INPUT

STRATEGIC MARKET PERSPECTIVE

U.S. Systems Software Market, 1995-2000

U.S. Market Analysis Program

M A Y 1 9 9 6

U.S. Systems Software Market 1995-2000

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Abstract

This annual report provides an analysis and five-year forecast of the U.S. systems software products market for the period 1995-2000. The forecasts contained in this report divide the market into systems control products, applications development tools and operations management tools. The market is also segmented into three platform categories: mainframe, minicomputer and PC/workstation.

The report considers the underlying trends and issues that impact the sale of systems software products in the information services market, and based upon these considerations, projects growth patterns for the next five years.

This report contains 74 pages, including 38 exhibits.

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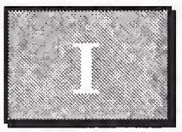


Introduction

This report is one of a series of market analysis reports prepared each year by INPUT for the key product/service sectors of the U.S. information services industry. These sectors are:

1. Professional Services
2. Systems Integration
3. Outsourcing/Business Integration
4. Processing Services
5. Network Services
6. Systems Software Products
7. Applications Software Products
8. Turnkey Systems

A
Purpose and Organization

1. Purpose

This report analyzes the systems software products segments of the U.S. information services industry.

- The report includes five-year forecasts, an assessment of market drivers, analysis of competitive trends and identification of leading vendors.

- The report assesses trends and events within the U.S. economy, the U.S. information services industry, and the systems software market to provide the reader with a comprehensive foundation for understanding this market sector and for anticipating future directions.

The report provides readers with insights and information that will help them:

- Understand the forces shaping the market
- Develop internal corporate financial projections
- Identify new markets and product and services opportunities
- Assess the competitive trends
- Determine potential market directions
- Assist in prioritizing investments

2. Organization

This report is organized as described in Exhibit I-1. Each product/service sector report within the Market Analysis Program follows this format. The industry and cross-industry sector reports, described below, follow a very similar format.

B
Scope and Methodology

1. Scope

This report addresses the U.S. information services industry for the systems software sector. It includes user expenditures that are noncaptive and generally available to vendors. Many large organizations have portions of their information services requirements satisfied by internal divisions. The resulting expenditure is not available for competitive bid by the general vendor community and is not included in INPUT's projections. The noncaptive distinction is important and is addressed in more detail in INPUT's *Definition of Terms.*

Exhibit I-1

Market Report Organization

I. Introduction

- Introduction and definition of the product/service sector and its substructure or segments

II. Executive Overview

- Synopsis of the report

III. Trends and Issues

- An analysis of significant trends and issues in systems software markets

IV. Information Services Market Forecast

- Presentation of the information services market forecast by product/service sector and subsector

V. Competition

- Discussion of the competitive environment for information services within the product/service sector with vendor profiles

VI. Conclusions and Recommendations

A. Forecast Database

- A detailed forecast by product/service sector, subsector and industry/cross-industry sector. Contains a reconciliation to the previous year's forecast.

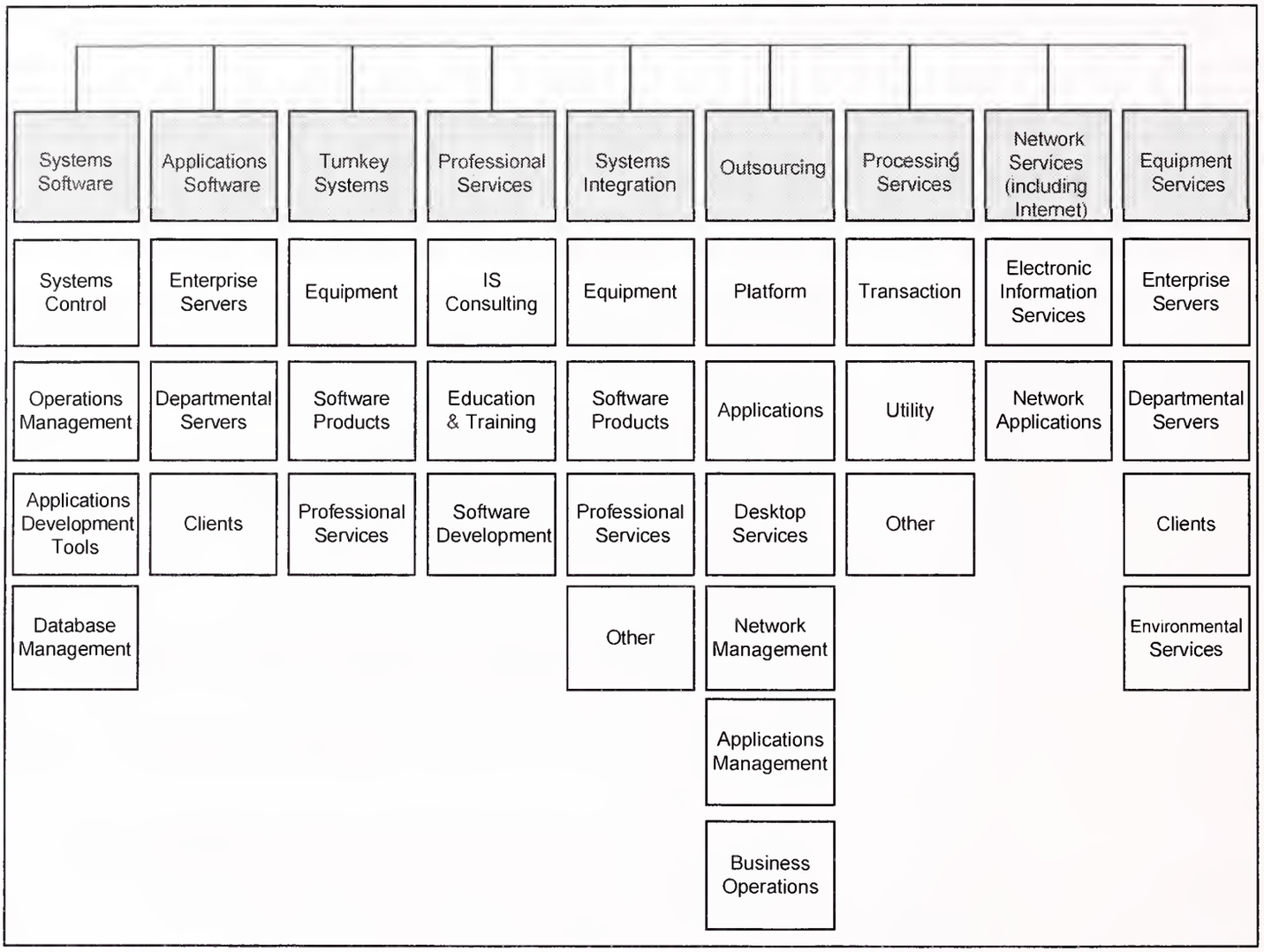
Source: INPUT

a. Information Services Industry Structure

Exhibit I-2 defines the structure of the information services industry as used by INPUT in its market analysis and forecasts. The industry consists of eight product/service sectors, each of which contains a number of subsectors.

Exhibit I-2

Information Services Industry Structure—1996



Source: INPUT

- *Product/service categories* are specific products and services that satisfy a given user's need. *Market sectors* specify who the buyer is and *product/service categories* specify what the user is buying.

- INPUT develops a five-year forecast for the product/service categories and each of the subcategories.

INPUT also publishes market sector reports analyzing fifteen industry and seven cross-industry market sectors. These reports, published annually by INPUT, analyze the information services opportunities in industry sectors such as insurance, transportation and discrete manufacturing and in cross-industry sectors such as accounting, human resources and office systems.

The relationship between product/service sector forecasts and market sector forecasts is shown in Exhibit I-3.

For a more complete discussion of INPUT's information services industry structure and market sector definitions, please refer to INPUT's *Definition of Terms*.

b. Product/Service Category Description

Systems software products enable the computer/communications system to perform basic machine-oriented or user interface functions. The systems software products product/service category, as shown in Exhibit I-4, is composed of the systems control products, operations management tools and applications development tools subcategories.

Exhibit I-3

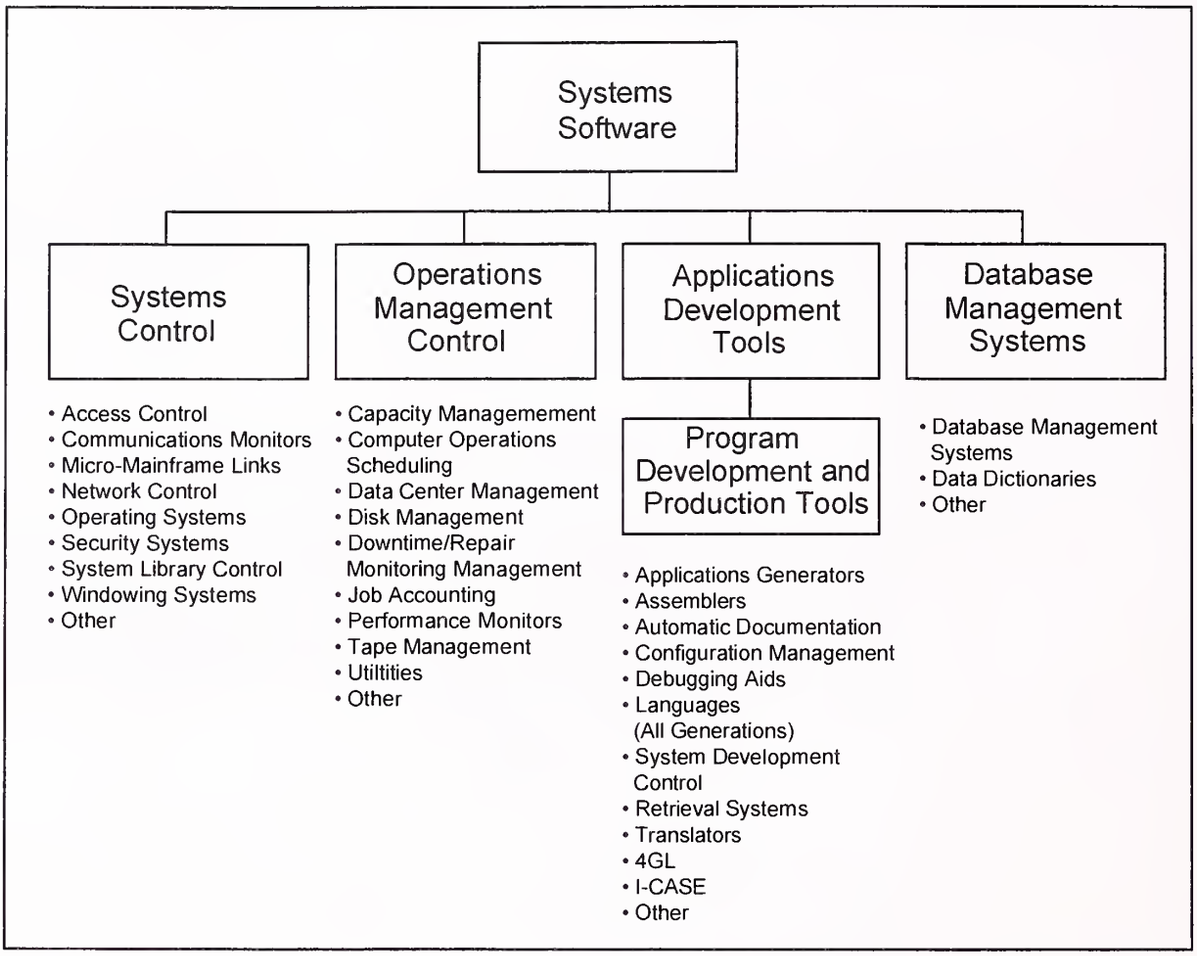
Product/Service Categories versus Market Sector Forecast Content

Product/Service		Market Sectors		
Category	Subcategory	Industry Sectors	Cross-Industry Sectors	Other
Processing Services	Transaction	✔	✔	
	Utility			✔
	Other			✔
Turnkey Systems		✔	✔	
Applications Software Products		✔	✔	
Outsourcing		✔		
Systems Integration		✔		
Professional Services		✔		
Network Services	Network Applications	✔		
	Electronic Info. Services	✔		✔
Systems Software Products				✔

Source: INPUT

Exhibit I-4

Systems Software Products Market Structure



Source: INPUT

The attributes of each subcategory are described below:

- *Systems Control Products*—Software programs that function during application program execution to manage computer system resources and control the execution of the application program. These products include operating systems, emulators, network control, library control, windowing, access control and spoolers.

- *Operations Management Tools*—Software programs used by operations personnel to manage the computer system and/or network resources and personnel more effectively. Included are performance measurement, job accounting, computer operation scheduling, disk-management utilities and capacity management.

- *Applications Development Tools*—Software programs used to prepare applications for execution by assisting in designing, programming, testing and related functions. Included are traditional programming languages, 4GLs, data dictionaries, database systems, CASE tools and other development productivity aids. Also included are system utilities (e.g., sorts) that are directly invoked by an applications program.

Systems software involves user purchases of software packages for in-house computer systems. Lease and purchase expenditures are included, as well as expenditures for work performed by the vendor to implement or maintain the package at the user's site. Vendor-provided training or support in operation and use of the package, if bundled in the software pricing, is also included.

Systems software that is sold as part of other product/service sectors—turnkey systems, professional services, outsourcing, or systems integration—is not included with systems software purchases, but is considered with each of these other product/service sectors.

Systems software products are not specialized by industry. Thus, the forecasts for the systems software products product/service sector and its subsectors are provided in total rather than separately for each of the industry or cross-industry sectors.

2. Methodology

Ongoing Research—Much of the data on which this report is based were gathered during 1995 as part of INPUT's ongoing market analysis program. Trends, market sizes, and growth rates are based upon INPUT research and in-depth interviews with systems software users and the IS vendors serving this market. INPUT maintains ongoing relationships with, and a data base of, all users and vendors that it interviews. Interviewees for the research portion of this report were selected from this data base of contacts.

Resources—Extensive use was made of INPUT's corporate library, located in Mountain View, California. The resources in this library include on-line periodical data bases, subscriptions to a broad range of computer and general business periodicals, continually updated files on over 3,000 information services vendors, and the most up-to-date U.S. Department of Commerce publications on industry statistics.

Forecast Estimates—Vendors, when responding to interviews or questionnaires, may be unwilling to provide detailed revenue breakouts by delivery mode or industry. Also, vendors often use different categories of industries and industry segments, or view their services as falling into different product/service categories from those used by INPUT. Thus, INPUT must estimate revenues for these categories on a best-effort basis.

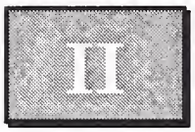
For this reason, the product/service and individual segment forecasts should be viewed as indicators of general patterns and trends rather than specific, detailed estimates for individual years.

When information is provided by vendors as requested, it is often offered under an agreement of confidentiality. Therefore, vendor rankings based on revenue figures should be viewed as approximations.

C
Related Reports

Related reports of interest to the reader are:

- *U.S. Applications Solutions Market, 1995-2000*
- *Impact of the Internet on Outsourcing and Processing Services*
- *Impact of the Internet on Systems Integration and Professional Services*
- *U.S. Industry Markets, 1995-2000* (Reports on major industry sectors, e.g.,insurance, banking and finance)
- *U.S. Cross-Industry Markets, 1995-2000*



Executive Overview

Systems software includes systems control products, operations management tools and applications development tools.

In this Executive Overview, INPUT provides a summary of trends and issues that will shape the demand for particular systems software products over the next several years. The overview also presents growth projections for systems software products, draws conclusions and makes recommendations regarding product and marketing strategies.

A
Trends and Issues

Exhibit II-1 outlines key trends and issues impacting the systems software products industry.

Exhibit II-1

Systems Software Products Industry Trends and Issues

- Migration of mission-critical enterprise systems to client/server distributed systems
- Integration of enterprise and desktop systems
- Increased complexity of systems management
- Increasing importance of alliances in meeting customer needs
- Necessity for object technology to support new environments
- Necessity of middleware for interoperability

Source: INPUT

Migration of Mission Critical Enterprise Applications to Client/Server Distributed Systems—Client/server computing is no longer an emerging trend. It has become a reality in many businesses of varying size and in virtually all industries. In INPUT's 1995 survey of systems software users, even the most cautious and traditional companies indicated plans to implement or increase usage of client/server computing. The difference today lies in the actual applications planned for this environment. Initial implementations were focused on departmental applications and decision support; companies are now moving toward implementation of their enterprise-wide mission-critical applications in the client/server environment. This trend is in its early stages, with leading-edge companies such as Federal Express taking the first steps toward distributed computing. At the other extreme are companies that don't want to "fix it if it ain't broke" and opt to keep their critical applications on the mainframe. However, INPUT's survey indicates that many companies plan to migrate at least some of their enterprise applications into a client/server environment within the next five years.

Integration of Enterprise and Desktop—Enterprise systems on proprietary mainframes and desktop applications on workstation/PCs grew up in two separate worlds using different operating systems and applications. The distinction between these worlds is blurring in today's environment in which users need access to enterprise information in a timely manner. A key trend is for these systems to be integrated. Systems software vendors are recognizing this and, through acquisitions and alliances, are working hard to bridge the gap. Microsoft, which has been the "king" of the desktop environment, has developed numerous alliances with vendors such as HP, Digital, and IBM. These vendors recognize the importance of linking with the desktop.

Increased Complexity of Systems Management—Systems management in the mainframe environment has been comparatively simple. Centralized systems allow for centralized management with the ability to monitor system performance directly. However, client/server computing significantly increases the complexity of systems management. Devices to be managed are now geographically dispersed and networks are an integral part of the systems. Applications are also dispersed and shared throughout the network, making application distribution, updates and performance monitoring more difficult. There is a need for integrated systems management that takes into account the multiple dimensions of systems, network, application and data management. These systems must be able to accommodate multiple platforms to provide integrated management of both desktop and enterprise-level systems.

Increasing Importance of Alliances in Meeting Customer Needs—The complexities of the client/server environment, coupled with the need for integration, make it clear that no one vendor can provide it all. Gone are the days of proprietary systems, when a single vendor such as IBM could meet overall requirements. Vendors need to develop alliances with providers of complementary services to address customer needs. Framework vendors are moving in this direction by providing an overall framework in the systems management area into which multiple vendor products can be integrated to provide a complete solution to the customer. Cross-platform integration is an integral part of such a solution.

Strategic partnering for product development and marketing is occurring among competitors in specific markets as well as among companies that provide complementary product solutions. The partners combine individual products to develop a solution for a new market niche. Marketing and support costs of the product can be divided among the partners.

A newer, emerging area of alliances is the evolution of integrated application development platforms that provide multivendor distributed processing solutions. Computer systems vendors, such as Hewlett-Packard, IBM, Digital Equipment and others, are working with a number of systems software companies to develop such integrated application development platforms. A key element in these relationships is an emphasis on open systems interfaces.

Another factor affecting partnering relationships is the development of competitive vendor consortiums that attempt to reinforce particular industry interoperability standards.

Necessity for Object Technology to Support New Environment—Object-oriented technology is no longer being endorsed only by niche systems software vendors. It has received major support from the large computer systems and systems software vendors, who make significant use of object-oriented technology in their newer products. In particular, large computer systems vendors such as IBM and Hewlett-Packard have become major endorsers of the technology.

Visual development tools such as MS Visual Basic and Powersoft are not robust enough to support the next wave of client/server applications—enterprise mission-critical applications. These applications will require object technology to drive growth of these tools in the marketplace.

Necessity of Middleware for Interoperability—Middleware represents an additional layer of systems software that facilitates development of interoperable and portable distributed applications solutions within a multivendor environment. In some ways, it represents a transition solution, particularly in the area of object-oriented technology, until a standards

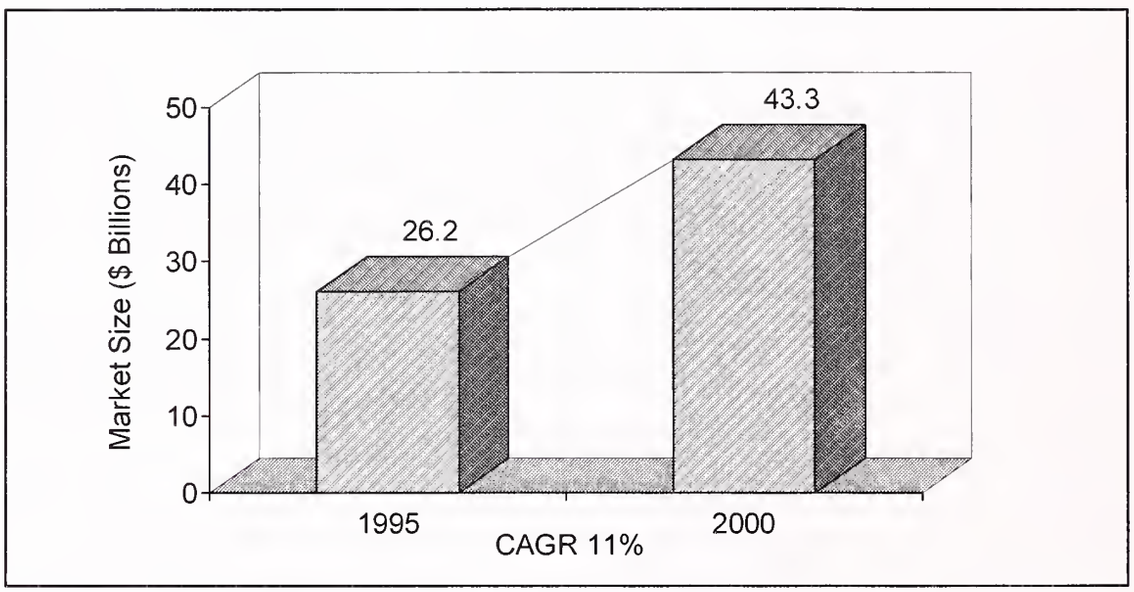
consensus is reached. Middleware is currently an enabling software technology for building distributed applications across a number of operating systems, database management systems and graphical user interfaces (GUIs). Particular types of middleware products include gateways and layered solutions based on application programming interfaces (APIs) and fourth generation languages (4GLs).

B
Systems Software Products Market Size and Expenditures

As noted in Exhibit II-2, the overall U.S. systems software products market will grow from $26.2 billion in 1995 to $43.3 billion in 2000, at a compound annual growth rate (CAGR) of 11%.

Exhibit II-2

U.S. Systems Software Products Market, 1995-2000



Source: INPUT

This projection is 3% higher than INPUT's five-year growth rate expectation made in its 1994 *Systems Software Products Market* report. This higher growth rate is attributed to the increased demand for systems management software and application development tools to meet the rigorous requirements of distributed enterprise applications.

Demand for more sophisticated application development tools that provide a higher level of programming abstraction, as well as cross-platform integration, is expected to expand the applications development tool market size significantly over the next few years.

The operations management systems software market should also be a beneficiary of products that address the need for integrated systems and

network management across multiplatform, distributed processing environments.

The overall systems control market, primarily operating systems and related network access software, will continue to show modest, if any, growth over the next several years. At the mainframe level, decreased expenditures are anticipated, with a five-year CAGR of -9%. This is due to the trend away from centralized processing as well as significant price reductions occurring in this area. At the minicomputer level, growth is expected to be modest with a CAGR of 3%. However, at the workstation/PC level, a more healthy growth rate of 11% is projected, reflecting the continued growth of client/server computing. In the client/server operating systems market, the trend continues toward UNIX and Windows NT for the server environment, with Windows dominating the client or desktop part of the solution. For client (desktop) applications that require 32-bit multitasking capabilities, OS/2 is also an alternative. UNIX on the desktop seems unlikely, given the popularity of Windows NT.

A potential area of growth in the systems control segment will be object-oriented operating systems, such as Microsoft's planned Cairo system and NeXT's NeXTSTEP operating system. However, UNIX operating systems may change dramatically over the next few years, with a more modular structure based on object components. The battle is really for the application server operating system platform in a distributed processing environment. Clearly, it will have a strong element of object technology, essential to reduce the current high cost of providing multivendor platform interoperability.

Companies with strong application development tool technology (that provide easy-to-customize applications solutions) are expected to be strong competitors in the applications solutions market. This could happen at the expense of applications software products vendors, unless the two software products groups engage heavily in strategic partnering. In this environment, industry- and interindustry-specific knowledge on the part of the applications software products vendors will provide a key value-added contribution to the partnership.

C
Conclusions and Recommendations

Exhibits II-3 and II-4 summarize the major conclusions and recommendations of this report for systems software vendors.

Exhibit II-3

Conclusions

- Distributed processing through a client/server architecture is becoming a reality for some mission-critical applications.
- Applications solutions for client/server environments have become more widely available.
- Systems management is a critical concern in the client/server environment.
- Network, systems, applications and data management are becoming integrated under the umbrella of systems management.
- The integration of the workgroup and enterprise systems continues to increase in importance.
- More sophisticated application development tools beyond 4GLs are required for distributed applications development.

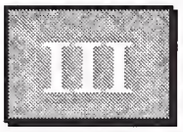
Source: INPUT

Exhibit II-4

Recommendations

- Develop alliances with key vendors that offer complementary products and services.
- Develop/offer products designed to address needs for integrated systems management.
- Adopt application development tools that allow for re-use of objects in building applications.
- Workstation and enterprise software vendors need to integrate their products.
- Conform to open standards.

Source: INPUT



Trends and Issues

A
Software Products Markets—Overview of Structural Changes

System software growth is being driven by the continued penetration of client/server computing in American businesses today. This architecture is expected to take a giant leap forward in the next several years as companies migrate enterprise applications, which have historically resided on proprietary mainframe systems, to a client/server environment. Initial movement into the client/server world focused primarily on departmental systems and use has been mostly limited to decision support. However, the growing sophistication of client/server systems, coupled with the increasing need for flexibility in mission critical systems in order to remain competitive, is driving increased application migration to more distributed environments. GTE Telops and Federal Express are examples of businesses that have chosen to move-mission critical applications to a distributed environment to gain a competitive advantage. As companies use business process engineering to streamline processes and boost productivity, they are finding that they need a more flexible computing environment to implement these changes. Distributed client/server systems offer this flexibility, which is becoming more and more a requirement to compete effectively.

A key reason that client/server computing focused on decision support applications initially was because of limited availability of packaged applications solutions for mission-critical applications. However, this has changed in recent years, with vendors such as Peoplesoft and SAP offering solutions in the financial, human resources and manufacturing areas for client/server systems. Vendors are now offering products that are scalable and can be partitioned between client and server. With the increased use of these systems for more critical applications comes more emphasis on system and network management to insure that these systems operate effectively. In the proprietary mainframe world, system management was centralized and relatively straightforward to handle. In a distributed environment, the

complexity and potential for problems arising increases exponentially. Products that can address these concerns will be in demand,

These changes in the information systems environment have led to a plethora of new systems software product introductions that specifically address the programming and operational requirements of distributed data processing. The complexity of the application development process in a distributed processing environment, particularly the element of cross-platform interoperability, is greatly expanding the requirement for new application development tool technology. These tools eliminate the developer's need to code numerous interfaces for cross-platform configurations by providing a higher level of programming abstraction that includes much prewritten code support for software interfaces.

Among the first client/server systems software products were relational database management system (RDBMS) platforms designed to work with desktop-based client front ends. To develop applications that work in this computing environment of shared processing across client/server platforms, a number of new application development tools have been introduced. The most successful have been the visually oriented programming tools for building graphical user interfaces (GUIs) and 4GLs with "middleware" enhancements that provide client-to-database access across heterogeneous environments.

Increasing sophistication of operating systems, systems/network management and application development tools is needed to accommodate mission-critical applications in a distributed environment. The pace of change in systems software products continues to accelerate to address these needs. The computing environment of today continues to become more heterogeneous, encompassing a mix of system platforms from a multitude of vendors. Open systems are increasing in popularity and UNIX plays a focal role in client/server implementations. Opportunities for growth exist for vendors that offer products to address requirements for sophisticated solutions to allow mission-critical applications to run effectively in a client/server environment.

INPUT expects the movement off of the "traditional" mainframe platform to accelerate as enabling software tools (based on open systems solutions) continue to evolve.

B
Software Product Segment Trends and Issues

1. Systems Control/Operating Systems

The centralized mainframe environment, traditionally the heart of large-scale mission-critical applications, has been in many ways a simple one. Proprietary systems have been managed from a centralized site where the computers reside. Software was either developed internally or acquired specifically for the system used. Everything was compatible because one vendor dominated the operating environment. The proliferation of personal computers and ultimately the growth of client/server computing turned that simple environment into an extremely complex one.

Today's businesses make use of enterprise, department and workgroup systems that use a mix of operating systems, including, but not limited to: MS Windows 95 and 3.1, Windows NT, OS/2, Mac, UNIX (HP, Digital, IBM, Sun,) and proprietary mainframe operating systems such as IBM, MVS and Digital's VMS. Most of the proprietary vendors, such as IBM, Digital and Hewlett-Packard (HP), have developed "open" versions of their software to facilitate integration with disparate systems.

Within the client/server world, it is still too early to tell which operating systems will dominate at the server and client levels. UNIX appears to be in a strong position, particularly at the server level, due to its open environment and sophisticated capabilities. UNIX vendors offer specific advantages within the client/server environment. The multitasking and multiprocessing capabilities of this system are currently considered superior to Windows NT. UNIX also provides scalability, allowing the system to grow without compromising functionality, which is a critical requirement for client/server applications. UNIX also offers high speed and portability. However, these capabilities come with a large price tag and are considered less user friendly. Microsoft's Windows NT is eroding some of the UNIX market share by offering competitive capabilities at a far lower price. UNIX vendors generally target large departmental database and application server requirements. Microsoft hopes to leverage its success at the PC client level to penetrate the server market also with Windows NT.

To collect information about issues and trends affecting this market, INPUT conducted two surveys regarding systems software. One was focused on users of systems software across a range of industries and company sizes. The other survey addressed the vendor perspective by interviewing leading vendors of systems software products. Among the companies responding to the user survey, many considered themselves unfamiliar with the UNIX environment. When asked to estimate the number of applications expected to migrate to UNIX in the next five years, only 36% indicated that all or most

of their applications would move in this direction. As seen in Exhibit III-1, 35% indicated that none of their applications were likely to reside on UNIX, while a slightly smaller percentage stated that some applications may move to UNIX.

Exhibit III-1

Plans for Migrating Applications to UNIX

Number of Applications That Will Migrate to UNIX Over Next 5 Years	Indicated by % of Respondents
No Applications	35%
Some Applications	29%
Most Applications	19%
All Applications	17%

Source: INPUT

This response may be due to a perception of UNIX as more of a technical operating system. Strengths and weaknesses of UNIX mentioned by these respondents are listed in Exhibit III-2.

Exhibit III-2

UNIX Strengths and Weaknesses

Strengths	Weaknesses
• Speed • Power • Application availability • Portability • Interfaces with other systems • Flexibility	• Not user friendly • Expensive • Complicated to use • Security problems • Hard to learn

Source: INPUT

Exhibits III-3 and III-4 show the results of a 1995 INPUT survey specifically focused on operating systems preferences for client and server platforms over the next five years.

Exhibit III-3

Importance of Operating Systems in the Next Five Years—Server Operating Systems

Operating System	Average Importance Rating*
Sun Solaris	4.5
IBM AIX	4.3
HP UNIX	4.3
Other UNIX	4.1
Windows NT	4.1
Silicon Graphics UNIX	3.9
Digital UNIX	3.7
Windows 95	3.7
NeXTSTEP	3.5
Mac	3.3

* Ranked on a Scale of 1=Least Important to 5=Most Important *Source: INPUT*

Exhibit III-4

Importance of Operating Systems in the Next Five Years—Client Operating Systems

Operating System	Average Importance Rating*
Windows NT	4.0
Windows 95	3.9
IBM AIX	3.7
Sun UNIX	3.5
Silicon Graphics UNIX	3.5
Other UNIX	3.5
HP UNIX	3.4
SCO	3.3
Mac	3.2
Digital UNIX	2.8
NeXT	2.0

* Ranked on a Scale of 1=Least Important to 5=Most Important *Source: INPUT*

Although these respondents expect UNIX to continue to be important on the server, Windows NT has the potential for leadership in both the client and server environment. However, the differences in importance levels are small, indicating an opportunity for lower ranked vendors to move ahead if competitive products are offered.

The majority (65%) of respondents (Exhibit III-5) have already implemented client/server computing, with most of the remaining companies (25%) either

developing a new client/server system now or intending to move in this direction in the near future.

Exhibit III-5

Use of Client/Server Architecture by Survey Respondents

Plans for the Use of Client/Server Architecture	Indicated by % of Respondents
Have implemented client/server	65%
New client/server system being developed	13%
Have plans to implement client/server in near future	12%
No plans for client/server	10%

Source:. INPUT

However, most respondents described their computing environment as centralized, as shown in Exhibit III-6.

Exhibit III-6

Today's Information Systems Environment

Type of Information Systems Environment in Use Today	Indicated by % of Respondents
Centralized	65%
Distributed	23%
Both centralized and distributed	11%

Source: INPUT

This is most likely due to the fact that most critical applications within companies currently reside on a centralized mainframe, with only the more aggressive adopters of technology distributing such applications. An average of 21% of the respondents' mission-critical applications reside in a client/server environment today. Nearly half indicate that *none* of their mission-critical applications currently make use of client/server computing. By contrast, in the next five years, these same respondents expect an average of 88% of mission-critical applications to reside on client/server system. Slightly more than half say that a full 100% of their mission-critical applications will be in a client/server environment.

Though these findings clearly show support for continued growth of client/server computing, it should be noted that whether this approach will completely replace the centralized computing environment is still debatable. Respondents to INPUT's user system survey were specifically asked if they had applications they believed would never migrate to a distributed environment. Over 50% of those responding to that question indicated "yes." Exhibit III-7 lists the specific applications mentioned as remaining within a centralized environment in respondents' companies and the stated reasons for this approach. Financial applications were mentioned most frequently within this group. The first column in the exhibit lists the applications most likely to remain in a centralized environment. The second column notes the reasons stated for remaining centralized. The two columns are independent of each other, with no relationship between entries on a specific line.

Exhibit III-7

Applications That Respondents Believe Will Remain Centralized

Application	Reasons Mentioned
• Financial • Dispatch • Warehouse • Order Management • Manufacturing Management • Billing • Materials Management	• Volume of information • Don't need a GUI • Competitors do it this way • Security • Centralized company management

Source: INPUT

Object-Oriented Systems—The growth in object technology is driving efforts to develop object-oriented operating systems. This effort has been led by Microsoft with its plans for the Cairo operating system and by IBM, which took over management of Taligent, the joint venture with Apple and HP to develop an object-oriented operating system. When the systems software survey respondents were asked to rank from 1-5, with 5 being the most important, the importance of object-oriented operating systems to them in the next five years, the average response rating was 3.5. Slightly more than half of these respondents gave these operating systems a ranking of 5.

The Internet and Operating Systems—The growth of the Internet is starting to have an impact on operating systems, as tools like Sun's Java make network-based applications development a potential future trend. Both Oracle and Sun have announced intentions to manufacture Internet access network computers that carry out the basic functions of a personal computer but cost under $500.

As the Web platform matures, developers may move from PC-based platforms, such as Windows 95 and OS/2 Warp, to developing applications on the network-based platform. Applications would be written to run within a Web browser. Web browsers would read HTML files from the server and provide the basic environment for the program. Programs would be buffered on the PC's hard disk or ROM and could be used for as long as the browser is kept open.

Although there has been a lot of discussion about the "hollow" computer, these slimmer PCs won't necessarily replace today's powerful Pentium and Power PC computers. However, the operating systems that run these powerful machines may not be necessary in a network-based environment. With the Web and Java, there is no need to develop closed, proprietary client programs that reside on the PC. Instead, an application can be written to run inside of a Web browser and can be downloaded from a central Web server. If a new revision is developed, it is simply placed on the Web server, so that the next time the users request the program, the latest update is received in the browser. With the shift from PC-based to a network-based platform, there may be less demand for robust client operating systems.

2. Operations Management

Systems Management—Systems management requirements will be impacted greatly when more sophisticated applications migrate to a client/server environment. Systems management for the purposes of this report includes four distinct elements that have previously been considered separately. They are:

- *Network management*: Managing networks and equipment such as bridges and routers.
- *System management*: Managing system problems, configurations, and disks.
- *Application management*: Distribution and upgrades of applications and problem diagnostics.
- *Information management*: Database management, interfaces and performance monitors.

Within a client/server environment, the distinction between these functions becomes less significant as the overall approach to computing becomes more integrated. Traditional systems management software for a single platform, like a minicomputer or a mainframe, typically fits into one of the above categories. Client/server systems management software increasingly includes the variety of software that can troubleshoot and monitor systems across the categories. This is due to the fact that when a problem occurs in a

client/server system, it may not be immediately apparent where the cause lies. Client/server systems management software that can intelligently cross traditional software boundaries and pinpoint potential system troubles before they occur is in high demand.

Centralized computer systems offered the advantage of centralized management. Isolated PC systems and networks have been managed traditionally through capabilities offered as part of the application or the LAN on which the system operates. However, as all of these segmented systems—enterprise, departmental and PC LANs—come together as part of a client/server environment, both system and network management becomes much more complex. This opens a whole new market for system and network management products specifically developed to support heterogeneous products operating in a decentralized multiplatform environment. Senior executives agreeing to place their most critical data on a client/server system will demand products that will ensure that their systems are reliable and operate efficiently.

Client/server systems management differs from traditional data center management and systems control in three major ways:

- Personnel administering a system tend to be scattered around a company rather than in a centralized data center.
- Network, applications, database and systems management functions are becoming more integrated.
- Software frameworks are increasingly being used to integrate system management software applications and simplify integration with new networks and platforms.

Generally there are two approaches to providing system management that various vendors have taken. One approach is the framework option, in which a vendor provides an overall system framework into which multivendor products can be integrated. Some vendors specialize in point solutions that can be integrated into these frameworks. The second option that some vendors have chosen is to develop integrated solutions. Some vendors, such as CA and Platinum Technology, have brought their experience in mainframe management to the client/server world. Many vendors have focused their products on an open systems model, including many of the UNIX vendors such as HP and IBM.

Open Framework Vendors—One major technology trend is toward the creation of software frameworks using object-oriented technology on which systems management applications can be built. These frameworks promise more integrated cross-platform, intelligent, flexible and scalable applications. This approach involves provision of a single systems

management framework onto which various solutions from systems management vendors can be integrated. Tivoli, which was recently acquired by IBM, is a leading framework vendor of the many UNIX vendors offering this alternative. Tivoli offers a suite of systems management products called Tivoli Management Environment (TME.)

Other examples of vendor frameworks include, HP's OpenView, IBM's Netview, CA's Unicenter, and Digital's Polycenter.

Proprietary Framework Vendors—These providers focus on providing a total systems management solution using their own products that facilitate interoperability with other systems. Long term (over the next ten years), unless they license their underlying frameworks widely or are already very large companies, they will be at a strategic disadvantage, as their development costs will not be amortized over a large enough installed base.

A distributed approach to enterprise-wide system management, as described in this chapter, is a relatively new phenomenon developed by vendors to address the anticipated demand for more complex system management capability. Many companies today have not yet begun to embrace these approaches even though they may recognize the need to do so. In INPUT's systems software survey, none of the user respondents made use of integrated frameworks from vendors such as Tivoli, Platinum, or HP. Most relied on management capabilities included with system hardware. Novell's product was mentioned most frequently, with 53% of survey respondents using Novell's management products.

Exhibit III-8 indicates which approach to systems management these respondents preferred. While the largest percentage (53%) indicated preference for an integrated approach, many (35%) still stated that they have no preference.

Exhibit III-8

Systems Management Approach Favored by Survey Respondents

Systems Management Approach	Indicated by % of Respondents
Frameworks for integrated systems management	53%
No preference	35%
Point solutions	12%

Source: INPUT

The lack of preference may indicate that these respondents have not yet reached the stage of analyzing the options and establishing an integrated strategy. Exhibit III-9 lists respondent comments regarding the strengths and weaknesses of their current systems management products, along with factors most important to them in systems management.

Exhibit III-9

Strengths and Weaknesses of Systems Management Products

Strengths	Weaknesses	Most Important Factors for Systems Management
• It works • Familiarity with product • WAN connectivity to host	• Can't anticipate problems • Hard to maintain • Proprietary	• Reliability • Security • Speed • Ease of integration

Source: INPUT

a. Alliances

Many alliances have been announced to address cross-platform client/server systems management requirements. Integration with Microsoft products is a key strategy. As Windows NT has grown in popularity as a platform for enterprise network management. Many client/server systems management applications were initially controlled from UNIX workstations using products like Sun's Solstice or HP's OpenView. As more Windows NT platforms are deployed for both servers and workstations, they will increasingly support systems management functions using Microsoft SMS with third-party enhancements as a foundation. Both Digital and IBM have developed plans with Microsoft to provide systems management using an NT workstation to manage the client/server network, including PC LANs and enterprise systems. Digital plans to offer products to integrate Open VMS with Windows NT, allowing integrated management.

Microsoft also offers CA management software as part of its NT Server and SQL server. It uses the capabilities of CA Unicenter for managing the server, while its own SMS handles client management. Included are job scheduling, backup and archiving, event and asset management, and security. SMS offers performance monitoring, inventory control, software distribution, help desk and remote monitoring. CA has announced plans for Windows NT to be a platform for future products. HP plans to offer an NT version of HP OpenView in 1996.

Computer Associates and HP also announced plans for integrating CA Unicenter and HP OpenView software. This demonstrates the evolution of network management packages like OpenView into comprehensive systems

management solutions that track applications, systems software, processes and components on a network. IBM's NetFinity also provides for remote management of multiple platforms and systems.

Object-oriented tools offer the opportunity for more sophistication in systems management. Bull HN is planning to offer a product named OpenMaster that uses object-oriented tools for integrating more than 40 elements of systems management. IBM has plans to provide systems management based on objects. Sun Soft is developing an object-oriented platform called Solstice Enterprise Manager that manages large networks, due for release in 1996.

Typically, systems management software has been internal to corporations. Network operators have dealt with systems management issues concerning WANs outside corporate firewalls. However, as more companies interconnect through both public networks and the Internet, they are taking greater responsibility for applications management across WANs. There are tremendous opportunities for vendors that can provide software to insulate corporate LANs from WAN problems.

Today's buyer is seeking system management that can handle various platforms, networks and operating systems. Software that is scalable and can address enterprise-wide, distributed environments will be in demand.

b. Transaction Monitors

Many believe that to accommodate on-line transaction processing (OLTP), transaction monitors are needed to maintain data integrity, balance the workload and provide needed security. Distributed OLTP managers are required to close a performance gap in distributed relational database management systems. OLTP monitors are incorporated into some RDBMS products. One of the principal functions is to improve upon the synchronization of database updates and allow for real-time data updates in mission-critical applications where data often remains on mainframes. OLTP manager monitors can function somewhat like a multiplexer to allow for optimizing load balancing across databases and other computer resources, and to enable multiple concurrent database access.

Examples of vendors of cross-platform transaction processing solutions include:

- Novell's integration of the Tuxedo distributed transaction processing monitor into its NetWare network operating system. A Tuxedo Application Loadable Module (ALM) is currently available for Novell's AppWare application development environment that enables the development of OLTP applications.

- Transarc Encina's open, distributed on-line transaction processing system, which supports a number of hardware platforms, including Windows, Windows NT and UNIX, along with a number of leading RDBMSs

- VISystems Inc.'s VIS/TP transaction processing system is a UNIX product with CICS application programming interfaces (APIs).

3. Object Technology

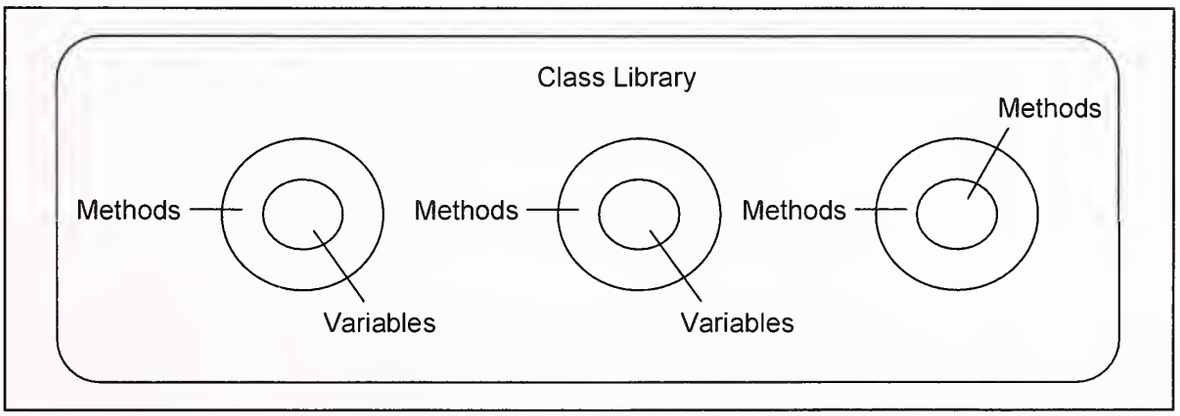
Objects are the fundamental elements that automate business processes. Business objects enable an enterprise to model its environment. These high-level objects can then be translated into applications software. Object technology allows developers to develop a design based on business analysis. Object-oriented (OO) tools provide code generation for business objects. Objects are an important development for programming client/server systems. They reduce the time to create systems, the cost of updating them and the cost of adding components.

A critical value of software objects is their ability to incorporate individual business rules and procedures involving work flow processing, which can be re-engineered easily compared to procedural language coding requirements.

The construction of an object, as shown in Exhibit III-10, is key to its flexibility of use and its ability to be easily adapted to customized computer applications. An object contains a collection of related procedures and data. The procedures are called methods, and the data elements are referred to as variables, in that the values can change over time.

Exhibit III-10

Characteristics of a Software Object Solution



Source: INPUT

Packaging-related data and procedures combined is called encapsulation. Objects interact with each other by sending messages asking them to carry

out particular methods. A message involves sending a request to an object along with the name of a task the sender wants executed.

The other principal term in object technology is "class." A class defines the methods and variables included in a particular type of object. Objects belonging to a class are called instances of the class and contain only their particular values for the variables. Interoperability among objects, particularly at the communications level now used for building distributed systems development platforms, is by object request brokers and provides a common messaging interface environment at the applications/ communications level.

- The use of object technology in building network and systems management products will greatly enhance distribution management capabilities, particularly in a distributed environment. Systems management companies such as Tivoli and Computer Associates are incorporating object technology as the solution for integrated, multiplatform systems management. Clearly, object-oriented systems software products and applications will be among the fastest growing IT products over the next several years.

- Adherence to common standards is critical as the vendors producing "application-level" object building blocks begin to proliferate. The Object Management Group plays an important role in creating interfaces for messaging among objects. However, for companies building application-level reusable object code, vendor-specific class libraries and development procedures could be a major problem. Consortiums of leading vendors of application development tools need to lead the way in establishing a methodology for building object class libraries.

- There must be extensive new training for programmers to work with object technology. However, languages such as C++ and possibly COBOL+ will likely be effective programming tools for a number of years, and those now programming can make the transition to such tools to help reduce the potential training cost factor.

Exhibit III-11 describes the three primary uses of object technology and related vendors.

a. OO Operating Environment

OO operating environments provide functions commonly found in operating systems like file management, network interfaces, support for peripherals and running applications. Examples include NeXTSTEP, a complete operating system, and OpenStep, an environment derived from NeXTSTEP that runs on UNIX. The term "operating environment" is preferred to "operating system" since there is a trend toward more modular operating

systems. Leading vendors are Microsoft, NeXT and the former joint venture, Taligent, which has since been taken over by IBM.

Exhibit III-11

Approaches to Object-Oriented Programming

Systems Software Category	Description	Approach Taken by Programmers
OO Operating Environments	Operating systems that run mainly on client workstations and PCs.	Replace a traditional operating system such as DOS or Windows with another environment. This may run across multiple existing OSs (like Taligent's TalAE) or replace them completely (like NeXTSTEP).
Visual Development Tools	Applications software development tools that are used to create user interfaces. They may connect modules that connect users to databases.	Use visual development tools on top of existing databases and operating systems. The underlying operating system remains unchanged.
ODBMSs	Object databases are databases that store objects. They may be OODBMSs, ORDBMSs, or Adapters that connect OO software to RDBMSs.	Instead of storing objects in traditional databases or files, store them either in OO or object-relational databases. Alternatively, use an OO database interface to link to a traditional relational database.

Source: INPUT

b. Visual Development Tools

Visual development tools are application development tools that have a component that programs the screen display and uses objects. This includes object-based tools like Sybase's Powersoft Powerbuilder and Gupta's SQL Windows, along with true object-oriented tools such as ParcPlace's VisualWorks and Easel's ObjectStudio. For simple applications, buyers may not be concerned with differences between OO and objected-based packages. However, for complex or nonrelational applications, the underlying architecture is more important.

c. Object Databases

Object-oriented database management systems (OODBMS) and object relational database management systems (ORDBMS) together will be called object databases (ODBMS). ODBMSs store objects and provide interfaces to both users and applications. There are three classes of ODBMSs:

- OODBMSs map the structures used in OO programming languages into databases.

- OO adapters link OO systems and standard relational databases.
- ORDBMSs store nontraditional objects such as image and spatial data, but also support queries similar to relational databases.

4. Application Development Tools

Many of the early uses of client/server systems have been well served by visual 4GL/GUI Tools. Microsoft's Visual Basic, Sybase's Powerbuilder, and Gupta's Windows SQL have been popular tools for decision support applications development. However, the planned information systems architecture for many corporations is enterprise-wide distributed applications and database environments, to support decision support and mission-critical, on-line transaction processing (OLTP) solutions. The migration of enterprise applications from the mainframe to a distributed environment brings with it a demand for tools that support more flexibility and scalability. Use of these lower-end visual 4GL tools can, however, lead to bottlenecks on the network, since all application logic resides on the PC. The market for these tools is moving toward a commodity status. Prices for the low-end tools are falling, leading to lower margins and profits.

Increased use of distributed networks for OLTP drives demand for databases and networks and along with them demand for more sophisticated tools. Object-oriented tools allow business and application logic and the user interface to be partitioned, creating a three-tiered approach. This minimizes the "fat client" problem, where most of the logic resides on the client PC, since functions can be more evenly distributed throughout the network among the server, client or mainframe. This separation also provides flexibility as network devices are added or changed. Partitioning can be changed to maximize efficiency. These tools provide this capability by building objects that can be reused on different platforms or in different configurations.

High-end tools provided by vendors such as Forte and Dynasty bring the sophistication of the mainframe to distributed client/server architecture. However, this capability comes at a high cost, compared to the visual 4GL development tools. Yet, in the long term, object capability offers the opportunity to reduce software costs, as programs will be able to be assembled quickly from pre-existing components or objects. Texas Instruments, Seer Technology and Andersen Consulting, along with Forte and Dynasty, are examples of companies that are well positioned to respond to the needs of customers focused on putting mission-critical applications on a client/server network.

Although INPUT believes that object-oriented application development represents an important trend for systems software growth in the future, its research also shows that many companies are not yet using such tools. For

example, INPUT's systems software survey indicated use of visual development tools by 65% of the respondents, with the majority indicating that these tools will continue to be somewhat or very important in the future. There was very limited use of more sophisticated tools from vendors such as Easel and ParcPlace. When asked what programming language was used within the company, Cobol and C dominated, with 53% usage and 29% usage respectively, as seen in Exhibit III-12.

Exhibit III-12

Programming Languages Used Today (by Respondents)

Programming Language	Indicated by % of Respondents
COBOL	53%
C	29%
C++	20%
Visual Basic	18%
RPG	16%

Source: INPUT

In terms of the future however, the survey respondents seem to be taking object oriented capabilities seriously. When asked to rate how likely their company is to invest in object oriented operating systems, development tools and databases in the next five years, on a scale from 1 (least likely) to 5 (most likely), the average of responses ranged from 3.2 to 3.7, with many respondents assigning a 5 in each of these categories. Average responses are shown in Exhibit III-13.

Exhibit III-13

Likelihood of Investing in Object Capability in the Next Five Years (by Respondents)

Object Capability	Average Likelihood Rating*
Object-oriented application development tools	3.7
Object-oriented operating system	3.5
Object-oriented databases	3.2

* Ranked on a Scale of 1=Least Likely to 5=Most Likely *Source: INPUT*

Efforts have been made to develop object standards that would allow them to be used on various platforms regardless of the language in which the objects are written. This would allow, in effect, interoperability among objects. Most notable are the Object Management Group, Inc.'s Common Object Request Broker Architecture (CORBA) and Microsoft's Object Linking and Embedding Component Object Model (OLE/COM). CORBA 1 determined a standard approach for the interface of an object. CORBA 2 provides interoperability between CORBA-compliant objects by defining how object request brokers (ORBs) will interrelate. ORBs provide a neutral language between objects developed in different languages. Microsoft announced plans for a distributed COM as part of its OLE standard that will support interoperability among objects throughout the enterprise. Ultimately, CORBA and Microsoft may move toward integration between the two standards, enhancing interoperability.

Progress made in standardization will drive demand for object-oriented tools, as buyers who have previously adopted a "wait-and-see" approach become more comfortable with investing in these tools. Standardization addresses buyers' concern that tools purchased today could become obsolete in the future as technology changes.

The explosion of Internet usage over the past several years has created opportunities for application tool developers. Many believe that in the future, application development will be network-based, with users accessing applications over the Internet. Sun Soft has taken the lead in this area with its introduction of the Java applications development tool. Though still in their relative infancy, network-based tools offer yet another opportunity for expansion in this growing market.

a. Database Management Systems

The growth of client/server computing has a direct, positive impact on relational database management systems, as RDBMS are a critical element of this computing architecture. These databases allow users to access information from a variety of sources and analyze critical relationships among the data regardless of where the data resides. Incorporating multimedia data into the equation has created growth opportunities for RDBMS vendors. Demand for these products is expected to grow significantly with the implementation of data warehousing, which supports rapid analysis of significant amounts of data to drive decision support. The market for these products, offered by vendors such as Oracle, Sybase and Informix, continues to be strong as client/server becomes the model for information systems.

Object-oriented RDBMSs have become a reality for certain specialized applications. Vendors such as Objectivity and Versant offer products that address requirements heavily focused on video and/or graphics. In addition, leading RDBMS vendors have included some object capability to enable capabilities such as multimedia. These companies too must provide the next level of products to support mission-critical OLTP.

Increasingly, independent database vendors are adding OLTP features to their relational database management systems. Another opportunity for growth in this market is related to opportunities on the Internet. RDBMS vendors with multimedia capability can provide the same capability over the Internet with the variety of information available.

b. Data Warehousing

Data warehousing refers to the development of a large, separate, comprehensive database for the purpose of making data that originates from a number of sources available to users quickly for the purposes of decision support. Data can be analyzed by various departments to review historical information from a variety of perspectives. Specific tools are available for use within the data warehouse environment. A market exists for tools both for querying the database and for adding data into the database.

c. Middleware

Middleware represents an additional layer of systems software that provides for the development of interoperable and portable distributed applications solutions within a multivendor environment. In a client/server system, it resides between the client and the server, translating client requests into appropriate SQL commands understood by the database. Some middleware is provided by relational database vendors along with their products.

Middleware is also a significant enabling software technology for building distributed applications across a number of operating systems, database management systems and GUIs. Particular types of middleware products include gateways and layered solutions based on application programming interfaces (APIs) and 4GLs.

Some of the initial middleware products came from 4GL vendors providing interoperability across diverse database management system architectures. A benefit of many cross-platform object-oriented development tools is that they can generate compiled code for application logic distributed across multiple platforms.

Middleware systems monitoring and management solutions also include on-line transaction processing (OLTP) monitors.

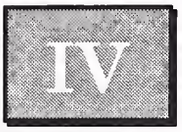
The distributed computing environment (DCE) developed by the Open Software Foundation (OSF) is a cross-platform, middleware software product model providing communications systems management functionality across a variety of hardware and operating systems platforms based on a common Remote Procedure Call model. A number of systems software product vendors are implementing their solutions with OSF DCE specifications and services, which essentially ties them into a multivendor middleware open systems development environment.

The Object Management Group (OMG) provides object interfaces for producing messaging interoperability across a variety of object-oriented distributed systems.

d. On-Line Analytical Processing

On-line analytical processing (OLAP) refers to analysis of large amounts of data distributed in various sources. Unlike on-line transaction processing, these transactions involve accessing large amounts of data, aggregated in a variety of ways and including complex calculations. OLAP servers store both data and data relationships in a multidimensional format. OLAP allows various types of analysis or "slicing and dicing" the data for decision support.

As users require more in-depth data analysis, OLAP servers offer advantages over relational database management systems due to their unique approach to organizing data in a multidimensional format. Users can perform complex analysis quickly. Proponents believe that this represents the next generation of analysis tools beyond RDBMSs for applications more complex than OLTP.



Information Services Market Forecast

This chapter identifies the forces encouraging or limiting the growth of the market for systems software products, and presents INPUT's forecast for the systems software market.

A
Driving Forces and Inhibiting Factors

1. Driving Forces

Market growth projections for system software products are driven by the business and technology factors discussed in this section.

a. Success of the Client/server Model

Client/server computing has moved beyond the trend stage to become an integral part of American businesses. Now that companies have implemented these systems for departmental and decision support applications, the next wave is toward migrating enterprise-wide applications to this distributed environment. As companies implement such mission-critical applications as part of client/server architectures, demand will increase for more sophisticated systems management and application development tools.

While companies may have been able to tolerate less sophistication in systems management for departmental uses, the applications that run their businesses will require the highest level of systems capability. In addition, areas such as application management are becoming much more important as application logic is distributed, and opportunities have arisen for vendors that can offer solutions in this area. The increased geographic distribution of businesses themselves (as well as their applications) is creating a demand for integration between systems, applications and network management.

b. Growth of the Internet

The Internet is affecting all areas of information systems. The systems software industry is in a position to provide new products to address this increasingly popular phenomenon. There is a new trend, as evidenced by Sun's Java product, to develop applications over the Internet that have tighter integration of applications with development tools. Systems software vendors have an opportunity to expand their products to include Internet development tools.

When INPUT interviewed systems software vendors regarding factors driving the growth of their businesses, the overwhelming majority of responses related to client/server computing and the growth of the Internet.

c. Increasing Popularity of Open Systems

As the computing environment of the future becomes less proprietary, open systems are increasing in popularity. Most computing environments today make use of multiple platforms and operating systems. Products that can offer open solutions to allow integration of various systems are expected to experience an increase in demand.

2. Inhibiting Forces

The factors noted below tend to inhibit or limit the growth of the systems software market.

a. Pricing Pressures in Mature Market Segments

As market segments mature, pricing pressures become more intense as products become more of a commodity. This phenomenon has occurred in several segments of systems software. In the system control arena, modest growth is expected in expenditures. This market, long dominated by the mainframe, is moving toward a client/server environment where PCs and servers, typically on a PC or midrange system, dominate. These systems have traditionally lower prices compared to mainframes and pricing competition is intense. Likewise, pricing of visual 4GL application development tools has leveled off and products such as Sybase's Powersoft are feeling the pressure.

b. Buyer Caution Regarding Longstanding Legacy Systems

While trends point toward distributed computing, many businesses have been running existing mission-critical applications for many years in a centralized environment. Some buyers are reluctant to make any changes to systems that currently work effectively and get the job done. Still others, while planning to embrace client/server for the enterprise, are moving with

caution and looking carefully at system reliability and security before making a leap to this approach for their most important systems.

c. High Cost of Object-Oriented Tools

Clearly, application development tools offer the largest opportunity for growth in systems software. Increased use of distributed networks for sophisticated on-line transaction processing types of applications require more sophisticated tools that facilitate programming by allowing for objects to be reused. However, these tools currently have high price tags. These high prices can slow down the adoption of these tools as companies carefully evaluate lower cost alternatives first. Lack of consistent standards among those tools can also slow buyer movement in this direction.

d. Retraining

Object-oriented tools also mean that in-house programmers may need to be retrained extensively to learn this new environment. Companies have made substantial investments in their internal staff and may seriously weigh how easily existing staff can learn these new tools as an important factor in choosing application development tools. This again could slow down the progress in adopting object-oriented tools.

e. Internet Operating Systems

While the Internet may well offer systems software vendors some opportunities to develop new products, it may also take away from their current product offerings. Should Internet applications become a reality as predicted, users may not need the sophisticated operating systems currently in place on today's PCs.

B
Market Forecasts

1. Systems Software Products Market, 1995-2000

a. Market Segments

The systems software products market is analyzed by the following subsegments: systems control, operations management tools, and applications development tools. Each of these subsegments is defined by particular product groups in Exhibit 1-4 of this report.

Market forecasts are provided for each of these subsegments and by hardware platform.

b. Systems Software Products Market Growth, 1993-1994

The actual market for systems software products grew by 9% in 1994, with the total market reaching $23.8 billion. These 1994 expenditures were in line with INPUT's 1993-1994 9% growth rate, forecast in its 1994 *Systems Software Market* report. The systems control product subsegment was slightly below forecast, with an actual growth rate of 2% instead of the 3% forecast. This is a function of price reductions in the operating systems environment and a decrease in demand for mainframe products, partially due to growth at the PC level. Mainframe products in this segment actually experienced a 10% decrease in demand instead of a projected 5% decrease. Minicomputer expenditures were slightly higher than predicted—5% as compared with the forecast 4%. Likewise, PC expenditures increased 14% as compared with projections of 13%.

Operations management products' 1994 growth of 10% was in line with the previous forecast. Within this segment, mainframe growth was slightly less than predicted—7% rather than 8%. Conversely, expenditures at the minicomputer and PC levels were both 1% higher than the previous year's forecast. Minicomputer expenditures increased by 9% and PC spending increased by 14%. Strong growth in systems management software, including network and applications management, is projected over the next five years as vendors expand product offerings to meet more sophisticated management demand in a client/server environment.

The applications development tools market, the largest systems software product segment, grew at a 15% rate in 1994, in excess of INPUT's 12% growth rate projection. Once again, PC-related expenditures dominated, increasing at 32% as compared with the 30% forecast in the 1994 report. Minicomputer expenditures grew by 13%, as compared with the 5% forecast last year, reflecting the strength of UNIX within the client/server architecture. Overall growth in applications tools can be attributed to the success of visual development tools such as MS Visual Basic and Sybase's Powersoft, as well as to the growth in the development of object-oriented applications development tools. This growth is expected to continue as companies move their more critical applications onto client/server systems, thus requiring the sophistication of object-oriented tools. Object-oriented technology is increasingly being incorporated into application development tools and tool frameworks, along with systems and network management software products, to enhance cross-platform software program interoperability and reduce the cost of software product development. Applications development tools represented 44% of the total systems software products market in 1994.

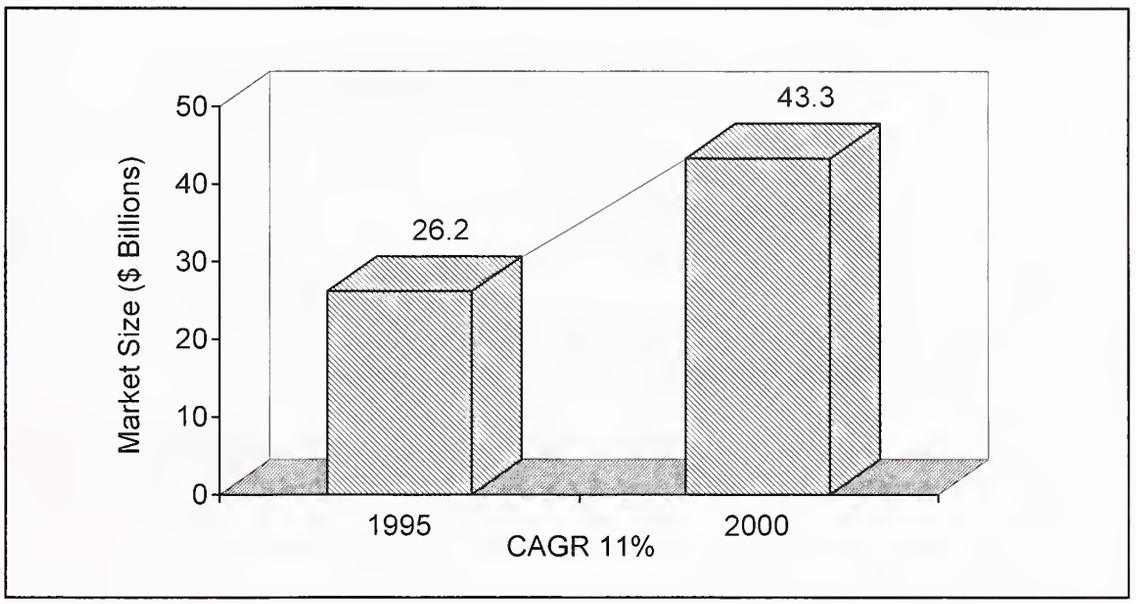
C
U.S. Systems Software Products Market Forecast

1. Overall Market Growth Rate Forecast

As indicated in Exhibit IV-1, INPUT forecasts the U.S. systems software products market to expand from $26.2 billion in 1995 to $43.3 billion in the year 2000, for a compound annual growth rate (CAGR) of 11%. This is a larger rate of growth than predicted in the 1994 report, which projected a CAGR of 8% between 1994 and 1999. The increased predictions are a result of the proven success of the client/server architecture, leading to increased demand for more sophisticated application development tools and systems management capabilities.

Exhibit IV-1

U.S. Systems Software Product Market, 1995-2000



Source: INPUT

Price-based competition is expected to be intense, reflecting increased product standardization in the systems control area. New product introductions in the operations management and application development tools markets that address multivendor distributed processing solutions will offset pricing pressures in other product sectors, particularly operating systems software.

Another market direction will be the bundling of application development tool technology with specific applications software product solutions, as process management and business rules become more central elements of applications software solutions. This will occur as object-oriented application development technology matures and applications software solutions become much more integrated into object-oriented development.

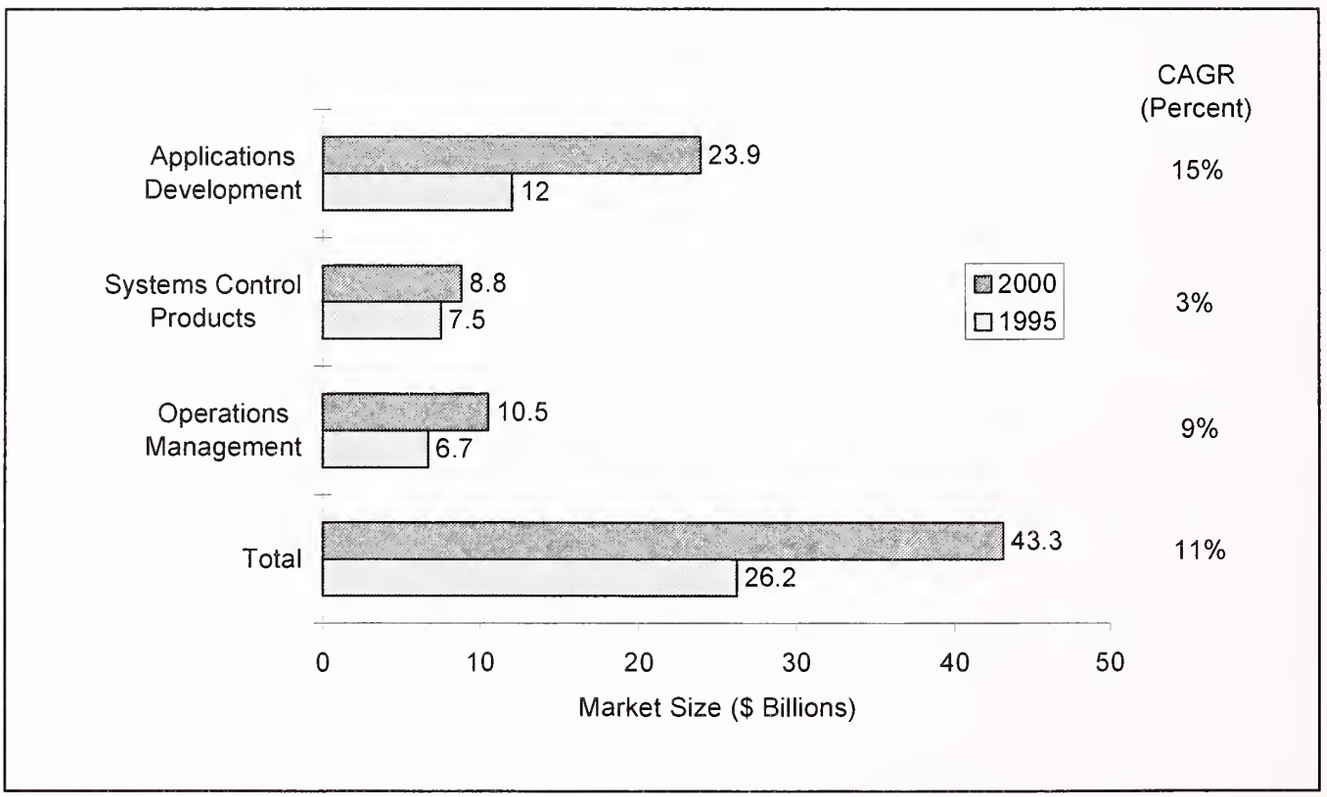
2. Systems Software Forecast by Market Subsegments

Slow growth in the systems control market primarily reflects the reduction in the overall cost of computer platforms as measured by the MIPS cost parameter, with system control software traditionally having been priced more in proportion to the cost per MIPS of processing power. Also, the transition from proprietary operating systems pricing to more open systems product pricing will make operating systems software more of a commodity product.

Exhibit IV-2 defines the forecast for the U.S. systems software products market by delivery submarkets.

Exhibit IV-2

U.S. Systems Software Products Submarkets, 1995-2000



Source: INPUT

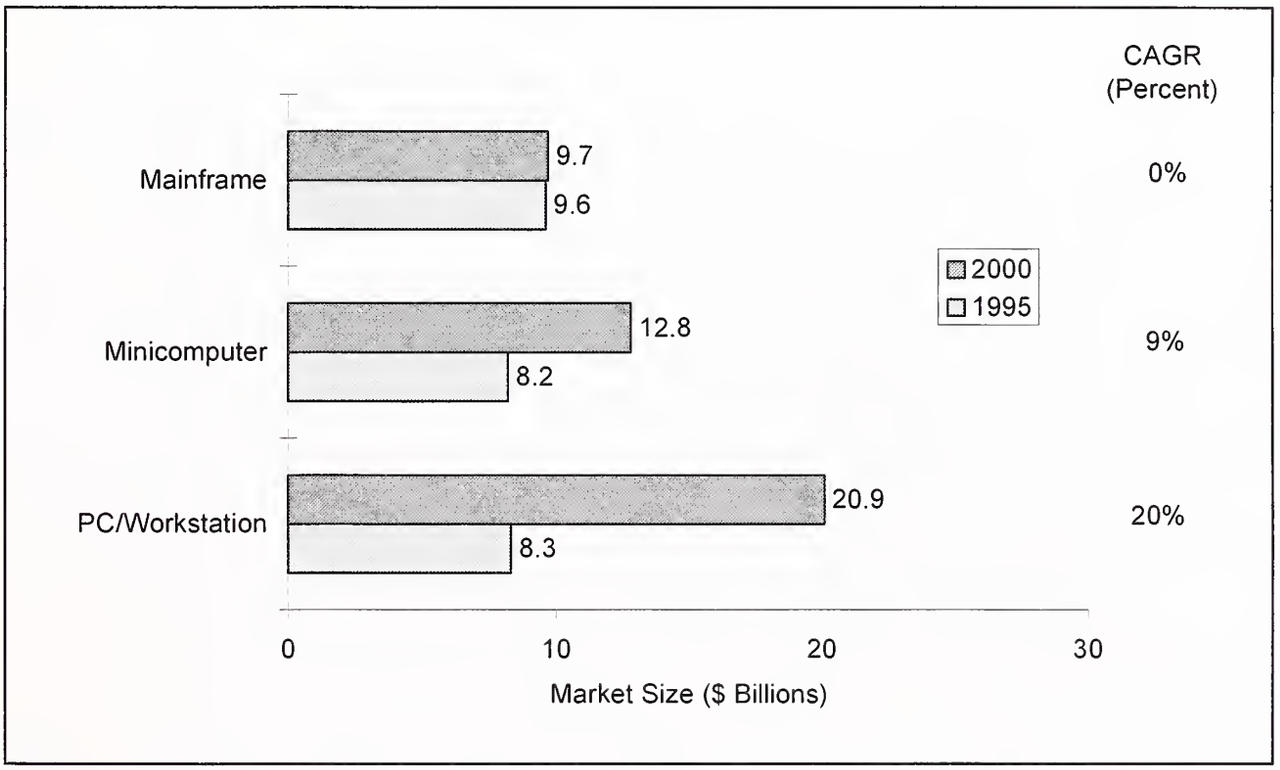
The struggle for dominance in the client/server operating systems environment between Microsoft's Windows and Windows NT (which has dominated the desktop) and UNIX should be of major interest in the upcoming years. Vendors who define *de facto* standards in operating systems for database and application servers could be in a preferred position to provide new application development tools and applications on a timely basis. Eventually, operating system and application development tools are expected to be much more integrated within an object-oriented programming environment. The move toward network-based application development tools such as Sun's Java could also impact the operating systems

environment. Companies such as IBM and Oracle are developing plans for low-cost, slimmer computers for network-based information access that will not require the sophisticated operating systems that PCs require today.

Exhibit IV-3 provides INPUT's forecast of systems software products by platform size. Though expenditures for mainframe products are larger than for minicomputer or workstation /PCs, this proportion is expected to change dramatically, with PC/workstation products dominating in the year 2000. Minicomputer growth is expected to be moderate at 9%, with the largest growth in the application development tools segment. Expenditures for mainframe-based systems software products are expected to level off in 1997.

Exhibit IV-3

U.S. Systems Software Products Market by Platform, 1995-2000



Source: INPUT

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Competition

A Overview

1. Competitive Overview

Though dominated by a few big players such as Microsoft and Computer Associates, the systems software industry continues to make room for new businesses entering the market to meet a need specific to changing technology. The expansion of client/server computing has created opportunities for vendors to provide systems and network management and applications development tools to address the unique considerations of this new environment. As new players enter, many businesses that formerly were riding the crest of success with earlier technology are falling behind in the race to address changing needs. The large companies, with substantial financial resources, have size on their side as they strive to keep up with technology. Smaller businesses that lose competitive positioning to stronger competitors or are providing products in a market segment that has matured, will ultimately find that acquisition becomes the only logical alternative. This is illustrated by several key acquisitions, shown in Exhibit V-1.

Consolidation in the systems software products market will continue, with mergers and acquisition activity in the operations management market segment in particular. The applications development tools market has been an emerging growth market in recent years. Several smaller companies that have entered the applications tools market for client/server application development have achieved industry growth rates that are well above average. Yet as the third-generation object-oriented tools become a reality, demand for second-generation tools will diminish. Competitors that offered products that address client/server requirements only at the departmental level may not be able to adapt their products to the scalability and interoperability needed for enterprise-wide client/server computing.

Exhibit V-1

Systems Software Acquisitions

Company	Acquired by ...
Powersoft	Sybase
Feye Computer Systems, Inc.	Seagate Technology
Coronet Systems	Compuware
LEGENT Corp. Ingres/ASK	Computer Associates
SQL Software Auto Systems Corp. Trinzic Brownstone Solutions, Inc. Viatech Development, Inc.	Platinum Technology

Source: Various Media

The next generation of distributed, enterprise-wide, mission-critical applications that represents real migration off the centralized mainframe environment will require integrated application development frameworks involving technology contributions from a number of vendors. In recent years, there has been a transition in the systems software products market from single vendors to a matrix of vendors. These vendors collectively provide various layers or modules of the systems software application development solution. Such an approach involves significant new strategic partnering initiatives. A core technology of either middleware and/or integrated CASE tools, with an emphasis on supporting an open systems philosophy, appears to be central to some of the alliances. Such partnerships also help leverage an individual systems software company's marketing effort, with each of the parties helping to market the complementary IS solutions of its partners.

For single-purpose application development tool vendors, particularly those that have provided an early stage solution to client/sever development, there is likely to be a significant shakeout over the next few years. Pricing, particularly in client development tools, has dropped rather dramatically over the past year. The smaller, independent applications development tool vendors benefiting from the newer market trends are those working with object-oriented technology that enhances mission-critical application development within a multivendor, distributed processing environment.

Systems control software products (operating systems) will become increasingly price competitive and particularly impacted by the lower prices of hardware platforms in a distributed environment.

The current desktop operating systems *de facto* standard is clearly that of Microsoft Windows.

Which operating system will dominate in the distributed, enterprise environment is still a major speculation for application developers and operations management software products vendors. The principal alternatives appear to be an object-oriented layered or modular software product solution integrated with a UNIX-flavored microkernel and/or the future Cairo product from Microsoft. The enterprise-wide systems software environment will continue to evolve until a more integrated, standards-based, object-oriented solution is developed through vendor cooperation.

Independent software vendors, corporate application developers and systems software vendors should work in integrated partnerships for development, marketing and other types of product support to remain competitive in the emerging world of distributed, multivendor computer processing. Such partnering should also help provide, over the longer term, more stable application development environments and lower cost solutions.

As noted earlier, the Internet has the potential to change the structure of the systems software market in several ways. Some of the innovative Internet companies such as Netscape are developing products that may ultimately support network applications and application development, thereby eroding requirements for sophisticated operating systems. Competitors like Oracle are working hard to develop network-based computing that could ultimately erode the current demand for Microsoft operating products on the PC. Microsoft is taking these developments seriously and has developed an Internet strategy, to include strategic alliances, to maintain its systems software market strength. As an example, in February 1996 Microsoft was expected to announce a company-wide reorganization in order to strengthen its focus on interactive computing as well as its operating systems business. The reorganization will include the formation of a new Interactive Media Division, which will focus on the Internet and the next generation of the digital video disk market.

2. Vendor Market Share

Software companies and entrepreneurial ventures have gone hand in hand historically. Even some of the largest software companies today began as small business partnerships. Though this pattern continues, with new companies continually coming along to address market niches, recent years have shown the emergence of industry giants that dominate the software industry. Most notably, Microsoft has become to the software industry what IBM has been to the hardware industry.

In May of 1995, *Information Week* released its list of "Top 50 Software Vendors" for 1995. In July of 1995, *Software Magazine* released its list of the "Top 100 Independent Software Vendors" for 1995. Both listings illustrate the continual growth of the market leaders to dominate the industry.

Software Magazine reported that the top 10 software firms earn about 63% of the total revenue of the top 100 companies. Microsoft's lead continues to be strong, achieving a third of the revenues obtained by the top 10 companies. It achieved 29% growth in 1994, while second-ranked Computer Associates' growth was 19%. The health of the software industry can be measured by the large number of companies with revenue growth exceeding 50%. The business pages attest to growth with the ever-increasing number of software companies going public.

Companies that have invested heavily in addressing the client/server market, particularly related to integrating enterprise systems in this environment, have been rewarded handsomely for their efforts. Platinum Technology achieved a revenue growth of 56% in 1994 with the strong success of its open enterprise systems management products. The tremendous interest in the Internet points to the growth potential for software vendors who can address needs in this market.

B
Leading Vendors

The leading independent systems software vendors are listed in Exhibit V-2. U.S. revenues for each company have been developed from INPUT's vendor files and surveys. Company revenues are for the 1994 fiscal year, since 1995 numbers for all companies were not available at the time this report was prepared.

Exhibit V-2

Revenues of Leading Independent System Softwares Vendors

Vendor Name	U.S. 1994 Revenues ($M)*
Microsoft	2,520
Computer Associates	1,250
Novell	1,090
Oracle	700
Sybase	400
Symantec	325
Candle	215
BMC Software	205
Informix	165

Note: numbers are rounded *Source: Various Public Data*

* For some vendors, these totals may include both systems and applications revenues.

Indicators of success in looking at these companies include how quickly they have addressed new technology demands. Many of the most successful companies in 1994 were those that provided client/server solutions and addressed demand for open systems by providing solutions for a variety of platforms. These were companies that jumped into the market quickly and were flexible enough to address customer needs. This trend should continue through 1996.

Other successful companies include those that have developed strong strategic alliances and a vertical market focus. Addressing the complex needs of open, enterprise computing, particularly in the areas of systems/network management and application development, is a daunting task for any one vendor. Responding to requirements in a timely manner demands strategic alliances to supplement internal strengths.

Exhibit V-2 focuses on independent software vendors—that is, software providers who do not also provide computer hardware. However, the major hardware vendors, such as IBM and Hewlett-Packard, are also strong contenders in the systems software market. Aside from the operating systems that these businesses have provided for their proprietary hardware, many of these companies have moved aggressively to provide UNIX solutions. Sun Microsystems, like many of the other hardware suppliers, has its own software subsidiary, SunSoft. Vendors are aggressively pursuing strategic alliances, along with internal development, to provide systems

management solutions and applications development tools. As seen in Exhibit V-3, a listing of total (both systems and applications) software revenues for major hardware vendors, IBM's 1994 software revenues were higher than the combined revenues of the independent software vendors listed in Exhibit V-2. The figures in Exhibit V-3 demonstrate the influence and importance of the hardware manufacturers in the software marketplace.

Exhibit V-3

Software Revenues of Leading Hardware Vendors

Vendor Name	U.S. 1994 Revenues* ($M)
IBM	11,350
Digital Equipment	935
AT&T	745
Unisys	710
Sun Microsystems	705
Hewlett-Packard	595

Numbers are rounded *Source: Various Public Data*

* For some vendors, these totals include both systems and applications revenues.

Exhibit V-4 lists the leading vendors in the system control products subsegment. Microsoft continues to dominate the desktop operating system arena with approximately 80% of the workstation operating system market. It is attempting to expand its strength beyond the desktop into the enterprise by developing key liaisons with strategic vendors such as Digital Equipment and Computer Associates.

Exhibit V-4

Leading Systems Control Vendors

Mainframe	Minicomputer	PC/Workstation
IBM (dominates)	IBM Digital Hewlett-Packard Sun	Microsoft (dominates) IBM Apple

Source: INPUT

IBM and other proprietary systems vendors dominate the mainframe operating system environment, with UNIX systems from Hewlett-Packard, IBM, Sun, and Digital leading the midrange UNIX market. In 1995,

expenditures for UNIX midrange systems surpassed those for proprietary midrange products for the first time. INPUT's estimate of the UNIX market share is shown in Exhibit V-5.

Exhibit V-5

Leading UNIX Vendors

Vendor Name	Estimated Market Share
Hewlett-Packard	45%
IBM	25%
Sun	15%
Digital	5%
Other	10%

Source: INPUT

Representative operations management tool providers are listed in Exhibit V-6. Once again, hardware vendors are aggressively moving to address requirements in this area. Systems vendors such as IBM are capitalizing on their systems management knowledge at the mainframe level to develop products or align themselves with complementary products to address requirements in the client/server world. Computer Associates has aggressively moved to provide client/server solutions with its systems management product, CA Unicenter for UNIX. Its acquisition of LEGENT positions it even more strongly in this arena. CA has developed liaisons with Microsoft, HP and others to strengthen its marketing position. Novell has used acquisitions to expand its position in the systems software arena beyond its networking roots.

Almost every vendor of systems management tools in the UNIX market supports the leading industry frameworks: HP's OpenView, IBM's NetView for AIX, Sun's Solstice and Digital's Polycenter. In the Windows NT environment, vendors are lining up to support Microsoft's SMS. Systems management vendors that support data management are partnering with the leading relational database vendors, Oracle, Sybase, Informix, Microsoft and IBM, with the first two in the list the choice for open systems software suppliers. Mainframe systems management companies tend to support IBM's DB2, IMS, VSAM and CICS.

Exhibit V-6

Vendors of Operations Management Tools

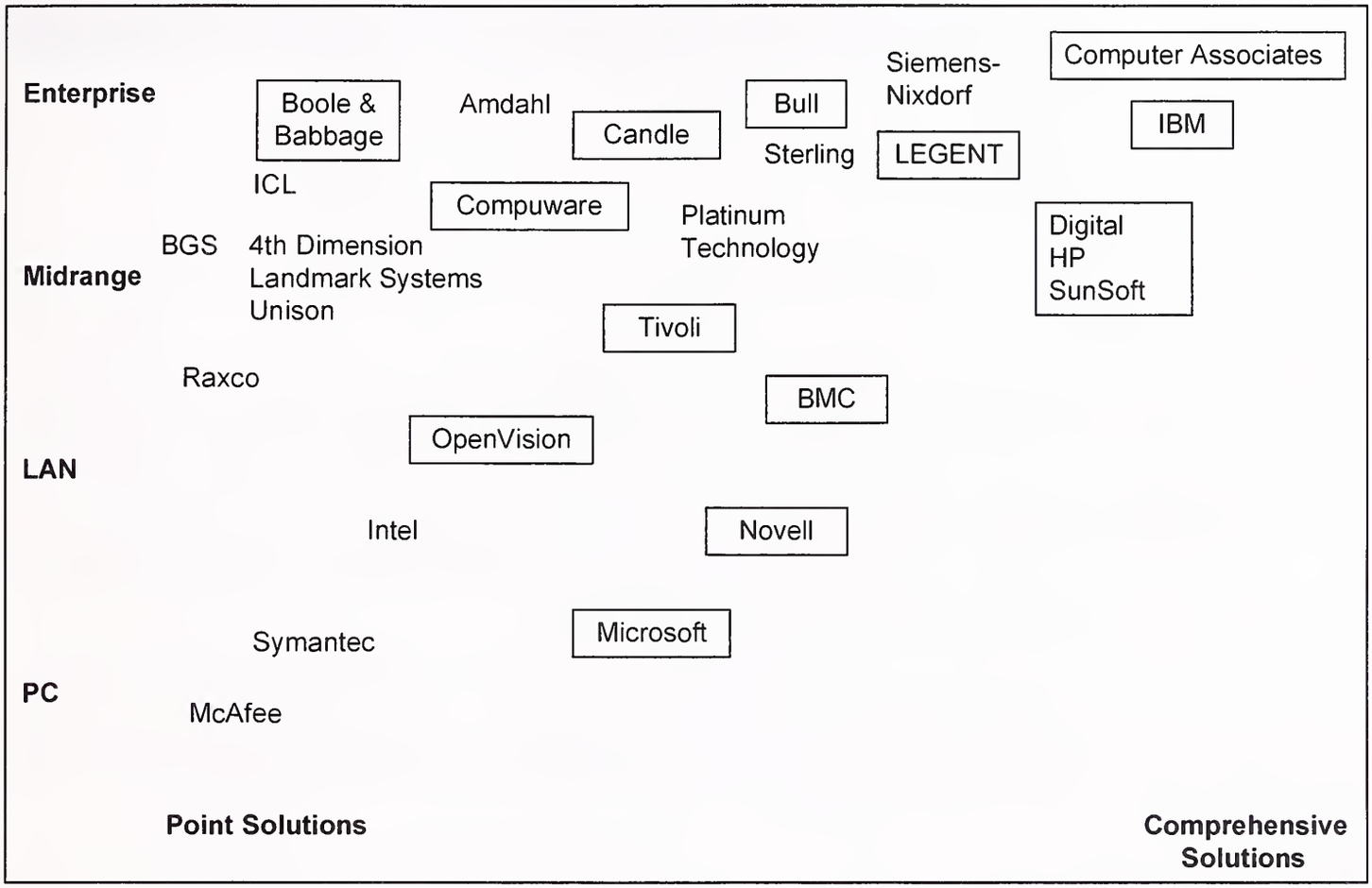
Vendor Classification	Representative Vendors	Vendor Role
Open Framework Vendors	Computer Associates, HP, IBM, Intel, Microsoft, Novell, Sun, Tivoli	Integrate third-party products into their frameworks
Proprietary Framework Vendors	BMC, Boole & Babbage, Candle, Compuware, LEGENT, OpenVision, Platinum Technology, Sterling Software	Use their own framework, primarily to integrate their own tools or sell a product line made up of point solutions
Hardware Suppliers	Amdahl, AT&T, Bull, Data General, Digital, HP, IBM, ICL, Siemens-Nixdorf—this category also includes storage management, network equipment and peripheral suppliers	Supply system management tools to support their hardware
Point Solution Vendors	4th Dimension Software, BGS, Elan, Eventus, Globetrotter, Informix, Landmark Systems, McAfee, Oracle, Raxco, Spire (ASI), Sybase, Symantex, Unison	Supply point solutions that are integrated into other vendors' frameworks

Source: INPUT

Exhibit V-7 positions systems software vendors according to the size of enterprise they support and their range of solutions.

Exhibit V-7

Vendor Positioning



Source: INPUT

The horizontal axis classifies vendors according to whether they provide point solutions or a range of solutions. The broader the range of products offered, the further to the right they are plotted. The vertical axis shows primary types of systems on which the vendors sell their products. Company names have boxes drawn around them if they offer a framework, the heavier line representing companies whose frameworks have wide acceptance. Those with lighter boxes are vulnerable to having proprietary infrastructures that they may not be able to support if they do not license their technologies more broadly.

Platinum Technology has made numerous acquisitions in order to offer an integrated set of point solutions to address systems software requirements within an open enterprise environment (OEE).

The application tools environment continues to provide opportunities to the next generation of vendors that can provide tools for efficient applications development in a client/server environment. Leading application tools vendors and relational database management vendors are shown in Exhibit V-8.

Exhibit V-8

Leading Application Development Tool Vendors

RDBMS	Visual 4GL Tools	Object-oriented Tools
Oracle Sybase IBM Informix Microsoft	Microsoft Sybase Gupta	Informix Oracle ParcPlace Easel Forte Dynasty Seer

Source: INPUT

The market for visual-based tools such as Sybase's Powersoft and Gupta's SQL Windows is expected to flatten as the next generation of tools becomes more in demand to address client/server requirements. These include products from companies such as ParcPlace and Easel as well as Forte and Dynasty. This market is more fragmented than the other segments; a variety of vendors are entering the field with specific products, and there is no clear-cut market leader at this time.

Oracle is a market leader in the relational database management arena and is leveraging its strength in this segment to offer applications solutions and other products and services. Application development tools are the strongest area of growth in the systems software market.

C
Vendor Profiles

This section contains brief profiles of the following four systems software vendors:

- Oracle Systems
- Computer Associates International, Inc.
- Informix Software
- Platinum Technology

For each vendor, the following data is provided: corporate information, key points of interest, company background and strategy, financials, key products and services, industry markets and clients, and strategic alliances.

1. Oracle Systems Corp.

500 Oracle Parkway
Redwood Shores, CA 94065
Phone: (415) 506-7000
Fax: (415) 506-7200

Chairman: Lawrence J. Ellison
Status: Public
Total Employees: 13,456 (12/94)
Total Revenue: $2,001,147,000

Fiscal Year End: 5/31/94

a. Key Points

- Develops, markets and supports software products for database management, CASE and applications
- Has moved aggressively into the professional services market, hiring industry-oriented consultants
- Formed alliances with telephone companies moving into the multimedia market

b. Company Strategy

Oracle has moved aggressively into the professional services market by leveraging its products. Oracle develops new products internally and through joint-venture partnerships. Its product and services strategy is to provide complete enterprise applications solutions. The company is also positioning itself as a provider of multimedia server technology, with multiple alliances with TV and entertainment firms that could lead to a strategic position on the information superhighway.

c. Financials

Total fiscal revenues in 1994 reached over $2 billion, a 33% increase over fiscal 1993 revenue. U.S. sales represented 40% of overall revenue. This increase can be attributed to the fact that Oracle's customer and product base has broadened during the past three years as the company increased the number of computers and operating systems on which its RDBMS operates and introduced additional software tools and applications products.

d. Key Products and Services

Oracle's principal product is the ORACLE RDBMS. ORACLE allows users to define, retrieve, manipulate and control data stored on multiple computers

using the industry standard SQL language. The company's products are grouped into three main product families:

Cooperative Server Technology (CST)—This product group consists of an integrated set of database and network products, including Oracle7, Oracle Office, and Oracle GroupWare, along with low-end workgroup information management products including Oracle Workgroup Server, OracleWare, Oracle Open Gateways and SQL Net. In January 1995, Oracle announced Secure Network Services offering built-in encryption software to protect corporate data in client/server environments. Oracle also offers Oracle Workgroup/2000 products for personal and mobile use.

Developer/2000-Designer/2000 (D/2000)—This product group includes an integrated set of products for client/server application development and data access. It includes data access tools such as Oracle Data Browser, Oracle Data Query and Oracle Glue. Also included are D/2000 tools allowing applications developers to design forms based applications, and highly formatted reports and high-resolution graphics.

Applications Software—Oracle offers applications software focused on financials, human resources, manufacturing and business productivity.

In addition Oracle offers consulting services that include strategic systems planning, systems management, systems architecture development, customized applications development and in-house technology integration support. Oracle provides more than 100 courses at more than 90 education centers worldwide. The company provides support services through the Oracle Customer Support organization.

e. Industry Market/Clients

Oracle products are used in a number of industries: financial services, telecommunications, defense, manufacturing, energy, government, health care, retail and transportation.

Oracle markets its products and services through its own sales and service organization, Oracle USA. Internationally, Oracle markets its products through distributors and subsidiaries, as well as through OEMs, value-added resellers, systems integrators and independent software vendors.

f. Strategic Alliances

Oracle maintains a variety of alliances and partnerships. The Cooperative Services Initiative (CSI) program teams Oracle with Big 6 consultants, systems integrators, hardware vendors and system management tool providers to build a comprehensive set of open implementation services for Oracle Cooperative applications.

Many alliances exist with companies such as Hewlett-Packard and Datalogix to provide applications solutions.

Oracle formed an alliance with Capital Cities/ABC Inc. to create interactive products for the information superhighway.

Oracle has an alliance with the Washington Post Co. to jointly create interactive products for the information superhighway.

2. Computer Associates International, Inc.

One Computer Associates Plaza
Islandia, NY 11788-7000
Phone: (516) 342-5224
Fax: (516) 342-5329

Chairman: Charles B. Wang
Status: Public
Total Employees: 9,000 (12/94)
Total Revenue: $2,622,922,000 (12/94)

Fiscal Year End: 3/31/95

a. Key Points

- Computer Associates International (CA) is the world's leading independent software provider of systems management, database management, application development and business applications software products.
- With its acquisition of LEGENT Corporation in July, 1995, CA expanded its systems software offerings in the management of enterprise distributed systems.
- CA is the world's leading multiplatform vendor.
- CA's fiscal 1995 financials reflected a continued increase in productivity.
- In December 1995, CA announced its ICE (Internet Commerce Enabled) family of solutions that provide the infrastructure required for mission-critical Internet applications.
- During fiscal 1995, CA Unicenter established itself as the industry standard for systems management across all platforms.

b. Company Strategy

CA's strategy is to provide its clients with corporate-wide software solutions through internal development, technology acquisition and extensive product integration. Its software solutions are designed to help clients evolve to client/server and distributed computing across desktop, midrange and mainframe computers. This is accomplished through adherence to CA's unique software blueprint—CA90s, Computing Architecture for the 90s. This layered architecture is the blueprint for the continuing development of all CA software and enables clients to choose the hardware platform of their choice (or even a combination of hardware platforms), based upon their distributed or cooperative processing requirements.

c. Financials

CA's fiscal 1995 revenue reached more than $2.62 billion, a 22% increase over fiscal 1994 revenue of nearly $2.15 billion. Net income rose 8%, from $401.3 million in fiscal 1994 to $431.9 million in fiscal 1995. Fiscal 1995 results include $249.3 million in charges associated with write-offs for purchased research and development associated with the acquisition of the ASK Group, Inc.

Increased revenue was attributed to licensing fees on the midrange platform as well as modest increases in product revenue from mainframe-based systems management products. The midrange platform increase was due chiefly to the success of the company's UNIX-based systems management product—CA Unicenter—as well as integration of the ASK/Ingres products acquired in June 1994. The continued demand for Enterprise Licensing alternatives and less restrictive pricing options affording clients licensing flexibility also contributed to revenue growth.

d. Key Products and Services

CA offers more than 300 systems and applications software products for a range of mainframe, midrange and desktop computers from many different hardware manufacturers. Products are organized into three categories: distributed systems management software, application development and database management software, and business applications software. Systems management software supports automated data center operations. Products are available for a range of operating environments. These products are organized into functional areas and support total data center automation. Functional areas supported include the following:

- Distributed Client/Server Solutions with CA Unicenter as the flagship product
- Automated Product Control

- Security, Control and Audit
- Automated Storage Management
- Data Center Administration
- Performance Management and Accounting
- Conversion

Application development and database management software improves productivity by integrating relational databases, repository services, integrated CASE tools and application generators.

Information management and application development products include the following:

- CASE Technologies
- COBOL and Testing Tools
- DB2 Tools
- Enterprise Information Solutions
- Application Development
- Life Cycle Management

LEGENT's products fall into three broad categories:

- Distributed systems management, including multiplatform agent-based management tools, client/server help desk and problem management, distributed storage management, cross-platform connectivity technology, performance and capacity planning and operations management
- Distributed data management, including multiplatform software distribution, data transfer and warehouse-enabling technology
- Application management, including multiplatform version control, change management and application configuration

e. Industry Markets and Clients

CA services and supports more than 10,000 clients worldwide. Included are 93 of the world's largest 100 companies, and more than 90% of the Fortune 500. Clients represent a wide range of industries, including manufacturers,

banks, computer and electronics companies, food and beverage companies, retailers and health care companies.

f. Strategic Alliances

CA distributes, markets and supports its products on a worldwide basis with its own employees and a network of independent value-added resellers, distributors and dealers. CA has approximately 3,700 sales and support personnel promoting and licensing CA's products to clients.

In August 1995, CA introduced the CA VARsity Club program. Resellers, consultants and independent software vendors who qualify for the program are authorized to sell the entire suite of CA client/server software and receive extended support and sales incentives.

Recent alliances include the following:

- In December 1995, CA announced a wide-ranging agreement with Netscape Communications Corporation. CA and Netscape will integrate CA Unicenter/ICE with Netscape's core server product to offer capabilities for conducting business over the Internet and other TCP/IP-based networks.

- CA and Microsoft will Internet-enable their C-branded integrated product (CA Unicenter/ICE with Microsoft Windows NT Server and Microsoft Internet Information Server), which manages Window NT servers.

- CA and Dataware Technologies announced a joint marketing agreement to cross-license CA-OpenIngres and Total Recall for BRS/Search.

- CA has a global development and marketing agreement with Mosaix Technologies Limited (MXL) to deliver a complete spatial development environment by enabling MXL's spatial client application development tool, Mosaix, to work seamlessly with CA-OpenIngres.

- CA and Sun will jointly market and support a co-branded product to be manufactured by CA, that will include CA-Unicenter, CA-OpenIngres and Solstice SunNet Manager.

3. Informix Software

4100 Bohannon Drive
Menlo Park, CA 94025
Phone: (415) 926-6300
Fax: (415) 926-6593

Chairman: Phillip White
Status: Public
Total Employees: 2,200 (12/94)
Total Revenue: $468,697,000 (12/94)

Fiscal Year End: 12/31/94

a. Key Points

- Informix provides database technology to build, deploy, run and evolve applications.
- In January 1995, Informix acquired the database division of ASCII Corporation of Tokyo (Japan).
- In December 1994, Informix formed a data warehousing alliance with Hewlett-Packard to provide client/server-based data warehousing solutions.
- In August 1994, Informix agreed to license and embed Tivoli Systems' TME Architecture into its INFORMIX-OnLine Dynamic Server.

b. Company Background and Strategy

Informix Software, founded in 1980, designs, develops, manufactures, markets and supports distributed database management systems, and object-oriented graphical- and character-based applications development tools for delivering information to most desktop platforms. The company also offers training, consulting and maintenance services to its customers.

Informix's primary strategy is to address customer needs through core product technology that delivers real-world solutions. The goal is to deliver the right technology to customers worldwide, through the company's own direct sales efforts as well as distribution channels and strategic partnerships.

Informix believes in making strategic investments in leading technology companies in an effort to complement its own product development strategies. Informix's product strategies are focused on two key areas:

- Continuing the Dynamic Scalable Architecture (DSA) database technology launch by working on new releases of the OnLine Dynamic Server

- Bringing to market the next generation of database application tools with the release of the new object-oriented application development technology

c. Financials

Total 1994 revenue reached $468.7 million, a 33% increase over 1993 revenue of $352.9 million. Revenue growth during 1994 can be attributed to the continued demand for the company's database servers and connectivity products. In 1994, database servers, connectivity and tools products accounted for substantially all license revenues. The company also released several products that provide market-specific extensions and enhancements to the 4GL application development tools family.

d. Key Products and Services

Informix's product offerings include database servers and application development tools for creating client/server on-line transaction processing (OLTP) production applications, decision support systems and *ad hoc* query interfaces and connectivity software.

Database servers include the following:

- INFORMIX-OnLine Dynamic Servers
- INFORMIX-OnLine Servers
- INFORMIX SE
- C-ISAM

Connectivity products include:

- INFORMIX STAR
- INFORMIX-NET
- INFORMIX-Gateway
- INFORMIX RP/XA
- INFORMIX-Enterprise Gateway
- INFORMIX DCE/NET

End user information access tools include:

- INFORMIX-New Era products
- INFORMIX 4GL product family
- INFORMIX HyperScript Tools

- INFORMIX SQL
- INFORMIX ESQUL
- INFORMIX-Ada/SAME

Informix provides maintenance, consulting and support services.

e. Industry Markets and Clients

Major market sectors served include: finance, manufacturing, retail, telecommunications, hospitality, health care, oil and gas, media, transportation and government. Major clients include Visa International, United Airlines, Holiday Inn, GTE Telephone Operations (GTE) and Home Depot. Informix distributes its products through channels of direct user licensing, OEMs, VARs addressing specific markets, systems integrators, distributors and dealers.

f. Strategic Alliances

A sampling of Informix's strategic alliances is given below:

- Informix acquired ASCII Corporation's database division in Japan through a joint venture formed with ASCII Corporation.

- Informix formed a joint development and marketing agreement with Texas Instruments to integrate the TI Composer application development tool with the INFORMIX-OnLine Dynamic Server.

- Informix formed an alliance with Hewlett-Packard to provide client/server-based data warehousing solutions.

- Informix entered into an agreement with Tivoli Systems, under which Informix can license and embed Tivoli's TME Architecture into its INFORMIX-OnLine Dynamic Server.

4. Platinum Technology

1815 South Meyers Rd.
Oakbrook Terrace, IL 60181
Phone: (708) 620-5000
Fax: (708) 691-0710

Chairman: Andrew J. Filipowski
Status: Public
Total Employees: 2,050 (8/95)
Total Revenue: $195,719,000 (12/94)

a. Key Points

- Platinum is focused on providing software and consulting services to address the need for open solutions in today's heterogeneous computing environment.
- Platinum is using a combination of internal development and acquisition to assemble an integrated set of open enterprise systems solutions.
- The company has acquired a number of businesses offering open systems products and data warehousing.
- Key acquisitions include the following:
  - Trinzic: Data warehousing, application development tools and open systems tools
  - Altai: Integrated automated operations software for open computing
  - Answer: A provider of client/server help desk solutions
  - Locus: A consulting company focused in information technology users.

b. Company Background and Strategy

Platinum Technology provides systems software products and related consulting services. Types of products include systems management, data warehousing, application development tools and database management products. Platinum's initial success was as a provider of tools and utilities for DB2. Platinum's overall strategy today is to be a market leader for systems software products within an open systems architecture. It has been aggressive in acquiring complementary businesses and developing alliances with other companies offering related products and services. Its acquisition strategy has focused on companies that offer systems management and data warehousing for an open systems environment.

c. Financials

Total 1994 revenues were $195,719,000, which represents a 27% increase over 1993 revenues. North American revenues accounted for 82% of the total; international revenues were 18%. Revenue increases in 1994 were primarily attributable to continuing expenditures for DB2 products and revenue from Platinum's open enterprise products.

d. Key Products and Services

Platinum's overall approach is referred to as the Platinum Open Enterprise Management System strategy, or POEMS. This strategy involves providing specific point solutions in the areas of systems management, data warehousing application development, database management and business intelligence. The POEMS strategy is an open systems approach focused on integration of systems. Platinum plans to release the POEMS architecture, which will provide integration of all Platinum's point products along with solutions from other vendors. Included in its product plans is a data warehouse product, and to that end Platinum acquired Trinzic, which offers a variety of data warehouse products.

Platinum's products can be used within the following operating systems:

- UNIX
- Windows
- IBM MVS, OS/2 and OS/400

It supports the major database products from IBM, Oracle, Sybase, Informix and Microsoft.

e. Industry Markets and Clients

Platinum markets its products to large Fortune 1000 companies in a variety of industries, including banking and finance, consumer products, technology, government, health care and other sectors. Products are marketed both directly and through VARs and OEMs.

f. Strategic Alliances

To achieve Platinum's goal of providing solutions to customers within the open enterprise, the company believes that alliances are crucial. Alliances with vendors such as IBM, Oracle, Sybase, Informix and Tivoli provide access to related products in development by other vendors. Alliances are both marketing and technically focused.

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Conclusions and Recommendations

The software industry in general is expected to continue to enjoy healthy rates of growth in the next five years. Yet there are ongoing changes occurring in the requirements for and usage of information technology as businesses evolve and technological capabilities grow. With change comes maturing of some segments of the market and sizable growth in others. This section considers the trends, issues, changes, competitive environment, forecasts and analyses documented in earlier chapters, and offers conclusions regarding the marketplace and recommendations for systems software vendors. The conclusions and recommendations are summarized in Exhibits VI-1 and VI-2.

A Conclusions

Distributed Processing via Client/Server Architecture Is Becoming a Reality for Some Mission-Critical Applications—Client/server computing is poised to move beyond decision support and departmental applications to handling enterprise-wide applications that have long been considered mission critical within organizations. This development changes the whole complexion of systems software products, as companies begin to demand rigorous and integrated systems and network management. Application management will become far more complex as applications become distributed throughout the organization. Middleware, including transaction monitors, will be critical to maintaining adequate response times and functionality. Data warehousing and OLAP are also becoming more in demand to allow decision makers to manipulate enterprise-wise data in a timely manner.

Systems Management Is a Critical Concern in the Client/Server Environment—As systems (and therefore data) become less centralized, managing these distributed systems will be an increasingly important issue. Vendors are recognizing this and are addressing this need through

frameworks that integrate multivendor product offerings, integrated single vendor offerings and through point solutions. Alliances have been announced between vendors of desktop and minicomputer/mainframe products to provide integrated management throughout the organization. However, these integrated offerings are still at the very early stages.

Network, Systems, Applications and Data Management Will Become Integrated Under the Umbrella of Systems Management—Systems management must become more integrated, not only to include desktop, departmental and enterprise systems, but also among the many functions that must be managed within a client/server environment. In a distributed network, the difference between systems and network management blurs as systems become distributed across a network. Such distribution requires tighter management of applications, including application distribution and performance management. These aspects have traditionally been handled by software from the applications vendors. However, distributed applications are often more complex than those found on a single platform, requiring new types of systems management software. Such software should report system errors at the application level so that users can fix problems. Other application management software product opportunities include performance optimization, software updating, user management, security and backup.

Applications Solutions for Client/Server Environments Have Become More Widely Available—One of the key reasons that many mission-critical applications have remained centralized on the mainframe for so long has been the lack of available third party software. Many companies have developed their own complex systems and retained sizable staffs focused on maintaining those systems. In some industries, companies that may have considered purchasing software as an alternative have found no acceptable options to meet their specific, unique needs. Applications solutions vendors have made some significant strides in this area in recent years. Companies such as SAP and Peoplesoft have developed software to operate in a client/server environment that addresses such mission-critical application areas as finance, manufacturing and human resources. The availability of such products, along with pressure to minimize staffing costs, has been driving some businesses to adopt a client/server architecture.

More Sophisticated Application Development Tools, Beyond Visual 4GL, Will Be Required for Enterprise Applications To Be Developed for a Distributed Environment—Distributed applications create greater complexity compared with centralized processing. In addition, distributing mission-critical applications adds even greater complexity that requires a new and more sophisticated level of systems management. These systems management activities, along with the business applications themselves, will require sophisticated tools. The visual tools that have been so successful in developing departmental applications are limited in addressing needs at this

higher level. True object-oriented tools will be in demand as growth in distributed enterprise systems continues.

Exhibit VI-1

Conclusions

- The integration of workgroup and enterprise systems continues to increase in importance.
- Applications solutions for the client/server environment have become more widely available.
- Systems management is a critical concern in client/server computing.
- Distributed processing via client/server architecture is becoming a reality for some mission-critical applications.
- Network, systems, applications and data management are becoming integrated under the umbrella of systems management.
- More sophisticated application development tools beyond visual 4GL are required for these distributed applications.

Source: INPUT

B
Recommendations

Based on these conclusions, INPUT has the following recommendations for vendors of systems software products:

Develop Alliances with Key Vendors that Offer Complementary Products and Services—Even the largest and most successful software vendors are realizing that it is impossible to single-handedly provide a total solution to customers. Microsoft, with its dominance in the desktop arena, has recognized the need for alliances as it moves beyond the desktop into the enterprise. Its strength in providing operating systems, systems management and application development tools at the desktop level must be linked with products from vendors whose strengths lie in the UNIX or mainframe arena. IBM has recognized that it must move beyond its proprietary environment and likewise is developing alliances with those that provide cross-platform integration or otherwise complement its own product set. Requirements are complex, with multiple platforms within organizations. Clearly, the winners will be those that not only capitalize on their own strengths, but also recognize their weaknesses and develop alliances to strengthen their competitive positioning.

Develop/Offer Products To Address the Need for Integrated Systems Management—This is a key area of need being addressed early in the game by vendors such as Tivoli and Platinum Technology. These early leaders are being successful by meeting the demand of an as-yet-untapped market. This opens up opportunities to other vendors to address these requirements as more and more businesses migrate critical applications into the client/server world. Traditional leaders in the systems and network management arena, such as Hewlett-Packard and IBM, are recognizing this need and are moving quickly to address it. Integrating enterprise and desktop systems will once again require alliances between key vendors dominating these areas of computing.

Adopt Application Development Tools To Address Sophisticated Needs for Enterprise Systems—High-technology vendors in general, and systems software companies in particular, need to be continually looking ahead to the next trend to ensure that products are not obsolete when the next generation of requirements comes along. The industry is now in a transition period—the market for the visual 4GL tools that have served users so well is maturing, yet true object technology has not yet taken off due to technology, cost and standardization issues. Vendors need to develop and apply tools that can address more sophisticated requirements, yet conform to emerging standards. Also, ease of use, training issues and affordability must be taken into account. *De facto* standards must also be taken into account in an environment where no clear-cut standard has yet emerged.

Vendors of Enterprise Systems and Desktop Product Vendors Need To Plan Integration Strategy—As noted earlier, IBM's huge success in the mainframe world did not make for easy going in offering PC products and services. Likewise, Microsoft—which has dominated the desktop—is now developing an enterprise strategy. For both of these vendors, and for others, it is no longer enough to focus solely on one level of computing—the business world has moved past considering the enterprise and desktop as separate worlds and now plans and expects integration between these two environments.

Conform To Open Standards—With the exception of Microsoft's dominance on the desktop, the days of proprietary systems are limited. Today's user is likely to make use of a best-of-breed approach, with multiple platforms and systems the order of the day. UNIX has gained favor over the years as an open solution; most of the primary hardware vendors having gotten into the UNIX market. Vendor products that conform to open standards will offer advantages in the future.

Embrace the Internet as the Platform of the Future and Develop Products and Services that Are Internet-Based—The Internet has become a phenomenon in the information systems industry. Users are continually finding new ways to leverage its capabilities and vendors are scrambling to find an Internet

niche. Clearly, it is changing the way we do business and offering new opportunities for communication and information distribution. Systems software vendors have just begun to recognize opportunities to make use of the Internet for application development. Companies that are leaders in developing Internet-based products will benefit from the huge popularity of the network, and also insure their competitive positioning in the future if Internet services begin to erode some traditional systems software sectors.

Exhibit VI-2

Recommendations

- Develop alliances with key vendors that offer products/services that are complementary.
- Develop/offer products designed to address needs for integrated systems management.
- Adopt application development tools to address sophisticated needs for enterprise systems.
- Desktop product vendors need to integrate with enterprise systems.
- Adopt and conform to open standards.
- Embrace the Internet as a platform for the future and develop products and services that are Internet-based.

Source: INPUT

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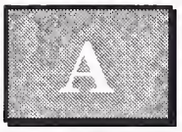

Forecast and Database Reconciliation

A
Forecast Database

Exhibit A-1 presents the detailed 1994 actual and 1995-2000 forecast for the U.S. systems software market, by product/service category.

Exhibit A-2 offers the same forecast data segmented by platform.

Exhibit A-1

Systems Software Products
Market Forecast by Product/Service Category, 1995-2000

Product/Service Category	1994 ($)	Growth 94-95 (%)	1995 (%)	1996 (%)	1997 (%)	1998 (%)	1999 (%)	2000 (%)	CAGR 95-00 (%)
Total Systems Software	23,845	10%	26,212	28,753	31,618	34,876	38,735	43,290	11%
Systems Control Products	7,204	4%	7,470	7,732	7,984	8,261	8,549	8,848	3%
- Mainframe	2,490	-6%	2,340	2,176	2,005	1,825	1,650	1,470	-9%
- Minicomputer	2,390	5%	2,515	2,616	2,694	2,761	2,816	2,872	3%
-Workstation/PC	2,324	13%	2,615	2,940	3,285	3,675	4,083	4,506	11%
Operations Management Tools	6,135	10%	6,730	7,319	7,958	8,661	9,501	10,525	9%
- Mainframe	3,160	7%	3,370	3,525	3,626	3,699	3,773	3,850	3%
- Minicomputer	2,010	8%	2,170	2,330	2,510	2,695	2,895	3,115	7%
-Workstation/PC	965	23%	1,190	1,464	1,822	2,267	2,833	3,560	25%
Applications Development Tools	10,506	14%	12,012	13,702	15,676	17,954	20,685	23,917	15%
- Mainframe	3,825	4%	3,978	4,097	4,179	4,220	4,262	4,264	1%
- Minicomputer	3,191	11%	3,550	3,976	4,495	5,122	5,916	6,833	14%
-Workstation/PC	3,490	28%	4,484	5,629	7,002	8,612	10,507	12,820	23%

Source: INPUT

Exhibit A-2

Systems Software Products
Market Forecast by Platform, 1995-2000

Product/Service Category	1994 ($)	Growth 94-95 (%)	1995 (%)	1996 (%)	1997 (%)	1998 (%)	1999 (%)	2000 (%)	CAGR 95-00 (%)
Total Systems Software	23,845	10%	26,212	28,753	31,618	34,876	38,735	43,290	11%
Systems Control Products	9,475	2%	9,688	9,798	9,810	9,744	9,685	9,584	0%
- Mainframe	2,490	-6%	2,340	2,176	2,005	1,825	1,650	1,470	-9%
- Minicomputer	3,160	7%	3,370	3,525	3,626	3,699	3,773	3,850	3%
- Workstation/PC	3,825	4%	3,978	4,097	4,179	4,220	4,262	4,264	1%
Operations Management Tools	7,591	8%	8,235	8,922	9,699	10,578	11,627	12,820	9%
- Mainframe	2,390	5%	2,515	2,616	2,694	2,761	2,816	2,872	3%
- Minicomputer	2,010	8%	2,170	2,330	2,510	2,695	2,895	3,115	7%
- Workstation/PC	3,191	11%	3,550	3,976	4,495	5,122	5,916	6,833	14%
Applications Development Tools	6,779	22%	8,289	10,033	12,109	14,554	17,423	20,886	20%
- Mainframe	2,324	13%	2,615	2,940	3,285	3,675	4,083	4,506	11%
- Minicomputer	965	23%	1,190	1,464	1,822	2,267	2,833	3,560	25%
- Workstation/PC	3,490	28%	4,484	5,629	7,002	8,612	10,507	12,820	23%

Source: INPUT

B
Reconciliation

Exhibits A-3 and A-4 provide INPUT's reconciliation of the 1994 and 1999 U.S. market forecasts by subsectors and platforms as noted in the 1994 *Systems Software Products* report.

The 1994 and 1995 market forecasts noted in Exhibits A-3 and A-4 indicate variances for platform and subsector values for the 1994 market ranging from -6% to +8%, with the total systems software products market running 2% above the prior forecast. The operations management market is at the forecast growth level; the applications development tools market is 3% higher overall than projected in the 1994 report.

The principal factor positively impacting the applications development tools market in 1994 was the growth of heterogeneous client/server networks, requiring increased use of application development tools overall and requirements for more sophisticated tools. Increased growth in RDBMSs and development of newer products such as middleware and OLAP also contributed to growth.

The figures projected for 1999 in this report (compared to the 1994 report) show more pronounced variances—from -10% to +57%. These variances generally reflect an upward adjustment in the growth rate for applications development tools at the minicomputer level due to the success of UNIX in

the client/server environment. PC tools have also been adjusted upward (8%). Growth in operations management will be greater than previously expected, especially on the minicomputer. This is attributed to the tremendous expected demand for systems management solutions for enterprise applications.

The pricing pressures for operating systems products at the mainframe level have been more severe than previously anticipated, and INPUT expects these pressures to be an influencing factor in the evolution toward commodity pricing in this market over the next five years. At the minicomputer and workstation/PC levels, projected expenditures in 1999 have been adjusted upward by 30% and 24%, respectively. These can be attributed to growth of the UNIX and MS Windows markets.

Exhibit A-3

Systems Software Products Market Forecast
1995 MAP Database Reconciliation by Product/Service Category

PRODUCT/SERVICE CATEGORY	1994 Market				1999 Market				94-99 CAGR per data '94 Rpt (%)	94-99 CAGR per data '95 Rpt (%)
	1994 Market (Forecast) ($M)	1995 Report (Actual) ($M)	Variance From 1994 Forecast ($M)	Variance From 1994 Forecast (%)	1994 Market (Forecast) ($M)	1995 Report (Forecast) ($M)	Variance From 1994 Forecast ($M)	Variance From 1994 Forecast (%)		
Total Systems Software	23,721	23,845	124	1%	35,046	38,735	3,689	11%	8%	10%
Systems Control Products	7,271	7,204	-67	-1%	7,295	8,549	1,254	17%	0%	3%
- Mainframe	2,635	2,490	-145	-6%	1,833	1,650	-183	-10%	-7%	-8%
- Minicomputer	2,357	2,390	33	1%	2,174	2,816	642	30%	-2%	3%
- Workstation/PC	2,279	2,324	45	2%	3,288	4,083	795	24%	8%	12%
Operations Management Tools	6,156	6,135	-21	0%	9,551	9,501	-50	-1%	9%	9%
- Mainframe	3,204	3,160	-44	-1%	4,089	3,773	-316	-8%	5%	4%
- Minicomputer	1,997	2,010	13	1%	2,548	2,895	347	14%	5%	8%
- Workstation/PC	955	965	10	1%	2,914	2,833	-81	-3%	25%	24%
Applications Development Tools	10,294	10,506	212	2%	18,200	20,685	2,485	14%	12%	15%
- Mainframe	3,899	3,825	-74	-2%	4,744	4,262	-482	-10%	4%	2%
- Minicomputer	2,955	3,191	236	8%	3,771	5,916	2,145	57%	5%	13%
- Workstation/PC	3,440	3,490	50	1%	9,685	10,507	822	8%	23%	25%

Source: INPUT

Exhibit A-4

Systems Software Products Market Forecast
1995 MAP Database Reconciliation by Platform

PLATFORM	1994 Market				1999 Market				94-99 CAGR per data '94 Rpt (%)	94-99 CAGR per data '95 Rpt (%)
	1994 Market (Forecast) ($M)	1995 Report (Actual) ($M)	Variance From 1994 Forecast ($M)	Variance From 1994 Forecast (%)	1994 Market (Forecast) ($M)	1995 Report (Forecast) ($M)	Variance From 1994 Forecast ($M)	Variance From 1994 Forecast (%)		
Total Systems Software	23,721	23,845	124	1%	35,046	38,735	3,689	11%	8%	10%
Mainframe	9,738	9,475	-263	-3%	10,666	9,685	-981	-9%	2%	0%
- Systems Control Products	2,635	2,490	-145	-6%	1,833	1,650	-183	-10%	-7%	-8%
- Operations Managem'nt Tools	3,204	3,160	-44	-1%	4,089	3,773	-316	-8%	5%	4%
- Applications Developm'nt Tools	3,899	3,825	-74	-2%	4,744	4,262	-482	-10%	4%	2%
Minicomputer	7,309	7,591	282	4%	8,493	11,627	3,134	37%	3%	9%
- Systems Control Products	2,357	2,390	33	1%	2,174	2,816	642	30%	-2%	3%
- Operations Managem'nt Tools	1,997	2,010	13	1%	2,548	2,895	347	14%	5%	8%
- Applications Developm'nt Tools	2,955	3,191	236	8%	3,771	5,916	2,145	57%	5%	13%
Workstation/PC	6,674	6,779	105	2%	15,887	17,423	1,536	10%	19%	21%
- Systems Control Products	2,279	2,324	45	2%	3,288	4,083	795	24%	8%	12%
- Operations Managem'nt Tools	955	965	10	1%	2,914	2,833	-81	-3%	25%	24%
- Applications Developm'nt Tools	3,440	3,490	50	1%	9,685	10,507	822	8%	23%	25%

Source: INPUT