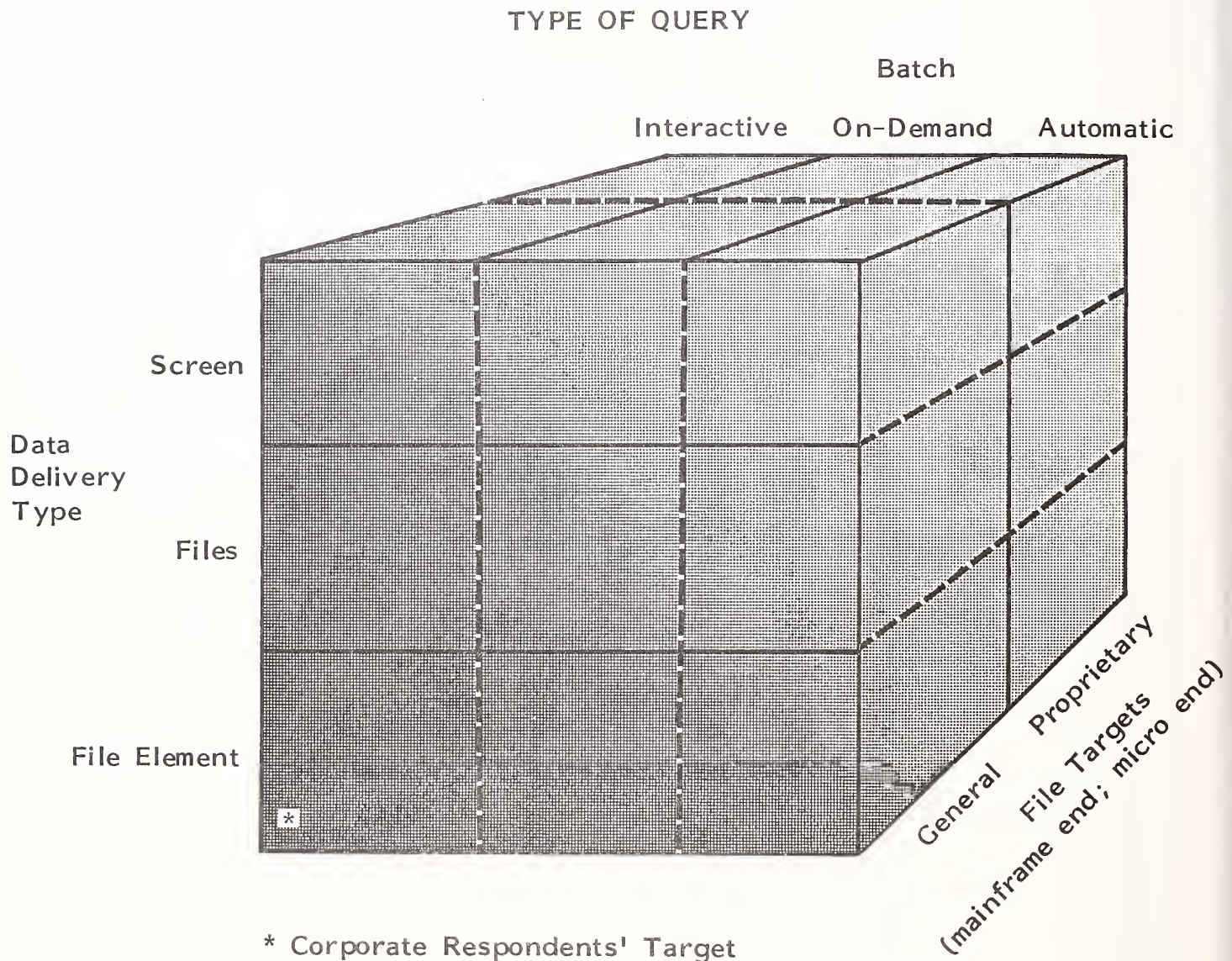
- As will be discussed later in this report, these expectations will not be realistic in the medium term.

- Vendors and corporations are out of sync on this issue, as shown by Exhibit III-5.

- Corporations have only recently begun to address this issue in depth, which is not surprising, given that rekeying mainframe reports is probably still the most widely-used method of M-M interface.

- Looking at the overall hierarchy of micro-mainframe connectivity, displayed in Exhibit III-6, most implementations and products now available are basic downloading applications (level 2).

- Even the newer vendor products only sketchily support level 3 activities (which many vendors admit off-the-record).

- It is important for vendors to realize that:

  - Corporations (at least IS departments) are aware that they are only at the beginning of a steep, rocky road.

  - IS departments (and especially end users) are convinced that M-M applications will be increasingly important.

- Note that additional information on the topics discussed here is contained in the companion reports, End-User Micro-Mainframe Needs and Micro-Mainframe: Communications Issues.

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EXHIBIT III-5

INTERACTIVE VERSUS ON-LINE BATCH MICRO-MAINFRAME APPLICATIONS:
CORPORATE AND VENDOR VIEWS

MICRO-MAINFRAME
APPLICATIONS
WILL BE

Percent of Respondents
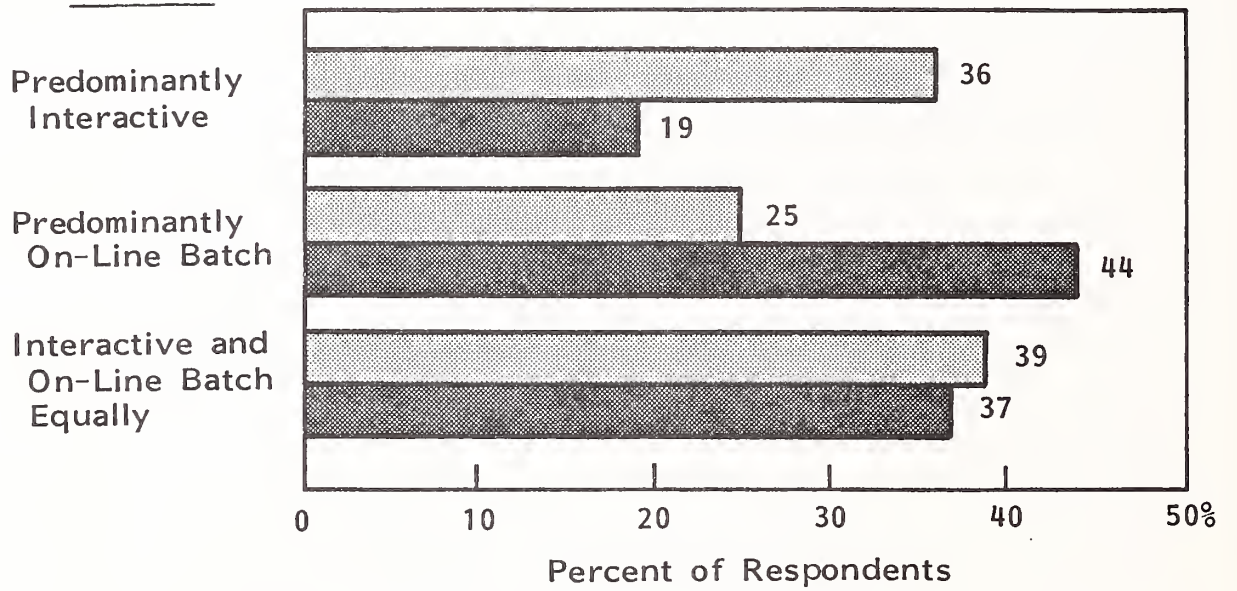
☐ Corporations

■ Vendors

EXHIBIT III-6

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HIERARCHY OF MICRO-MAINFRAME CONNECTIVITY

1. Manual

    a. New Data
    b. Rekeyed Data

2. Downloading - Low Speed

    a. Extracts
    b. Operational Files

3. File Exchanges (Bidirectional)

    a. Low Speed, Proprietary Structure
    b. Low Speed, Generalized Structure
    c. High Speed, Proprietary Structure
    d. High Speed, Generalized Structure

4. Logical Data Bases Covering

    a. Multiple Physical Hardware Environments
    b. Multiple Software Environments

5. Segmented Applications Programs
    (Coordinated Processing Between Mainframe
    and Micro)

    a. Batch
    b. Interactive

Key: Darker Shades Indicate More Complex
      Issues/Unresolved Implementations

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B. THE MANUFACTURING SECTOR'S MICRO-MAINFRAME NEEDS: A CASE STUDY

- Elsewhere in this series of reports (especially in <u>End-User Micro-Mainframe Needs</u>) specific company case studies and analyses of M-M applications are provided. However, it is equally useful to examine the likely impact on an entire industry (driven by end-user needs).

- The end-user needs are those described by Harlan Meal in the March 1984 <u>Harvard Business Review</u>, "Putting Production Decisions Where They Belong."

  - Meal contrasts traditional centralized manufacturing production planning with what he terms "hierarchical production planning" (HPP).

  - These are structural trends for which he sees a need (and which are beginning to occur). INPUT has observed similar trends in its research and consulting in this industry.

- The traditional centralized production planning process has pernicious effects.

  - Corporate management has taken on the virtually impossible task of forecasting detailed production requirements for multiple plants and processors over an extended time period.

  - Local managers and supervisors are given little leeway to react to changing or local needs. The result is:

    - High inventories.

    - Parts shortages.

    - Poor customer service.

    - Costly and ineffective planning.

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- Meal sees the expensive, large data processing systems now in place as not being "the key to good management."

• His prescription, HPP, would essentially leave global allocations to corporate decision makers and push detailed, shorter term decisions to local managers.

• He does not discuss the specific data processing needs of HPP outside of the context of the general relationship of material requirements planning (MRP) and HPP. However, INPUT's research and consulting experiences have confirmed that for approaches such as HPP to work effectively, M-M systems must mirror the management systems they are supporting. The recent market successes of turnkey manufacturing systems show this trend. (See INPUT's 1984 report Market Update: Discrete Manufacturing Opportunities for Information Services Vendors.)

• However, M-M manufacturing applications would go much further than either host-based systems or the smaller turnkey systems.

- The corporate production planning data base would contain key aggregated data needed for central analysis and decision support.

- Further down in the organization, the kind of data used would become narrower but much deeper.

- Even if technically feasible to implement on a traditional host system, the interdependence of individual components would increase, and the entire data system would be harder to deal with and understand. At the same time it would become more fragile and error- and failure-prone.

- Exhibit III-7 illustrates the relationship of components in a host-based manufacturing system.

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INPUT

EXHIBIT III-7

HOST-BASED MANUFACTURING SYSTEM

Department/Shop Terminals

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MC
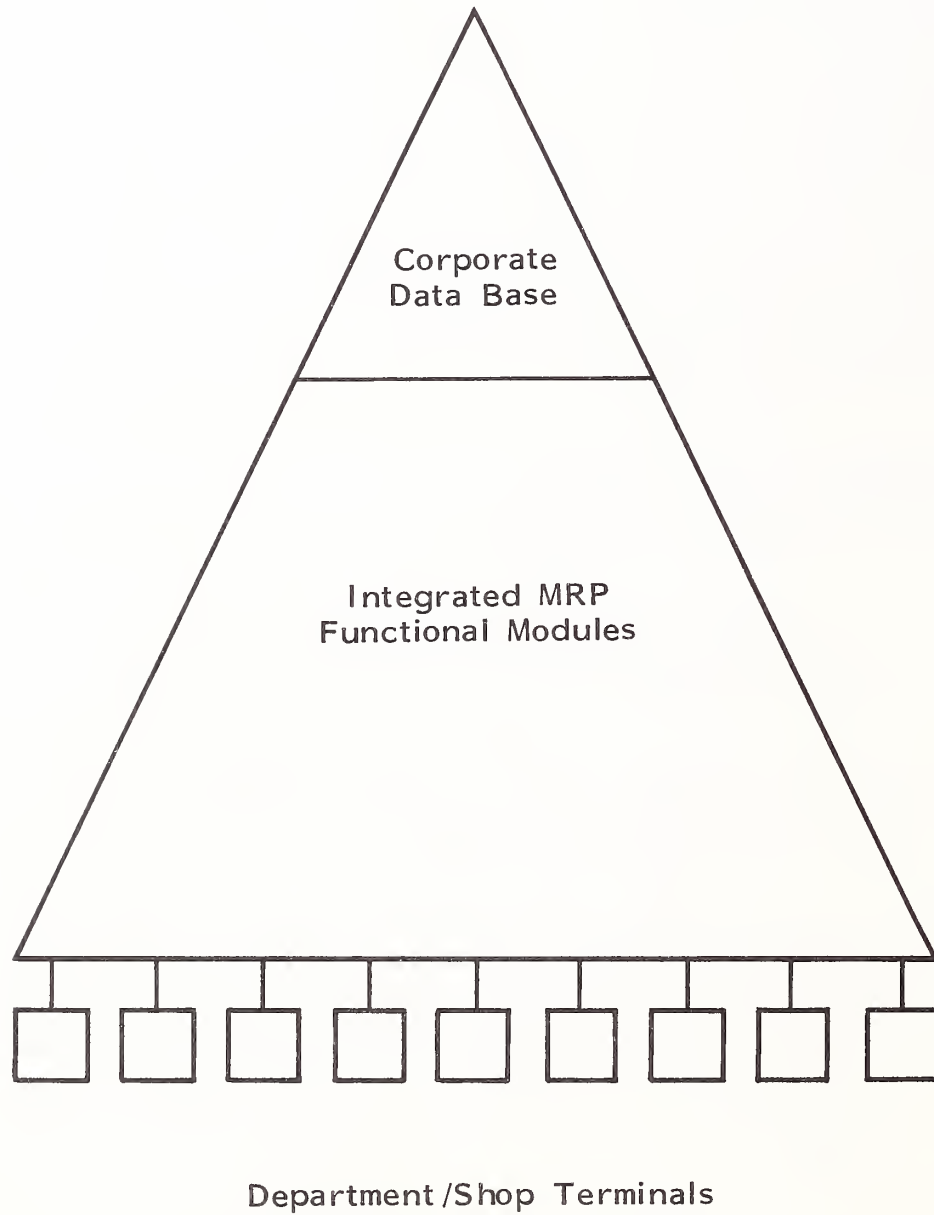
- Each plant can be thought of as containing a pyramid of data, as shown in Exhibit III-8.

  - The top of each pyramid is aggregated for use in the corporate planning data base.

  - Separate components at the bottom are needed by individual departments in the plant.

- An important thing to note is that this use of micros turns the conventional wisdom and early use of M-M links upside down. Conventionally, micros have used downloaded, usually summarized, data to perform analytic tasks. The main production work continues on the host system.

  - This state of affairs is primarily a historic artifact; the VisiCalc-like tools were first on the scene, and problems were soon found to fit their solution.

  - It is also true that "downloading" operations-oriented systems is an enormous task. The technical tasks are on the edge of the unknown. (Refer to Exhibit III-6 earlier in this chapter.)

- The different levels of M-M computing support will be related to these differing needs. Although the corporate data base will contain relatively small amounts of data, it will often need to be combined with other corporate-level data (accounting, marketing, etc.) and will in any event be subject to sophisticated analysis using complex software tools.

- The plant-level systems would contain a combination of medium-sized and small systems, e.g.:

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EXHIBIT III-8

DATA PYRAMIDS MIRROR HIERARCHICAL PRODUCTION PLANNING

- 40 -

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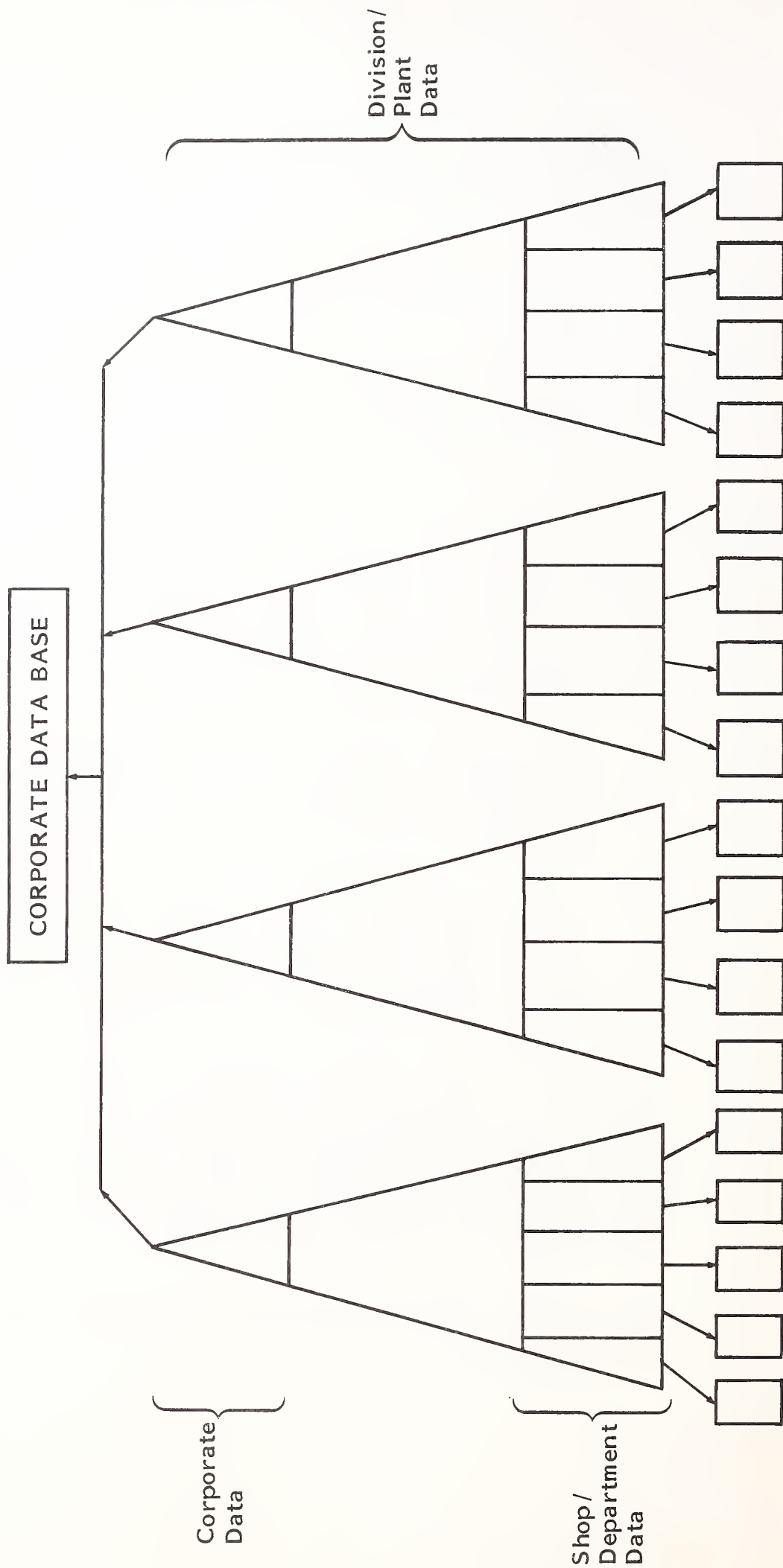
- System 38s or 4300s for plant-level needs.

- PCs at the shop level.

- In the real world, then, there would not be just M-M applications but, often, M-M-M applications (micro-mini-mainframe).

- One current difficulty for companies heading in this direction is that no software vendor now supports this type of approach. Companies will have to go-it-alone for the time being. This is only really advisable for three kinds of companies:

    - Those committed to making comprehensive changes to their manufac- turing systems, where software development cost is a small fraction of expected benefits.

    - Those with unique production planning needs that are unlikely to be met by a first generation M-M product.

    - Very large companies with many locations to spread the cost of custom development.

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INPUT

IV MICRO-MAINFRAME SOFTWARE PRODUCT
GROWTH

IV   MICRO-MAINFRAME SOFTWARE PRODUCT GROWTH

A.   FORECASTED GROWTH

- INPUT expects that M-M applications used by major corporations will show a very high growth rate during the remainder of the 1980s. (Refer to Exhibit II-I in Chapter 2.)

    - The growth is subject to many qualifications, of course, but the average annual growth rate should range from 51% to 76% between now and 1988.

    - By 1988 between one-fifth and one-third of all applications (and processing) should be M-M applications. INPUT expects that these will represent a cross-section of applications and types of corporations. That is, in the course of INPUT's interviews and research there generally were few significant differences in M-M attitudes or plans that correlated with:

        - Application size.

        - Company size.

        - Industry type.

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- Consequently, INPUT expects that M-M growth will be a broad advance covering all aspects of data processing and will be of importance to vendors of all modes of delivery.

    - When there are indications that a type of company may have a stronger or weaker set of attitudes or plans toward M-M applications, these are noted and discussed.

    - INPUT expects that this growth will begin to level off in 1990 or shortly thereafter as an M-M saturation point of about 50% of applications is reached. Thereafter, M-M growth will approximate overall levels of data processing growth.

- INPUT expects that by 1988 the software products mode of delivery will be the single largest participant in the M-M market, potentially with almost one-third of sales deriving from M-M products. This impact is displayed in Exhibit IV-1.

    - A significant amount of this growth will come at the expense of traditional software products, i.e., replacement.

    - However, there is the potential for the overall market to grow by perhaps an additional 8% to 10%.

    - The additional growth will be essentially transitory; i.e., it will probably not act as a long-term addition to the already high software products growth but will be a "blip" during the 1980s, illustrated by Exhibit IV-2.

    - This additional growth will be caused by the sooner-than-expected replacement of traditional systems--e.g., a system replaced or upgraded significantly at, say, four years into a normal life of eight years.

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EXHIBIT IV-1

- 45 -

MICRO-MAINFRAME IMPACT ON SOFTWARE PRODUCTS
1984-1988

YEAR	TOTAL MODE FORECAST(a)	MICRO-MAINFRAME IMPACT ($ Billions)		
		LOW	MIDPOINT	HIGH(b)
1984	$10.3	$0.3	$0.4	$0.5
1985	13.8	0.6	1.0	1.3
1986	18.2	1.6	2.1	2.6
1987	23.7	3.1	4.4	5.7
1988	30.7	6.0	8.4	10.9

NOTES: (a) = Total information services forecast for this mode from INPUT's 1983 annual report.

(b) = Difference between "midpoint" and "high" is potentially additive.

Source: Appendix D

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EXHIBIT IV-2

THE MICRO-MAINFRAME "BLIP"

The Growth Rate
"Blip"
(e.g., 40%)

Underlying
Growth Rate
(e.g., 35%)

1984   1985   1986   1987   1988   1989   1990   1991   1992

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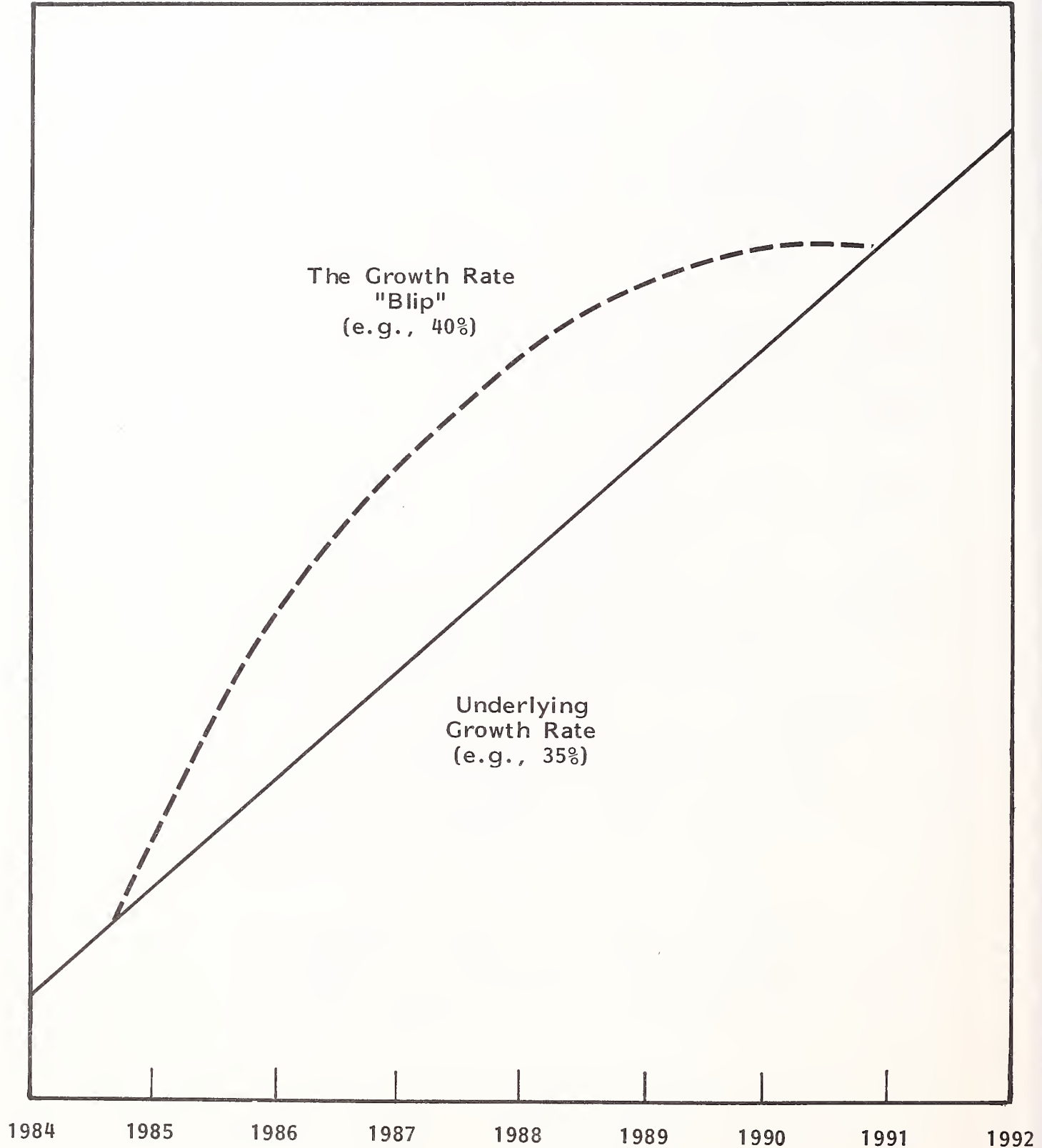
- Micro-mainframe rates in the 1990s may essentially be of theoretical interest; however, INPUT does not expect to see a compensating decline in the growth rates in the 1990s to balance the temporary increase in the 1980s. This is because once M-M systems are installed:

    . They should be replaced at normal rates.

    . The underlying need for software products generally will not decline in an M-M environment (and may, in fact, be further spurred by M-M capabilities).

- Forecasts and analyses of M-M growth in the RCS and turnkey sectors are contained in INPUT's companion report, Micro-Mainframe: Processing and Turnkey Strategies.

- The impact on the professional services sector is contained in Appendix E of this report.

B. MICRO-MAINFRAME MARKETS: A RIPENING PROCESS

- As described above, the M-M market will gradually grow in size. Besides growing numerically, there will also be a tendency for different parts of the market to open up incrementally. Exhibit IV-3 shows this process.

- Large corporations are the obvious initial market and will be by far the largest market.

    - Fortune 500 type firms will probably account for over three-quarters of potential market.

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EXHIBIT IV-3

SHARED FUNCTIONALITY MARKET SEGMENTS: RIPENING PROCESS

Home (Education) After 1990

Corporate Employees (Home)

Small Business

Large Corporations

| 1984 | 1985 | 1986 | 1987 | 1988 | 1990 |

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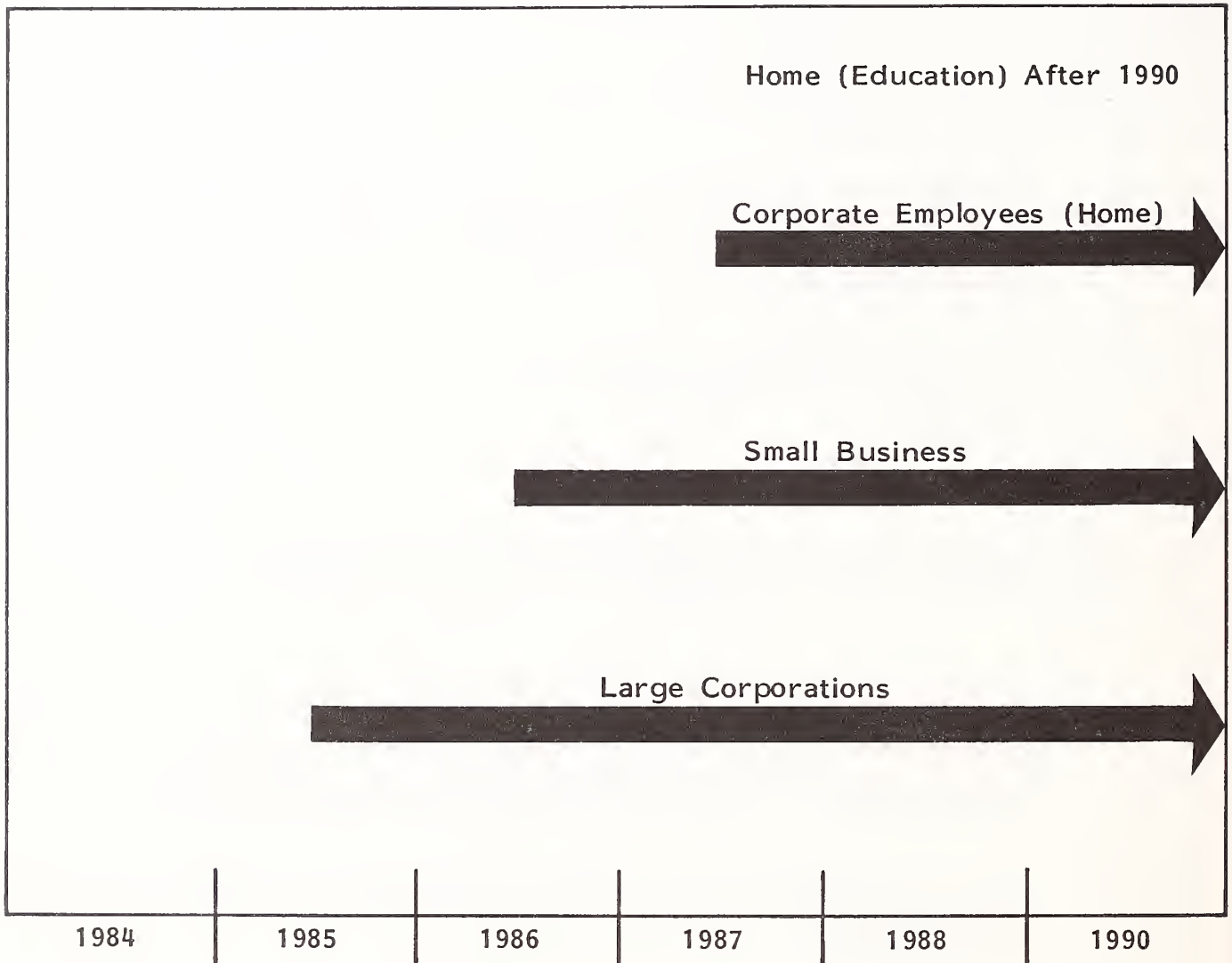
- These large firms, therefore, have been the target of research, the basis for the projections, and (implicitly or explicitly) the focus of most analyses in these studies.

- However, the other markets will progressively come on-stream as their needs become more pronounced; they will often be forced to obtain M-M applications because of competition.

  - Many small firms, especially those in manufacturing and distribution, will be forced to interconnect to the computer systems of larger firms to remain competitive. (This issue is addressed extensively in the companion report, <u>Micro-Mainframe: Processing and Turnkey Strategies</u>.

  - "Personal" PCs of corporate employees will be M-M candidates for explicitly business use as well as for borderline activities, e.g., securities analysis that could be used for either corporate or personal functions.

  - Finally, after 1990, the home education area could be linked with commercial education (in a new form) or with traditional public education. This area is very unfocused and speculative and is not treated in these studies as part of the "real" M-M market.

C. QUALITATIVE ASPECTS OF MICRO-MAINFRAME GROWTH

- These growth projections are not immutable, especially this early in the M-M development cycle. In addition to the quantitative factors described in Appendix D there are other influences (more qualitative ones), which fall into these groups:

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- Customer factors.

- Market factors.

- Technical/product factors.

• The area of <u>customer factors</u> includes two very important components:

- The influence of end users.

  . End users are already active proponents of M-M applications in many organizations.

  . End-user influence will undoubtedly become even stronger in the years ahead. INPUT's companion report, "<u>End-User Micro-Mainframe Needs</u> examines this issue in much more detail.

- Information systems department acceptance.

  . At the least, IS acceptance of the more ambitious M-M applications is required; a surprising number of IS departments are already at this stage of acceptance.

  . There are signs that this acceptance could become proactive support, depending on some of the market and product factors below.

• <u>Market factors</u> are those that are dependent neither on the customer factors above nor on technical and product-related factors. They include:

- The objective M-M need.

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- There is little question that there is a relatively high real need in many organizations for shared functionality M-M applications.

- The need exists to distribute data processing in ways similar to the distribution of many management and operational tasks.

- Early implementation experience.

  - The impression made by the more ambitious initial M-M applications will greatly influence both end users and IS.

  - These early experiences are likely to be mixed--enthusiasm and support combined with poor IS/end-user communications and technical obstacles. (See <u>End-User Micro-Mainframe Needs</u>.)

- The availability of industry-specific packaged applications.

  - This is not as important as the earlier factors, since corporations will write their own systems if the need is sufficiently high.

  - In the short run it is unlikely that there will be considerable numbers of these, for reasons discussed in Chapter VIII.

- <u>Technical/product factors</u> are more numerous and varied in their importance, including:

  - The existence of acceptable (not ideal) technical solutions.

    - That is, well-thought-out on-line batch systems will be quite acceptable for many initial applications.

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- These kinds of solutions are feasible, although they often are neither what is desired nor what is appropriate.

- An interactive product breakthrough.

  - A technical breakthrough that would result in the early availability of truly interactive shared functionality M-M applications would be desirable.

  - This is unlikely, however.

- Retrofits of currently available applications.

  - This will be an important step forward, making transitions easier for both vendors and customers. This could give older, batch-oriented products a new lease on life.

  - Some of the newer interactive, integrated applications might, in fact, be less suited to be converted to operate in an M-M environment.

- Availability of new M-M application packages.

  - Having new packages available will be desirable but not as important as having familiar names available in an M-M environment.

  - Because of the expense and risk, new packages will probably lag somewhat behind conversions. However, new packages will be necessary to optimize M-M functionality and performance.

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- Exhibit IV-4 summarizes the above analysis, showing:

  - The importance of each factor.

  - The effect that each factor will have on M-M growth (in the medium term).

- The factors taken together will have a somewhat positive effect on the over-all growth and acceptance of M-M applications. However, each factor's influence can change over time and should be continuously monitored.

- This analysis has looked at vendors and customers as a group, since industry and company size are not very strong determinants of M-M plans, as noted earlier in this chapter.

  - However, these factors can also be used to examine and assess individual customers, comparing different customers to assess their relative attractiveness as M-M prospects.

  - The vendor- and product-oriented factors can also be used to assess individual vendors and groups of vendors.

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EXHIBIT IV-4

FACTORS INFLUENCING GROWTH OF
MICRO-MAINFRAME APPLICATIONS SOFTWARE

FACTOR	FACTOR RATING AFFECTING MICRO-MAINFRAME GROWTH		IMPORTANCE OF FACTOR*
	High Growth	Low Growth	
	1 2 3 4 5		
Customer Factors			
• Influence of End Users	High ⟵ (3.5) ⟶ Low		A
• IS Acceptance	High ⟵ (3.0) ⟶ Low		A
Market Factors			
• Objective Micro-Mainframe Need	High ⟵ (2.0) ⟶ Low		A
• Early Implementations	Success ⟵ (3.0) ⟶ Failure		A
• Industry-Specific Applications Available	Many ⟵ (4.0) ⟶ Few		B
Technical/Product Factors			
• Acceptable Technical Solutions	(Yes) No		A
• Interactive Product Breakthrough	Yes (No)		B
• Old Package Micro-Mainframe Retrofits	Many ⟵ (3.5) ⟶ Few		A
• Integrated Mainframe Packages Installed	(Few) ⟵ ⟶ Many		B
• New Micro-Mainframe Packages Available	Many ⟵ (3.0) ⟶ Few		B

◯ = INPUT's assessment of situation in medium term (2-4 years)

* A = Important, B = Less Important.

Rating: (1) = Causing Higher Growth, (5) = Causing Lower Growth.

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V MARKET DIRECTION AND NEEDS

V   MARKET DIRECTION AND NEEDS

● Chapter III shows the changing M-M environment and the major forces that are and will be impelling companies into planning ambitious M-M applications. This chapter will analyze particular issues that may affect the direction and use of M-M applications.

A.   FACTORS INFLUENCING STRENGTH OF SHARED FUNCTIONALITY PLANS

● One of the most important findings is how closely clustered different types of companies are in their attitudes and plans toward shared functionality.

- Exhibit V-I shows types of companies that were above average (by 0.2 or more of a rating point) in their attitudes toward using shared functionality M-M applications.

- Similarly, Exhibit V-2 lists groups whose attitudes toward shared functionality are below average. There are only a few groups whose low rating suggests a cause-effect relationship.

- It is useful to compare the general characteristics of the groups in these two exhibits.

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EXHIBIT V-1

ATTITUDES TOWARD SHARED FUNCTIONALITY APPLICATIONS:
SELECTED GROUPS WITH HIGHER THAN AVERAGE ATTITUDES

	Rating
Corporate Average	+1.7
Plan to Use Vendor Software (Generally)	+1.9
Plan to Use Vendor Professional Services	+1.9
Plan to Communicate from Own Micros to Other Companies' Hosts	+2.0
View Data Base Synchronization as a Serious Problem	+2.1
Plan to Communicate from Own Micros to Micros in Other Departments	+2.1
Expect Equal Amounts of Interactive and On-Line Batch Micro-Mainframe Applications	+2.1
Micros Linked to More Than One DBMS	+2.2
Discrete Manufacturers Planning to Use Turnkey Vendors	+2.4
Vendor Assessment of Company Attitudes	+3.2

-5   -4   -3   -2   -1   0   +1   +2   +3   +4   +5
Very   Very
Unfavorable   Attitude Toward   Favorab
                 Shared Functionality
                     (Rating)

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EXHIBIT V-2

ATTITUDES TOWARD SHARED FUNCTIONALITY APPLICATIONS:
SELECTED GROUPS WITH LOWER THAN AVERAGE ATTITUDES

Corporate Average — +1.7

Companies over $2 Billion — +1.5

Process Manufacturers — +1.4

Plan to Use Existing Data Base with Micro-Mainframe Applications — +1.4

Few Plans to Communicate from Micros to Other Departments' Micros — +1.4

Few Plans to Communicate from Own Micros to Other Companies' Hosts — +1.4

Banks — +1.3

Few Plans to Use Turnkey Vendors — +1.2

Do Not View Data Base Synchronization as Serious Problem — +1.1

Few Plans to Use Vendor Software — +1.0

Few Plans to Link Micro to More Than One Data Base — +0.8

Plan Predominantly On-Line Batch Micro-Mainframe Applications — +0.7

Vendor Assessment of Corporate Attitudes — +3.2

Scale: -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5

Very Unfavorable ← Attitude Toward Shared Functionality (Rating) → Very Favorable

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- Those with above-average attitudes toward shared functionality tend to be doing or planning more complex approaches to, and utilizing a variety of, sources for M-M applications.

- Those with below-average attitudes plan many fewer actions and are generally less aggressive in their plans.

- Companies that are the most serious about M-M shared functionality applications are active companies with complex environments.

- One characteristic of companies most favorable toward shared functionality M-M applications at first glance seems counter-intuitive; these companies expect to be adding micros at a low rate compared with companies expressing a neutral/negative attitude toward shared functionality (180% versus 320% growth over a two-year period).

  - On closer examination, it turns out the negative/neutral respondents are starting from a much lower base, as shown by Exhibit V-3; they are playing "catch-up."

  - This reinforces the conclusion that those having the most interest in shared M-M functionality are those that have done the most in the past.

  - These micro growth rates are not a function of company size; there is surprisingly little difference between companies over and under $2 billion in their micro growth rates.

  - As shown by Exhibit V-4, vendors as a group are much more positive in their attitude toward shared functionality than corporate respondents generally are (or, indeed, than any particular subgroup is).

EXHIBIT V-3

MICROS PER ENTERPRISE IN RELATION TO
RESPONDENT POSITION ON HOST-MICRO SHARED FUNCTIONALITY

Respondent Position

Micros per Enterprise

January 1984

January 1986

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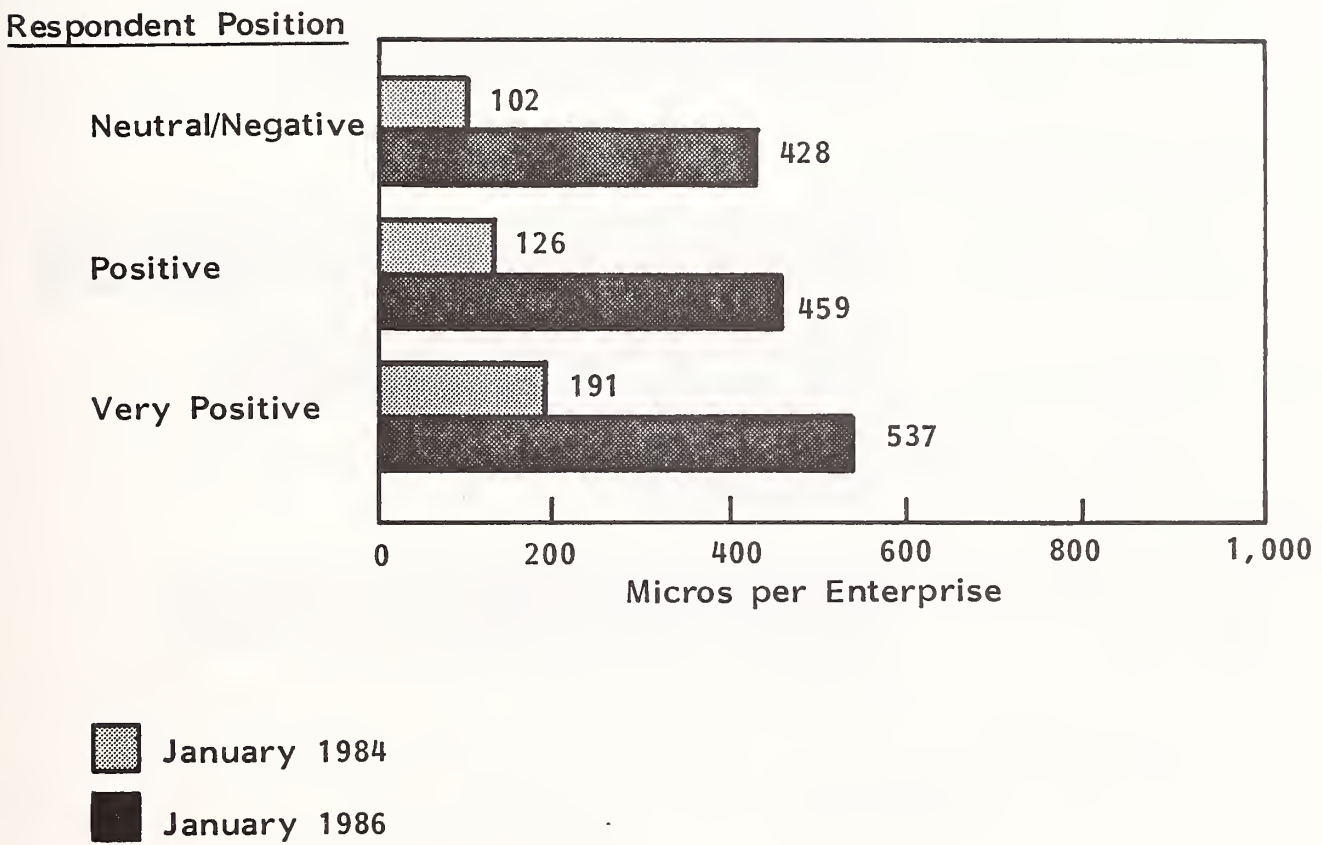
EXHIBIT V-4

CORPORATE AND VENDOR VIEWS ON THE
SHARED FUNCTIONALITY ENVIRONMENT

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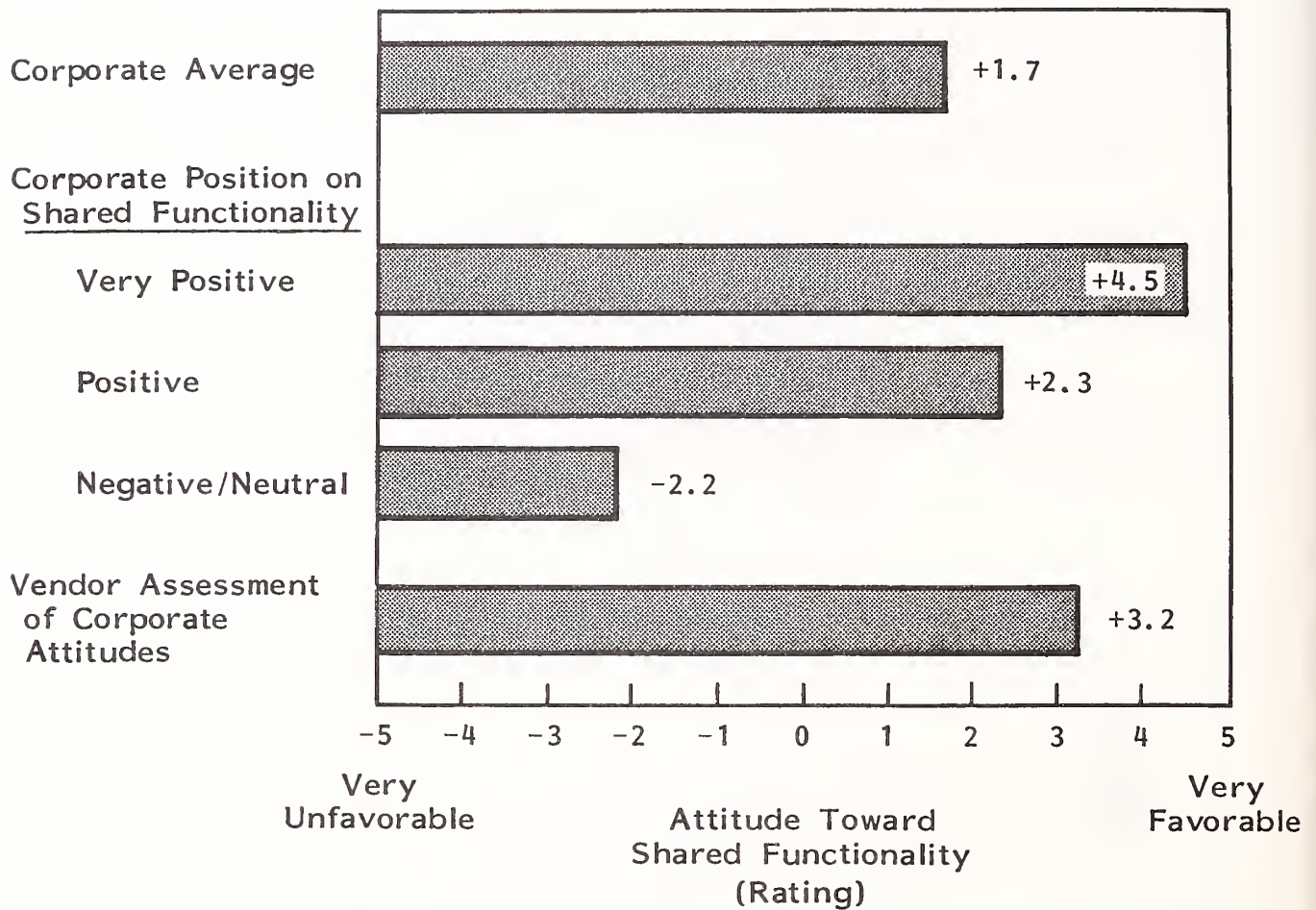
- This may represent a slight self-selection on the part of vendor respondents (i.e., respondents had often considered these M-M issues intensively). To the extent this is the case, the vendors are somewhat ahead of corporations, from a timing standpoint.

- Vendors are in tune with the positive/very positive groups of companies.

- However, there is a danger that vendors do not fully understand the positions of companies, especially of their IS departments. Vendors must make sure they do not identify too thoroughly with end-user ideals, thus neglecting the IS position.

B.   IMPLEMENTATION STRATEGIES

- Companies interviewed plan to use multiple strategies to implement shared functionality M-M applications, as shown in Exhibit V-5.

    - More importantly, selecting one development strategy does not exclude others. Exhibit V-6 illustrates this point.

    - In fact, corporations most in favor of adding applications to existing data bases are also more likely to favor the other approaches.

- One difference between companies and vendors, as illustrated in Exhibit V-7, is their assessments of whether backup issues are a barrier to M-M applications.

    - Vendors are almost twice as likely as companies to see backup as a problem. This certainly reflects their increased awareness of such issues. It does not mean that vendors have solutions to these problems, only that they recognize them.

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EXHIBIT V-5

DEVELOPMENT STRATEGIES FOR APPLICATIONS SOFTWARE FOR
MICRO-MAINFRAME SYSTEMS: CORPORATE AND VENDOR VIEWS

DEVELOPMENT
STRATEGY

Assessment of Importance   (Rating)

☐ Corporate View

■ Vendor Assessment of Corporate Plans
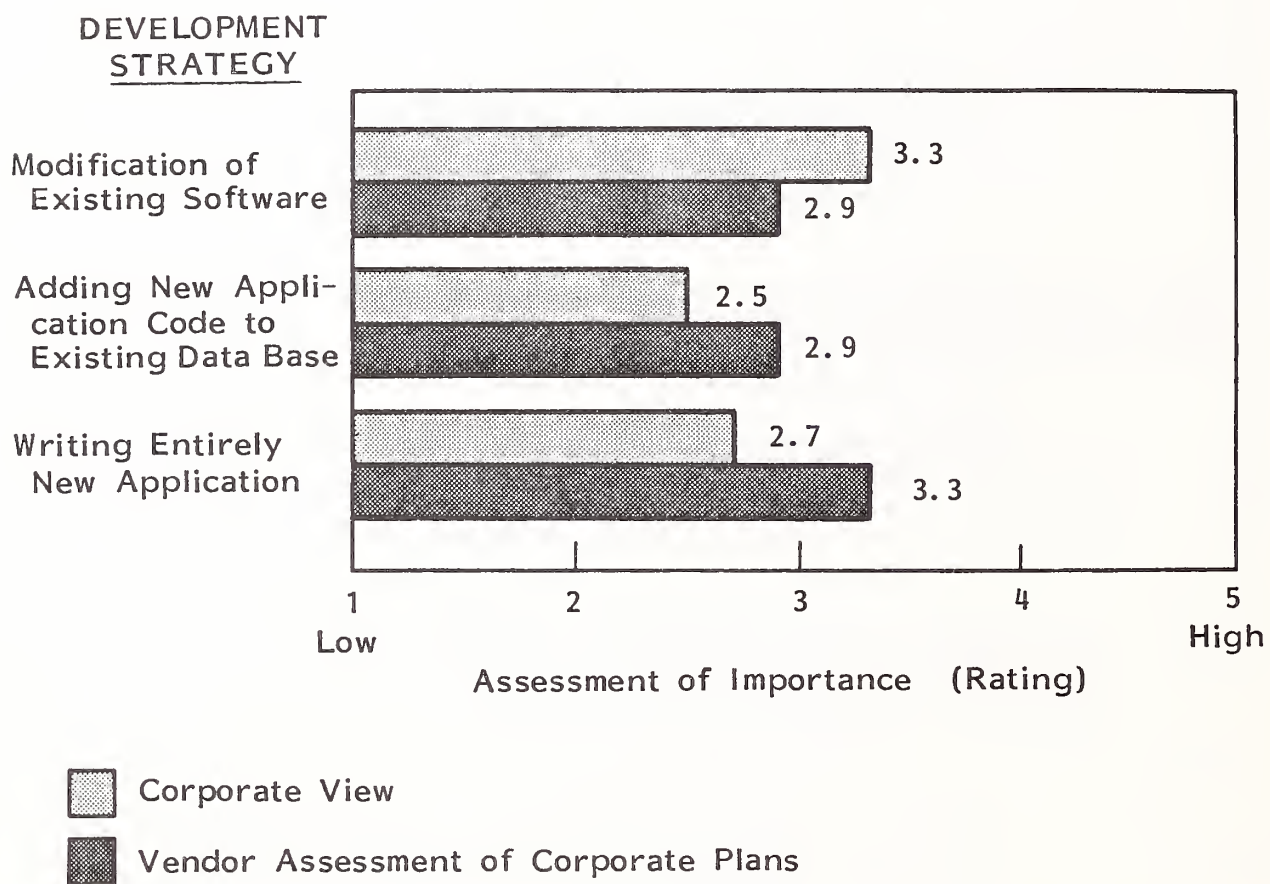
EXHIBIT V-6

EXTENT TO WHICH A PARTICULAR
DEVELOPMENT STRATEGY SUPPORTS OTHER STRATEGIES

		THEN ITS RATING OF THE FOLLOWING IS:		
		Modifying Existing Software	Adding Applications to Existing Data Base	Writing New Applications
IF A COMPANY FAVORS:	Modifying Existing Software	N/A	2.5	2.7
	Adding Applications to Existing Data Base	3.5	N/A	3.2
	Writing New Applications	3.2	2.4	N/A
Average Rating		3.3	2.5	2.7

Rating: 1 = Low Importance, 5 = High Importance

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EXHIBIT V-7

EXTENT TO WHICH BACKUP IS VIEWED AS A
BARRIER TO MICRO-MAINFRAME APPLICATIONS
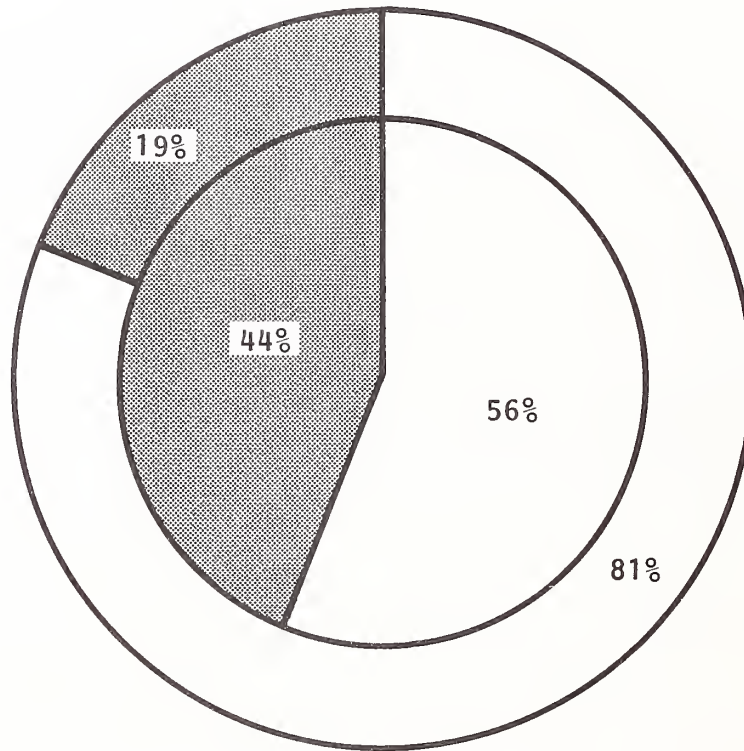
Inner Circle - Corporations
Outer Circle - Vendors

Do Not Consider Backup a Problem
Do Consider Backup a Problem

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- This difference in assessment can lead to two kinds of customer-vendor difficulties:

    . Selling solutions that lead to new problems.

    . Selling solid solutions that do not seem avant-garde.

C. COMPLEX LINKAGE REQUIREMENTS

- There is a high level of agreement among companies that M-M environments will be complex from the standpoint of:

    - Computer links.

    - Telecommunications links.

    - Data base links.

- More than half of the corporations interviewed see a need to link to multiple mainframes; according to Exhibit V-8, 50% see a requirement for the same micro to be able to link to different hosts.

    - A similar proportion sees the need to link to multiple telecommunications and DBMS environments.

    - Vendors see even higher needs for linking to multiple environments. There is one interesting difference in these vendor-customer attitudes.

        . More than 60% of the companies see M-M applications accelerating the use of relational DBMSs.

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EXHIBIT V-8

COMPLEX ENVIRONMENTAL LINKAGE REQUIREMENTS: CORPORATE AND VENDOR ASSESSMENTS

Percent of Companies
Requiring Complex Environmental Linkage

Corporations

Vendors

- 66 -

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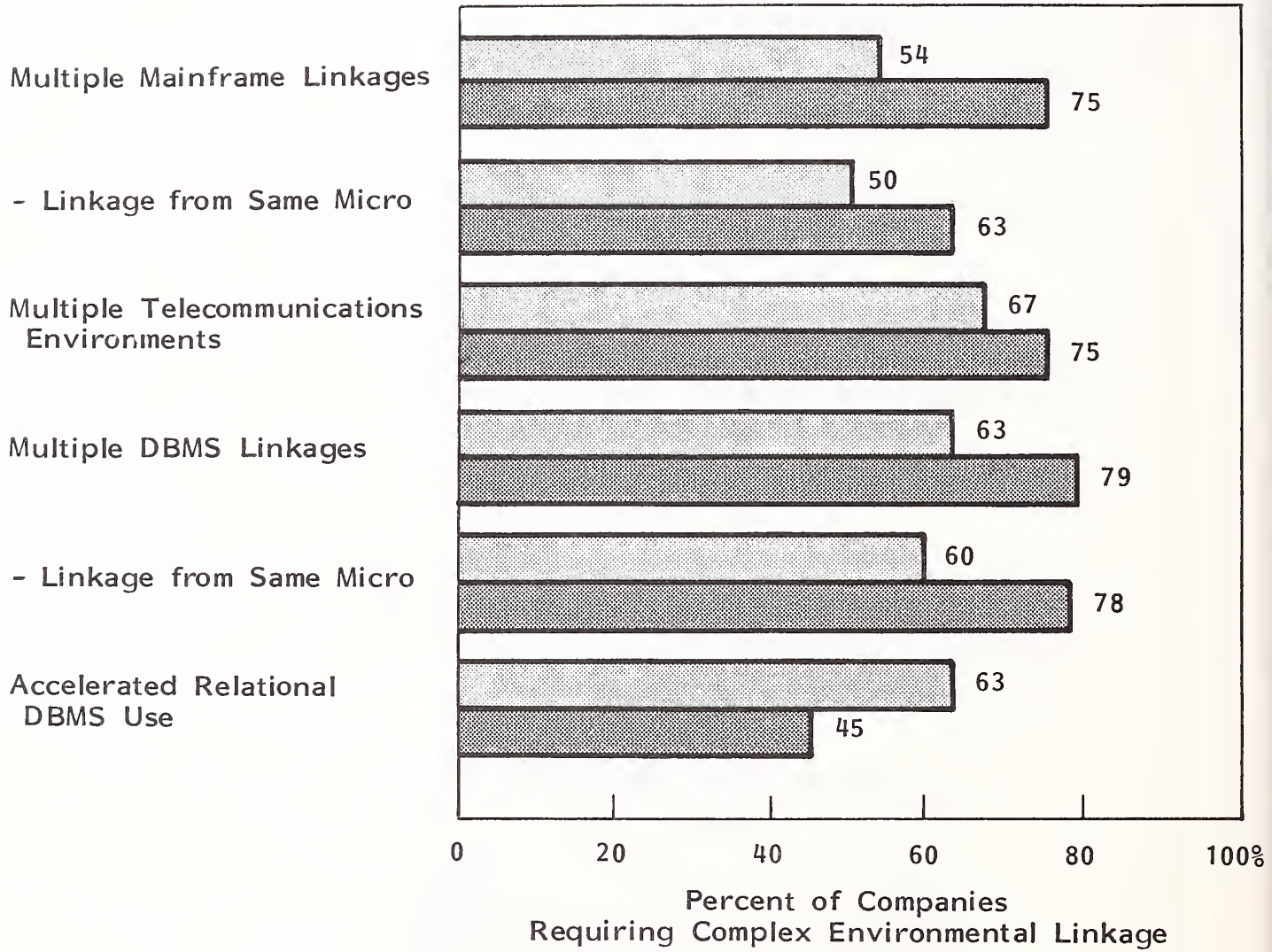
- However, fewer than half of the vendors see this occurring. In this case the companies may be ahead of the vendors, since in principle a relational DBMS does offer one set of solutions to M-M connectivity. (See Chapter VIII for more discussion on this topic.)

- Companies that are very positive toward shared functionality have even greater requirements for operating in complex environments, as shown by Exhibit V-9.

D. TECHNOLOGICAL NEEDS

- Generally, as Exhibit V-10 shows, companies and vendors have similar views on the kinds of technology that will be used in the future in an M-M environment.

  - Both see downloading to spreadsheet programs as a continued high-importance need, although companies consider it somewhat less important than vendors do.

  - Companies are much less sold on the concept of a micro using mainframe software (e.g., the XT/370).

- As shown by Exhibit V-11, companies see downloaded spreadsheets overtaking standalone spreadsheets in importance within two years.

  - Programs developed in-house will increase considerably in importance, but they will still be behind vendor applications in importance.

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EXHIBIT V-9

DATA BASE LINKAGE NEEDS FOR
SHARED FUNCTIONALITY APPLICATIONS
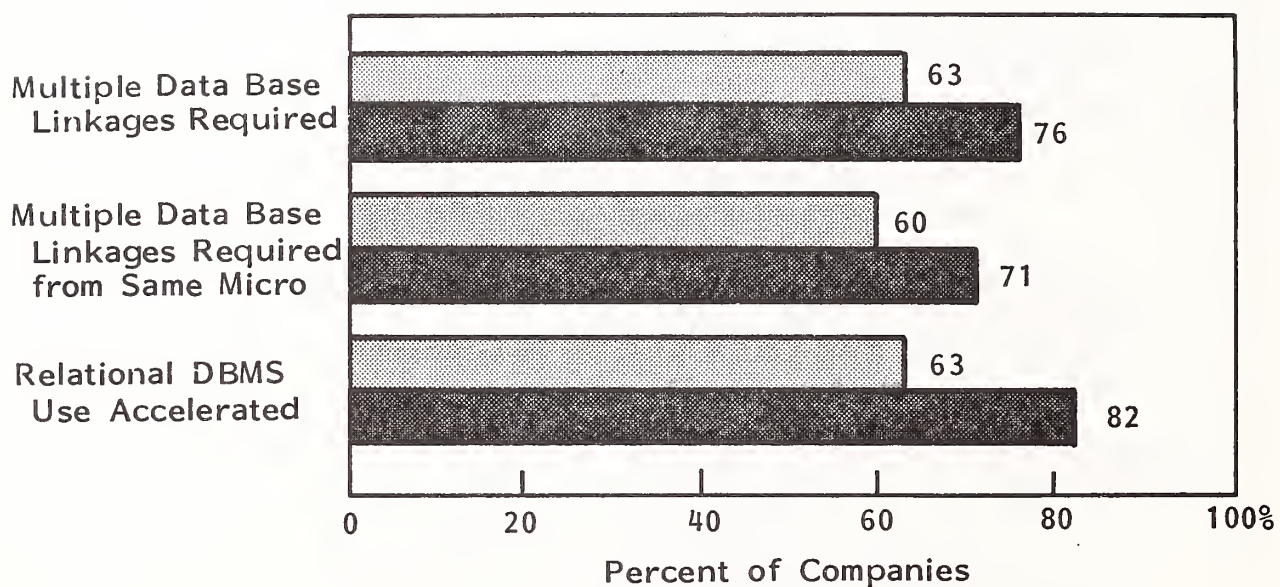
EXHIBIT V-10

FUTURE MICRO APPLICATIONS TECHNOLOGY:
CORPORATE AND VENDOR VIEWS

Technology Area

Standalone Micros with
Micro Software — 3.4 / 3.2

Standalone Micros with
Mainframe Software
(e.g., XT/370) — 2.4 / 3.2

Micros in Local Area
Networks — 3.3 / 3.4

Terminals as PCs — 3.5 / 3.3

Downloading to
Spreadsheet Programs — 4.2 / 4.7

1   2   3   4   5
Low   Importance   High
(Rating)

Corporations

Vendors

- 69 -
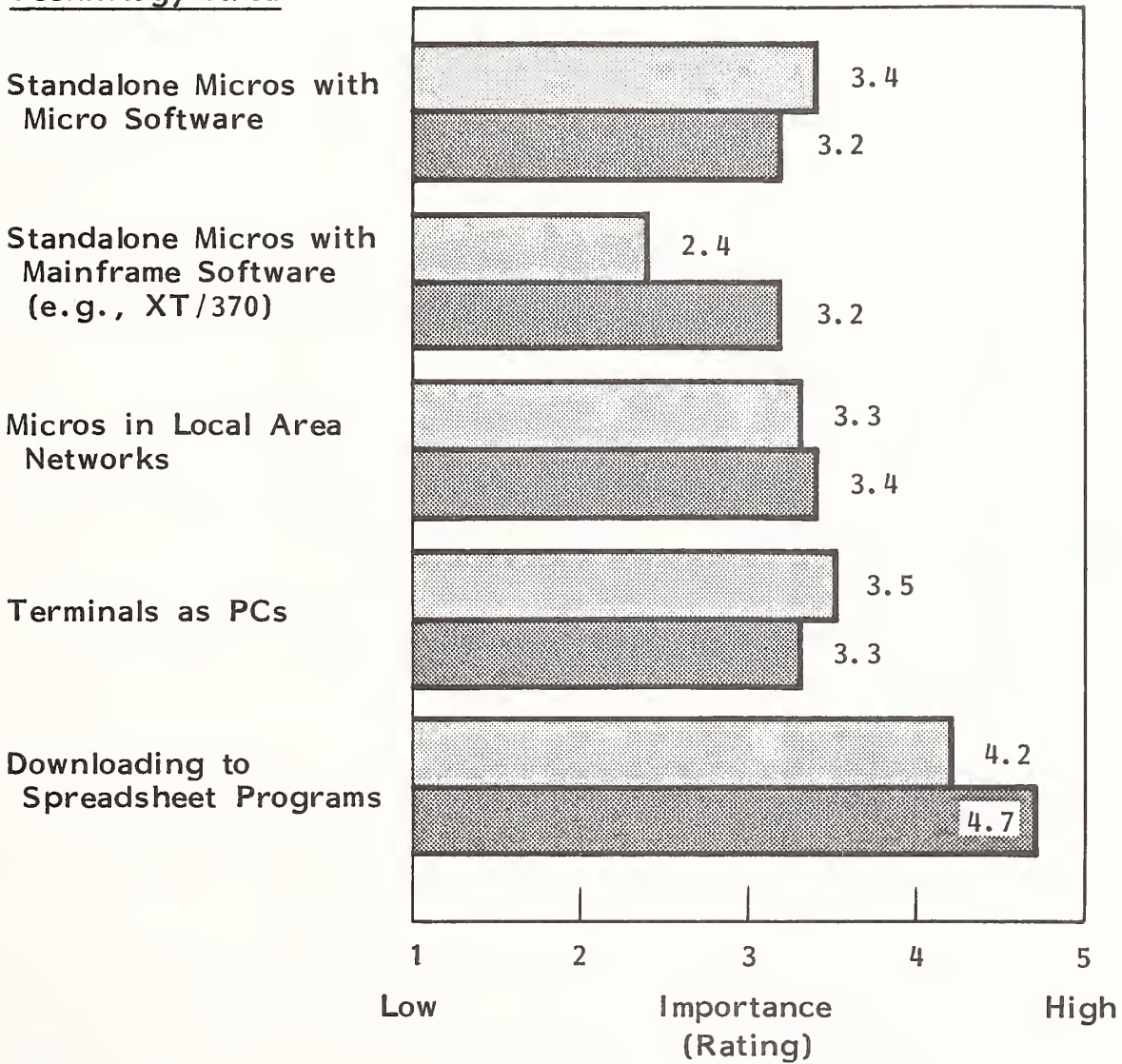
EXHIBIT V-11

USE OF PC SOFTWARE TYPES

1984 AND 1986
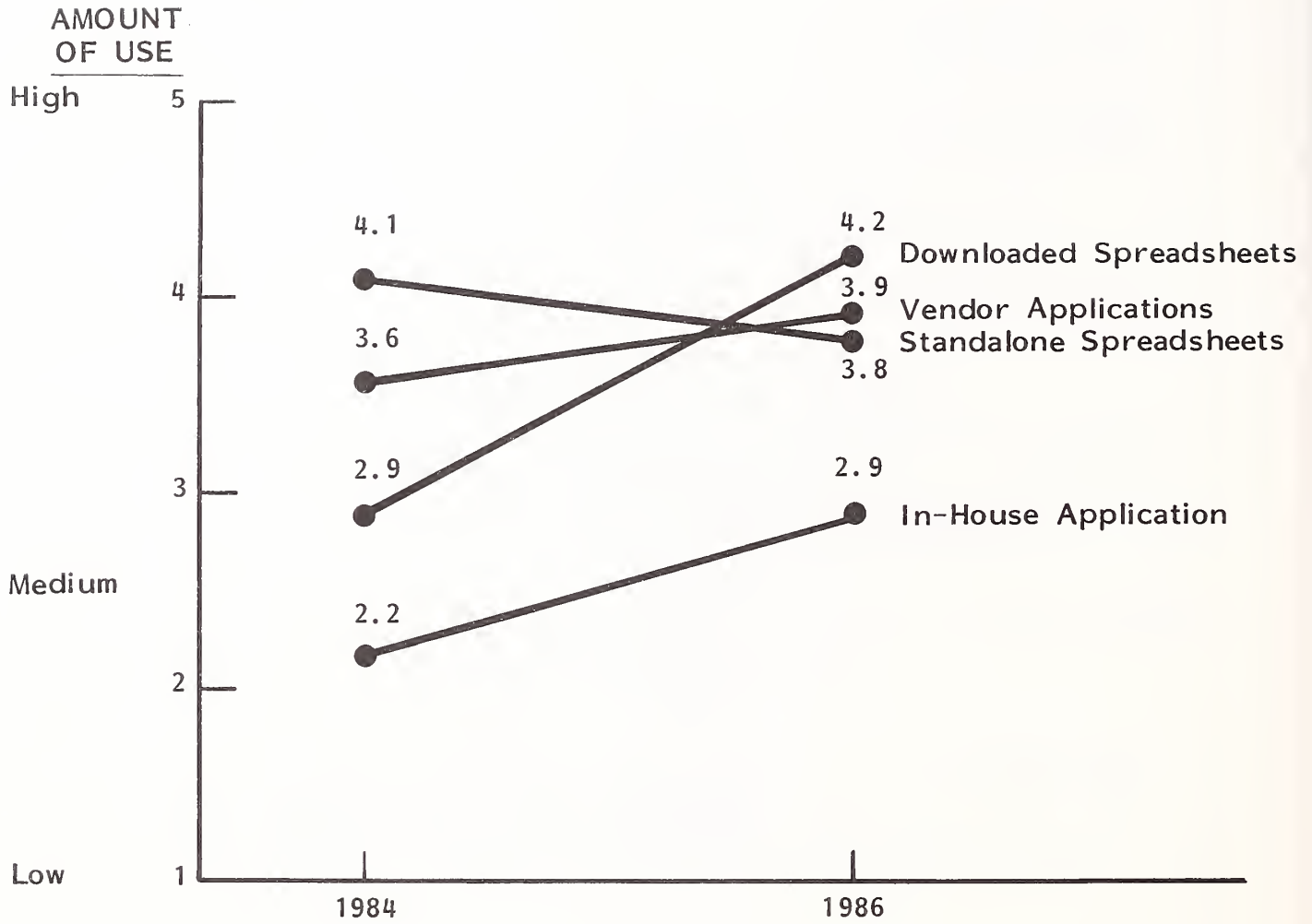
- As will be discussed at greater length in the next chapter, the increase in in-house applications is driven by the increasing magnitude of M-M commitments coupled with a lack of understanding of specific vendor assistance available.

● As shown by Exhibit V-12, vendors are generally more extreme in their assessment of current and future spreadsheet use compared to the corporations' own assessments.

● Since using host software on a micro (such as the XT/370) would be one solution to many M-M issues, this was explored in some depth with the companies interviewed.

  - In general, companies were not very enthusiastic. Only a few groups, as shown by Exhibit V-13, rated this even moderately above average.

  - The same is true when industry groups are examined. Exhibit V-14 indicates that banking is especially negative.

● This same general pattern emerges when assessing the 3270 PC type solution. Exhibit V-15 demonstrates this. As in the case of the XT/370, vendors were considerably more enthusiastic than were companies, concerning future use.

● In part, this downplaying of the XT/370 and the 3270 PC represents a knowledge gap--certainly on how these machines will perform in real life. Exhibit V-16 illustrates this gap.

● However, INPUT believes that the lack of enthusiasm for the XT/370 in M-M applications, at least with the XT/370's current capabilities, is well placed. (The XT/370 is analyzed at some length in the companion report, <u>End-User Micro-Mainframe Needs</u>.)

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EXHIBIT V-12

SPREADSHEETS: CORPORATE AND VENDOR VIEWS
1984 AND 1986

Amount of Corporate
Spreadsheet Use Seen By:

Corporations (Standalone
Spreadsheet Use) — 4.1 / 3.8

Vendors (Standalone
Spreadsheet Use) — 4.6 / 3.3

Corporations (Down-
loaded Data) — 2.9 / 4.2

Vendors (Downloaded
Data) — 2.4 / 4.7

1   2   3   4   5
Low   High

Amount of Use
(Rating)

Amount of Use in 1984
Amount of Use in 1986

- 72 -

INI
MCP
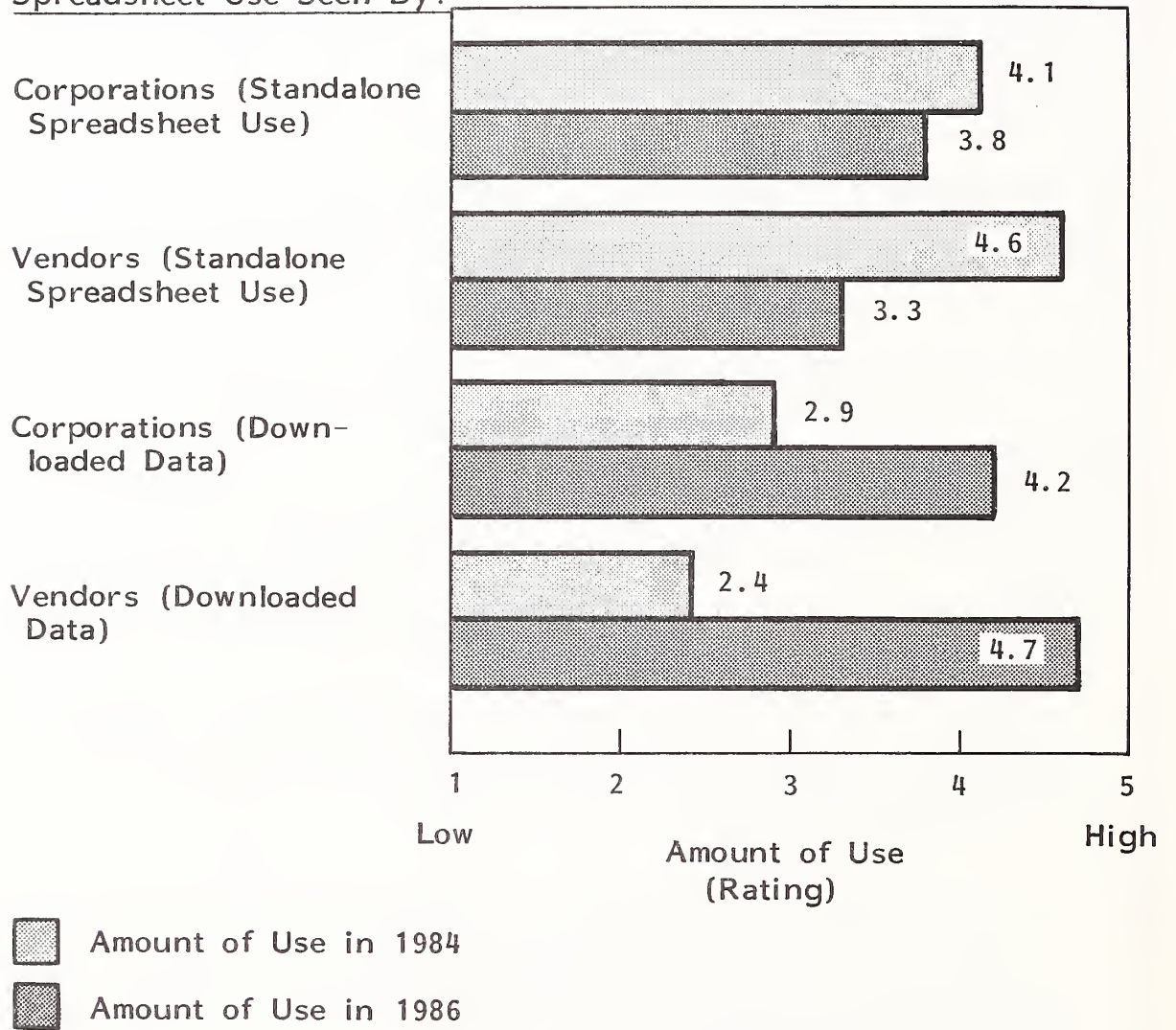
EXHIBIT V-13

FUTURE IMPORTANCE OF XT/370 TO SELECTED GROUPS

Company Respondents*

* Future Use

INPUT
UEPM MCPM
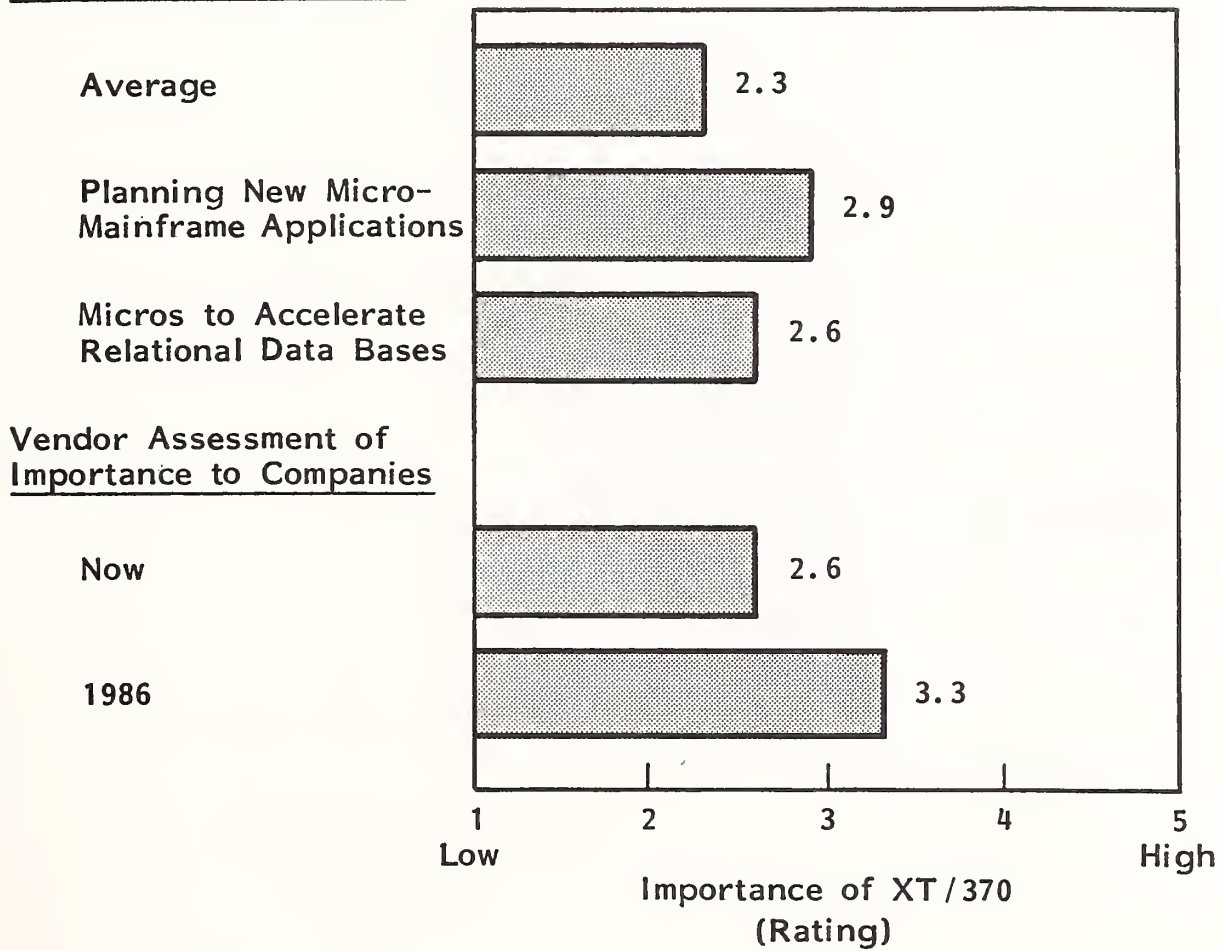
EXHIBIT V-14

PROPENSITY TO USE
.HOST SOFTWARE ON MICRO
BY INDUSTRY

Propensity to Use Host
Software on a Micro
(Rating)

IN
MC
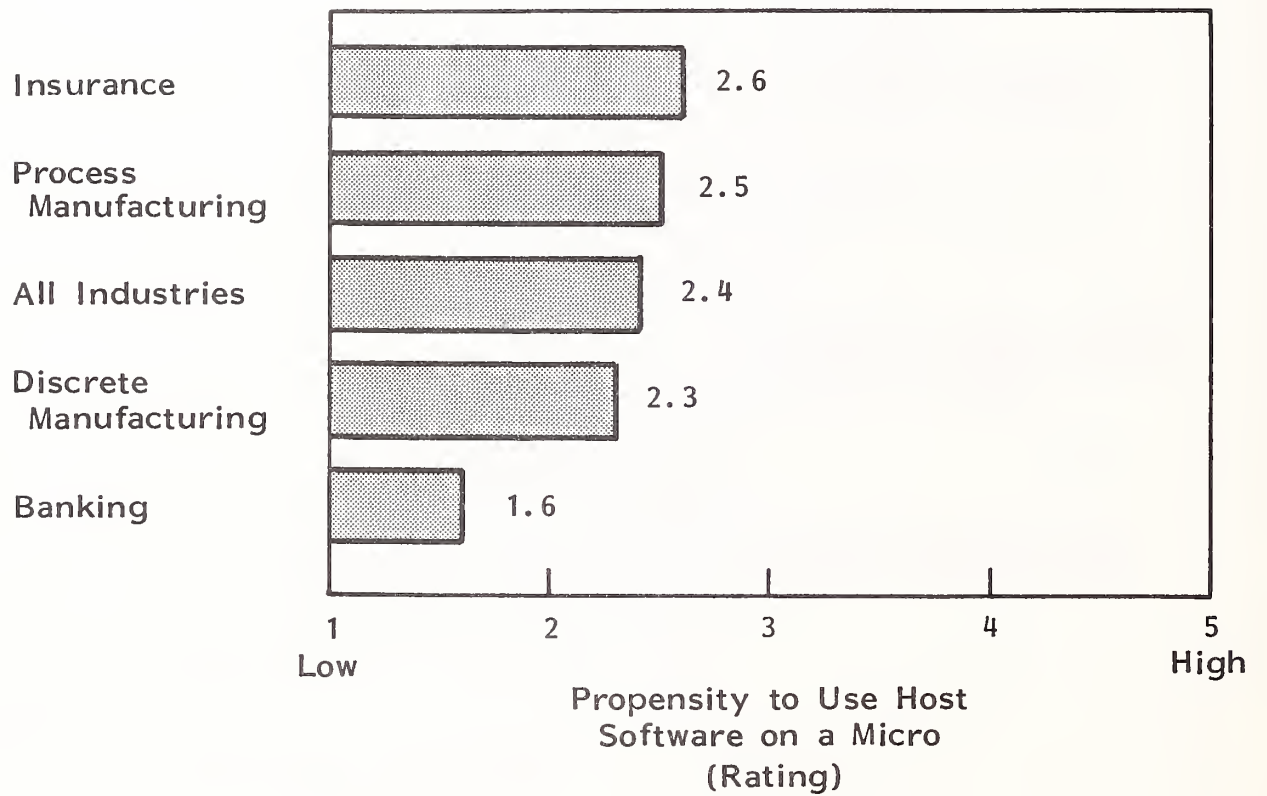
EXHIBIT V-15

FUTURE IMPORTANCE OF 3270 PC TO SELECTED GROUPS

Company Respondents *

Importance of 3270 PC
(Rating)

* Future Use

INPUT
MCPM
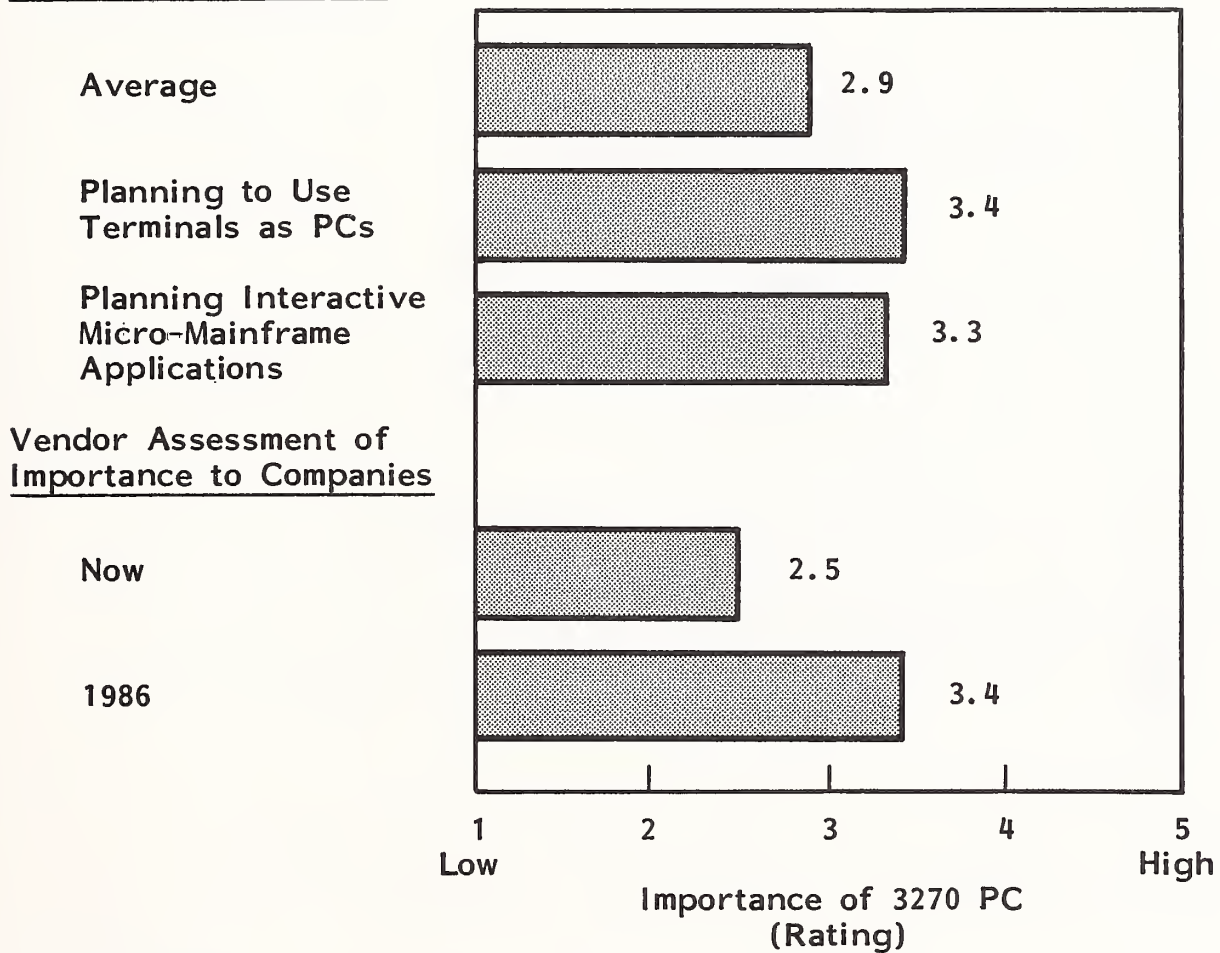
EXHIBIT V-16

XT/370 AND 3270 PC:
FUTURE IMPORTANCE AND CURRENT UNDERSTANDING
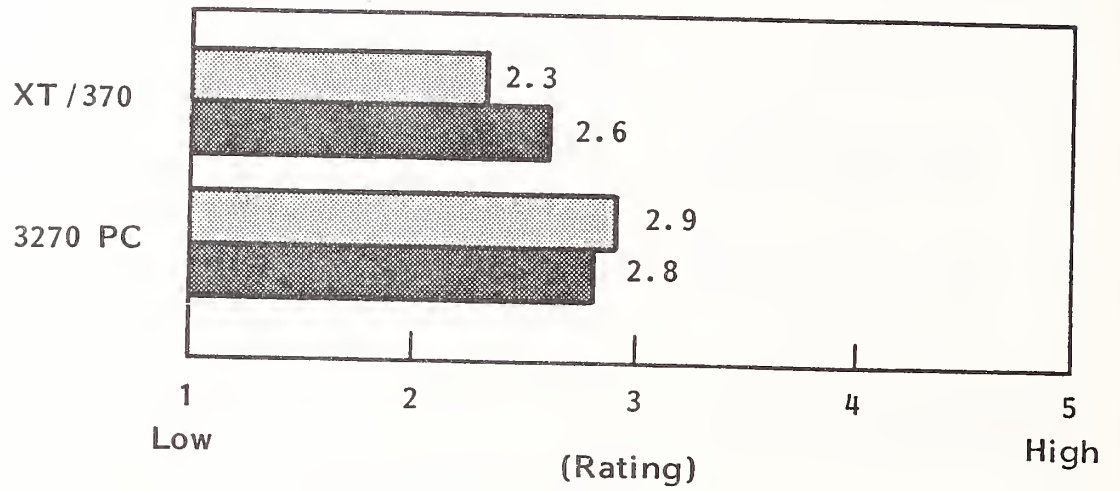
□ Future Importance to Company

■ Current Understanding of Product by Company

INI
UEP

E.   UNIX

●   UNIX is in principle a good foundation for M-M applications, given its port-
     ability, "piping," and other technical attributes. This, combined with AT&T's
     recent emphasis on UNIX as a vehicle for market entry, makes UNIX a subject
     of serious examination by many vendors.

     -    However, the market to date has shown little interest, according to
          Exhibit V-17.

     -    Vendors as a group see more promise for UNIX than do companies.
          However, the vendors INPUT interviewed did not appear particularly
          better informed than corporations.

F.   ON-LINE BATCH PLANS

●   As discussed in Chapter III, only a quarter of the corporations plan to utilize
     on-line (as opposed to interactive) batch as the means of implementing shared
     functionality M-M applications.   Almost twice the proportion of vendors
     favored this approach.

     -    From the vendor standpoint, this is not the worst of the story. Those
          companies that favor on-line batch are the least favorably disposed to
          shared functionality or vendor assistance as shown in Exhibit V-18.

     -    Those that are least in favor of on-line batch are the most active firms
          (including those planning to use vendor assistance), as shown in Exhibit
          V-19.

INPUT

EXHIBIT V-17

FUTURE IMPORTANCE OF UNIX TO SELECTED GROUPS

Company Respondents*

Average	1.8
Banking	1.3
Insurance	1.3
Discrete Manufacturing	2.3
Companies over $2 Billion	1.9
Companies under $2 Billion	1.6
In-House Micro Applications Developers	2.5

Vendor View of
Importance to Companies

Now	1.9
1986	2.8

1 (Low) — 2 — 3 — 4 — 5 (High)

Importance of UNIX
(Rating)

* Future Importance

INP
MCPN
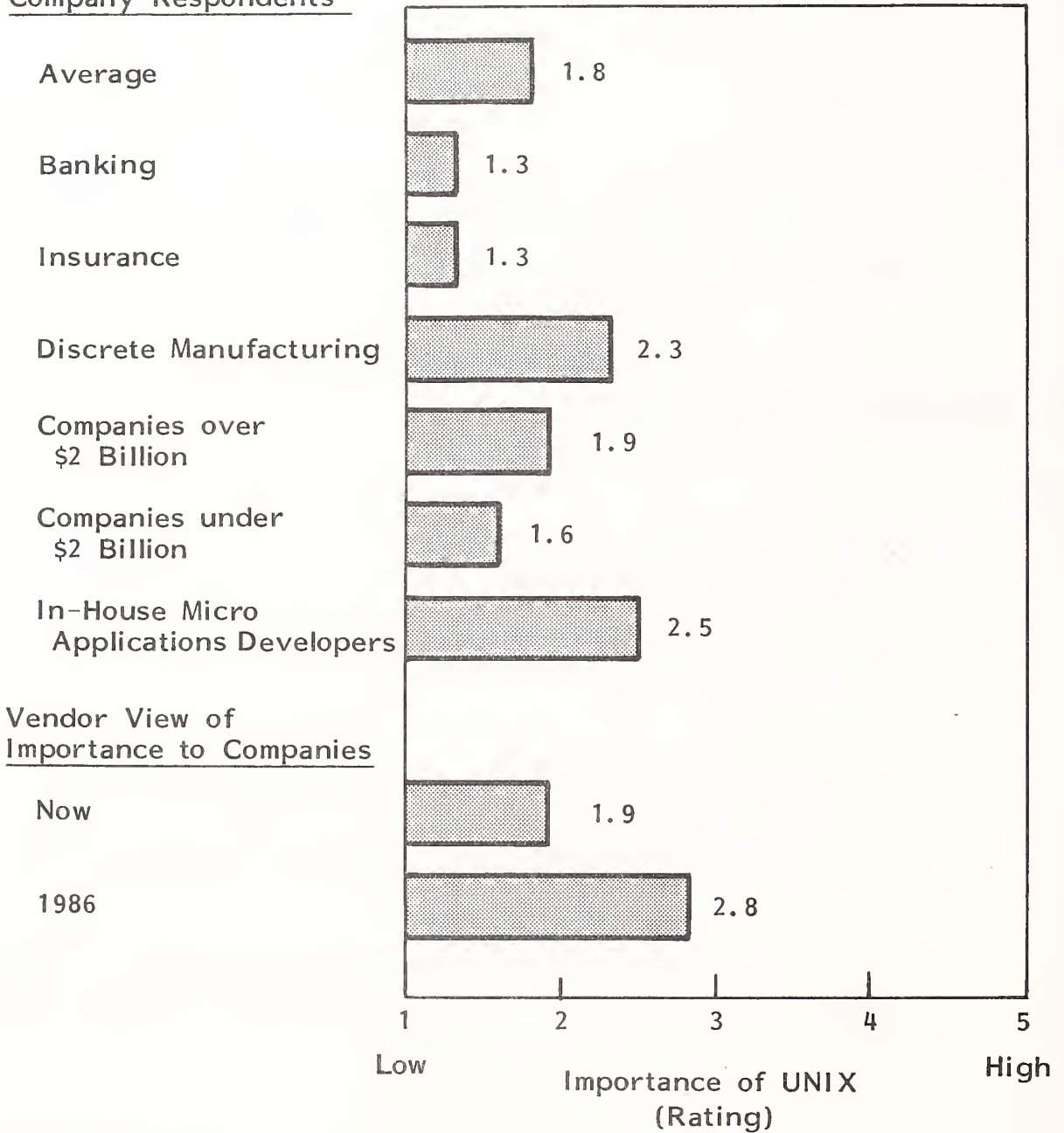
EXHIBIT V-18

PROSPECT TYPES MOST IN FAVOR OF
ON-LINE BATCH MICRO-MAINFRAME APPLICATIONS

Percent of Companies Expecting
Micro-Mainframe Applications to Be
Predominantly On-Line Batch

- 79 -
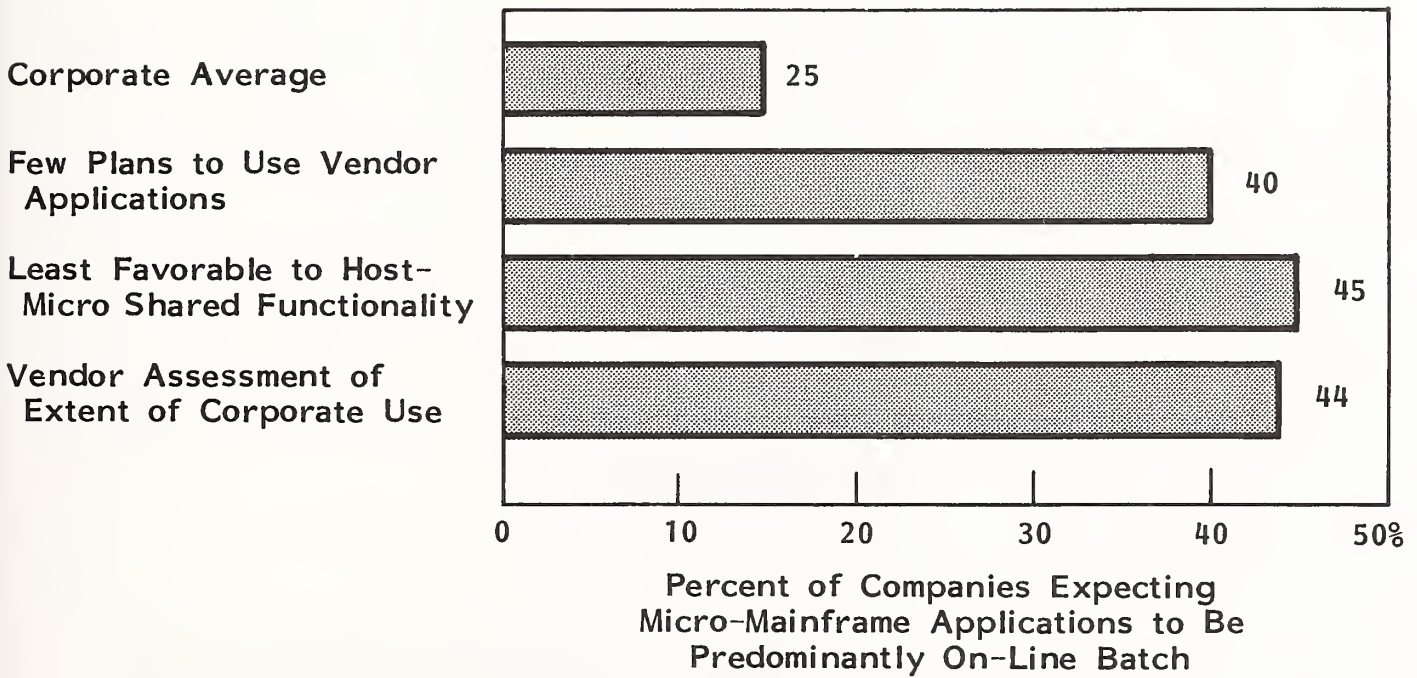
EXHIBIT V-19

PROSPECT TYPES LEAST IN FAVOR OF
ON-LINE BATCH MICRO-MAINFRAME APPLICATIONS

Prospect Type	Percent
Corporate Average	25
Plan to Use Vendor Software	19
Very Positive to Shared Host-Micro Functionality	18
Plan to Use RCS Firm	18
Plan to Use Turnkey Firm	17
Banks	17
Insurance Companies	14
Vendor Assessment of Extent of Corporate Use	44

Percent of Companies Expecting
Micro-Mainframe Applications to Be
Predominantly On-Line Batch

- 80 -

INP
MCPM
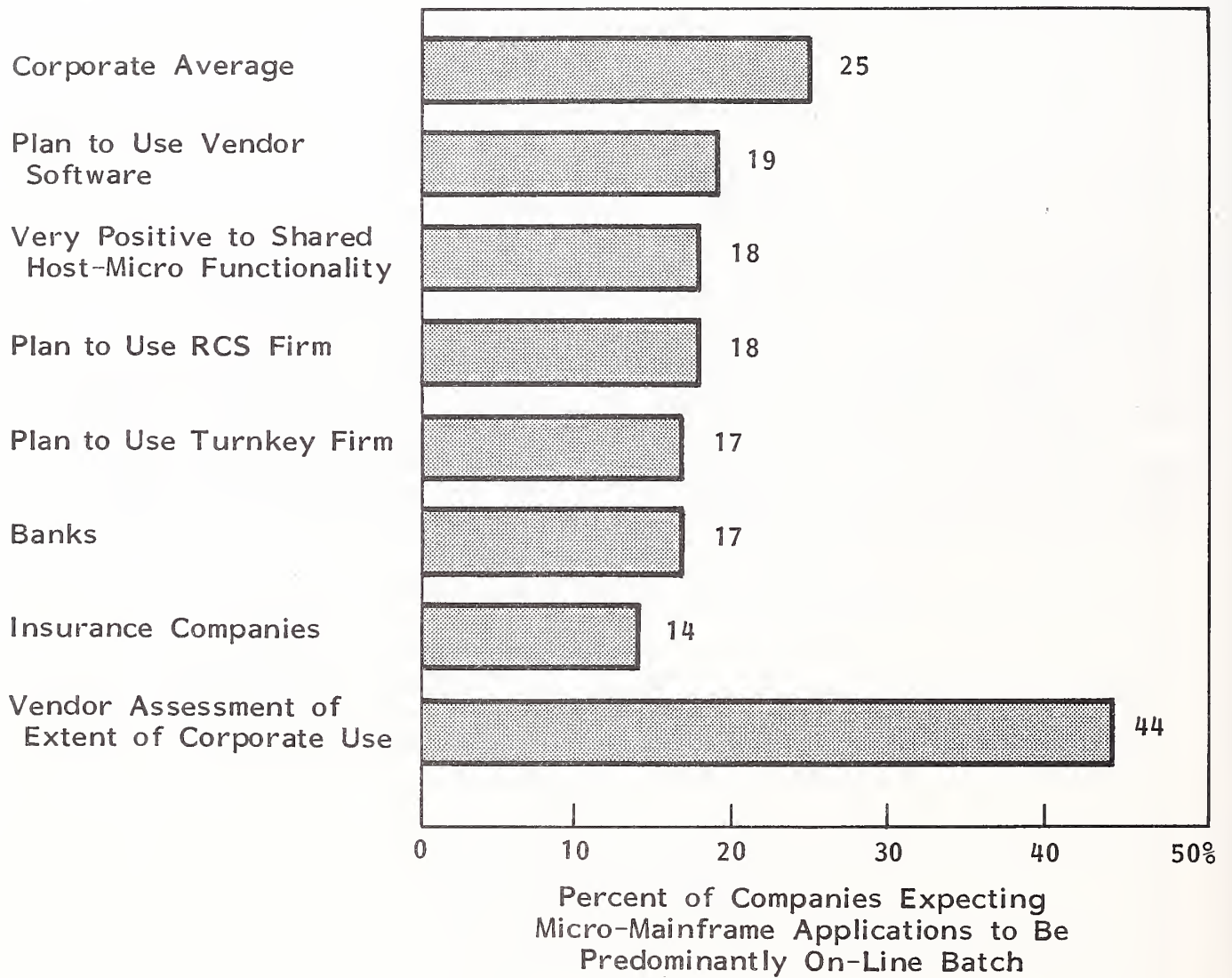
VI CUSTOMER REQUIREMENTS FOR VENDOR ASSISTANCE

VI   CUSTOMER REQUIREMENTS FOR VENDOR ASSISTANCE

- This chapter looks at customer requirements for vendor assistance and considers:

    - How much assistance customers expect to obtain from vendors.

    - How well particular kinds of vendors (i.e., software, professional service firms, etc.) meet these needs.

A.   CURRENT AND EXPECTED AMOUNTS OF VENDOR ASSISTANCE

- Vendors generally overestimate the amount of in-house M-M development and underestimate the amount of vendor software that will be used, as shown by Exhibit VI-1.

- This divergence between corporations and vendors is especially dangerous since the vendor participation rate is already very high, as shown by Exhibit VI-2. Vendors stand a good chance of walking past an open door.

    - The vendor participation rate is even higher, as shown by Exhibit VI-3, when M-M applications in the concept/planning pipeline are taken into account.

INPUT

EXHIBIT VI-1

SOURCE OF MICRO APPLICATIONS:
CORPORATE AND VENDOR VIEWS

INP
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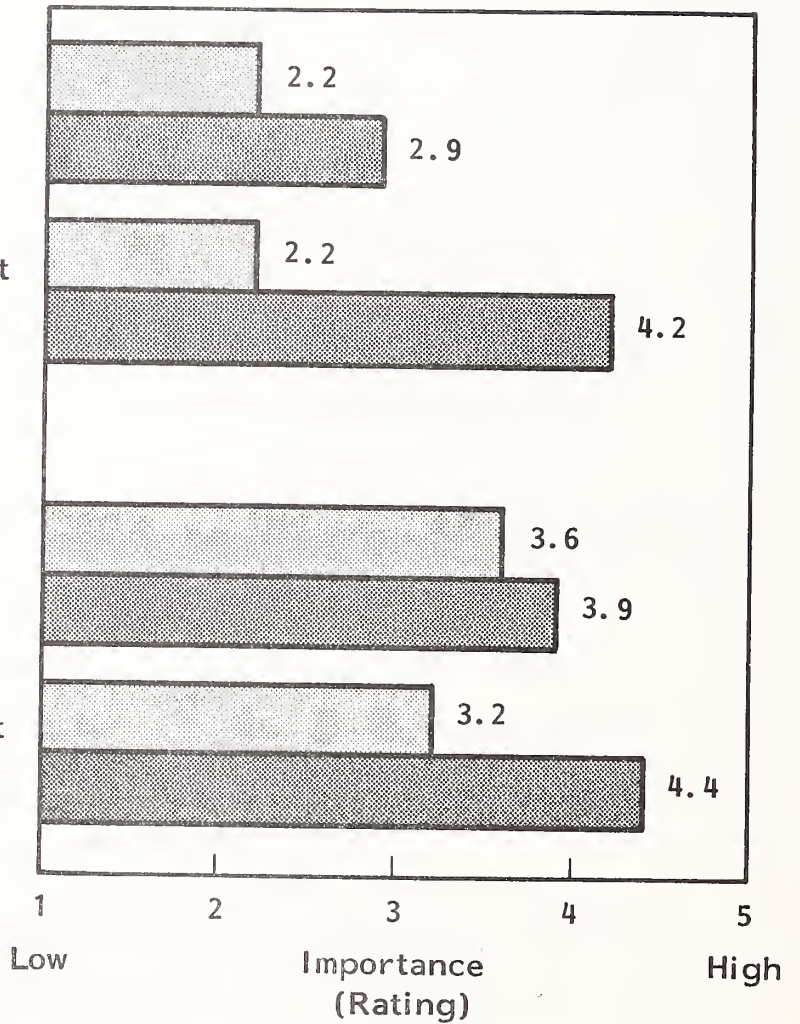
EXHIBIT VI-2

IN-HOUSE AND VENDOR INVOLVEMENT IN
MICRO-MAINFRAME APPLICATIONS DEVELOPMENT
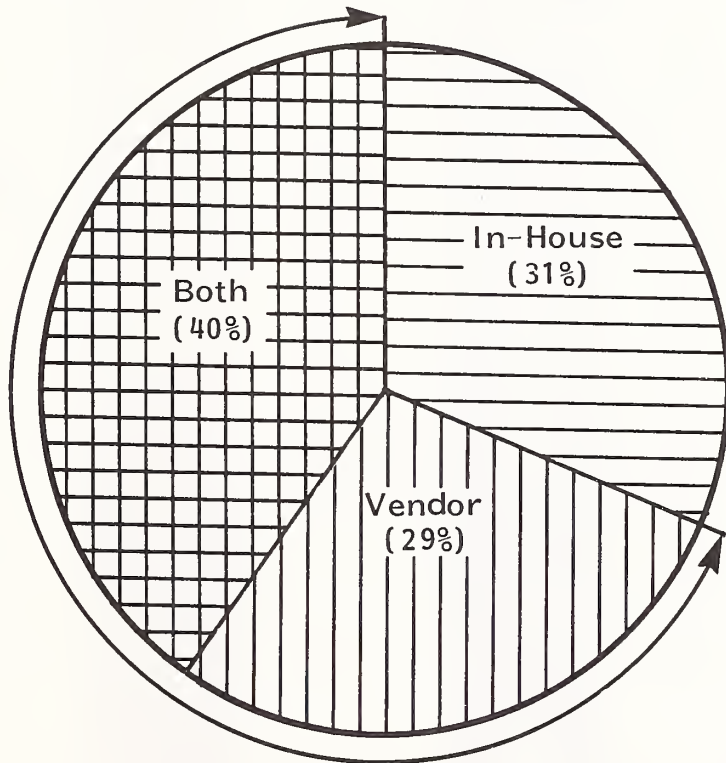
Vendor Participation = 69%

INPUT
MCPM

EXHIBIT VI-3

VENDOR PARTICIPATION IN
MICRO-MAINFRAME APPLICATIONS DEVELOPMENT
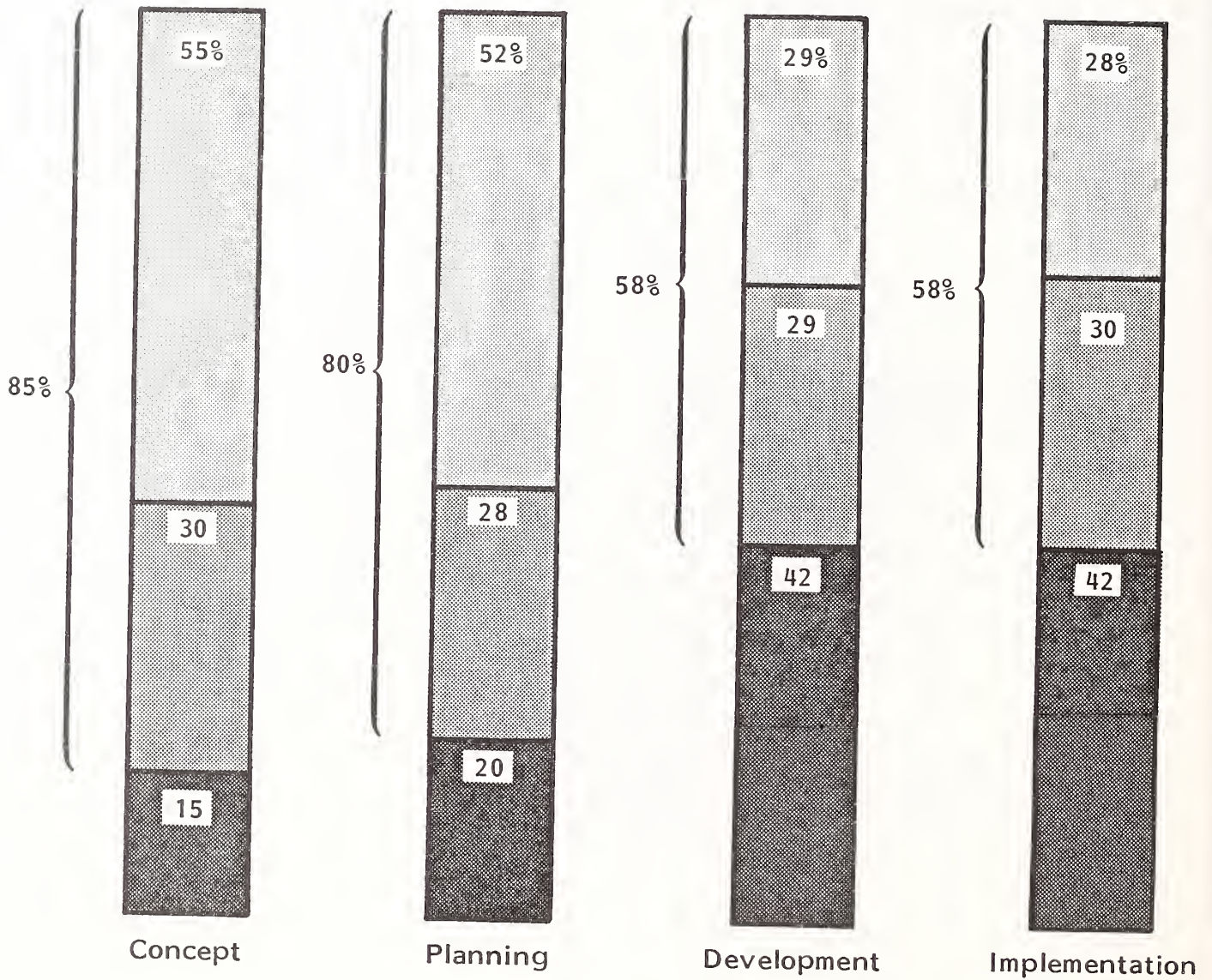
Source of Development

Both

Vendor

In-House

$X\% \left\{ \right.$ = Vendor Participation Percent

INPU
MCPM

- The percentages shown on the exhibit are not artifacts; virtually every company interviewed had one or more M-M application under planning or development.

• The vendor contribution is very diverse and may even, on occasion, be unrecognized by the vendor. This kind of participation includes:

  - Custom programming.

  - Modification of current software.

  - Modified vendor packages (mainframe and micro).

  - Downloaded and integrated data from public data bases.

• Micro-mainframe applications are very diverse.

• Exhibit VI-4 shows that companies most favoring shared functionality M-M applications are also very positive in their view of vendor-supplied micro software.

  - Vendor software rates highest among all groups, both now and in 1986.

  - This high-need group is the most favorably disposed to both in-house and vendor software, compared to the other groups.

  - However, a window of opportunity could close for vendors, since in-house-developed micro software is rated closer to vendor software in 1986 than it is now.

• The propensity to use vendor software does not seem to be influenced by whether a company plans wholly new M-M applications or plans to add applications to existing data bases. Exhibits VI-5 and VI-6 contain data regarding the importance of the sources for M-M software.

INPUT

EXHIBIT VI-4

VENDOR VERSUS IN-HOUSE SOFTWARE: RELATION TO
RESPONDENT POSITION ON HOST-MICRO SHARED FUNCTIONALITY

ATTITUDE TOWARD:	POSITION ON SHARED FUNCTIONALITY	ATTITUDE TOWARD VENDOR AND IN-HOUSE SOFTWARE
Vendor Supplied Micro Software	Most Favorable	4.2 / 4.5
	All Respondents	3.6 / 3.9
	Least Favorable	3.1 / 3.6
In-House Developed Micro Software	Most Favorable	2.8 / 3.5
	All Respondents	2.2 / 2.9
	Least Favorable	2.2 / 2.9

1   2   3   4   5

Low   High

Rating

1984
1986

INI
MCPI
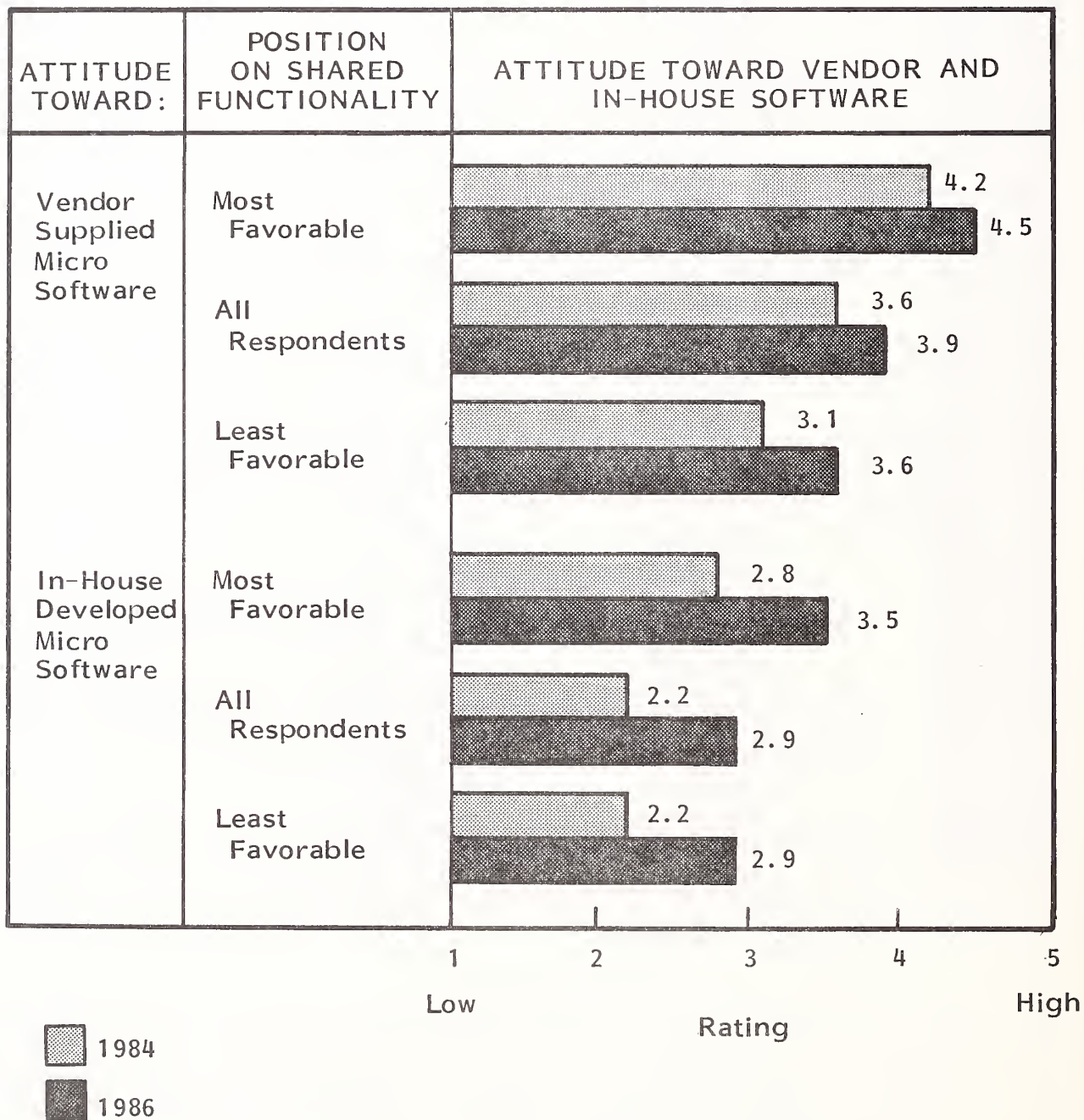
EXHIBIT VI-5

SOURCE OF MICRO-MAINFRAME SOFTWARE
APPLICATIONS ADDED TO EXISTING DATA BASE USED

**Importance of
In-House Development
Where There Is:**

Low Propensity to
Use Existing
Data Base — 2.4 / 3.0

High Propensity to
Use Existing
Data Base — 1.8 / 2.5

**Importance of
Using Vendor Software
Where There Is:**

Low Propensity to
Use Existing
Data Base — 3.5 / 3.8

High Propensity to
Use Existing
Data Base — 3.9 / 4.2

1   2   3   4   5

Low   High

Importance
(Rating)

☐ Importance in 1984

■ Importance in 1986

- 87 -

INPUT
MCPM
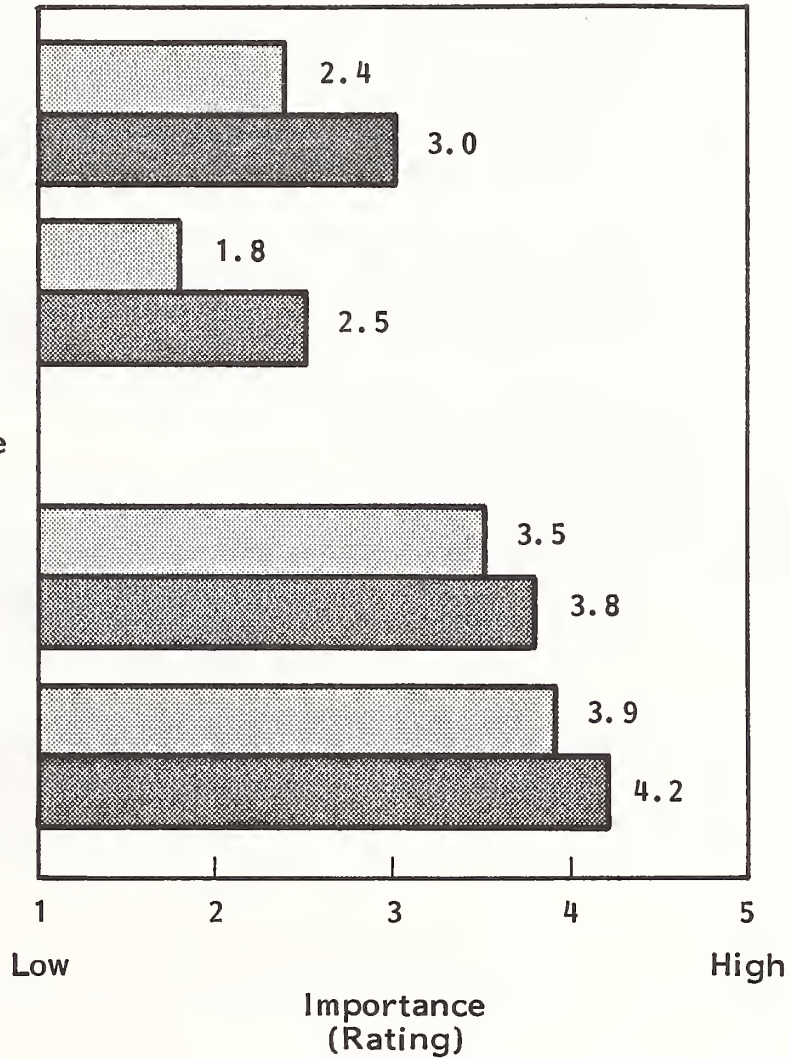
EXHIBIT VI-6

SOURCE OF MICRO-MAINFRAME SOFTWARE
WHOLLY NEW APPLICATIONS

Importance of
In-House Development
Where There Is:

    Low Propensity to
    Develop New
    Applications

       2.3
       3.1

    High Propensity to
    Develop New
    Applications

       2.1
       2.5

Importance of Using
Vendor Software
Where There Is:

    Low Propensity to
    Develop New
    Applications

       3.5
       3.8

    High Propensity to
    Develop New
    Applications

       3.9
       4.1

1   2   3   4   5

Low   High

Importance
(Rating)

[ ] Importance in 1984

[ ] Importance in 1986

INF
MCPF
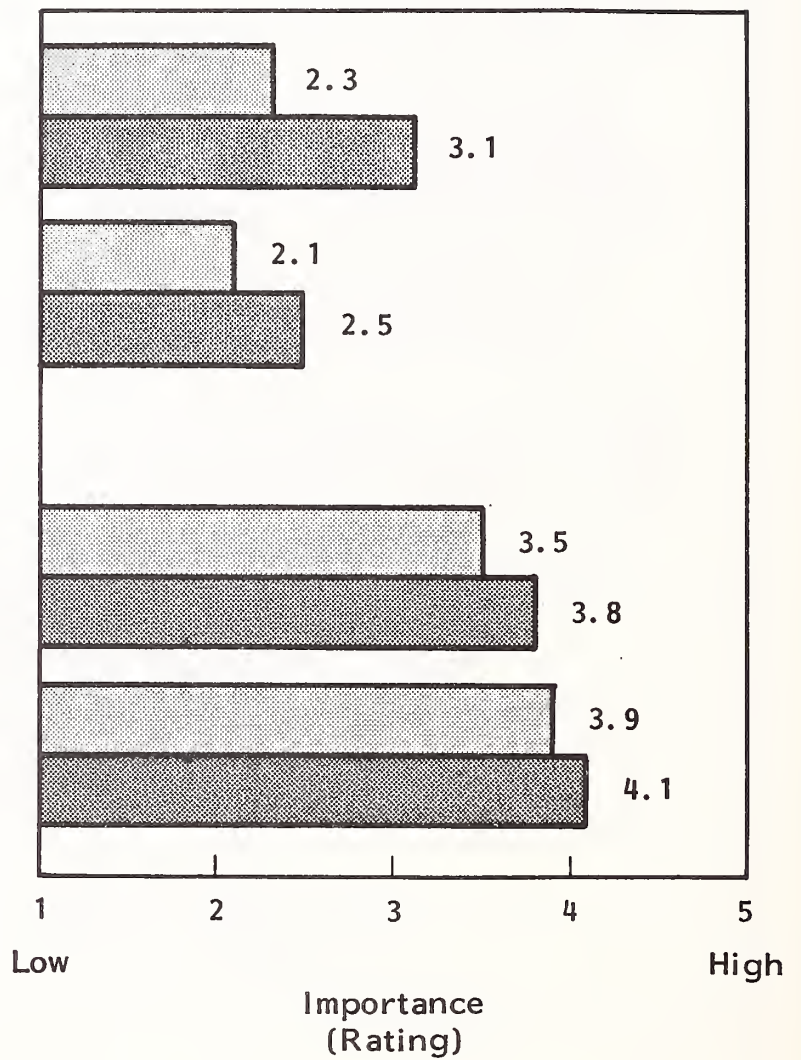
B.   ASSISTANCE FROM SPECIFIC TYPES OF VENDORS

● As shown in the previous section, corporations are using significant amounts of vendor assistance in putting together M-M applications and are utilizing much assistance now. Micro software packages are well established.

● It would seem logical, then, that vendors are well placed to move into the M-M business. Actually, there is a considerable problem, as shown by Exhibit VI-7: corporations give information service vendors a rating of only 2.7 on a scale of 5 for the amount of assistance they expect to receive. Only IBM and vendors that offer both mainframe and micro software are rated even slightly higher.

● This coolness toward M-M vendors is influenced by the M-M development strategies planned, as Exhibit VI-8 shows. Nor is it influenced by the technical approach, as Exhibit VI-9 shows.

   - The data on the need for general vendor assistance was further analyzed by dividing corporate respondents into "high" and "low" potential need groups based on their:

      . Propensity to use vendor versus in-house micro software.

      . Likelihood to use interactive versus on-line batch M-M applications.

      . Degree of support of M-M shared functionality.

   - Exhibit VI-10 shows that at this level of analysis there was no further improvement in corporations' attitudes toward vendor use.

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INPUT

EXHIBIT VI-7

ASSISTANCE EXPECTED FROM VENDORS IN
PLANNING/IMPLEMENTING MICRO-MAINFRAME APPLICATIONS

POTENTIAL SOURCE
OF ASSISTANCE

Source	Amount of Assistance
Mainframe/Micro Software Vendors	2.9
IBM	2.8
General Vendors	2.7
Mainframe Software Vendors	2.6
Professional Services Firms	2.4
Micro Hardware Vendors	2.1
Turnkey Vendors	2.0
RCS Firms	1.5

Amount of Assistance
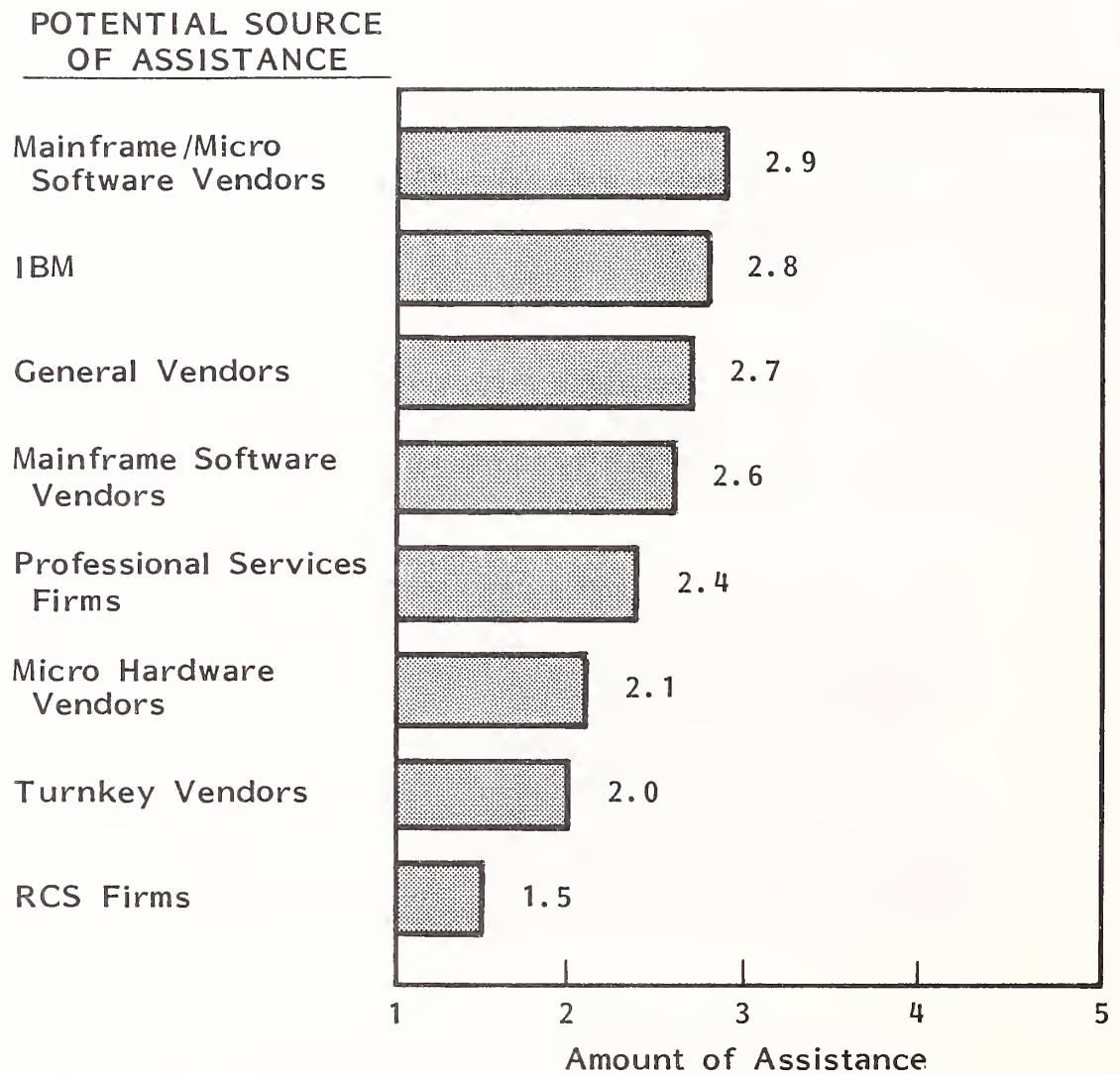
Rating:
    1 = No Assistance Expected
    5 = Much Assistance Expected

IN
MC

EXHIBIT VI-8

- 91 -

EFFECT OF MICRO-MAINFRAME DEVELOPMENT STRATEGIES ON
VENDOR OPPORTUNITIES

		THEN THE CORPORATION RATES:		
		USE OF KNOWN VENDOR APPLICATIONS	FUTURE IN-HOUSE DEVELOPMENT	VENDOR ASSISTANCE GENERALLY
IF A CORPORATION FAVORS:	Modifying Existing Software	4.0	2.7	2.4
	Adding Applications to Existing Data Base	4.2	2.5	2.6
	Writing New Applications	4.1	2.5	2.5
	Average Rating	3.9	2.9	2.7

Rating: 1 = Low Importance, 5 = High Importance

INPUT
MCPM

EXHIBIT VI-9

EFFECT OF MICRO-MAINFRAME TECHNICAL APPROACHES ON
VENDOR OPPORTUNITIES

		THEN THE CORPORATION RATES:		
		USE OF KNOWN VENDOR APPLICATIONS	FUTURE IN-HOUSE DEVELOPMENT	VENDOR ASSISTANCE GENERALLY
IF A CORPORATION FAVORS:	Interactive Micro-Mainframe Applications	4.2	2.8	2.8
	On-Line Batch Micro-Mainframe Applications	3.3	2.9	2.5
	Interactive/On-line Batch Equally	4.0	2.9	2.7
	Average Rating	3.9	2.9	2.7

Rating: 1 = Low Importance, 5 = High Importance

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EXHIBIT VI-10

VENDOR ASSISTANCE EXPECTED FROM HIGH-NEED GROUPS
(For Assistance Generally)

INPUT
MCPM
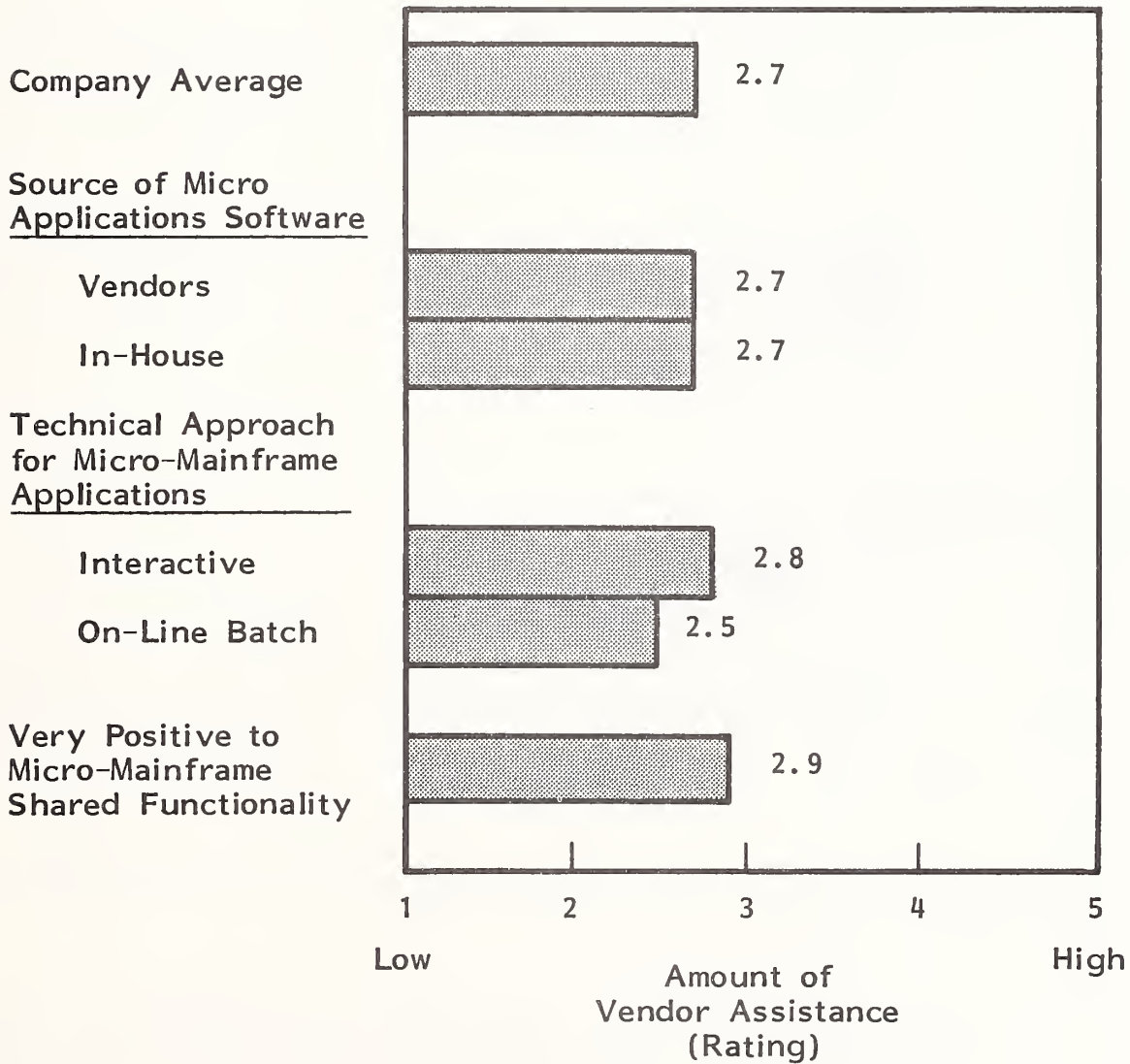
- However, when applying the same type of analysis to attitudes toward specific vendor types, a picture begins to emerge.

    - Companies most favorably disposed to using micro software rate mainframe software vendors high. Those favoring the interactive approach also rate mainframe software vendors more positive than average, as shown in Exhibit VI-11.

    - The same general picture applies to vendors offering mainframe and micro software; in addition, those corporations very positively inclined to M-M shared functionality are, not unnaturally, supportive of this type of vendor, as Exhibit VI-12 shows.

    - Exhibit VI-13 demonstrates that professional service firms also do well among those that are micro software oriented and those that favor the interactive approach.

C.   CONCLUSIONS

- The two pictures of the current and future levels of vendors versus requirements for assistance from vendors as a class are not in as much conflict as they appear to be at first glance.

- Essentially, corporations like the assistance they have gotten from vendors, and they want more.

    - However, they have a very unclear idea of the capabilities of different classes of vendors. Even IBM does not (at least not yet) produce a clear picture in customers' minds as to its capabilities.

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EXHIBIT VI-11

VENDOR ASSISTANCE EXPECTED FROM MAINFRAME
SOFTWARE VENDORS
(High-Need Corporate Groups)

Amount of
Vendor Assistance
(Rating)

INPUT
MCPM
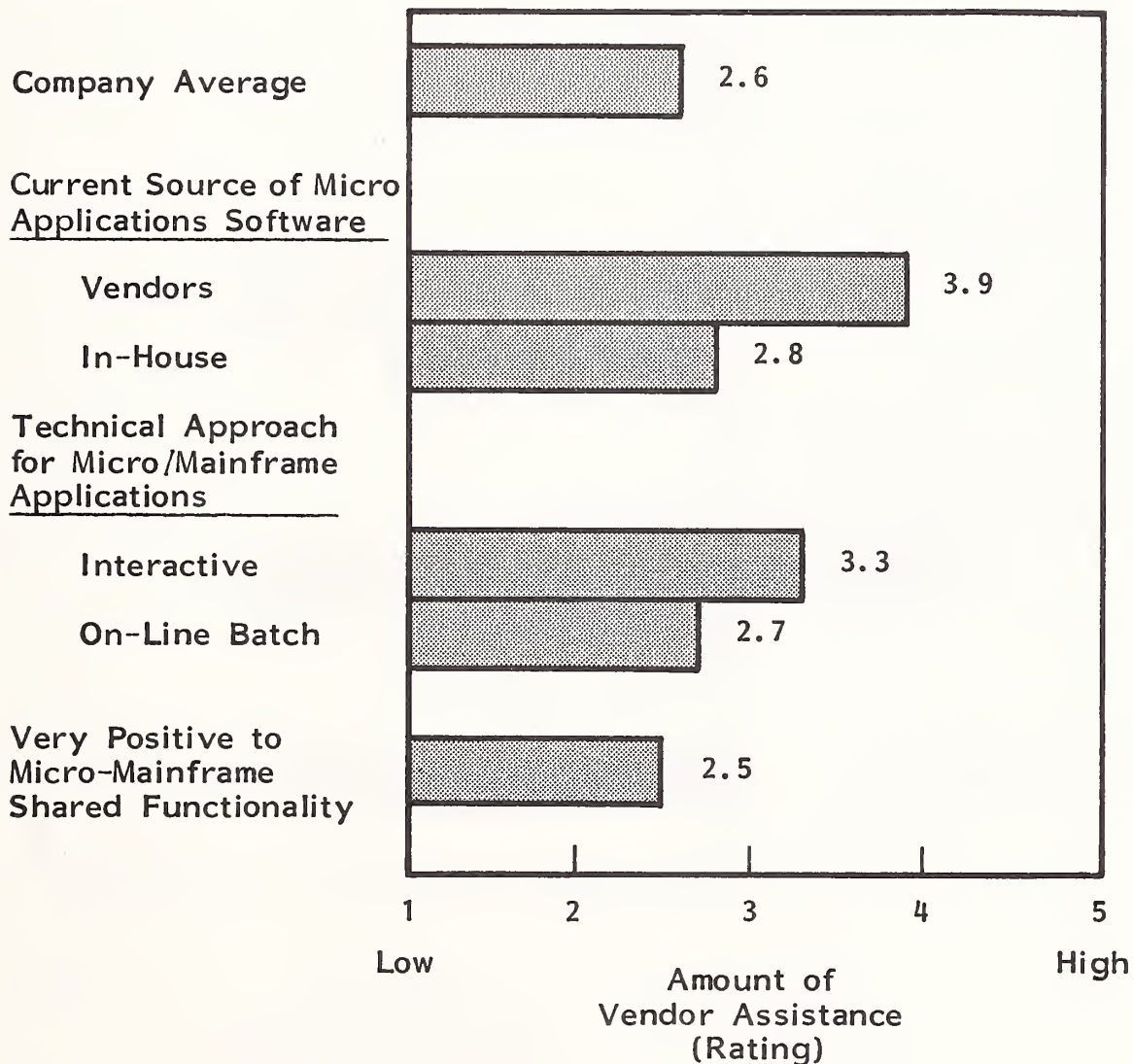
EXHIBIT VI-12

VENDOR ASSISTANCE EXPECTED FROM VENDORS OFFERING MAINFRAME AND MICRO SOFTWARE
(High-Need Corporate Groups)

Company Average — 2.9

Current Source of Applications Software

Vendors — 3.9

In-House — 3.0

Technical Approach for Micro/Mainframe Applications

Interactive — 3.7

On-Line Batch — 2.5

Very Positive to Micro-Mainframe Shared Functionality — 3.6

1 (Low) — 2 — 3 — 4 — 5 (High)

Amount of Vendor Assistance (Rating)

INF
MCPM
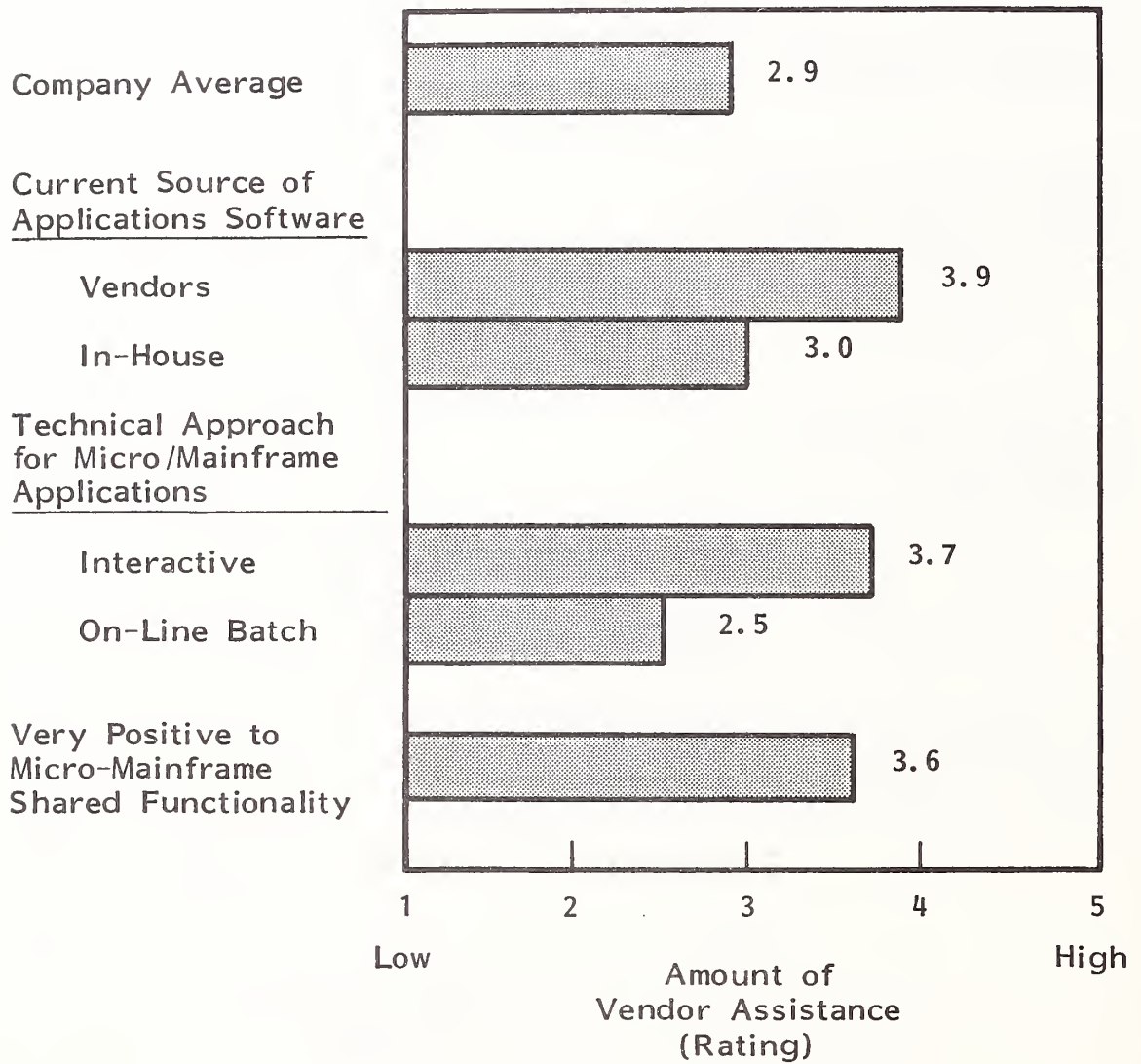
EXHIBIT VI-13

VENDOR ASSISTANCE EXPECTED FROM PROFESSIONAL SERVICE FIRMS

(High-Need Corporate Groups)

Amount of
Vendor Assistance
(Rating)

INPUT
MCPM
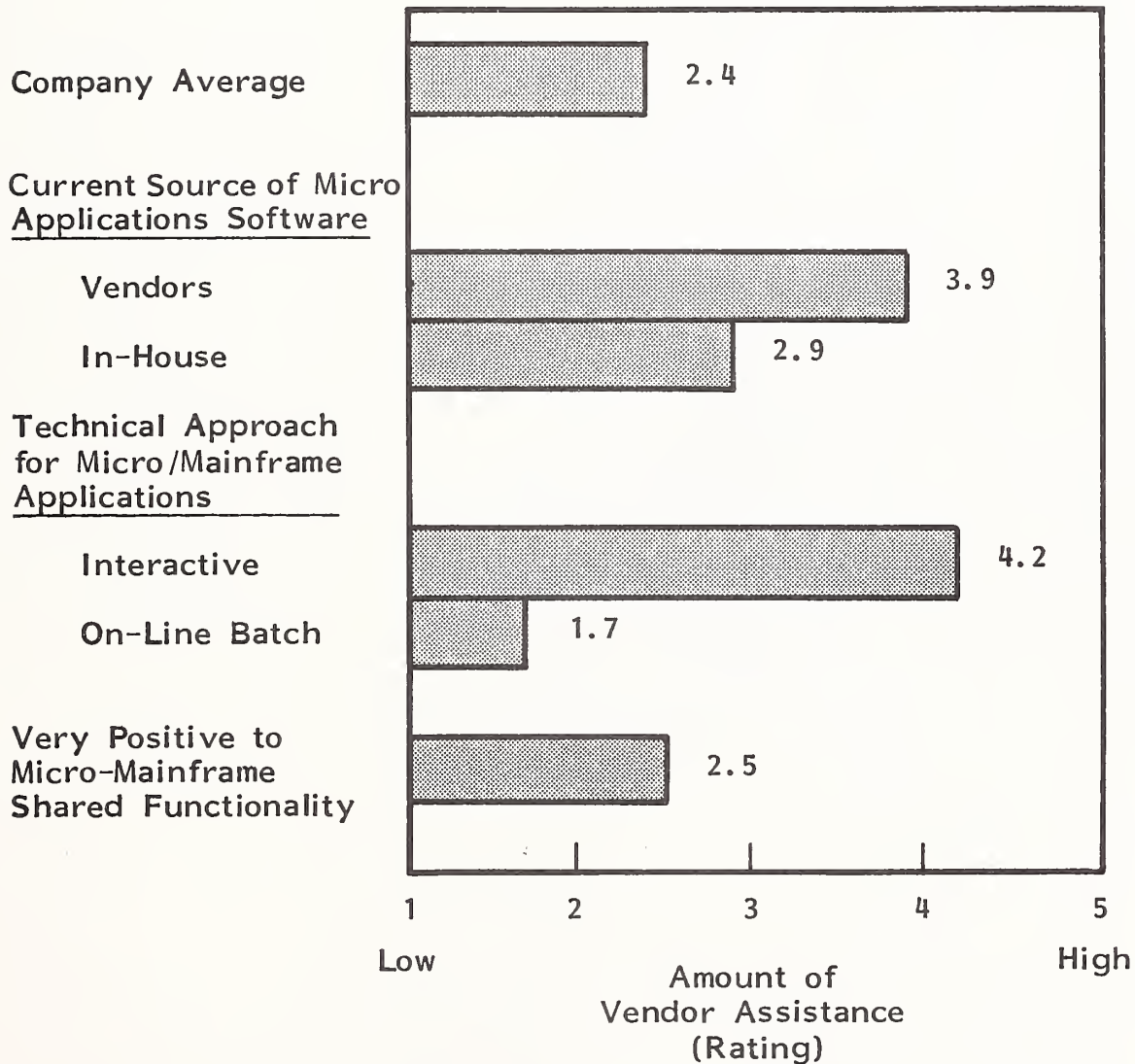
- In essence, the field is open to particular types of vendors--and individual vendors--that can show the market they have the products and capabilities it needs.

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VII COMPETITIVE ENVIRONMENT

VII COMPETITIVE ENVIRONMENT

- The micro-mainframe application market is singularly fluid. As the last chapter demonstrated, no particular vendor or type of vendor has yet achieved market recognition, not to say dominance.

- There are two principal and partly connected competitive concerns:

    - The rate at which to close the connectivity gap.

    - IBM's eventual role.

A. CLOSING THE CONNECTIVITY GAP

- Micro-mainframe connectivity is primarily a software issue. Consequently, the logical sources for solutions to these problems are the independent software vendors, which historically have shown the most creativity in developing and marketing innovative products.

- The independents have been active in what could be termed "first generation" products. Exhibit VII-1 shows representative products; these are discussed in more detail in the companion report, Micro-Mainframe: Communications Issues.

INPUT

EXHIBIT VII-1

MAINFRAME/MICRO SOFTWARE PRODUCT RELATIONSHIP

Mainframe Vendor:	Informatics	McCormack & Dodge	Information Builders (FOCUS)	MSA	Cullinet
	↓	↕	↕	↓	↓
Micro Environment:	VisiCalc	Lotus	Information Builders (Micro FOCUS)	MSA/ Peachtree	Cullinet (Source Code Modifications)

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MCPM
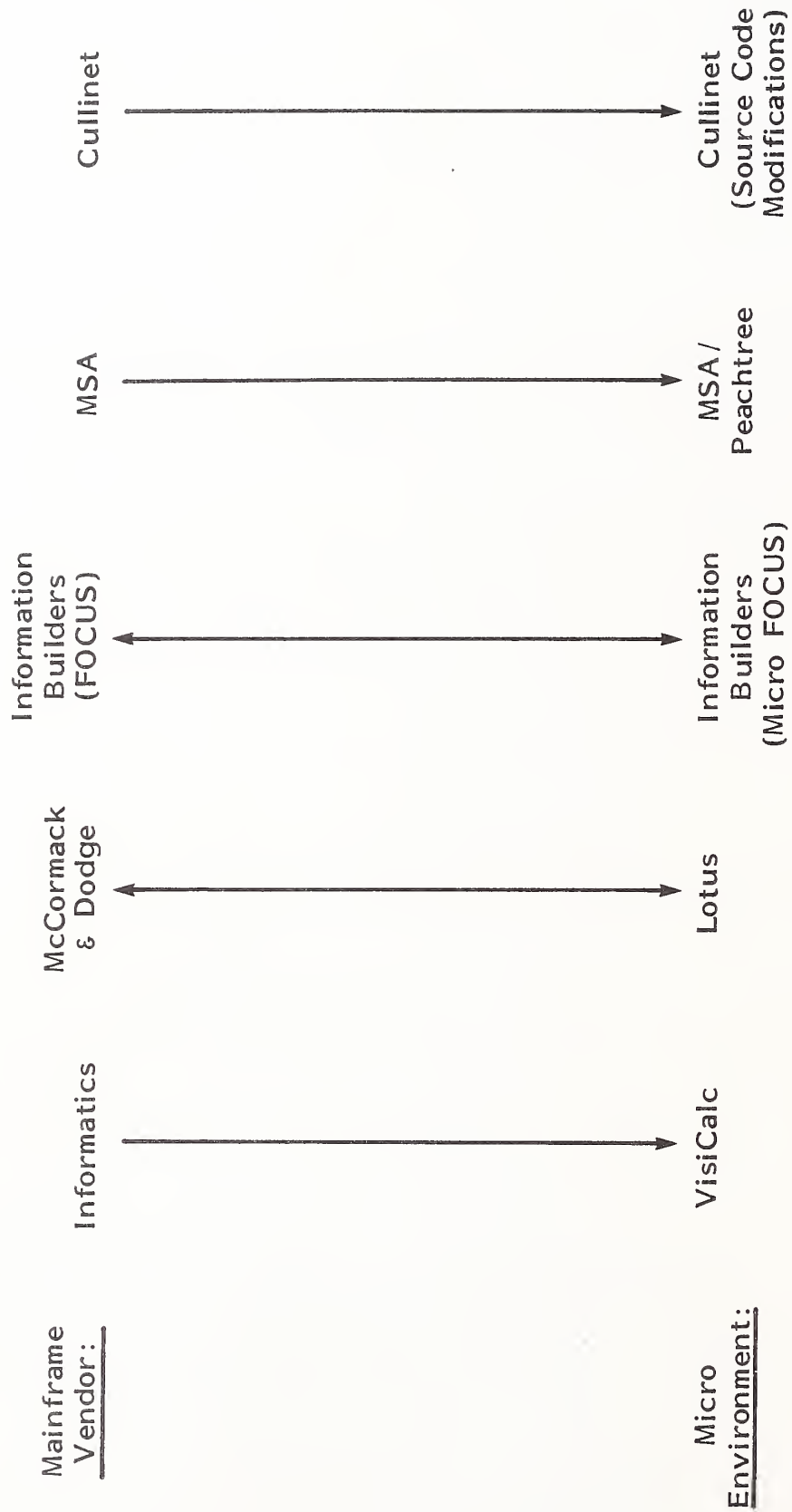
- These have been typified so far by being aimed at an essentially down-loading environment, as the calc connection makes clear.

- Ironically, the least applications-oriented of this group, FOCUS, provides perhaps the best foundation for M-M shared functionality applications because essentially the same software environment is on both ends of the connection. FOCUS is not, however, currently being marketed in this way; rather, it is marketed as a "down-processing" version of the host product.

- However, the situation is very fluid. If the independents do not produce such solutions, other suppliers will. Exhibit VII-2 summarizes some of the opportunities that will be presented to other potential suppliers if good connectivity solutions are not offered by software vendors. If too much time elapses, the product area will have become splintered, much as mainframe application development was before widespread acceptance of DMBSs by the mid-1970s.

B. IBM

- The largest threat to independent information service vendors comes from hardware firms (especially IBM), which could provide alternate solutions that, depending on the implementation approach, could partially lock out many software offerings. For example:

  - The Teradata, multiple microprocessor approach to data base management, although currently disappointing from a performance standpoint, could potentially allow production-capable mainframe-linked relational and DBMS systems.

  - The multiple microprocessor concept, coupled with the relational model, could serve as the foundation for M-M shared functionality control.

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EXHIBIT VII-2

EFFECTS OF CONNECTIVITY GAP REMAINING OPEN

ALTERNATE MICRO-MAINFRAME SOURCE	OPPORTUNITY/EFFECT
In-House (IS) Developers	• Develop Nonstandard Micro-Mainframe Applications • More Difficult to Install Standard Product Later • Potentially a Source of Micro-Mainframe Software Products
Professional Service Firms	• Develop and Install Own Micro-Mainframe Applications • Use as Springboard for Own Micro-Mainframe Software Products
Turnkey Vendors	• Provide Mainframe "Hooks" for Mini/Micro Products • Potentially Expand Upward
RCS Firms	• Expand Current Distributed Product Offerings • Use Connectivity Experience to Provide Micro-Mainframe Applications • Potentially Offer Micro-Mainframe Software Products
Hardware Firms	• Provide Standard, Possibly Inefficient, Foundation Software • Foreclose Some Independent Solutions • Gain Market Share at Independent's Expense • Possibly Introduce Hardware/Software Solution, Foreclosing Much Competition

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MCPM

- As always, IBM is a multiple threat with many parallel, overlapping efforts to test marketplace acceptance. Exhibit VII-3 illustrates this. So far, IBM's activities have focused largely on hardware and PC operating systems. However, DB2 provides a strategic entry point for more inclusive M-M systems.

- It should be kept in mind that IBM's success in the micro market has come about mostly through good luck and good management (i.e., the introduction of a sound but not spectacular PC at the time when there was a noticeable lack of a corporate-oriented PC).

  - There has been little sign of any trend on IBM's part, except to provide at least one of everything.

  - IBM's handling of the PCjr, UNIX, and LAN issues has not shown the same sure touch (or perhaps the understanding) of similar product and market planning issues as in the mainframe market.

- If IBM is among the first to arrive at an adequate (not spectacular) solution, or set of solutions, to the M-M shared functionality question, then the pattern has been set for the M-M environment.

  - Although this would undoubtedly be a bad thing for specific services vendors, it would on balance be neutral.

    . There would be a de facto standard.

    . Acceptance and use would be faster.

    . Overall connectivity would be enhanced and the M-M market widened.

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INPUT

EXHIBIT VII-3

IBM: BREAKING THE MICRO-MAINFRAME
BARRIER FROM MANY DIRECTIONS

IBM
LAN

Local
Communication
PC Clusters

Telecommunication
SNA, DCA/DIA

Direct Ties
to Medium and
Large Systems

Other RCS
Firms

Remote Computing
Service (RCS)
Information
Network

Independent
Hardware
Add-Ons

Conventional PCs
IBM PC, PC-XT
PC jr., PC Portable

Independent
Software
Vendors

3270 PC
Follow-Ons

3270 PC

XT/370

System 34,
4300 Child
XT/370
Follow-Ons

VM

Multi-User
Machine OS
PC/IX, UNIX

Host-Based
UNIX

INPU
MCPM

- Competing or overlapping vendors would have to put their pride behind them and write off competitive products that were not both compatible and superior, since in mainframe connectivity they would be on IBM's turf. For those that could make the transition rapidly, the rewards would be large.

INPUT

VIII STRATEGIC ISSUES AND RECOMMENDATIONS

VIII   STRATEGIC ISSUES AND RECOMMENDATIONS

A.   STRATEGIC ISSUES

- Analysis and recommendations for the following issues are provided:

    - Micro-mainframe missing links.

    - The structure of future M-M software products.

    - The problem of integrated software packages.

    - The position of micro software companies.

I.   MISSING LINKS

- Future applications will need production-oriented linkage between the main-frame and micro. However, the types of linkages necessary to establish shared functionality between production programs do not really exist. There are two basic ways now of linking micros and mainframes:

    - Micros as terminals.

    - File/record downloaders and uploaders for spreadsheet environments.

INPUT

- The terminal-oriented approach does not, in its present form, take advantage of the micro's capabilities for independent processing, while the uploader/downloader approach largely views micros as subsidiary entities that feed off host-generated data.

- In order to put the micro on a footing of equality that end users will increasingly demand, several technical issues must be solved. Exhibit VIII-I indicates that three such issues are:

    - Data concurrency control.

    - Processor task allocation.

    - Security issues.

- <u>Data concurrency control</u>: This is both the most important and probably the most difficult task. For example:

    - Assuming that absolute interactivity is not feasible, how often should mainframe and micro files be synchronized and balanced?

    - Will different classes of data be "refreshed" at different intervals?

    - How can definitions of shared data be prevented from being modified at the local level?

    - How will local-only data be related to shared data?

    - How can the establishment of local data elements that duplicate and/or conflict with shared data be controlled?

- An active data dictionary will be essential. None exists yet, although several vendors are at work in this area.

EXHIBIT VIII-1

SHARED FUNCTIONALITY: MISSING LINKS

-------- Missing Links

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MCPM
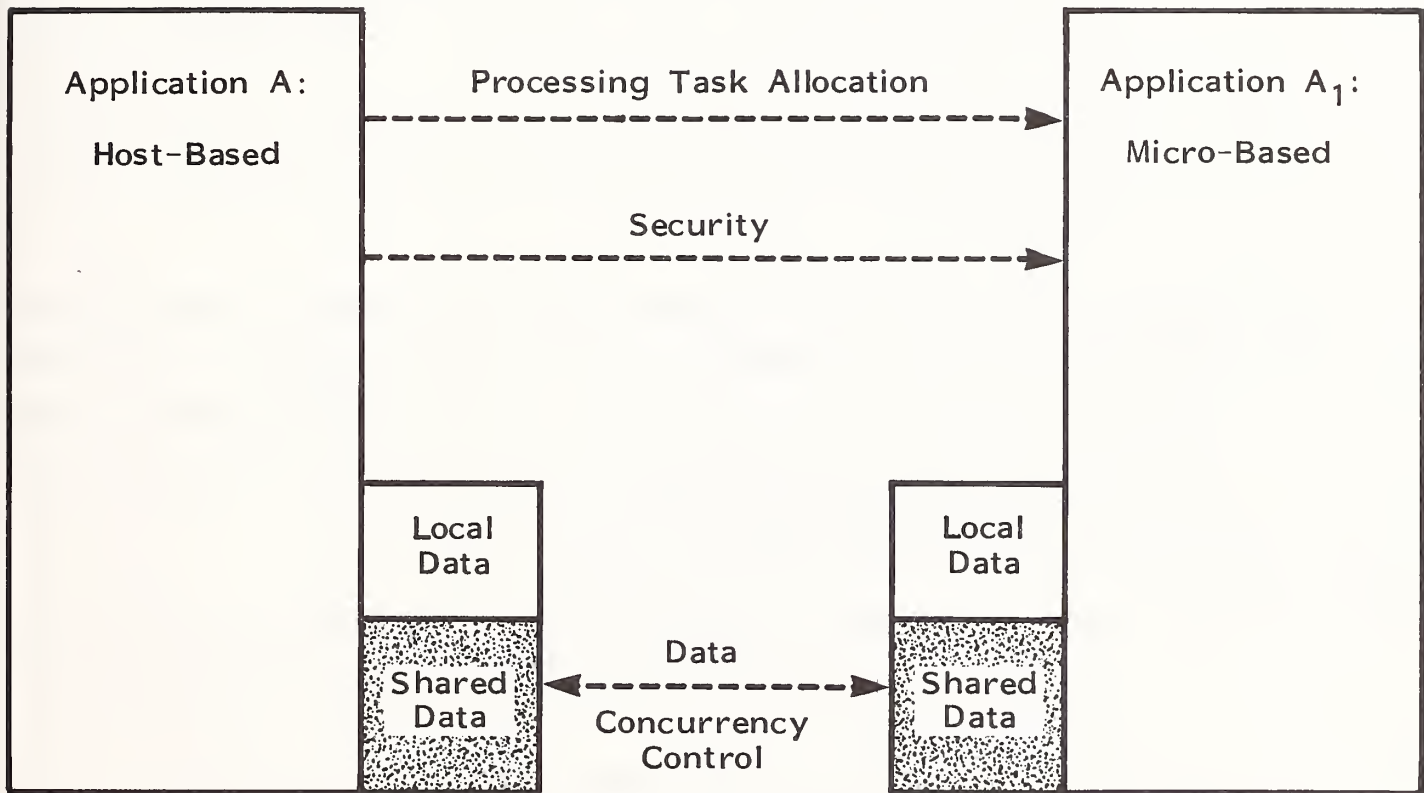
- Processor tasks allocation: This determines which processing functions will take place at the host and which will take place at the micro. Obviously, housekeeping functions will primarily be the responsibility of the host.

  - However, applications-related tasks may take place at the host in some situations and at the micro in others.

  - The initial allocation of tasks at a particular site may change over time as user needs change. There will be an ongoing trade-off in any product between flexibility and feasibility.

  - A downsized JES3 would provide the dynamic model, assuming it can be downsized.

- Security: The same type of security required for mainframe-based systems will also be required for M-M systems. This will be easier said than done because of the need to establish mainframe-type software controls at each micro node. Physical and personnel security measures will also be more difficult to establish and enforce.

  - RACF or ACF2, assuming they could be downsized (potentially onto a chip), would solve some security problems (sign-on, file-access, etc.).

  - However, data field control and validation would still require a data management solution, e.g., an active data dictionary.

- In summary, M-M linkages for shared functionality applications will be non-trivial to implement calling for a balance between:

  - Creative application design.

  - Flexibility.

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- End-user accessibility and control.

- Central control.

• For additional analysis on designs implementation issues, refer to the following reports in the information systems program: <u>End-User Micro-Mainframe Needs</u> and <u>Micro-Mainframe: Communications Issues</u>.

2. THE STRUCTURE OF FUTURE MICRO-MAINFRAME SOFTWARE PRODUCTS

• Micro-mainframe software products will have the same general relationship to each other as different classes of products now have to each other.

- There is underlying system software that controls and facilitates the applications software. Today this kind of software is generally a DBMS.

- On top of this foundation there is applications software, both cross-industry and industry-specfic. (On the micro level, this could be manifested in the "window" approach; however, the logical distinctions are more important.)

• Emerging M-M software products will be similar but will differ in some important respects, as Exhibit VIII-2 shows.

- The foundation software could be a DBMS (most likely a relational DBMS) that would establish an umbrella environment over both the mainframe and micro, similar to the experiments with Ingres at the University of California. A "data base manager's manager," interposing a software controller between the host and micro, would be another approach.

- III -

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EXHIBIT VIII-2

FUTURE MICRO-MAINFRAME SOFTWARE
PRODUCT RELATIONSHIPS
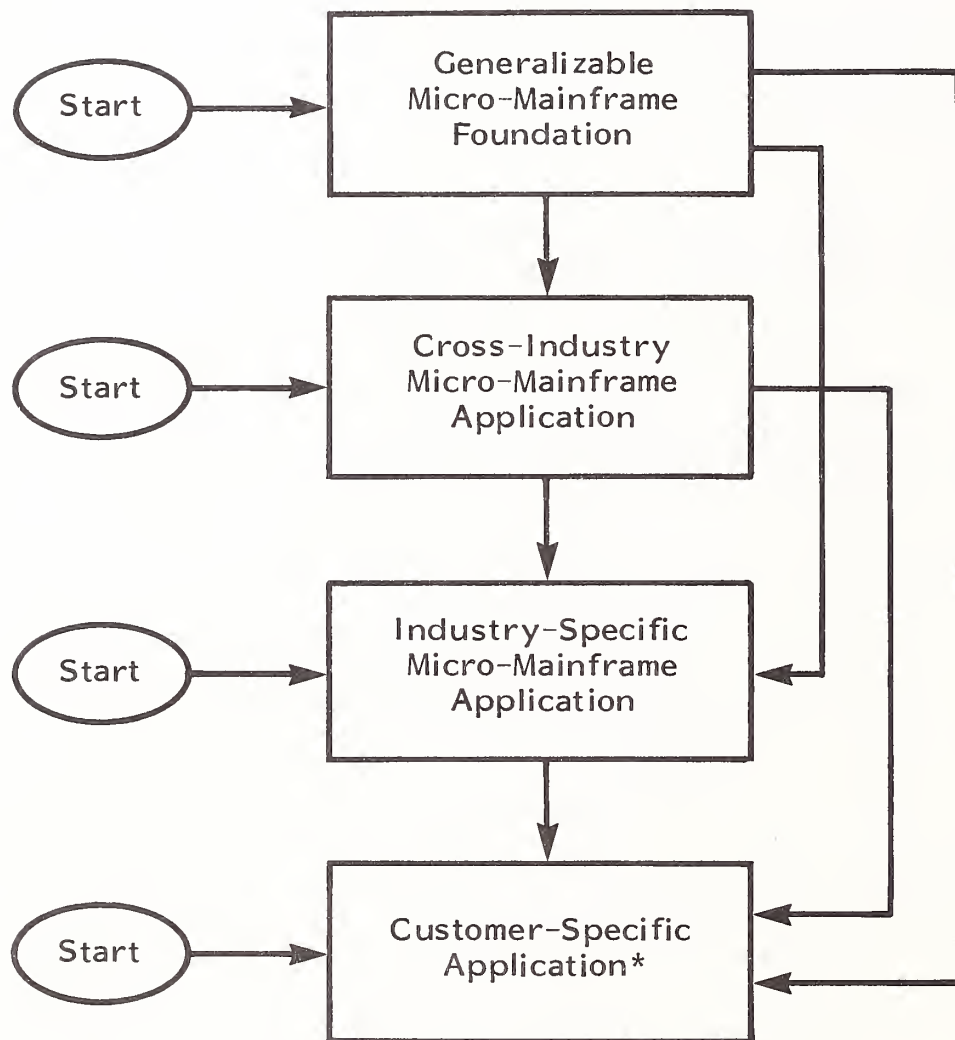
*This is custom software, developed either by the
customer (IS) or by a professional services
vendor.

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- This foundation could be used to build totally custom M-M applications software, not unlike the way that current DBMSs are used to construct conventional systems today.

- Because of the complexity of managing an M-M applications environment, it is likely that even more applications packages will use foundation software than occurs today in the use of DBMSs.

• Applications products can still be constructed using proprietary M-M interfaces. The trade-offs between a vendor developing its own proprietary M-M linkages and using an externally obtained M-M foundation are finely balanced, as shown in Exhibit VIII-3.

• There will be niches--analogous to those that exist today--for different kinds of vendors. Vendors may provide:

- Their own applications software using another vendor's foundation.

- Self-contained applications software.

- Their own foundation software.

- Their own foundation software with their own applications software.

• This last category is analogous to the emerging software conglomerates of today (i.e., Cullinet) and is a difficult but potentially rewarding objective.

• However, for some time in the future M-M vendors will tend to specialize because of the scarcity of resources (both people and dollars) as well as the marketing problems involved.

INPUT

EXHIBIT VIII-3

TRADE-OFFS: SELF-CONTAINED APPLICATIONS VERSUS
USE OF A MICRO-MAINFRAME FOUNDATION

ADVANTAGES TO HAVING SELF-CONTAINED APPLICATIONS	ADVANTAGES TO LINKING APPLICATIONS WITH AN EXTERNAL MICRO-MAINFRAME FOUNDATION
• Optimize Interfaces • Control Technical Changes • Avoid Being Dependent on Outside Organization • May Be Able to Sell Systems Software Foundation Separately • "Halo Effect" from Additional Technical Expertise • Can Produce Unique Technical Solutions (i.e., Not Constrained by a Given Architecture)	• Economize Initial and Ongoing Expense • Conserve Technical Skills • Focus Business on Applications Knowledge • May Produce Better Technical Solutions • Potential Sales Leads from Other Installations of Foundation Product

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- Both systems software vendors and applications software vendors will have a wide variety of customer targets, defined in Exhibit VIII-4.

- The only primary target they are likely to have in common are in-house developers.

- Turnkey and professional service vendors may appear to be unusual choices of sales targets.

  - However, both kinds of vendors will be having to retool themselves for the M-M environment.

  - In additional, both will be under heavy pressure to keep their costs down.

    . For the turnkeys, this will be as a result of moving down from mini to micro hardware vehicles.

    . Professional service firms have also been trying to assemble a collection of reusable software modules.

3. THE PROBLEM OF INTEGRATED SOFTWARE PACKAGES

- Ironically, constructing M-M foundation and applications software will be hampered by the current movement toward integrated packages. Integrated packages exist in different forms on both the mainframe and micro levels.

  - Mainframe-level integrated packages consist of a DBMS and one or more applications package. (See INPUT reports, Integrated DBMS-Applications Software and Integrated Software Systems: Experience and Outlook, for more information and analysis on these integrated applications.)

INPUT

EXHIBIT VIII-4

MICRO-MAINFRAME SOFTWARE PRODUCT CUSTOMERS

VENDOR TYPE:	SYSTEMS SOFTWARE VENDOR	APPLICATIONS SOFTWARE VENDOR
Micro-Mainframe Product Type:	Generalizable Foundation	Targeted Application
Potential Customers	–	–
Professional Service Vendor	2	2
Turnkey Vendor	1	2
End Users	N/A	1
In-House (IS) Developers	1	1
Application Software Vendors (Generally)	2	N/A
Application Software Vendors (Cross-Industry Products for Industry-Specific Vendors)	N/A	2

1 = Primary Target
2 = Secondary Target

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- On the other hand, micro integrated packages, such as Lotus's Symphony, Ashton-Tate's Framework, or VisiCorp's Visi On, provide spreadsheets, word processing, graphics, and so on, in a series of linked programs.

- One problem in both kinds of environments is that each individual software component may not be the best available or may not best meet a particular user's requirements.

- Both of these approaches to integration serve very real needs, especially at the mainframe level where different in-house applications may have been created by different groups using different data management environments at different times.

  - This can create significant problems when changing needs require linkages between applications. (See Exhibit VIII-5 regarding uninte-grated applications.)

  - While integrated applications cannot solve the problem of retrofitting existing applications, they can at least set the stage for better future linkages.

- Integrated mainframe and micro environments can be good settings for certain types of M-M connectivity, specifically when going from the main-frame to the micro, downloading subsets of mainframe data for micro analysis, as in Exhibit VIII-6.

  - In this situation, the common interfaces that exist at both ends make working within a self-contained environment relatively easy and attractive.

  - However, the very closed nature of integrated systems make them less suitable as vehicles in an M-M environment.

INPUT

EXHIBIT VIII-5

UNINTEGRATED APPLICATIONS:
CURRENT SITUATION (Example)

IDMS	VSAM	IMS	FOCUS
Application A – MRP	Application B – Warehouse Control	Application C – Order Entry	Application D – Capacity Forecasting

⟶ Record Updates (Daily Batch)

- - - - ⟶ Rekeyed Data (Weekly)
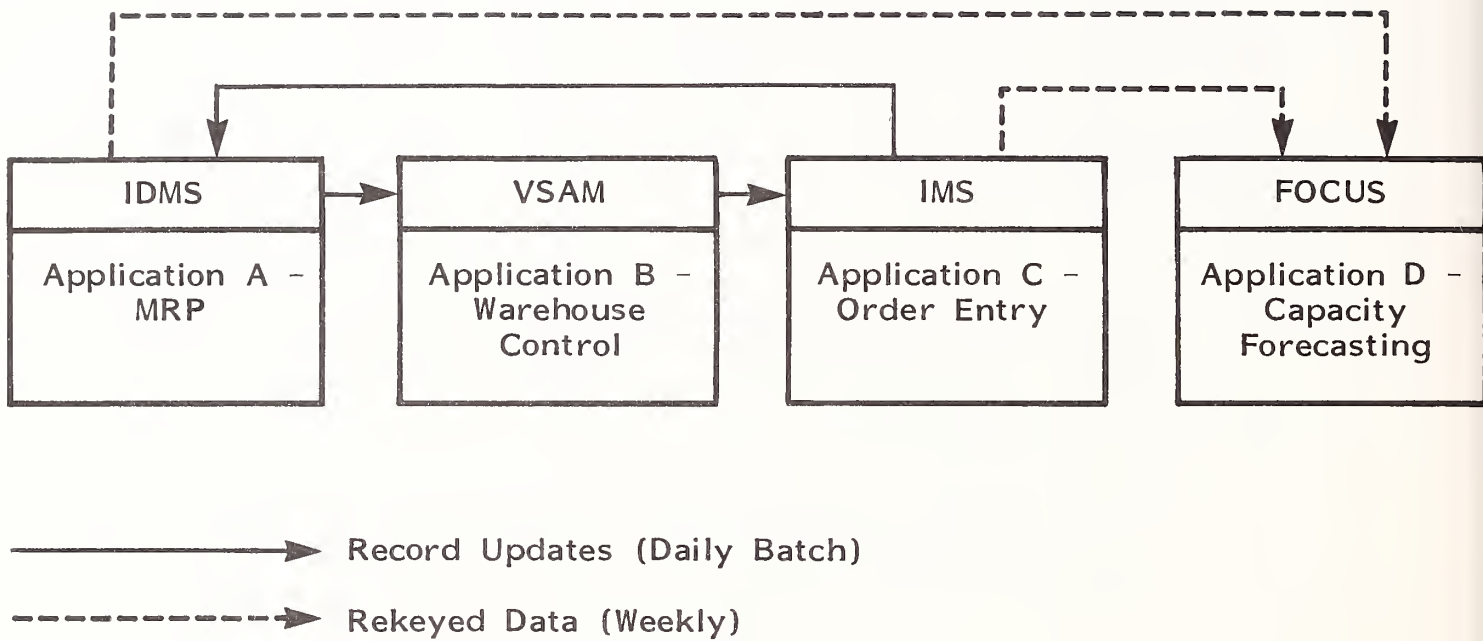
EXHIBIT VIII-6

PACKAGE INTEGRATION: TREND

Integrated Application - Mainframe

Integrated
Environment - Micro

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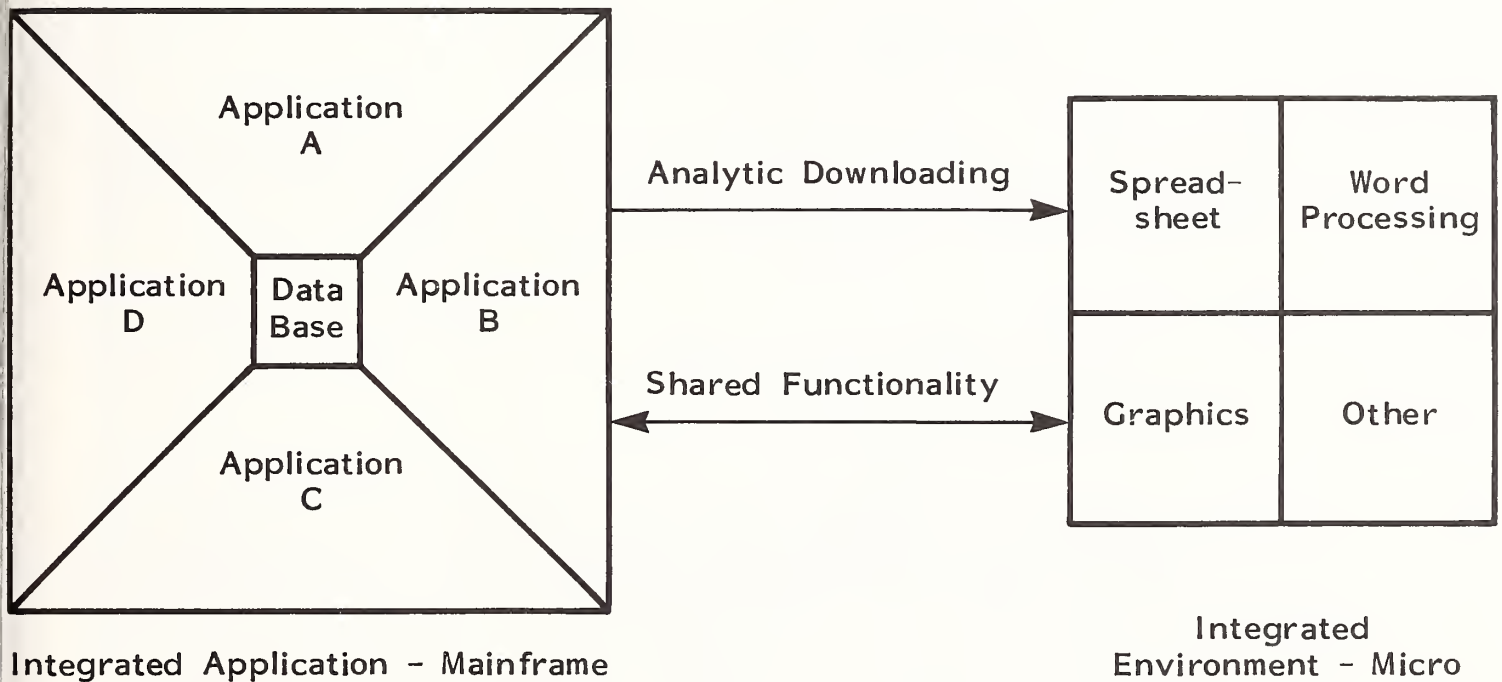
- The complexity, self-sufficiency, and module interdependence of the mainframe integrated applications will tend to make them difficult to modify and to link with external systems except under rigidly defined circumstances.

- The micro integrated environments are not really suited as the vehicle for production-type systems. The interactive strengths that serve them so well for one-on-one analytic functions are not so suited to the world of transactions, transaction files, controls and balancing, etc.

- Conceptually, a somewhat different approach will have to be made to permit integration in a shared functionality M-M environment.

  - A common mainframe data base is still very desirable at the mainframe level.

  - However, the different sections of the DBMS relating to different applications must be relatively loosely coupled, since applications will be oriented at least as much vertically (i.e., to micros) as they are--or should be horizontally (i.e., to other mainframe applications).

- New micro foundation level software will need to be developed to serve as drivers to the linked applications at the micro level. It would be desirable for:

  - The mainframe and micro DBMSs to be directly linked to simplify data definitions and control. A relational DBMS is the ideal tool for this, but relational DBMSs currently have performance problems in the real world.

  - Exhibit VIII-7 graphically depicts how integrated environments will have to be modified to serve M-M needs.

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EXHIBIT VIII-7

APPLICATION LINKAGE

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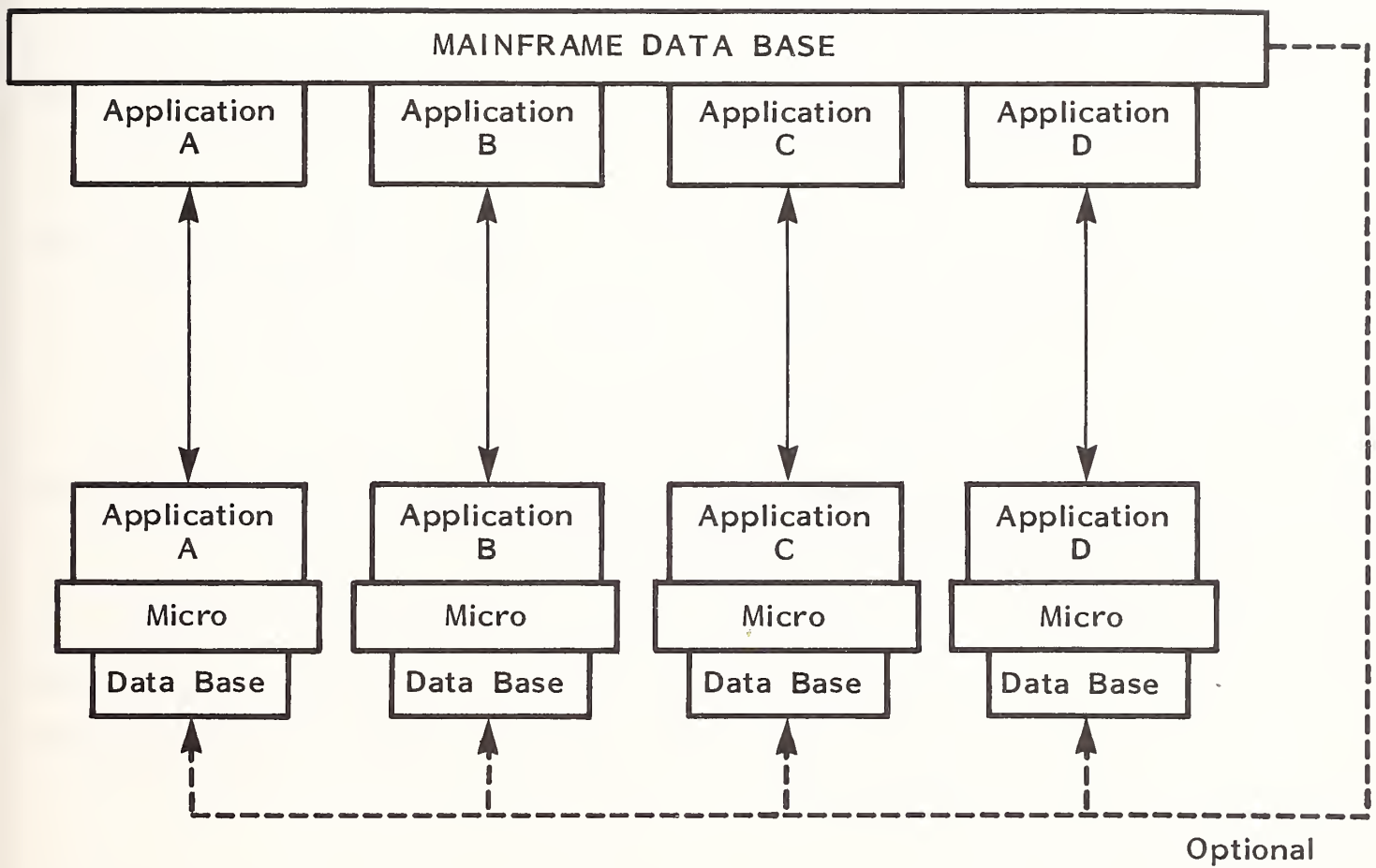
4.   THE POSITION OF MICRO SOFTWARE COMPANIES

•   The position of all but a handful of micro software vendors will be made much
      more difficult in an M-M environment, for reasons arising from their being
      "micro" software companies.

      -     By and large these are all small companies; the inevitable costly
            mistakes associated with entering the M-M market cannot easily be
            absorbed.

      -     Product lines are small; the breadth of interest and management vision
            in many of these companies is surprisingly limited.

      -     The knowledge of virtually the entire staff of these companies relates
            to the micro market.

            .   Mainframe technical knowledge is scanty.

            .   More important, knowledge of corporate needs in general and of
                  M-M needs in particular is lacking.

            .   This is accentuated by the fact that most micro companies view
                  themselves as being in the consumer marketing business. (Or
                  worse, they have ambivalent views on their marketing
                  direction.)

•   Consequently, except for those micro firms that wish to write off the business
      market, they will have little choice but to establish strong ties, a "partner-
      ship" of sorts, between themselves and a mainframe software company.

      -     Exhibit VIII-8 shows the decision points involved.

INP

EXHIBIT VIII-8

OPTIONS FOR MICRO SOFTWARE VENDORS

```
┌─────────────────────┐
│  Good Integrated    │
│  Micro Applications │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐        Yes
│   Remain in         │─────────────────────────────┐
│ Fortune 500 Market? │                              │
└─────────────────────┘                              │
          │ No                                       │
          ▼                                           │
┌─────────────────────┐   Yes                        │
│ Market to Smaller Firms│──────────────────────────┐│
│   with High Inter-  │                            ││
│     company         │                            ▼▼
│ Communications Needs?│
└─────────────────────┘
          │ No
          ▼
┌─────────────────────┐   Yes    ┌──────┐  ┌──────────────────┐
│ Market to Smaller Firms│──────→│ By   │  │ Partnership with │
│ with Moderate Inter-│         │ 1985 │  │   Mainframe      │
│     company         │         └──────┘  │ Software Company │
│ Communications Needs?│                   └──────────────────┘
└─────────────────────┘
          │ No
          ▼
┌─────────────────────┐
│  Targeting Home/    │
│  School Marketing   │
└─────────────────────┘
```

INPUT
MCPM
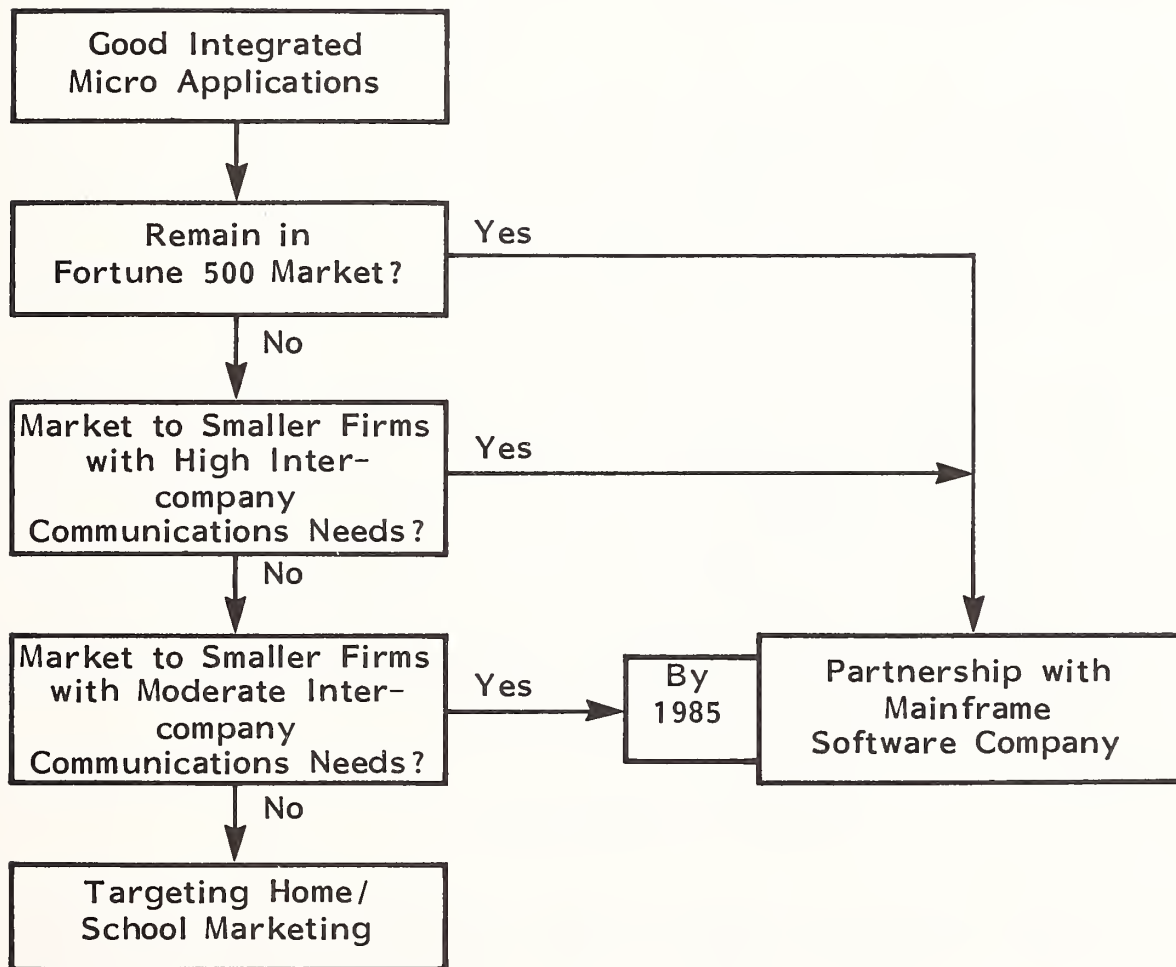
- This partnership process will probably take the acquisition path in order to guarantee the long-term coordination of products and strategies involved. IBM's acquisition of equity interests in Rolm and Intel indicate similar actions taken in analogous hardware areas.

B.   RECOMMENDATIONS

- Many recommendations have been made in the course of dealing with individual issues. They are summarized here.

1.   DISTRIBUTED PRODUCTION APPLICATIONS SHOULD BE THE GOAL

- Interim solutions to M-M connectivity are useful, although as the current asynch communications/downloading product array shows, the rate of product obsolescence is almost as fast as the growth in the number of products offered.

- Vendor objectives should ultimately be high value-added proprietary applications (and the associated systems software).

2.   DEVELOP AND MARKET CAPABILITIES

Customers have been using and intend to continue using significant amounts of vendor products and services. Vendors underrate customers' willingness in this regard.

- This underrating could become a self-fulfilling prophecy.

    - Corporations find it difficult to think of new vendors (as a class or individually) as a source of assistance in developing M-M applications.

INP

- This is because, except for downloading packages, vendors are not marketing their capabilities: vendors are selling tools (often confusingly) and not solutions to difficult and important problems.

3. SELECT A STRATEGY

- Vendors must develop strategies for attacking the M-M market. For example, vendors must consider selling:

    - As applications versus systems software foundation suppliers.

    - To corporations versus to OEMs.

- The strategy should be implemented in reasonable stages.

4. BE CAUTIOUS TECHNICALLY

- Corporations want interactive M-M applications. These will be hard to deliver. Suppliers of M-M services will have to walk a narrow line between:

    - Embarrassing and expensive failure.

    - Providing "ho-hum" and "me-too" products.

- One way of balancing these factors is to deliver solutions to specific applications problems.

    - These can be generic problems (addressable with software packages or turnkey systems).

    - Or they can be specific problems (addressable via professional services, often built around software modules).

INPUT

APPENDIX A: MICRO-MAINFRAME USER
QUESTIONNAIRE

MICRO-MAINFRAME USER QUESTIONNAIRE

INPUT is conducting a study on the issues involved in linking microcomputer host systems and data. We will make recommendations on how corporations can best deal with these issues in the coming years. We would like your organization to take part in this study by describing what you are doing now, what your plans are and what problems you see. This information will be used by IS departments in their planning and will also be used by a wide variety of information service vendors to offer more useful products and services.

None of the information that you provide will be associated with your company. In return for your taking part in this study, we will send you a summary of this study on its completion and will also send you a summary of INPUT's report, PC Software Support in Large Corporations.

1. How many personal computers are in use within your company? (If no PCs are used or planned by the end of 1985, end interview.)

	Now	End of 1984	End of 1985
Total all types	_____	_____	_____
IBM PC XT/370 or 3270/PC	_____	_____	_____
IBM PC except XT/370 or 3270/PC and IBM PC SW/data-compatible types	_____	_____	_____
UNIX-based systems	_____	_____	_____
Other personal computer types	_____	_____	_____

(Total should equal sum of parts)

2a. How will the UNIX-based systems be used? _____

_____

2b. In the future, how important do you see UNIX-based systems being to your organization's plans? (1 = low importance, 5 = high importance)

UNIX-based systems _____

Why? _____

_____

INPUT

3a. In the long run, how important is the XT/370 in your organiza- ganiza-
tion's plans? (1 = low importance, 5 = high importance)

XT/370 _____

Why? _____

_____

The 3270/PC? _____

Why? _____

_____

3b. How well would you rate your organization's current understanding of the
capabilities of the XT/370 and the 3270/PC? (1 = low degree of under-
standing, 5 = high degree of understanding)

XT/370 _____   3270/PC _____

Please give me some examples of particular areas where your organization
requires additional information on the capabilities of the XT/370 and the
3270/PC. (PROMPT AS NECESSARY: for example, what has to be done to
permit current applications software to run on the XT/370, how will concurrent
data bases be handled, etc.)

XT/370 _____

_____

_____

3270/PC _____

_____

_____

4a. How many multiuser microcomputer systems (e.g., Altos) and local area
networks (LANs) do you now have installed? Who are the vendors?
What are these systems being used for?

	Multiuser Micros	LANs
Number of installations	_____	_____
Vendors	_____	_____
Applications/Uses	_____	_____

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INPUT

4b. How many multiuser micros and local area networks do you expect to have installed in two years? What new uses will you have?

	Multiuser Micros	LANs
Number of installations	_____	_____
Vendors	_____	_____
Applications/Uses	_____	_____

5. In the future, what will the relative importance be to your organization of the following kinds of microcomputers? (1 = low importance, 5 = high importance) Why? (READ EACH ITEM BELOW)

	Rating	Reason Why
Standalone personal computers running personal computer software? (e.g., IBM PC/XT)	_____	_____
		_____
		_____
Standalone personal computers running mainframe software?	_____	_____
		_____
		_____
Personal computers in local area networks?	_____	_____
		_____
		_____
Mainframe terminals that also have personal computer capabilities (e.g., 3270/PC)	_____	_____
		_____
		_____

INPUT

6. On a scale of 1 to 5 with 1 representing low importance and 5 representing high importance, how would you rate the following functional areas? In two years how would your importance rating change for these? Why the change?

	Now	Two Years	Reason for Change
Spreadsheet packages using local data	_____	_____	_____
			_____
			_____
Spreadsheet packages using downloaded data	_____	_____	_____
			_____
			_____
Vendor application packages for PCs	_____	_____	_____
			_____
			_____
In-house developed programs for PCs (including fourth-generation languages)	_____	_____	_____
			_____
			_____

7a. The next set of questions relate to so-called micro-mainframe application systems. For the purposes of this study, we are defining this to mean the following: "Applications in which neither the mainframe host nor a microcomputer can fully carry out an activity without utilizing processing capabilities or data from the other." Do you agree with this definition?

☐ Yes   ☐ No

7b. If no, please tell me how you would modify it: _____
_____
_____

INP

8. With +5 representing agreement and -5 representing disagreement, to what extent do you agree that "Within three to five years most applications that are now host-based will have a considerable amount of functionality taken over by personal computers that are linked to the host." _____

   Why? _____

   _____

   _____

9. Do you believe that links between host computers and micros will be predominantly interactive, predominately on-line batch, or about the same? (READ DEFINITION IF NEEDED)

   DEFINITION: ON-LINE BATCH - where the micro performs processing on a standalone basis and, periodically, the personal computer and the host exchange data; the host may then further process the data received.

   ☐ Predominantly interactive

   ☐ Predominantly on-line batch

   ☐ About the same

   Reason why _____

   _____

10. In constructing micro-mainframe systems how common do you think each of the following approaches will be? (READ LIST BELOW) Why? (1 = very common, 5 = not common) NOTE: ALL OPTIONS MAY BE RATED "NOT COMMON" OR "VERY COMMON" - OPTIONS ARE NOT MUTUALLY EXCLUSIVE.

	Rating	Reason Why
Modification of existing software	_____	_____
Use existing data base but write new application code	_____	_____
Write entirely new applications	_____	_____

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INPUT

11a. Generally, to what extent do you see data base linkage and synchronization as a serious problem in establishing micro-mainframe links? (1 = not a problem, 5 = a serious problem) _____

11b. How serious is this problem for systems used for analysis? (e.g., spreadsheets) _____

Why? _____

_____

11c. How serious is this problem for production systems? (e.g., order entry, payroll) _____

Why? _____

_____

11d. What can an organization like yours do to solve these kinds of data base linkage and synchronization problems?

_____

_____

12a. Do you see backup and security as significant barriers to expanded use of linked micro-mainframe applications?

☐ Yes   ☐ No   If no, skip to question 13.

12b. What are the major problems that you see? _____

_____

12c. What can an organization like yours do to solve these problems?

_____

_____

12d. What solutions can vendors provide? _____

_____

INPL

13a. For your own organization, what specific applications do you see as being the most suitable as micro-mainframe applications? (They need not be computerized applications now.) (Use workspace below.)

13b. Are these applications planned and if so, what is the current stage of implementation (i.e., do not have concrete plans, are in the planning stage, applications are being developed, applications are already implemented)? (Use workspace below.)

13c. Do you expect to develop these applications in-house, purchase an existing package from an outside vendor, or modify in-house an existing package? (Use workspace below.)

Application Name	Stage				Source		
	None	Plan	Dev.	Imp.	In-house	Vendor	Both
1.							
2.							
3.							
4.							
5.							

Comments:

1. _____

2. _____

3. _____

4. _____

5. _____

14a. Do you have electronic mail? ☐ Yes   ☐ No
If no, skip to question 15.

14b. How many users currently use the electronic mail now? In two years?

Now _____   Total in two years _____

14c. On the average, how many messages are now sent via electronic mail per month? In two years?

Now _____   Total in two years _____

14d. What percentage of this change in electronic mail use do you expect to be attributable to microcomputers? _____%

INPUT

15a. In what ways do you see micro-mainframe applications increasing your data communications requirements?

_____

_____

15b. In what ways do you see micro-mainframe applications decreasing your data communications requirements?

_____

_____

15c. Overall, do you think that the net effect will be to increase or decrease your data communications requirements? By what percent?

Increase: _____ %   Decrease: _____ %   No effect: _____

16a. With 1 representing low importance and 5 representing high importance, how important will it be for your company's micros to communicate with micros in other departments? _____

Why? _____

_____

16b. What type of communication facility will your firm be likely to use for this type of communication? (Use matrix on following page.)

_____

_____

17a. With 1 representing low importance and 5 representing high importance, how important will it be for your company's micros to communicate with mainframes in other companies (i.e., suppliers, customer)? _____

Why? _____

_____

17b. What types of communication facilities will your firm be likely to use for this type of communication? (Use workspace on following page.)

_____

_____

INPU

18a. With 1 representing low importance and 5 representing high importance, how important will it be for your company's micros to communicate with public data bases?

_____

Why? _____

_____

18b. What types of communication facilities will your firm be likely to use for this type of communication? (Use workspace below.)

_____

_____

Type of Communication Facility	Micros in Other Departments	Mainframes in Other Companies	Public Data Bases
LAN			
Existing network			
Leased lines			
WATS			
Dial-up			
Public data network			
Other			

19a. Do you expect your company's micros to be linked to more than one type of mainframe (e.g., IBM and DEC)? ☐ Yes ☐ No
If no, skip to question 20.

19b. What would be the most common types of mainframe linkages?

_____

_____

19c. Would, typically, the same micro have to link to more than one kind of mainframe at different times? ☐ Yes ☐ No

INPUT

20a. Do you expect that your company's micros will have to be linked to more than one type teleprocessing environment (e.g., to both TSO and CMS, or to CICS and IMS DC)? ☐ Yes   ☐ No

If yes:

20b. Which ones? _____

_____

20c. Would, typically the same micro have to link to more than one kind of software environment at different times? ☐ Yes   ☐ No

21a. Do you expect that your company's micros will be linked to more than one type of data base management system (e.g., to both IMS and IDMS)? ☐ Yes   ☐ No

If yes:

21b. Which ones? _____

_____

21c. Would, typically, the same micro have to link to more than one kind of DBMS at different times? ☐ Yes   ☐ No

22a. Do you expect microcomputer use in your company to accelerate the use of relational data base systems in your company? ☐ Yes   ☐ No

If no, skip to question 23.

22b. Which one? _____

_____

22c. Would this data base be located on a regular mainframe ☐ or have a special machine ☐ devoted to it? IF SPECIAL MACHINE: Which one?

_____

_____

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INPU

23a. With 1 representing no assistance and 5 representing much assistance, how much assistance generally do you expect to be able to get from vendors in helping with planning and implementing your organization's critical micro-mainframe applications? _____

23b. More specifically, how would you rate:

Vendor Type	Rating	Reason Why
Microcomputer hardware vendors	_____	_____
		_____
IBM	_____	_____
		_____
Software vendors who primarily offer mainframe software	_____	_____
		_____
Software vendors who offer both mainframe and microcomputer software	_____	_____
		_____
Remote processing (timesharing) vendors (e.g., MCAUTO, Boeing Computer Services)	_____	_____
Integrated systems (turnkey) vendors	_____	_____
		_____
Professional services and consulting firms	_____	_____

24. What current problems do you see micro-mainframe systems solving or alleviating?

_____

_____

INPUT

25a. What problems do you see being created or aggravated by micro-mainframe systems?

_____

_____

25b. How do you think these new problems should be dealt with?

_____

_____

THANK YOU.

INP

APPENDIX B: CORPORATE RESPONDENT PROFILE

APPENDIX B: CORPORATE RESPONDENT PROFILE

- The 78 corporate respondents were from the following industrial sectors:

    - Process Manufacturing: 26.

    - Banking and Finance: 18.

    - Discrete Manufacturing: 16.

    - Services: 11.

    - Insurance: 7.

- Large corporations (i.e., revenues of over $2 billion) accounted for 42 of the respondents. Smaller organizations (revenues between $500 million and $2 billion) had 36 of the respondents.

- As noted in the body of the report, there were generally few respondent differences that correlated with industry sector or company size.

INPUT

APPENDIX C: MICRO-MAINFRAME VENDOR
QUESTIONNAIRE

MICRO-MAINFRAME VENDOR QUESTIONNAIRE

INPUT is conducting a study on the issues involved in linking microcomputer host systems and data. We will make market forecasts on related products and services. We would like your organization to take part in this study by describing what you are doing now, what your plans are, and what problems you see. This information will also be used by IS departments in their planning.

None of the information that you provide will be associated with your company unless you wish otherwise. In return for your taking part in this study, we will send you a summary of this study on its completion and will also send you a summary of INPUT's report, <u>PC Software Support in Large Corporations</u>.

1. Which microcomputer hardware and software environments in the following list does your company expect to be important for micro-mainframe applications in 1984 and in 1986? (1 = low importance, 5 = high importance) Why?

	End of 1984	1986	Reasons
IBM PC AND PC/XT	____	____	_____
IBM XT/370	____	____	_____
IBM 3270/PC	____	____	_____
UNIX-based products	____	____	_____
Other micro hardware (describe)	____	____	_____
Other micro software (describe)	____	____	_____

2. What do you see as the major opportunity areas in connection with the XT/370 and the 3270/PC?

XT/370 _____

_____

3270/PC _____

_____

What do you see as limiting the growth in supplying software specifically aimed at the XT/370 and 3270/PC?

_____

INPUT

3. In the future, what will the relative importance be of the following kinds of microcomputers? (1 = low importance, 5 = high importance) Why? (READ EACH ITEM BELOW)

	Rating	Reason Why
Standalone personal computers running personal computer software? (e.g., IBM PC/XT)	_____	_____
		_____
Standalone personal computers running mainframe software? (e.g., XT/370)	_____	_____
		_____
Personal computers in local area networks?	_____	_____
		_____
Mainframe terminals that also have personal computer capabilities (e.g., 3270/PC)	_____	_____
	_____	_____

4. On a scale of 1 to 5, with 1 representing low importance to corporate users and 5 representing high importance, how would you rate the following functional areas? In two years how would your importance rating change for these? Why the change?

	Now	Two Years	Reason for Change
Spreadsheet packages using local data	_____	_____	_____
			_____
Spreadsheet packages using downloaded data	_____	_____	_____
			_____
Vendor application packages for PCs	_____	_____	_____
			_____
In-house developed programs for PCs (including fourth-generation languages)	_____	_____	_____

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5. The next set of questions relates to so-called micro-mainframe application systems. For the purposes of this study, we are defining this to mean the following: "Applications in which neither the mainframe host nor a microcomputer can fully carry out an activity without utilizing processing capabilities or data from the other." Do you agree with this definition?

    ☐ Yes   ☐ No

    If no, please tell how you would modify it: _____

    _____

6. With 1 representing agreement and 5 representing disagreement, to what extent do you agree that "Within three to five years most applications that are now host-based will have a considerable amount of functionality taken over by personal computers that are linked to the host?"

    _____

    Why? _____

    _____

7a. Do you believe that links between host computers and micros will be predominantly interactive, predominantly on-line batch, or about the same? (READ DEFINITION IF NEEDED)

    DEFINITION: ON-LINE BATCH - where the micro performs processing on a standalone basis and, periodically, the personal computer and the host exchange data; the host may then further process the data received.

    ☐ Predominantly interactive

    ☐ Predominantly on-line batch

    ☐ About the same

    Reason why: _____

    _____

7b. How is your firm addressing this issue?

    _____

    _____

7c. How does this compare to other specific products?

    _____

    _____

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INPUT

8a. In constructing micro-mainframe systems how common do you think each of the following approaches will be? (READ LIST BELOW) Why? (1 = very common, 5 = not common) NOTE: ALL OPTIONS MAY BE RATED "NOT COMMON" OR "VERY COMMON" - OPTIONS ARE NOT MUTUALLY EXCLUSIVE.

	Rating	Reason Why

Modification of existing software _____ _____

_____

Use existing data base but write new application code _____ _____

_____

Write entirely new applications _____ _____

_____

8b. How is your firm addressing this issue? _____

_____

8c. How does this compare to other specific products? _____

_____

9a. Generally, to what extent do you see data base linkage and synchronization as a serious problem in establishing micro-mainframe links? (1 = not a problem, 5 = a serious problem) _____

9b. How serious is this problem for systems used for analysis (e.g., spreadsheets)? _____

Why? _____

_____

9c. How serious is this problem for production systems (e.g., order entry,, payroll)? _____

Why? _____

_____

9d. What do you see as the general solution to this problem? _____

_____

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9e. How are you addressing it? _____

_____

10a. Do you see backup and security as significant barriers to expanded use of linked micro-mainframe applications?

☐ Yes   ☐ No   If no, skip to question 13.

What are the major problems that you see? _____

_____

_____

10b. What do you see as the general solutions to these problems?

_____

_____

10c. How are you addressing it? _____

_____

INPUT

11a. What specific applications do you see as being the most suitable as micro-mainframe applications? (They need not be computerized applications now.) (Use workspace below.)

11b. Are products for these applications planned, and, if so, what is their current stage of implementation (i.e., do not have concrete plans, are in the planning stage, applications are being developed, applications are already implemented)? (Use workspace below.)

11c. Do you expect users to develop these applications in-house, purchase an existing package from an outside vendor, or modify in-house an existing package? (Use workspace below.)

Application Name	Stage				Source		
	None	Plan	Dev.	Imp.	In-house	Vendor	Both
1.							
2.							
3.							
4.							
5.							

Comments:

1. _____
2. _____
3. _____
4. _____
5. _____

12a. In what ways do you see micro-mainframe applications increasing data communications requirements?

_____

_____

12b. In what ways do you see micro-mainframe applications decreasing data communications requirements?

_____

12c. Overall, do you think the net effect will be to increase or decrease data communications requirements? By what percent?

Increase: _____% Decrease: _____% No effect: _____%

INPUT

13a. With 1 representing low importance and 5 representing high importance, how important will it be for a company's micros to communicate with micros in other departments? _____

Why? _____

_____

13b. What type of communication facility will a firm be likely to use for this type of communication? (Use workspace below.)

_____

_____

14a. With 1 representing low importance and 5 representing high importance, how important will it be for a company's micros to communicate with mainframes in other companies (i.e., suppliers, customer)? _____

Why? _____

_____

14b. What types of communication facilities will a firm be likely to use for this type of communication? (Use workspace below.)

15a. With 1 representing low importance and 5 representing high importance, how important will it be for a company's micros to communicate with public data bases? _____

Why? _____

_____

15b. What types of communication facilities will a firm be likely to use for this type of communication? (Use workspace below.)

Type of Communication Facility	Micros in Other Departments	Mainframes in Other Companies	Public Data Bases
LAN			
Existing network			
Leased lines			
WATS			
Dial-up			
Public data network			
Other			

INPUT

16a. Do you expect a company's micros to be linked to more than one type of mainframe (e.g., IBM and DEC)?

☐ Yes ☐ No   If no, skip to question 17.

16b. What would be the most common types of mainframe linkages?

_____

_____

16c. Would, typically, the same micro have to link to more than one kind of mainframe at different times?

☐ Yes ☐ No

16d. Which of your products will facilitate this?

_____

17a. Do you expect that a company's micros will be linked to more than one type teleprocessing environment (e.g., to both TSO and CMS, or to CICS and IMS DC)?

☐ Yes ☐ No   If yes:

17b. Which ones? _____

_____

17c. Would, typically, the same micro have to link to more than one kind of software environment at different times?

☐ Yes ☐ No

17d. Which of your products will facilitate this?

18a. Do you expect that a company's micros will be linked to more than one type of data base management system (e.g., to both IMS and IDMS)?

☐ Yes ☐ No   If yes:

18b. Which ones? _____

_____

18c. Would, typically, the same micro have to link to more than one kind of DBMS at different times?

☐ Yes ☐ No

18d. Which of your products will facilitate this?

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19a. Do you expect microcomputer use in a company to accelerate the use of relational data base systems in a company?

☐ Yes ☐ No   If no, skip to question 20.

19b. Which one? _____

_____

19c. Would this data base be located on a regular mainframe ☐ or have a special machine ☐ devoted to it? IF SPECIAL MACHINE: Which one?

_____

_____

19d. Which of your products will facilitate this?

_____

20a. What other products have you introduced or planned to introduce that will address micro-mainframe issues?

_____

20b. What functions will they perform?

_____

20c. What hardware and software environments will they function in?

_____

20d. When will they be available?

_____

20e. What competitive products will they most closely compete with? What will distinguish your product from the competition's?

_____

_____

21. What current problems do you see micro-mainframe systems solving or alleviating?

_____

_____

INPUT

22. What problems do you see being created or aggravated by micro-mainframe systems?

_____

_____

23. How do you think these new problems should be dealt with?

_____

_____

_____

24. Can you provide technical descriptive material about the products discussed?

☐ Yes   ☐ No

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APPENDIX D: FORECAST METHODOLOGY

APPENDIX D: FORECAST METHODOLOGY

A. BACKGROUND AND ASSUMPTIONS

1. 1983 PENETRATION

- Ninety-five percent of respondents already have M-M applications.

    - They average approximately three applications per company, i.e., about 0.5% of all applications.

    - Many of these are small, almost trivial, analytic downloading applications.

    - However, many are ambitious, operations-oriented applications.

- Vendor participation in these types of applications is high (over 50%). Even more striking is expected vendor participation of over 80% for applications in the pipeline (concept or planning).

- Because this vendor participation rate is over twice as high as the average, the 1983 M-M share of the information services market is approximately 1% to 1.5%.

    - The low range is 0.5%.

    - The high range is 1.5%.

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2.   PLANS OF COMPANIES

- The single most striking result of the M-M survey was that over three-quarters of companies interviewed expected that most applications that are now host-based will have a considerable amount of their functionality taken over by microcomputers in three to five years.

- This faction, the three-quarters of companies that are positive toward the M-M principle, is composed of three groups of approximately equal sizes and representing three stages of acceptance:

    -    The early innovators, who are very sure that the M-M approach is correct. Most of these are already starting to act.

    -    The followers, who are somewhat less sure. This group has plans they will put in motion (although less aggressively than the innovators).

    -    The wait-and-sees, who are positive in principle but will proceed more cautiously.

- The remaining quarter are somewhat doubtful of the M-M principle and/or would not expect to see most of their applications become M-M in the medium term.

- While virtually all companies are experimenting with M-M applications, for projection purposes it is useful to view the four types of companies as successively phasing into M-M applications.

    -    Group one, the early innovators, is assumed to have already started.

    -    The other three groups will phase in every one-and-a-half years (high assumption) or two years (low assumption).

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- Similar assumptions can also be made regarding:

    - The percentage of a company's "application portfolio" that will be made up of M-M applications.

    - The period of time it will take to reach this "steady state."

- Although respondents probably do in fact intend most applications to be of an M-M type, it is very hard for them to state precise systems plans more than about two years in the future. Hence, INPUT believes that a steady-state micro-mainframe percentage of the application portfolio would be 50-65%.

- Companies will reach this steady-state position before the eight years that is the normal life for an application.

    - Respondents agreed with the range of three to five years.

    - INPUT believes that the outer portion of the range is more realistic and has assigned five years as the high-end assumption and six years as the low-end assumption.

3. INDUSTRY SEGMENT FACTORS

- Industry sectors do not by themselves appear to be a strong segmenting force. Discrete manufacturing companies appear to be somewhat more aggressive in their M-M orientation and somewhat less so in process manufacturing. But in both cases they are not significantly more aggressive than other industry groups are.

- The position of individual firms, departments, and even small groups of people appear to be at least as important driving forces, particularly in the initial stages of M-M development.

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- There is little question, though, that a successful M-M strategy should be industry- and application-focused.

4. SERVICE DELIVERY MODES

- Micro-mainframe services will be made up, at least initially, of the standard components of information services, i.e.:

    - Software.

    - Professional services.

    - Remote computing (including underlying communications transport and data base information delivery).

    - Integrated systems (which will undergo a change and not be the stand-alone systems they generally are now).

- INPUT's 1983-1988 information services figures are used as the base for each of the four delivery modes (with the integrated systems adjustment previously noted).

    - It is assumed that, at least in the medium term, the proportions of information services revenues claimed by the different modes would probably not change appreciably. (Or, to be more precise, there were equally good arguments for any mode expanding or contracting as a result of M-M impacts).

    - RCS was the most difficult case since traditional RCS growth is falling. Micro-mainframe services are well-positioned to take up the slack and, depending on how communications transport is purchased, may even help revive it.

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5.   CUSTOMER SIZE VARIABLES

●   Micro-mainframe markets will, at least initially, not represent much of a divergence from the current situation.

   -     Data processing expenditures (generally) and information services vendors expenditures (specifically) are related to overall corporate revenues. While smaller companies spend a larger proportion of their revenues than larger ones do (e.g., 1.25% versus 0.75% in discrete manufacturing), they are swamped in terms of absolute numbers and absolute opportunity.

   -     INPUT's recent in-depth examination of three major sectors (manufacturing, banking, and insurance) indicate that similar types of needs--and willingness to use vendors--exist at all size levels.

6.   SUMMARY OF ASSUMPTIONS IN A1-5: RANGES

Factor	Effect on Forecast: Makes Forecast Lower/Higher	
	Lower	Higher
(1) 1983 micro-mainframe penetration	0.5%	1.5%
(2) Staging delay between four customer groups	2 years	1 1/2 years
(3) Micro-mainframe proportion of applications at a steady state	50%	65%
(4) Time to reach steady state	6 years	5 years

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B. CALCULATION OF MICRO-MAINFRAME PROPORTION OF INFORMATION SERVICES

- In order to calculate low and high percentages, the "lower" and "higher" assumptions were each inserted into the following formula to produce the average increase per year until steady state was reached.

$$\frac{\text{Steady state percent (from 6.(3))}}{\text{Years in buildup (from 6.(4))}} = X$$

- This amount was divided by 4 to get an average percent increase for each of the four customer types described in section A2 of this Appendix. This percentage is 2.1% using low assumptions (50/6 divided by 4) and 3.25% using high assumptions (65/5 divided by 4).

- These percentages were applied to the fast and slow staging assumptions from A2 and are shown in Exhibits D-1 and D-2. (The percentages were substituted for X.)

- The cumulative M-M proportion of information services is shown in Exhibit D-3. These percentages have been applied to the appropriate INPUT forecasts. (Note: Where there is believed to be a potential for additional sector growth beyond previous INPUT estimates, this is the portion between the high and midpoint estimates.)

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EXHIBIT D-1

MICRO-MAINFRAME MARKET SIZING WORKSHEET: 1½-YEAR STAGING
(Additional Percent of Expenditures)

CUSTOMER TYPE*	1984	1985	1986	1987	1988
1.	X	X	X	X	X
2.		0.5X	X	X	X
3.				X	X
4.					0.5X
Year Total	1X	1.5X	2X	3X	3.5X
Cumulative Total†	1X	2.5X	4X	7X	10.5X

* 1. "Early innovators" of micro/mainframe approach.
  2. "The followers."
  3. "The wait-and-sees."
  4. Doubtful of micro/mainframe approach.

† Add additional 1.5% for 1983 base.

$X = \dfrac{\text{Steady state percent}}{\text{Years in buildup}}$

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EXHIBIT D-2

MICRO-MAINFRAME MARKET SIZING WORKSHEET: 2-YEAR STAGING
(Additional Percent of Expenditures)

CUSTOMER TYPE*	1984	1985	1986	1987	1988
1.	X	X	X	X	X
2.			X	X	X
3.					X
4.					
Year Total	1X	1X	2X	2X	3X
Cumulative Total†	1X	2X	4X	6X	9X

* 1. "Early innovators" of micro/mainframe approach.
2. "The followers."
3. "The wait-and-sees."
4. Doubtful of micro/mainframe approach.

† Add additional 0.5% share for 1983 base.

$X = \dfrac{\text{Steady state percent}}{\text{Years in buildup}}$

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MICRO-MAINFRAME PROPORTION OF
INFORMATION SERVICES (Cumulative)

YEAR	PERCENT LOW	PERCENT MIDPOINT	PERCENT HIGH
1983	0.5%	1.0%	1.5%
1984	2.6	3.7	4.8
1985	4.7	7.2	9.6
1986	8.9	11.7	14.5
1987	13.1	18.7	24.3
1988	19.4	27.5	35.6

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APPENDIX E: MICRO-MAINFRAME IMPACT ON PROFESSIONAL SERVICES

MICRO-MAINFRAME IMPACT ON PROFESSIONAL SERVICES
1984-1988

| YEAR	TOTAL MODE FORECAST(a)	MICRO-MAINFRAME IMPACT ($ Billions)		
		LOW	MIDPOINT	HIGH(b)
1984	$ 8.1	$0.2	$0.3	$0.4
1985	9.5	0.4	0.7	0.9
1986	11.2	1.0	1.3	1.6
1987	13.3	1.7	2.5	3.2
1988	15.7	3.0	4.3	5.6

NOTES: (a) = Total information services forecast for this mode from INPUT's 1983 annual report.

(b) = Difference between "midpoint" and "high" is potentially additive.

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EXHIBIT E-2

MICRO-MAINFRAME IMPACT ON PROFESSIONAL SERVICES: FORECAST

Key:

1983 Annual Report Forecast

Minimum Expected (Replacement)

High Range (Potentially Additive to Previous Forecasts)

Most Likely (i.e., Replacement)

(\$ Billions)

\$20

15

10

5

0

1984 1985 1986 1987 1988

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