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Semiconductors

Worldwide Semiconductor Five-Year Forecast—Fall 1996

A Market Trends Report

The semiconductor industry, by product and geographic region, is forecast over the five years from 1996 through 2000. Each region is examined individually, and forecast assumptions are provided. Products are grouped into the major categories of memory ICs, microcomponent ICs, logic ICs, analog ICs, discrete devices, and optical semiconductors.

Price: $2,495
Product Code: SEMI-WW-MT-9603
Publication Date: November, 1996

1995 Semiconductor Market by Product

A Market Trends Report

This report consolidates the product, technology process, forecast, and market share data of the six product categories-memory, microcomponents, logic, analog, discrete, and optical semiconductors. Hybrid IC data is included to complete the total semiconductor review. The product forecasts contain historical data from 1994 with estimated projections through 2000. Company-related market share data will cover 1994 and 1995.

Price: $2,495
Product Code: SEMI-WW-MT-9602
Publication Date: August, 1996

European Semiconductor Purchasing Trends 1996—1997

A User Perspective Report

This report summarizes the results of the 1996 European procurement survey that was conducted by Dataquest's European Semiconductor Group during March and April 1996. This section of the report overviews the market conditions faced by the purchasing community this year, and summarizes the main results of the survey.

Price: $2,495
Product Code: SEMI-EU-UW-9601
Publication Date: July, 1996

Midyear 1996 Forecast: Capital Spending, Wafer Fab Equipment, and Silicon

A Market Trends Report

Dataquest provides historical market sizing, forecasts of market segments through year 2001, product technology trends, and overall analysis of the competitive landscape for the semiconductor equipment, manufacturing, and materials industry. Forecasts for semiconductor production and capital spending on a regional basis are provided, with a discussion of investment trends in semiconductor manufacturing.

Price: $2,495
Product Code: SEMM-WW-MT-9602
Publication Date: August, 1996

Consumer Electronics Semiconductor Application Markets

A Market Trends Report

This document provides reference information and analysis about the principal system application markets for semiconductors. It brings forth the basic information about the opportunity offered by particular systems including: system market size in revenue, units, and average selling price; system market and product feature trends; hardware architecture trends and semiconductor device opportunities; semiconductor content and market forecast; and key OEMs. The application markets covered in this document include: audio, video, personal electronics, appliance, and other consumer products

Price: $2,495
Product Code: SAMM-WW-MT-9605
Publication Date: October, 1996

Communications Application Markets—Telephones and Mobile Communication

A Market Trends Report

This document provides reference information and analysis about the principal system application markets for semiconductors. It brings forth the basic information about the opportunity offered by particular systems including: system market size in revenue, units, and average selling price; system market and product feature trends; hardware architecture trends and semiconductor device opportunities; semiconductor content and market forecast; and key OEMs. The application markets covered in this document include: corded telephones, cordless telephones, cellular/broadband PCS telephones, pagers, and answering machines.

Price: $2,495
Product Code: SAMM-WW-MT-9604
Publication Date: October, 1996

Communications Application Markets—LAN, WAN, Voice, and Public Systems

A Market Trends Report

This document provides reference information and analysis about the principal system application markets for semiconductors. It brings forth the basic information about the opportunity offered by particular systems including: system market size in revenue, units, and average selling price; system market and product feature trends; hardware architecture trends and semiconductor device opportunities; semiconductor content and market forecast; and key OEMs. The application markets covered in this document include: LAN system, modem and fax machine, digital WAN system, videoconferencing system, premise switching and call processing system, and public switching and transmission system.

Price: $2,495
Product Code: CSAM-WW-MT-9601
Publication Date: July, 1996

Data Processing Application Markets

A Market Trends Report

This document provides reference information and analysis about the principal system application markets for semiconductors. It brings forth the basic information about the opportunity offered by particular systems including: system market size in revenue, units, and average selling price; system market and product feature trends; hardware architecture trends and semiconductor device opportunities; semiconductor content and market forecast; and key OEMs. The application markets covered in this document include: personal computers and workstations (including motherboard upgrades and portable computers); midrange computers, mainframe computers, and supercomputers; data storage products, including rigid disk drives (RDDs), optical disc drives, flexible disk drives (FDDs), and tape drives; printers; selected input/output and dedicated systems, including sound boards, graphics boards, digital video boards, monitors, copiers, scanners, and keyboards

Price: $2,495
Product Code: SAMM-WW-MT-9603
Publication Date: August, 1996

Board Design Opportunities

A User Perspective Report

This survey was conducted to identify major trends in electronic systems design and to explore how these trends may impact the semiconductor opportunities in those systems. This report is intended to provide a valuable snapshot, from a semiconductor user's point of view, of current and future system design requirements and the applications driving semiconductor usage. Understanding the needs and challenges of the current and emerging electronic system designer enables the semiconductor and design tool vendors to target their market more strategically.

Price: $2,495
Product Code: SAMM-WW-UW-9601
Publication Date: October, 1996

Compute Microprocessor Market Trends and Forecast

A Market Trends Report

Vendors fortunate enough to have gained admission to the mainstream compute microprocessor market have all the privileges that accrue to members of any elite society. They collect the highest revenue per square inch of delivered silicon accorded any semiconductor vendor. Their customers, and more importantly, their customers' customers, continue to show even greater brand loyalty (or at least architectural loyalty) than almost any other consumer group. As long as these vendors and their partners can find new customers, or persuade old customers that their old systems are too slow, the sun continues to shine on them. This report provides the overview of both CISC and RISC microprocessors. Forecast data is also included through 2000.

Price: $2,495
Product Code: PSAM-WW-MT-9604
Publication Date: September, 1996

Audio Chips Let PCs be Heard and Not Just Seen

A Focus Report

This document provides an overview of the market for PC audio chips. It shows a generic block diagram for an audio subsystem, identifies major trends for new features in these chips, and highlights the changing ways that PC OEMs are adding audio chips to their systems. It provides an overview of the five largest PC audio chip vendors, holds the market share statistics and analysis, and presents the forecast for PC audio chips through the year 2000.

Price: $1,295
Product Code: PSAM-WW-FR-9602
Publication Date: September, 1996

The Microcontroller Forecast - A Mixed Bag, Then Back on the Track

A Market Trends Report

This report presents Dataquest's analysis of the microcontroller market of 1995 as well as Dataquest's forecast for microcontrollers over the next five years. The forecast is backed by extensive research and in-depth analysis of product characteristics, market dynamics, and end equipment. Various breakdowns of the market are given for classifications of 4-bit, 8-bit, and 16-bit microcontrollers, with tables and graphs of revenues and unit shipments given, as well as the applications of those microcontrollers. Trends in the marketplace are analyzed, along with the conditions that will influence their outcome.

Price: $2,495
Product Code: MCRO-WW-MT-9603
Publication Date: September, 1996

Microprocessor Forecast and Embedded Microprocessor Trends through the Year 2000

A Market Trends Report

This report presents Dataquest's forecast for the microprocessor market over the next five years, with special attention on those microprocessors going into embedded application markets. This forecast is backed by extensive research and in-depth analysis of product characteristics, market dynamics, and end equipment. Various breakdowns of the market are given for classifications of 8-bit, 16-bit, 32-bit complex-instruction-set computers (CISC) and 32-bit reduced-instruction-set computers (RISC) microprocessors. Tables and graphs of revenue, unit shipments, and average selling prices (ASPs) are given for embedded as well as for the total microprocessor market. Particular microprocessor architectures are spotlighted where they are sufficiently significant, although not all architectures are itemized. Trends in the marketplace are analyzed, along with the conditions that will influence their outcome.

Price: $2,495
Product Code: MCRO-WW-MT-9602
Publication Date: September, 1996

LAN, WAN, Voice, and Broadband Communications Semiconductor Device Forecast

A Market Trends Report

This document presents Dataquest's view of the market opportunity for semiconductors used in wireline communications system applications. These applications include local area network (LAN) systems, wide area network (WAN) systems, premises voice-based systems, and public transmission and switching systems. Devices covered include communications system-specific devices that embody some dedicated standard or functionality.

Price: $2,495
Product Code: CSAM-WW-MT-9602
Publication Date: September, 1996

North American Semiconductor Price Outlook: Fourth Quarter 1996

A Pricing Trends Report

This document provides information on and forecasts for the North American bookings prices of more than 200 semiconductor devices, including logic, microprocessor, memory, gate array, CBIC, and CMOS PLD. Dataquest collects price information on a quarterly basis from North American suppliers and major buyers of these products. This document includes associated long-range forecasts.

Price: $2,495
Product Code: SPSG-WW-MS-9604
Publication Date: September, 1996

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Electronic Newsletter -- Weekly News and Commentary on Semiconductor Industry Events

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- ☐ **DRAM Product/Market Update 1996: Is Allocation a Thing of the Past?** ($1,295, SPSGWWDP9608)

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Computer Systems and Peripherals

PC Market Update: No Lack of Challenges for PC Industry

A Market Trends Report

Personal computer manufacturers must compete globally in order to grow and maintain or improve their positions within the industry. This report provide top-level market information for Japan, Western Europe, U.S., and Latin America. Updated forecast data is provided by packaging type, microprocessor type, market sector, and region. Major vendors' market share and analysis are also included.

Price: $2,495
Product Code: PCIS-WW-MT-9601
Publication Date: August, 1996

U.S. Distribution Channel Trends

A Market Trends Report

The U.S. distribution channels are highly segmented and the channels have evolved to a point where they are specialized providers to selected market segments. This document will discuss the trends for the various distribution channels that exist within the United States. Later documents will cover additional regions of the world. In examining U.S. distribution channels, market trends, history, and forecast will be evaluated for three platforms:1) Desktop/Deskside-a combination of these two form factors; 2) Mobile-notebooks, ultraportables, laptops, and transportables; 3) PC server-uniprocessor systems that are positioned and marketed as dedicated servers by the system manufacturer. Each of these platforms will be segmented by the distribution channels that are used for the U.S. market.

Price: $2,495
Product Code: DCPC-WW-MT-9601
Publication Date: August, 1996

Personal Computers in Small Business

A User Perspective Report

This survey has focused on some of the top-level attributes and purchasing patterns of three classes of small business: very small business having 1-19 employees, transition business having 20-49 employees, and growth business having 50-100 employees. This report specifically has focused on the desktop PC purchases of these groups.

Price: $2,495
Product Code: PCIS-WW-UW-9601
Publication Date: September, 1996

Affordability vs. Relevance: The Home PC Market—Europe

A Focus Report

This report presents Dataquest's view of the state of the market and its expected development during 1996. Key drivers of the home market are examined, including end-user demand, new technologies, a comparison of vendors' products and offerings, and vendors' success in selling through retail, the main channel serving this market. The report also considers: 1) current and potential size of the European PC market; 2) strengths and weaknesses of industry competitors; 3) effects of the video-game industry on the sale of PCs; 4) upcoming technology for home PCs and current penetration of CD-ROMs; 5) PC sales by Internet; 6) to what extent vendors should provide warranty; 7) vendors' strategy to benefit from opportunities in the home market.

Price: $2,495
Product Code: PCIS-EU-FR-9601
Publication Date: September, 1996

Mobile Computing Joins Mainstream, to Grow with Overall Market

A Market Trends Report

The 1996 Mobile Computing Worldwide Trends report examines the mobile computing industry from the computer perspective. The form factors that Dataquest classifies as mobile computers range from transportable PCs to handheld computers. This report analyzes the results of 1995 in addition to providing forecasts through 2000.

Price: $2,495
Product Code: MBLC-WW-MT-9601
Publication Date: July, 1996

Mobile Computing in the Small Business Enterprise

A User Perspective Report

The purpose of this study is to provide a "snapshot" of mobile computing trends in the small business sector. It is hoped that hardware, software, and peripherals vendors who review this document will derive an understanding of past and current installations of mobile PCs, past and future purchase considerations, as well as customer reasons for and against the purchase of mobile computing technologies.

Price: $2,495
Product Code: MBLC-WW-UW-9601
Publication Date: August, 1996

The State of the Technical Desktop

A User Perspective Report

The objective of this research is to determine current user patterns in advanced desktops and to understand the differences among the various classes of systems in this market. These patterns include the hardware and operating system selection, system configuration, usage behavior of select features, and satisfaction/importance concerning workstations or high-end PCs.

Price: $2,495
Product Code: WKST-WW-UW-9601
Publication Date: September, 1996

Advanced Desktops and Workstations Europe—Trends and Forecasts

A Market Trends Report

This Market Trends covers some of the major trends affecting the European advanced desktop and workstation market and its various segments. Technological developments, competitive forces and other factors driving the market are examined. A set of forecasts is included towards the end of the document and is used as a basis for an analytical outlook at the future prospects of workstation vendors.

Price: $2,495
Product Code: WKST-EU-MT-9601
Publication Date: August, 1996

Client/Server Computing: Fault Tolerance, High Availability, and the Web Take Center Stage

A User Perspective Report

The intent of this study was to capture a snapshot of the client/server environment through a series of interviews with end users. User sites were chosen randomly, without any prequalification based on the size of the company or the extent of its client/server implementation. Readers of this survey should not extrapolate these findings as being representative of the client/server user community in total. The findings represent the current situation of a small set of end users and the strategies they have developed that are specific to their environments.

Price: $2,495
Product Code: SRVR-WW-UW-9601
Publication Date: November, 1996

1996 Economic Review—Europe

A Market Trends Report

This report provides a summary of the key economic indicators for leading countries from 1996 to 1997. It is not an in-depth analysis but, rather, is designed to provide top-level insight into the main trends affecting those countries and regions where information technology (IT) and telecommunications companies are active. Ultimately, the state of a country's economy will have an impact on spending levels for IT services. Data for this survey were collated from a number of eminent sources to provide Dataquest's best estimate of worldwide economic trends.

Price: $2,495
Product Code: CSYS-EU-MT-9601
Publication Date: July, 1996

European Computer Market Trends and Forecasts

A Market Trends Report

In this Market Trends, Dataquest discusses some of the major trends in the European computer and client/server systems market. A summary is given of our main observations during 1995, together with an overview of our expectations for the market in 1996 and beyond.

Price: $2,495

Product Code: CSYS-EU-MT-9602
Publication Date: August, 1996

Rigid Disk Drives

A Market Trends Report

In this report, Dataquest provides a quantitative and qualitative analysis of the current state of the RDD industry. The analysis includes how well did the industry perform in 1995 and 1996?; A profile of industry shipments, revenue, and installed base data using historical data for 1991 through 1995 and forecasts for 1996 through 2000; an analysis of the industry by form factor; an analysis of the current state of disk drive technology; a review of disk drive pricing; a review of industry participants and their market share; and unit volume market share data for 1995 and 1996.

Price: $2,495
Product Code: RGID-WW-MT-9601
Publication Date: September, 1996

European Rigid Drives

A Market Trends Report

The rigid storage industry as a whole will continue to grow in unit shipments and factory revenue for the forecast period. Rigid drives will be ranked as the most important storage solution to the European data processing market from a shipment and revenue viewpoint. This report provides the market trends for 1.8-inch, 2.5-inch, 3.0-inch, 3.5-inch, 5.25-inch rigid disk drives. Market shares of manufacturers and distribution channels information are presented. Country-level data is also included.

Price: $2,495
Product Code: RGID-EU-MT-9601
Publication Date: August, 1996

Laser Zone Texturing Machine Market Analysis

A Focus Report

This report covers disk drive technology over the next few years, primarily in the area of components such as heads, disk media, motors, and channels.

Price: $1,295
Product Code: RGID-WW-FR-9601
Publication Date: October, 1996

Removable Disk Drives

A Market Trends Report

This report will address what are the key applications for removable storage, and how will they impact the development and adoption of the next-generation removable technology?; what is the status of current removable storage technologies and companies, and what future developments can we expect from the industry?; and what technology and economic models will be required to gain acceptance within the respective applications?

Price: $2,495
Product Code: RMDD-WW-MT-9601
Publication Date: September, 1996

The 1995 Optical Disk Drive Market

A Market Trends Report

This Market Trends report provides a quantitative and qualitative analysis of the current state of the CD-ROM, optical rewritable, and WORM disk drive industry worldwide. The products covered in this report are CD-ROM drives, CD-Recordable drives, 3.5-inch rewritable optical disk drives, 5.25-inch rewritable optical disk drives. and 12-inch WORM optical disk drives. Dataquest will discuss the market trends and the key issues surrounding the growth of the optical disk drive markets. As the technologies and products gain acceptance in the niche markets, what will propel future growth? What are the future threats? What are new revenue opportunities? This Market Trends document is designed to answer those questions and provide Dataquest's opinions and views on the future direction and outlook of this market.

Price: $2,495
Product Code: OPTI-WW-MT-9601
Publication Date: September, 1996

Tape Drives

A Market Trends Report

The intent of the Tape Drives Market Trends report is to provide a comprehensive analysis of the current and future market for tape drives. In this report, Dataquest examines the total tape drive market and the individual tape drive segments and provides a quantitative and qualitative discussion of each. The key trends and issues for the overall market are also identified, as well as the major issues and competitive influences for each of the technologies.

Price: $2,495
Product Code: TAPE-WW-MT-9601
Publication Date: October, 1996

Back to the Future

A Market Trends Report

This Market Trends report gives an overview of the distribution channels for PCs and printers in Western Europe. Top-level market research data are presented for the major European countries for both PCs and printer products. This report gives country profiles for the seven largest markets, with both analysis and results relating to the structure of each country. The countries covered include France, Germany, Italy, Netherlands, Spain, Sweden, and United Kingdom. It is hoped that these summaries will help European marketing managers to tune their strategies appropriately for the local markets. It also gives an alternative perspective on the way PC products are sold.

Price: $2,495
Product Code: DIST-EU-MT-9601
Publication Date: October, 1996

Desktop & Mobile Weekly Review

Electronic Newsletters -- Weekly News and Commentary on Computer Industry Events

Desktop & Mobile Weekly Review summarizes key announcements in the personal computing industry, including PCs used as servers, advanced desktop systems (Pentium- and RISC-based), desktop and mobile CPUs, and displays. Stories are accompanied by Dataquest's analysis of their significance to the market and players.

Price: $595/year/user—Multiuser Licenses Available
Product Code: DTMB-WW-NT-0000

Client/Server Virtual Views

Electronic Newsletters -- Weekly News and Commentary on Computer Industry Events

Client/Server Virtual Views provides summaries and analyses of top announcements in client/server computing. Topics cover client/server hardware, software, and operating environments. News briefs summarize the event and then provide a sharp recap of Dataquest analysis.

Price: $595/year/user—Multiuser Licenses Available
Product Code: SRVR-WW-NT-0000

Channel Trax

Electronic Newsletters -- Weekly News and Commentary on Computer Industry Events

Channel Trax analyzes computer distribution channels news and events. Stories focus on developments in the distribution of mobile and desktop PCs, advanced desktop systems, workstations, and client/server and midrange computers. These popular electronic newsletters are available via CompuServe and Internet.

Price: $595/year/user—Multiuser Licenses Available
Product Code: DCPC-WW-NT-0000

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- ☐ **Small Business Channels—Choices and Criteria** ($795, DCPCWWDP9607)

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And More...

Document Management

Multifunction Products Market

A Focus Report

The multifunction product (MFP) category contains a wide variety of products that have evolved from different base systems. Some digital copiers have evolved into digital copiers that also print, scan, and/or fax. Some printers have evolved by adding facsimile and copying capabilities. Fax machines have similarly evolved into printers, copiers, and scanners. The MFP market is segmented into three main groups by prime function: copier-based, printer-based, and fax-based. Dataquest also considers the products' target market, sales channel, and end-user perception.

Price: $1,295
Product Code: DMGT-NA-FR-9601
Publication Date: November, 1996

Plain Paper Copier, Page Printer, and Plain Paper Facsimile Supplies Market

A Market Trends Report

Dataquest provides the information on the copier, printer, and facsimile supplies market, such as photoreceptor, toner, developer, and paper supplies. Dataquest includes both history and forecast for the above market segments from 1990 to 2000.

Price: $2,495
Product Code: DMGT-NA-MT-9601
Publication Date: November, 1996

The Use of Color Printers in Business

A User Perspective Report

Dataquest's color printer User Wants and Needs report is based on a telephone survey of U.S. businesses that have purchased one or more color printers in the last two years. The study is designed to uncover the critical issues driving the wants and needs of color printer users.

Price: $2,495
Product Code: PRNT-NA-UW-9601
Publication Date: October, 1996

Color: A Hard Journey With No Crossroads—Just Stop Lights

A Market Trends Report

This report covers Dataquest's recent research into the color copier and color printer markets, providing forecasts and analysis for each of the markets. The document will be a useful tool for all those involved in the market: in particular, players in the copier and printer markets, controller suppliers, finance/leasing companies and supplies companies particularly.

Price: $2,495
Product Code: CLRP-EU-MT-9601
Publication Date: August, 1996

United States Printer Market

A Market Trends Report

This document presents the state of the printer market in the United States and focuses on the various printer technologies—ink jet, page/laser, dot matrix, line impact, and line thermal transfer printer. Five-year forecast and market share data for the various printer segments are also provided in this document.

Price: $2,495
Product Code: PRNT-NA-MT-9601
Publication Date: July, 1996

Copier 1996

A Market Trends Report

This document is a comprehensive report providing quantitative and qualitative information on the copier market. Dataquest includes the history of and forecast for the copier market by segment and the market share information for the past six years. Dataquest's numbers include both analog and digital copiers. Dataquest gives its perspective on the segments of the copier market: total, low-volume, mid-volume, high-volume, and multifunction. This information covers only the U.S. copier market, which includes all 50 states.

Price: $2,495
Product Code: COPY-NA-MT-9601
Publication Date: July, 1996

Copiers—Europe 1995: The Survival of the Fittest

A Market Trends Report

This publication includes detailed placement and population market share data from 1993 to 1995, five-year history and five-year forecast (in terms of plain paper copier [PPC] placements, population, copy volume and revenue), and analysis for the Western European market. Data are revised annually and published for the Western European copier market, the Rest of Europe and thirteen major markets: Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.

Price: $2,495
Product Code: COPY-EU-MT-9601
Publication Date: June, 1996

Document Management NewsTakes

Bi-Monthly Newsletter -- Bi-Monthly News and Commentary on Document Management Industry Events

SUBSCRIBE TODAY! This newsletter focuses on leading events in the digital documents, copier, facsimile, and printer industries. Each issue recaps key announcements, then provides concise analysis of the significance of the event to the industry. This popular bi-month newsletter is available via fax.

Price: $595/year/user—Multiuser Licenses Available
Product Code: DMGT-NA-NT-0000

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Printers

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And More...

Online, Multimedia, and Software

The Hesitant Buyer: Attracting Consumers to Electronic Commerce

A User Perspective Report

This study examines online users in the United States, and is based on the results of several different home telephone surveys taken between fall 1995 and fall 1996, primarily of users of America Online, CompuServe, Prodigy, and The Microsoft Network. The specific objectives of this studies are to understand changes in attitude among the same consumers between 1995 and 1996, particularly with regard to readiness to buy and bank online and to update data on demographics, attitudes, and the computing environment among consumer online and Internet users in the United States.

Price: $2,495
Product Code: OLST-WW-UW-9601
Publication Date: October, 1996

Internet Software: The Giveaway Growth Market

A Market Trends Report

The Internet and the World Wide Web have changed the rules of competition for the software, hardware, communications and content industries. No market enjoys more opportunity, uncertainty, and hype than the Internet software market-and understanding the major forces driving that market is key to anticipating its future. Unlike the client/server generation, Internet software is not user-requirements driven, but rather is the result of high stakes power struggles among and within the industries it affects. Although a rich variety of users are actively integrating the Web into their businesses, this market is now driven by three major forces, all of them led by vendors. This report discusses the current state of the Internet software market, key competitors, and opportunities through year 2000.

Price: $2,495
Product Code: OLST-WW-MT-9602
Publication Date: September, 1996

Internet and Online in Europe: The Heat Is on

A Market Trends Report

Right now we see the number of companies offering Internet access and services in every European country grow at almost the same rate as the number of Internet and online services customers expands. We are already seeing a shakeout on the horizon. This report provides an overview of Central, Eastern, and Western European Internet market.

Price: $2,495
Product Code: OLST-WW-MT-9603
Publication Date: August, 1996

Online/Internet Service Providers: Gateways to Survival

A Market Trends Report

This report looks at issues around online/Internet service providers, consumer usage, bandwidth, future connections, using the Internet as a sales tool, and other Internet products. Dataquest provides the user installed base data for the top online service providers, Internet seat forecast, and percentage of dial-up by modem speed in North America.

Price: $2,495
Product Code: OLST-WW-MT-9601
Publication Date: August, 1996

Multimedia Market Trends

A Market Trends Report Set

Volume I: 1996 Multimedia Market Trends—Pushing Full Steam Ahead

In this report, we will look at the many market segments impacted by multimedia technology and assess the current and future prospects in the areas of content, delivery, and communication. In this report, Dataquest provides both quantitative and qualitative analyses of the worldwide market for the following products:

- Complete multimedia systems
- Multimedia kits
- Sound boards
- CD-ROM drives
- Video boards
- Video server hardware and software
- Multimedia content and development software
- Video game hardware and software

- Videoconferencing hardware and software
- Television set-top boxes
- ITV hardware and software
- Voice recognition hardware and software

The specific objectives of the report are as follows:

- To identify the demand- and supply-side issues, technological developments, and environmental trends shaping the industry
- To estimate the size and growth (or decline) of each market segment based on key market forces
- To examine major opportunities and challenges facing vendors competing in the various markets impacted by multimedia technologies.
- To provide specific recommendations that can lead to actionable items for our clients to help them be successful in the market(s) they pursue

Product Code: MULT-WW-MT-9601
Publication Date: November, 1996

Volume II: Multimedia Market Statistics 1995

This report presents the most reliable and comprehensive set of market data available on the worldwide multimedia market. This volume includes 1995 shipments and revenue data by vendor, in both alphabetical and ranked order. Analyses of shipments by company provide insight into high-technology markets and reinforce estimates of consumption. Worldwide shipment and revenue estimates combine data from many countries, each of which has a different and fluctuating exchange rate. Estimates of non-U.S. market consumption or revenue are based on the average exchange rate for the given year. Qualitative analysis is provided in Volume I.

Product Code: MULT-WW-MS-9601
Publication Date: August, 1996

Volume III: Multimedia Forecast 1996

This report presents the most reliable and comprehensive set of forecast market data available on the worldwide multimedia market. and contains Dataquest's forecast of the multimedia hardware and software markets including four-year historical shipments in most cases and revenue and five-year forecast shipments and revenue to the year 2000.

Product Code: MULT-WW-MS-9602
Publication Date: September, 1996

Price: $7,995/set

1996 Business Use of Multimedia

A User Perspective Report

In 1996, Dataquest conducted an end-user survey to understand current and planned uses of multimedia technology within corporate environments. This report presents an analysis of the results of this survey and points toward the future trends in multimedia usage in the enterprise. The objectives of this report are: 1) to arrive at a computer system and networking profile of the users surveyed; 2) to assess what multimedia technologies are being used, where they are being used, by whom, and for what purposes; 3) to determine current computing and networking infrastructure in place and users' plans for upgrading over the next 18 months; 4) to assess the demand, uses, and plans for upgrading for business multimedia; 5) to assess inroads made by business multimedia technology in the portable computer market and the Internet/Intranet.

Price: $2,495
Product Code: MULT-WW-UW-9601
Publication Date: November, 1996

GIS Market—Changes on the Horizon

A Market Trends Report

In this report, we define, quantify, and examine the technologies, tools, and vendors that will impact the GIS market in the years to come. This geographic information systems 1996 report presents the results of Dataquest's research and analysis of the state of and outlook for the GIS market. It provides a snapshot of the GIS market as it stands today, and identifies the trends having the greatest impact on the GIS industry for the future. It looks at each of the GIS applications in greater detail. Industry trends and driving forces for each subapplication are identified and discussed.

Price: $2,495
Product Code: CAEC-WW-MT-9601
Publication Date: October, 1996

1996—A Year of Transition

A Market Trends Report

This EDA Market Trends report presents the results of our investigations into the current and future conditions of the EDA marketplace. It is intended to provide insight and analysis of the intricacies of this technically demanding and complex market.

We have divided this report into six major sections. Chapter 2 includes an explanation of the methodology used in this report. Our EDA subapplications are defined, our survey methodology and data collection methods are outlined, and our forecast methodology is explained. Chapter 3 identifies the major trends with the greatest impact on the EDA industry. Chapter 4 looks at each of the CAE subapplications in more specific detail. Market share information, trends, and forecasts for each subapplication are included. Chapter 5 looks at the IC CAD subapplications and Chapter 6 deals with PCB Design. Appendix A is the forecast by subapplication.

Price: $2,495
Product Code: CEDA-WW-MT-9601
Publication Date: October, 1996

The Design Verification Problem Accelerates with Clock Speed

A User Perspective Report

This study provides an in-depth look at the users of EDA tools in North America. The information presented here is the result of a telephone survey of 215 hardware designers in North America. The objectives of this study were as follows:

- To understand what trends are taking place in the electronic design industry
- To investigate the design environment in which users work
- To examine end-user satisfaction with EDA software
- To underscore some of the changes that will take place in the EDA industry in the future

Price: $2,495
Product Code: CEDA-WW-UW-9601
Publication Date: September, 1996

Mechanical CAD/CAM/CAE—The Shape of Things to Come

A Market Trends Report

This report has an explanation of the market research methodology used in this report and a summary of our new market share methodology by distribution channel, a snapshot of the mechanical CAD industry as it stands today, and trends having the greatest impact on the mechanical CAD/CAM/CAE industry for the future. Market share information, industry trends, and driving forces for each subapplication are identified and discussed.

Price: $2,495
Product Code: CMEC-WW-MT-9601
Publication Date: September, 1996

Mechanical CAD/CAM/CAE Applications—A User's Perspective

A User Perspective Report

The objectives of this study are to understand what trends are taking place in the mechanical CAD/CAM/CAE industry, to understand the design environment in which users work, to examine end-user satisfaction with the current CAD/CAM/CAE tools, and to underscore some of the changes that will take place in mechanical design in the future.

Price: $2,495
Product Code: CMEC-WW-UW-9601
Publication Date: October, 1996

The Gathering Storm in Personal Computer Software

A Market Trends Report

This report summarizes the results of our 1995 PC software industry data and analyzes current and future trends for the industry. We focus on each of 15 key markets within the PC software industry and compare the strategies of the top 10 PC software vendors. To complete the analysis, this report will discuss developments in each of the major operating systems (OS) and worldwide regions.

Price: $2,495
Product Code: PCSW-WW-MT-9601
Publication Date: October, 1996

QuickTakes

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SUBSCRIBE TODAY and receive weekly news and commentary on Online, Multimedia, and Software industry events. QuickTakes provides summaries of the top news in these industries. Each story provides a concise news recap and is accompanied by the "Dataquest Take," an analysis of the significance of the event or announcement. This popular electronic newsletter is available via CompuServe and Internet.

Price: $595/year/user—Multiuser Licenses Available
Product Code: OMAS-WW-NT-0000

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CAD/CAM/CAE and GIS Applications

Market/Technology Reports

- ☐ **GIS Growth by Application** ($1,295, CAECWWDP9606)
- ☐ **AEC CAD European Trends** ($1,295, CAECWWDP9605)
- ☐ **CAD Market Leadership: In the Wallet and at the Bank** ($795, CAECWWDP9604)
- ☐ **GIS Market Leadership—In the Wallet** ($495, CAECWWDP9603)
- ☐ **Mechanical CAD/CAM/CAE: European Trends** ($1,295, CMECWWDP9608)
- ☐ **Channel Analysis of the Mechanical Design Market** ($795, CMECWWDP9607)
- ☐ **Mechanical CAD: Opportunities in Asia/Pacific** ($795, CMECWWDP9606)
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Client/Server Software

Market/Technology Reports

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Electronic Design Automation

Market/Technology Reports

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Multimedia

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☐ **Novell: Addressing The Challenges** ($795, WKGPWWDP9609)

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Telecommunications

Scorecard for the LAN Vendors: Hub and Switch Market Shares for the First Half of 1996

A Market Trends Report

In the first half of 1996, revenue reached $4.4 billion, and shipments reached 30.97 million ports for the hub and switch market combined. This is a 64 percent increase in revenue and a 44 percent increase in shipments compared to the same period last year. The bottom line is that revenue and port shipments for the combined hub and switch market remained strong. This report presents the major market segments including 10—Mbps ethernet hub, 100-Mbps ethernet hub, token-ring hub, FDDI hub, 10-Mbps ethernet switch, 100-Mbps ethernet switch, token-ring switch, FDDI switch, and ATM switch. The report includes the top 10 companies' market shares in each of the major market segments in the second half of 1995 and first half of 1996.

Price: $2,495
Product Code: LANN-NA-MT-9601
Publication Date: November, 1996

1996 Wide Area Network Equipment Market Share and Forecast

A Market Statistics Report

This document contains detailed information on Dataquest's view of the digital WAN equipment market. Included in this document are the historical data from 1991 to 1995 and forecast data from 1996 to 2000 by unit shipments, growth rates, average end-user prices, and end-user revenues. The equipment segments include access equipment, backbone equipment, inverse multiplexer, and data service units (DSUs). This report also contains a vendor directory. Both worldwide and North American markets are presented. Top companies' market shares for 1994 and 1995 are also included.

Price: $3,500
Product Code: WANB-NA-MS-9601
Publication Date: August, 1996

Personal Communications in North America

A Market Trends Report

This document contains detailed information on Dataquest's view of the personal communications services (PCS) market. Analyses of the top companies in the PCS market provide insight into the wireless industry and reinforce estimates of consumption, production, and market revenue. Dataquest provides both quantitative and qualitative analyses of the markets in the areas of cellular, broadband and narrowband PCS, paging, and wireless data. This report includes an estimated tabulation of industry shipments and revenue for 1995 with market share data for each segment. It also includes a nine-year profile of industry shipments, revenue, and installed base data from 1992 through 2000. The specific objectives of the report are 1) to identify the demand- and supply-side issues, technological developments, and environmental trends shaping the industry; 2) to estimate the size and growth (or decline) of each market segment based on key market forces; 3) to examine major opportunities and challenges facing vendors competing in the various markets impacted by wireless technologies; 4) to provide specific recommendations that can lead to actionable items to help Dataquest clients achieve success in the markets they pursue.

Price: $2,495
Product Code: PERS-NA-MT-9601
Publication Date: November, 1996

Consumer Spending on Cellular Telephony Will Grow

A User Perspective Report

The goals of this survey are to construct a picture of the current use and perception of cellular communications among consumers in the U.S. and to investigate the expectations, satisfaction, and changes in spending patterns as a result of decreased per-minute charges.

Price: $2,495
Product Code: PERS-NA-UW-9601
Publication Date: September, 1996

Cellular Services Europe—Market Trends

A Market Trends Report

The European cellular market continued to grow rapidly in 1995: the total subscriber base was up 60 percent on the previous year. This report focuses on the Western European countries' cellular service market. Country level information includes analysis and forecast through year 2000 for France, Germany, Italy, Netherlands, Spain, Sweden, and United Kingdom.

Price: $2,495
Product Code: PERS-EU-MT-9601
Publication Date: July, 1996

U.S. Inbound Call Centers Market Share and Forecast

A Market Statistics Report

This document contains detailed information on Dataquest's view of the incoming call centers (ICC) market. Dataquest is now referring to automatic call distributors (ACD) as ICC. Included in this document are the historical data (1991 through 1995), forecast data (1996 through 2000) and market share estimates. Analyses of the ICC (also ACD) market by company provides insight into high-technology markets and reinforces estimates of consumption, production, and company revenue. The ICC market is segmented in PBX-based, KTS-based, standalone, and central office/network-based systems. This report provides data on unit shipments, average selling price, end-user revenue, retirements, and installed base.

Price: $5,000
Product Code: VOCA-NA-MS-9601
Publication Date: July, 1996

The Importance of Call Center Communications and Applications Integration in Finance and Banking

A User Perspective Report

The purpose of this report is to provide the reader with a better understanding of the nature of call center implementation within the context of the communications environment in the finance and banking industry. This report provides a definition of the installed base of communications equipment, data processing platforms, the operating systems environment, associated database and Telebusiness software. It identifies the relative importance of available technologies and assesses usage, that is, what users have implemented to support which applications. It evaluates buying intentions within the next purchasing period. It also provides useful indicators of technology perceptions, user expectations and brand imaging of would-be "one-stop solutions" suppliers in the context of convergent systems provisioning.

Price: $2,495
Product Code: VOCA-EU-UW-9601
Publication Date: October, 1996

Switching Equipment Market Share and Forecast—North America

A Market Statistics Report

This document contains detailed information on Dataquest's view of the switching equipment market. Included in this document are the historical data (1991 through 1995), forecast data (1996 through 2000), and market share estimates for the major players. Analyses of the switching equipment market by company provides insight into telecommunications markets and a basis to understand technology trends, infrastructure development, and service directions. The market segments discussed in the report include both analog and digital central office equipment. A directory of vendors is also included.

Price: $2,500
Product Code: PNEQ-NA-MS-9601
Publication Date: October, 1996

Transmission Equipment Market Share and Forecast—North America

A Market Statistics Report

This document contains detailed information on Dataquest's view of the transmission equipment market.

Included in this document are the historical data (1991 through 1995), forecast data (1996 through 2000), and market share estimates for the major players. Analyses of the transmission equipment market by company provides insight into high-technology markets and reinforces estimates of consumption, production, and company revenue. The market segments discussed in the report include local loop access, multiplexers, digital cross connect, broadband loops, HDSL, and ADSL. A directory of vendors is also included.

Price: $3,500
Product Code: PNEQ-NA-MS-9602
Publication Date: October, 1996

Broadband Technologies in the United States: A Snapshot of an Emerging Market

A Focus Report

This report examines the emerging market of broadband services. It examines the various broadband services, their pricing components, and marketing strategies. A selection of current product offerings, associated features, and future offering is discussed. This report also considers potential barriers to service rollout and adoption and undertakes a competitive analysis of the services and service providers.

Price: $2,495
Product Code: PNSR-NA-FR-9601
Publication Date: September, 1996

ISDN Equipment—Europe

A Market Trends Report

After record growth in equipment shipments in 1995, and with further record growth forecast for 1996, these are golden years for the ISDN industry in Europe. In this Market Trends report, we analyse the issues surrounding the ISDN equipment market and look at the trends that are likely to take place in the period to 2000.

Price: $2,495
Product Code: ISDN-EU-MT-9601
Publication Date: September, 1996

Local Loop—Western Europe

A Market Trends Report

This report provides a general trends of the Western European local loop market. Technology segments discussed include ADSL, FITL, access multiplexers, HDSL, Radio in the loop, and business lines. This report provides tables and figures showing the size of the local loop market in Western Europe between 1992 and 2001.

Price: $2,495
Product Code: PNEQ-EU-MT-9601
Publication Date: September, 1996

European Virtual Private Network Services

A Focus Report

This report examines the status of national and international virtual private network (VPN) services in Europe. For each European country, market revenue estimates are provided for 1994 and 1995, together with forecasts until the year 2000. Market statistics are split between national and international VPN services in each country. This report focuses on VPN services offered over circuit-switched rather than packet-switched networks, that is voice rather than data VPNs. Also reviewed in this report are market drivers and inhibitors; operators' service strategies with regard to target markets, tariff structures and Centrex features; access options available and their respective usage; voice versus data traffic over the VPN; and how customers' needs are likely to change during the product's life cycle. Countries include Belgium, Finland, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and United Kingdom.

Price: $1,995
Product Code: PNSR-EU-FR-9602
Publication Date: July, 1996

User Demand for Public Network Services—Western Europe

A User Perspective Report

This report summarizes the results of a survey of 400 end-user organizations in France, Germany, Italy, Sweden and the United Kingdom. The main objectives of the survey are: 1) to evaluate the current and future level of demand for different types of public network service offered by telephone operators; 2) to understand what is most important when purchasing these services and how satisfied companies are with their suppliers. The report analyses significant country and vertical sector differences where appropriate.

Price: $1,995
Product Code: PNSR-EU-UW-9601
Publication Date: July, 1996

Central Office—Europe

A Market Trends Report

Dataquest provides historical market sizing, five-year forecasts of market segments, product technology trends and overall analysis of the competitive landscape for the European central office market.

Price: $2,495
Product Code: PNCO-EU-MT-9601
Publication Date: August, 1996

Telecommunications TeleViews

Electronic Newsletter -- Weekly News and Commentary on Telecommunications Industry Events

SUBSCRIBE TODAY! *Telecommunications TeleViews* provides a weekly recap of the top stories in the telecommunications industry. Topical areas include networking, voice, public network equipment and services, and personal communications. Dataquest analysts supplement these stories with their commentary on the events. This popular electronic newsletter is available via CompuServe and Internet.

Price: $595/year/user—Multiuser Licenses Available
Product Code: TCOM-NA-NT-9501

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- ☐ **PCMCIA NICs: A Market on the Go?** ($795, LANNNADP9607)
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Personal Communications

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Voice Communications

Market/Technology Reports

- ☐ **U.S. Inbound Call Centers Market Share—First Half of 1996** ($495, VOCANADP9601)
- ☐ **Inbound Call Center and the Year 2000** ($795, VOCANADP9602)
- ☐ **U.S. Premise Switching Systems Market Share—First Half of 1996** ($795, VOCCNADP9603)
- ☐ **Premise Switching Systems and the Year 2000** ($795, VOCCNADP9602)
- ☐ **Value Added Voice Processing** ($795, VOCVNADP9604)

And More...

IT Service and Support

Professional Services Trends

A User Perspective Report

This study examines the U.S. IT professional services market from the customers' perspective. Dataquest defines professional services as those services that facilitate the implementation, integration, operation, and management of IT. The focus of this report is customer wants and needs rather than current customer outsourcing strategies that are covered in a separate document. This report is based on the results of more than 250 interviews with senior IT executives representing Fortune 1000 and public sector organizations.

Price: $2,495
Product Code: PFST-NA-UW-9601
Publication Date: August, 1996

Emerging Opportunities in Distributed Systems Management

A Focus Report

This report focuses on distributed systems management, one of the fastest growing opportunities in the IT outsourcing market. It examines a variety of support issues focused on this relatively new and emerging opportunity for distributed systems management and the following:

- Analyzes factors accelerating the movement to distributed computing
- Identifies the key trends and market dynamics influencing distributed systems outsourcing
- Provides market sizing and forecasts for distributed systems management
- Summarizes end-user research, including customers' opinions and strategies relating to distributed systems management
- Highlights some of the vendors' distributed systems management service offerings
- Offers recommendations to vendors that offer, or are considering offering, distributed systems management services

Price: $3,995
Product Code: PFSM-NA-FR-9601
Publication Date: October, 1996

Strategies for Success in SAP Services

A Focus Report

This report defines the solution product market and identifies its primary product and professional services players. Forecasts the market's impact on a professional services company's management consulting, application development, systems integration, and system management services offerings. Provides insights into the market opportunities, threats, growth potential, and entry barriers by analyzing the current status and strategies of the software providers and professional services players dominating the market. The intent being to understand how the leaders gained and intend to maintain their leadership positions and the strengths, weaknesses, and strategic approaches of all study participants.

Price: $2,495
Product Code: PFSI-NA-FR-9601
Publication Date: August, 1996

Professional Service Trends: Systems Integration and Application Development

A Market Trends Report

The purpose of this report is to examine the trends that impact the systems integration and application development segments of the professional services market and to identify the keys to success for IT service providers attempting to capitalize on the growth opportunities. This report focuses on: 1) identifying the major trends impacting integrators and developers markets; 2) estimating the size and future growth prospects of the application development and system integration markets; 3) identifying the key market opportunities for integrators and developers attempting to broaden and deepen their penetration of these market segments; 4) examining the major challenges of vendors trying to compete in these markets; 5) analyzing the business performance of systems integration and application development companies and identifying the market leaders.

Price: $2,495
Product Code: PFSI-NA-MT-9601
Publication Date: October, 1996

Professional Services: Vertical Market Opportunities Report Series

A Series of Industry Trends Reports

Vertical Market Opportunities in Financial Services

This report contains key findings and recommendations for the professional services providers. It discusses various trends and forces shaping financial services and the related impact on IT opportunity. It offers an update on the activities of IT solution providers.

Price: $1,995
Product Code: PSVM-NA-IT-9601
Publication Date: May, 1996

Supply Chain Planning and Management: Vertical Market Opportunities in Distribution

This report analyzes current demand-side dynamics within the distribution segments of retail and wholesale trade. Emphasis is placed on the rapid emergence of the Internet, electronic data interchange at all stages of the supply/demand chain, and trends that are blurring traditional lines of demarcation among retail, wholesale, manufacturing, and logistics. This report examines the interacting elements of the IT/services market and also highlights key technology requirements and trends in relation to supply chain planning and management from the perspective of distribution.

Price: $1,995
Product Code: PSVM-NA-IT-9602
Publication Date: November, 1996

Vertical Market Opportunities in Health Care

This report reviews and analyzes current demand-side dynamics within the health care industry. Primary emphasis is placed on the physician and physician group, hospital, nonacute/nonhospital, managed care organization, and indemnity insurer sectors of the market. An extensive discussion of private and public payers is also included.

Price: $1,995
Product Code: PSVM-NA-IT-9603
Publication Date: November, 1996

Vertical Market Opportunities in Transportation

This report reviews and analyzes demand-side dynamics within the transportation industry. Primary emphasis is placed on the railroad, trucking, air transportation, and water transportation segments. Also included is a discussion of an emerging business approach called third-party logistics, which is the outsourcing of transportation-related activities and crosses multiple SIC codes. Key issues in public transit and travel services also are summarized.

Price: $1,995
Product Code: PSVM-NA-IT-9604
Publication Date: November, 1996

Vertical Market Opportunities in Utilities

This report reviews and analyzes current demand-side dynamics within the utilities segments of primarily electric and gas. The interacting elements of the IT industry and highlights of key technology requirements and trends are examined. This report identifies the requirements of U.S. utilities companies as related to IT. Subsegments of the utilities industry are grouped by SIC code and provide the basis for Dataquest's industry market size and forecast.

Price: $1,995
Product Code: PSVM-NA-IT-9605
Publication Date: November, 1996

Vertical Market Opportunities in Education

This report reviews and analyzes demand-side dynamics within the education industry. Primary emphasis is placed on the elementary and secondary school segments that have significant latent demand, although discussion of key trends in higher education and libraries is also included. This report identifies the requirements of U.S. educational institutions as related to IT.

Price: $1,995
Product Code: PSVM-NA-IT-9606
Publication Date: November, 1996

Vertical Market Opportunities: State of the Industries—1996

A Market Trends Report

The purpose of this report is to provide vendors of IT products and services with key vertical (or industry) market data and analysis that will assist them in assessing specific vertical market opportunities. The objectives of this report are:1) to identify selected business trends that are driving further technology adoption and change, and specifically signal a variety of growth opportunities for providers of IT solutions; 2) to provide a comparative trend review of Dataquest's 12 major industry groupings; 3) to share Dataquest's initial or benchmark effort for future sizing and forecasting of total IT opportunity by major industry grouping.

Price: $2,495
Product Code: PSVM-NA-MT-9601
Publication Date: November, 1996

1996 Market Trends: Internet-Based Software Support: Hype or Hope?

A Market Trends Report

The use of the Internet to deliver service and support is a growing trend in the software services marketplaces. More service providers are delivering general service information as well as electronic incident capabilities via the World Wide Web (WWW). Users seem to be excited about this expanding trend as they continue to desire more availability of Internet-based service options. This Market Trends document takes a look at top software companies as well as users to get an idea of how the current services are meeting user needs and also expectations for future delivery options in 1998 and beyond.

Price: $2,495
Product Code: SWSV-NA-MT-9601
Publication Date: October, 1996

Partnership Satisfaction Study

An Industry Trends Report

The purpose of the study is to compare and contrast the importance these managers (strategic service relationship managers, senior service operation managers, U.S. service group managers, and executives, service marketing executives, and others) place on various aspects of service relationships versus their satisfaction with how well their service partners are performing in these same areas. From a strategic standpoint, the purpose of this study is to help vendors implement and maintain more responsive and productive strategic service relationships by understanding where these relationships seem to be working well and where they may require additional attention.

Price: $1,995
Product Code: SSPA-NA-IT-9601
Publication Date: November, 1996

Strategic Service Partnership Terms and Conditions: 1996 Annual Edition

A Market Trends Report

Successful strategic partnerships and alliances are built upon a solid foundation of reasonable and well-understood terms and conditions. Although not always written into a partnership contract, terms and conditions can prevent many problems before they begin and help to quickly resolve others. In this 1996 study, Dataquest examines the terms and conditions strategic service partners impose upon themselves and each other in order to define mutually beneficial strategic service relationships..

Price: $2,495
Product Code: SSPA-NA-MT-9601
Publication Date: October, 1996

Distributed System Support Services Market Trends: 1996 Annual Edition

A Market Trends Report

The rapid pace of change in the computer industry is matched only by the ever-adaptable computer service industry. In many instances, the same enabling technologies driving the computer industry (simultaneous voice and data and the Internet, among others) are the engines of change for computer service and support. In this 1996 Market Trends study of distributed systems services, Dataquest examines the dynamics of change driving the computer services industry and forecasts anticipated system service and support spending into the millennium.

Price: $2,495
Product Code: SYSS-NA-MT-9601
Publication Date: October, 1996

System Services - Budget Allocation and Buying Intentions

A User Perspective Report

This report is dedicated to overall information technology (IT) budget spending, with an emphasis on desktop-focused budget spending, and how this spending will translate into opportunity for service providers. For the purpose of this report, Dataquest defines the desktop environment as including desktops, notebooks, PC Servers, desktop workstations, and PC peripherals. The information in this report is based on responses from over 600 users of information technology products and services. It is intended to be useful for assessing where end users will focus their IT budgets and how those budgets will be segmented into external services spending. The report presents information reflecting last year's (1995) IT budgets and the anticipated budget spending for next year (1997). Two additional features of this year's report are budget cuts specific to the desktop environment, and the inclusion of specific data points segmented by small, medium-size and large organizations.

Price: $2,495
Product Code: SYSS-NA-UW-9601
Publication Date: July, 1996

Focus on the Intangibles

A Focus Report

The objective of our research was to reveal as many of the intangible factors relating to the use of IT consultants as possible. The topics covered include usage of consultants at different points along the systems life cycle, what areas that consultants are more in demand for, how consultants are primarily used for, and many others discussions.

Price: $1,295
Product Code: PFCE-EU-FR-9601
Publication Date: September, 1996

Also Available...

Customer ServiceTrends

Market/Technology Reports

- ☐ **A Partnership Update—Who's Partnering with Whom and Why** ($795, CUSTNADP9607)
- ☐ **Hardware Service Pricing Trends** ($795, CUSTNADP9606)
- ☐ **Future Hardware Maintenance** ($795, CUSTNADP9605)
- ☐ **The Internet & Service Delivery—Great Expectations** ($1,295, CUSTNADP9604)

Network Integration and Support

Market/Technology Reports

- ☐ **Network Service and Support Opportunities for Wireless Networks** ($795, NISSNADP9604)
- ☐ **The Internet & Corporate Intranets: Service and Support Opportunities** ($795, NISSNADP9603)

Professional Services & Vertical Markets

Market/Technology Reports

- ☐ **Asia/Pacific Year-End Review** ($795, PFSTAPDP9607)
- ☐ **Business Process Reengineering—Supply Constrained** ($795, PFSTAPDP9606)
- ☐ **Hot Service: End User Buying Intentions** ($795, PFSTNADP9609)
- ☐ **How Professional Services Vendors Are Responding to the Year 2000** ($1,295, PFSTNADP9608)
- ☐ **User Buying Intentions for External Professional Services** ($1,295, PFSTNADP9606)
- ☐ **Market Trends—IT Consulting Market Size and Forecast** ($795, PFCENADP9602)
- ☐ **Market Trends: Changing Economics of Consulting** ($1,295, PFCENADP9603)
- ☐ **Global Industry Markets** ($1,295, PSVMNADP9604)
- ☐ **The Customer Service Process—An Industry Comparison** ($795, PSVMNADP9603)

Software Services

Market/Technology Reports

- ☐ **Software Training Programs: Producing Courseware to Keep Up with Rapidly Changing Technology** ($1,295, SWSVNADP9608)
- ☐ **Buying Software Over a Wire: What do Customers Think?** ($1,295, SWSVNADP9607)

Strategic Service Partnering

Market/Technology Reports

- ☐ **A Quick Guide to Choosing a SSP** ($795, SSPANADP9608)
- ☐ **Now and Emerging Strategic Service Partnership Models: Hewlett-Packard and IBM's Channel—Friendly Service Strategy** ($795, SSPANADP9607)
- ☐ **A Partnership Update—Who's Partnering with Whom and Why** ($795, SSPANADP9606)
- ☐ **Strategic Service Partnering and the Parts Requirement** ($795, SSPANADP9605)
- ☐ **Strategic Service Partnering Compensation** ($495, SSPANADP9604)

Systems Support Services

Market/Technology Reports

- ☐ **Dataquest Predicts Strategies for Success in Desktop Services** ($1,295, SYSNNADP9604)
- ☐ **Distributed System Support Services Market Forecast 1996 Annual Edition** ($1,295, SYSSNADP9605)
- ☐ **Strategies for Success: Service Opportunities and Servers** ($495, SYSVNADP9601)

And More...

Emerging Markets

Asia/Pacific IT Market Insight—Regional Overview

A Market Trends Report

This IT Market Insight Regional Overview report summarizes the individual Asia/Pacific country reports of the program. The report aims to give a brief overview of the entire Asia/Pacific hardware market, a country-level market overview, a product-level market overview, and statistical and forecast data on the Asia/Pacific countries. Market opportunities, trends and activities, and comparative hardware markets are reviewed in this report.

Price: $2,500
Product Code: RITS-AP-MT-9601
Publication Date: July, 1996

Asia/Pacific IT Market Insight—Country Overview

Country-Level Market Trends Reports

Each country-level report contains market forecasts of hardware, software, and services markets in the given country by business sector and by product. The reports also provide competitive information on key vendors, including their target business sectors and strengths and weaknesses in the country. To put national IT trends into context, reports include regional IT market and economic information. Countries covered include:

Australia	China
Hong Kong	Indonesia
Korea	Malaysia
Singapore	Taiwan
Thailand	

Price: $2,500/each country-level report
Product Codes: Australia Report--RITS-AU-MT-9601
China Report--RITS-CH-MT-9601
Hong Kong Report--RITS-HK-MT-9601
Indonesia Report--RITS-IN-MT-9601
Korea Report--RITS-KO-MT-9601
Malaysia Report--RITS-MA-MT-9601
Singapore Report--RITS-SI-MT-9601
Taiwan Report--RITS-TA-MT-9601
Thailand Report--RITS-TH-MT-9601

Professional Services Trends: Asia/Pacific

A User Perspective Report

The professional services market is the most dynamic segment in the information technology (IT) industry. It is the fastest-growing sector, fueled by increasing customer demand for innovative IT solutions and services to support business needs. And within the professional services market, successful vendors need to have a thorough understanding of customers' service needs, technology and business requirements, budget, and buying criteria. This report provides this critical information by examining the professional services market in five major Asia/Pacific countries from the customers' perspective. The specific objectives of this report are: 1) to examine customers' IS budget allocations and spending patterns; 2) to identify key technologies and professional services today, and their projected importance in two years; 3) to analyze customers' willingness to outsource a variety of systems management services; 4) to identify criteria and processes customers use to learn about and select systems management vendors.

Price: $2,495
Product Code: PFST-AP-UW-9601
Publication Date: Nobember, 1996

Professional Services Trends: Consulting—Asia/Pacific

A Market Trends Report

The purpose of this report is to examine the trends shaping the market for IT consulting services. It also identifies the keys to success for IT service providers attempting to capitalize on the growth opportunities in the Asia/Pacific region.

Price: $2,495
Product Code: PFST-AP-MT-9601
Publication Date: August, 1996

Professional Services in Asian Banking

A Focus Report

This report reviews and analyzes current demand-side dynamics within the financial services market, specifically in the banking industries of Asia/Pacific.

Emphasis is placed on the rapid emergence of the Internet and electronic delivery of financial services. This report highlights key technology requirements and trends including IT products and related IT services, customers, economic/technical, competitive environments, key trends and issues in the financial services industries, and opportunities and recommendations for IT services/product providers.

Price: $2,495
Product Code: PFST-AP-FR-9601
Publication Date: November, 1996

Multifunctionality in Asia/Pacific

A Focus Report

This focus report discusses the concept of multifunctionality in the context of the Asia/Pacific market. Three distinct segments of the market are examined-the low-end market where facsimile vendors dominate; the midrange segment where copier vendors struggle for identification, and the high-end niche market, which Xerox monopolizes. This report concludes with an analysis of the various opportunities and challenges that the multifunction device market offers and the approaches that vendors should adopt in order to gain greater market acceptance.

Price: $1,295
Product Code: PRNT-AP-FR-9601
Publication Date: September, 1996

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Quantity	Report Title	Product Code	Unit Price	Amount
			Subtotal	
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			Shipping & Handling	$15.00
			TOTAL	

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Michael R. Polcari
IBM Thomas J. Watson Research Center
Yorktown Heights, NY 10598

Dr. Polcari received his BS degree in Physics from the University of Notre Dame and his MS and Ph.D. degrees in Physics from Stevens Institute of Technology. From 1977-1978, he was employed at National Micronetics in Kingston, New York as a process development engineer in thin films. In 1978, he joined IBM at Kingston, New York as a process development engineer in a silicon pilot line. In 1980, he became manager of process development there.

In 1982, he joined the IBM Research Division at the T. J. Watson Research Center as a research staff member in the Silicon Technology Department. He held various management positions in the Yorktown Silicon Facility, the research pilot line, until 1988. In 1988, he became manager of the Yorktown Silicon Facility which he managed until October 1992. From 1992 until 1994, he was responsible for the Advanced Lithography Systems Department of IBM's Semiconductor Research and Development Center (SRDC) in East Fishkill, New York.

In January of 1994, he was appointed to his present position as Research Director, Silicon Technology and Director, Advanced Semiconductor Technology Laboratory in the SRDC. In his present assignment, he is responsible for silicon process technology in the Research Division and advanced semiconductor process development in the SRDC. He currently serves as IBM's representative on the Board of Directors of the Semiconductor Research Corporation, and the Advisory Board of Stanford's Center for Integrated Systems and MIT's Microsystems Technology Laboratory.

Dr. Polcari is a member of IEEE, SPIE, ECS and the APS.

Dataquest's
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Dr. Michael R. Polcari
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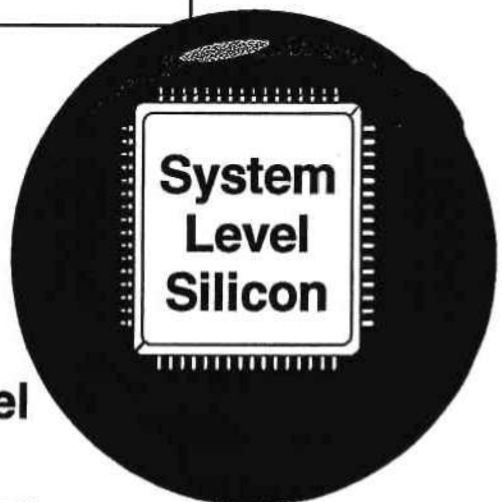
Elements of Success

Technology

- On-going circuit/bit density improvements
- Decreasing power supply voltage
- Integration of system-level technologies

Intellectual Property

- Broad portfolio of Cores
  - Proprietary functions
  - Industry Standard functions
- IP migration across process technologies



Design Skill

- Combined system-level (Hardware / Software) and chip-level expertise

Design Tools & Methodology

- System-level design optimization
- First-Time-Right designs
- Reuse of hardware and software objects

Alliances, Partnerships and Licensing can enhance competitiveness

Elements of Success

Technology Integration

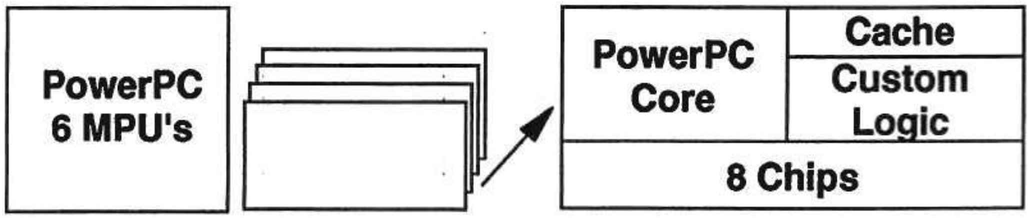
Integrating system-level functions requires:

- Challenges:
  - Multi-faceted technology integration
  - Cost of process technology development

System Level Silicon - Product Examples

Power 2 Super Chip

Processor Integration
The Heart of Deep Blue

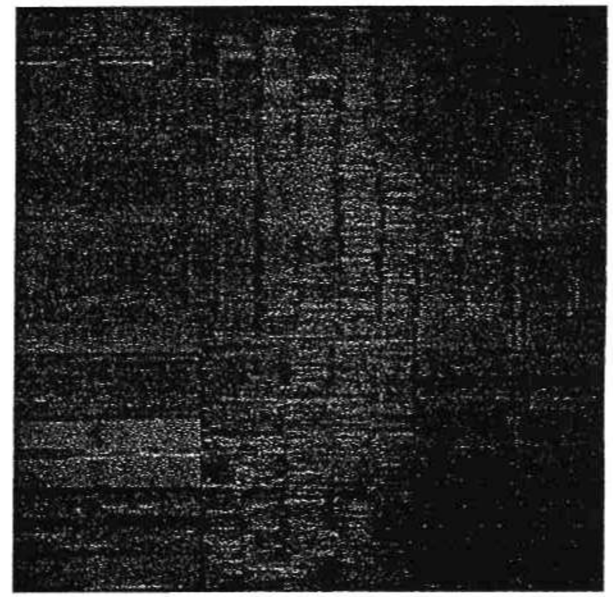


1995 → Systems-on-a-chip 1997

Attributes	Attributes
• 6 PowerPC Processors	• Single chip processor
• 8 chips on MCM module	• 15 million transistors
• $1215mm^2$ MCM	• $334mm^2$ chip

Performance	1X	Performance	1.7X
Power	1X	Power	.6X

Power 2 Super Chip
(18.4mm x 18.2mm)



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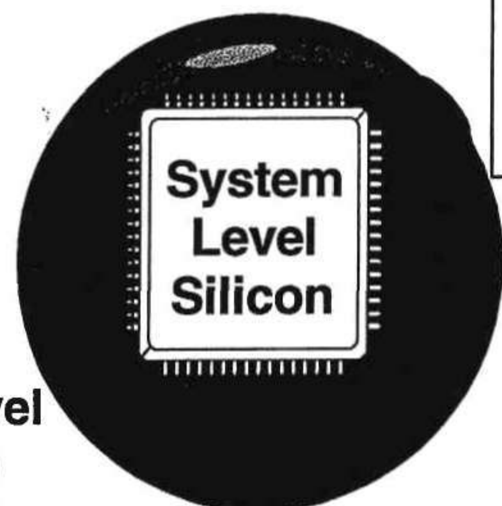

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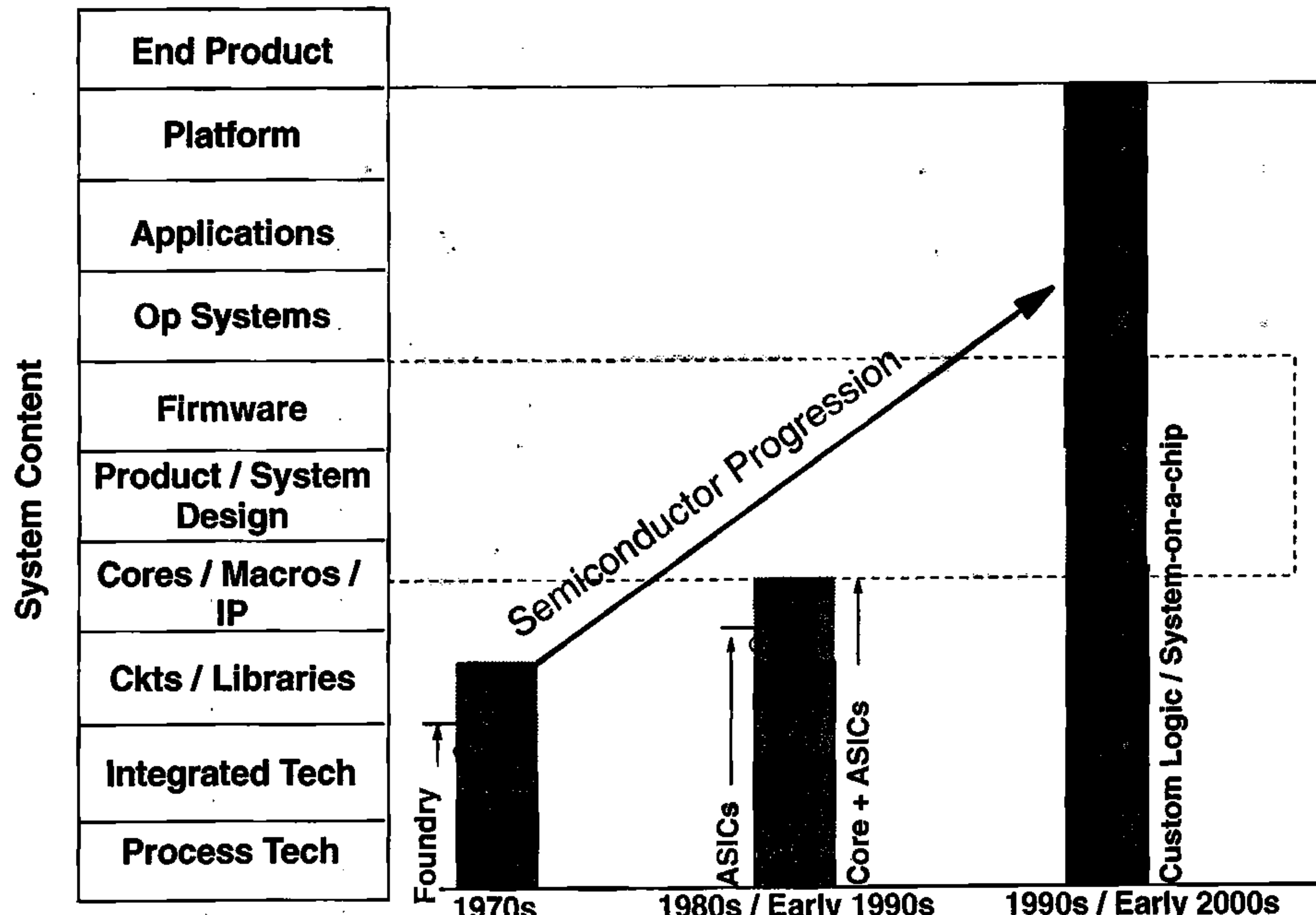
- Reuse of hardware and software objects

Alliances, Partnerships and Licensing can enhance competitiveness

Semiconductor Migration Through Time



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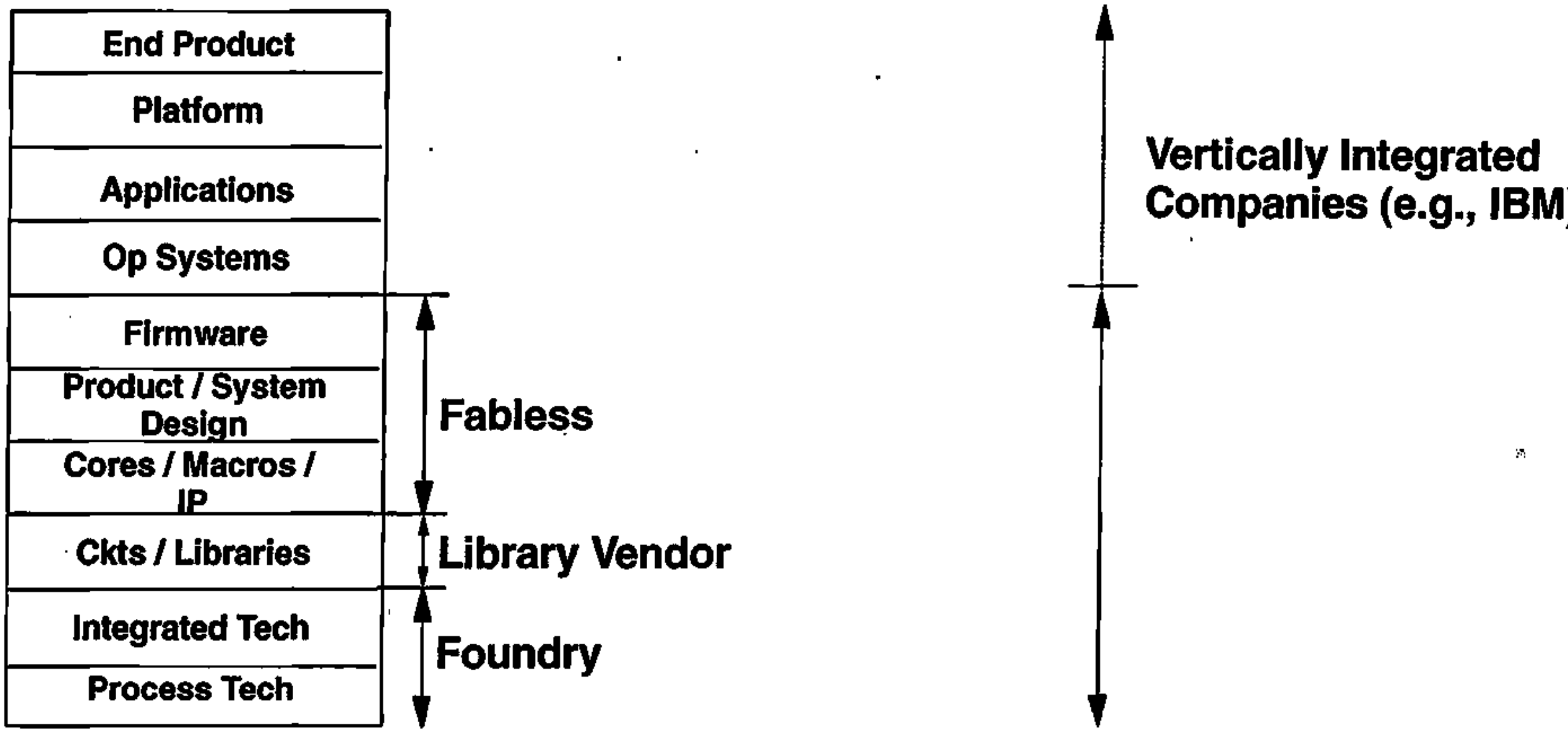
"Horizontal" (specialized) vs. "Vertical" (integrated) Business Models



- **Advantages:**
  - Pieces locally optimized
- **Disadvantages:**
  - Lost opportunity to optimize across "boundaries"

- **Advantages:**
  - Time-to-market of total solution
  - Optimized synergy between technology and design
  - Synergistic design tools and test methodologies
- **Dependencies:**
  - Licensing of some cores / IP
  - Partnerships

intel.

Semiconductor Interconnects as Market Differentiator: Microprocessors Centric View

R. Shukla/Bill Siu

Intel Corporation

Dataquest Semiconductors'97

San Diego, CA

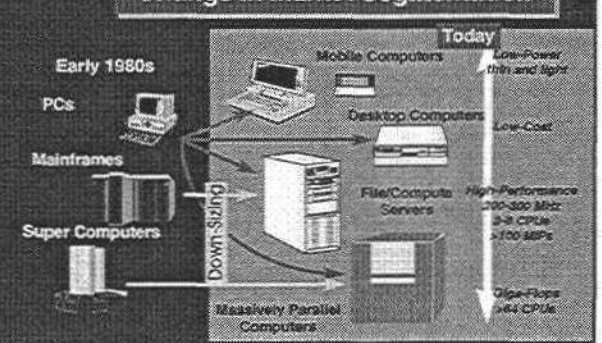
intel.

Agenda

- The Microprocessor as the ubiquitous computing engine
- Interconnect hierarchy
- Current Approaches for differentiation
- Challenges and future direction

intel.

Microprocessor Evolution: Change in Market Segmentation



Microprocessor Evolution

- **Multiple segmentations driven by specific needs**
  - Mobile
  - Performance desktop
  - Multimedia home PC
  - Volume & enterprise Servers and workstations
- **Opportunity: growing, segmented markets!**
- **Challenges**
  - *Continuously improving cost/performance*
  - Standardization (a significant cost driver)

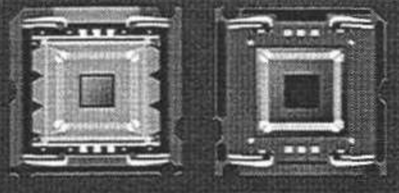
Dataquest Semiconductors'97 Shukla/Siu page 4

CPU Package as a Differentiator

- **Socketed solution**
  - CPGA ----> PPGA (performance/cost)
- **Low cost integration with motherboard**
  - PQFP, BGA's
- **Small is beautiful**
  - TCP for Pentium® notebooks
- **Flexibility with headroom**
  - Slot 1 and Slot 2 Pentium® II Processors.

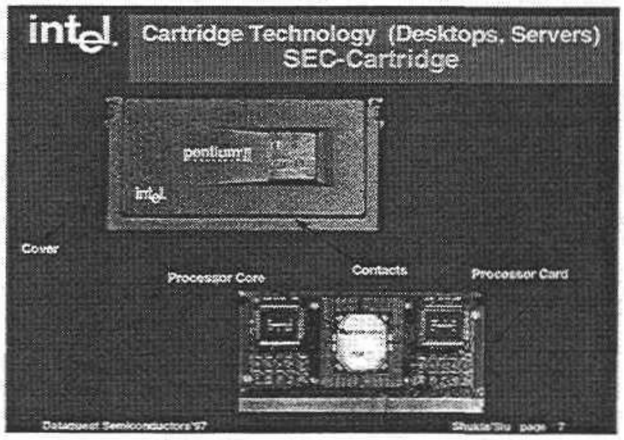
Dataquest Semiconductors'97 Shukla/Siu page 5

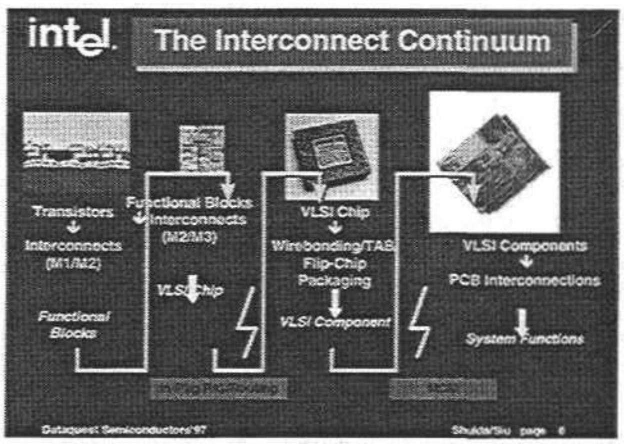
TCP - CPU Technology for Notebook PC's

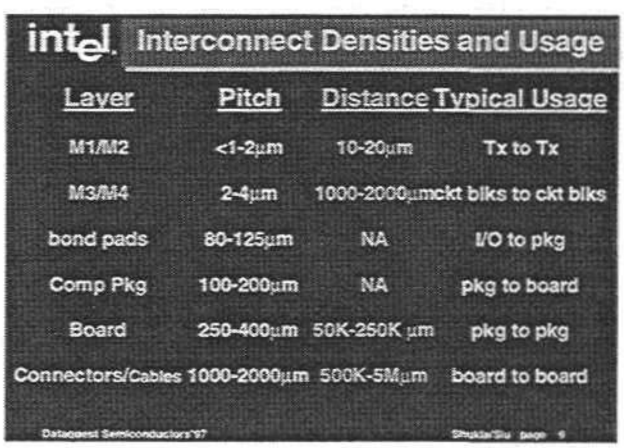


Pentium (tm) Mobile Package

Dataquest Semiconductors'97 Shukla/Siu page 6






intel. Interconnect Densities and Usage

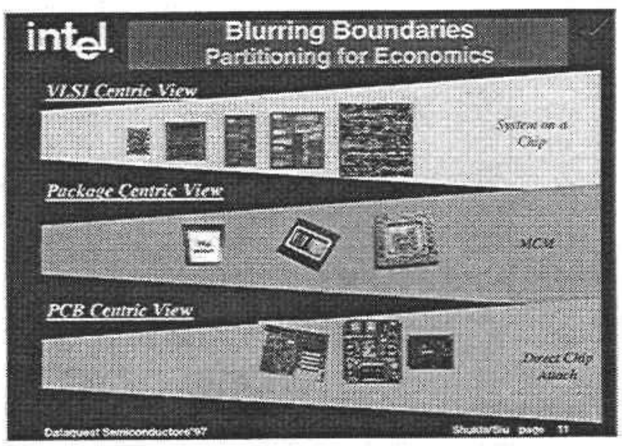
Layer	Pitch	Distance	Typical Usage
M1/M2	<1-2µm	10-20µm	Tx to Tx
M3/M4	2-4µm	1000-2000µm	ckt blks to ckt blks
bond pads	80-125µm	NA	I/O to pkg
Comp Pkg	100-200µm	NA	pkg to board
Board	250-400µm	50K-250K µm	pkg to pkg
Connectors/Cables	1000-2000µm	500K-5Mµm	board to board

Dataquest Semiconductors'97 Shukla/Siu page 9

intel. Interconnect Evolution

- **Past: Local Integration**
  - optimization (interconnect fiefdoms for silicon, package, systems: different technologies, little interdependencies)
- **Present: Partitioning by market segments**
  - Mobile form-factors
  - Socket 7, Slot 1, Slot 2 etc.
- **Future: Partitioning paradigm shift**
  - Global integration/optimization: distributed logic
  - Breakthrough Paradigms needed as enablers

Dataquest Semiconductors'97 Shukla/Siu page 10



intel. VLSI Centric View

- **System on a chip: the ultimate integration**
- **Barriers:**
  - Large die economics (cost limiter)
  - Global signal RC delays, clock skew (performance limiter)
  - Power distribution and delivery (performance limiter)
- **Enablers:**
  - VLSI process technology advances (Cu, low K dielectric, extreme submicron litho etc.)
  - Decoupling capacitance and di/dt management
  - Flip Chip Array (power distribution/delivery) and associated collaterals
- **System on a chip is a niche market, at best!**

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Microprocessor Treadmill Electrical Impact

- Clock frequency (~ 2X/3 years)
  - core noise control and power delivery
  - increased di/dt
    - Increased simultaneous switching noise
    - integrated and/or discrete capacitors in packages
  - higher power ($P = k\,CV^2 f$)
- Wider/faster Busses
  - 2nd level cache integration
  - Parasitic delays in packages
- Voltage scaling (transistor scaling, power reduction)
  - Lower noise margins
  - Power delivery at increased currents

Dataquest Semiconductors'97 Shukla/Siu page 13

Package Centric View

- **MCM's : Put all high speed chips in one integrated package.**
- **Barriers:**
  - Cost and manufacturing complexity
  - Limited flexibility (bare die availability)
  - Interconnect limitations (flip chip availability)
  - Competing with VLSI integration life cycles
- **Enablers: low cost substrates, KGD, flip chip array, thermals, etc.**
- **"True" MCM's are not a volume technology.**

Dataquest Semiconductors'97 Shukla/Siu page 14

System Centric View

- **Eliminate first level package interconnects (Direct chip attach)**
- **Barriers:**
  - PCB Substrates routing capability
    - interconnect technology
    - cost
  - Thermomechanicals (reliability limiter)
  - Flexibility (VLSI design cycles)
- **Enablers: Non evolutionary advances in PCB substrates and flip chip/array technology**
- **Not a viable mainstream option**

Dataquest Semiconductors'97 Shukla/Siu page 15

intel. Direction: Blurring Boundaries for Economics

- **Problem Statement:**
  - what is the best way to continue to improve performance and form-factor
    - » Silicon?
    - » Package?
    - » System?

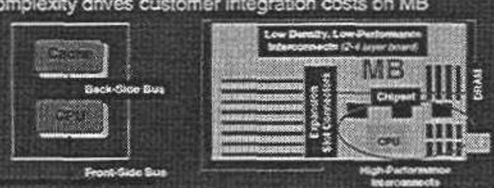
Challenge is to achieve global optimization for cost/performance using a blur of interconnect hierarchy.

intel. Intel's Approach

- **Maintain focus on high performance but provide compatibility (IA) and standardization (e.g., one CPU: Slot 1, Slot 2)**
- **Partition functions for economics**
  - Dual independent bus architecture
  - Optimized Cache systems
- **Control of high speed electricals without burdening the motherboard.**
- **Speed up CPU as well as Platform**
  - PCI bus, AGP, real time video etc.

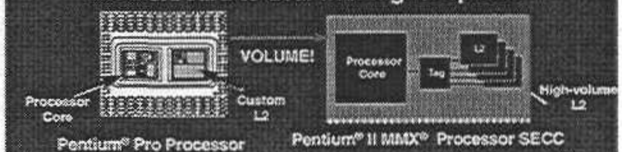
intel. Blurring Boundaries Partitioning for Economics

- **Pentium® Pro and Pentium II ® CPU architectures depend on backside bus and L2 cache**
  - integration drives packaging costs
  - complexity drives customer integration costs on MB



intel. Intel's Approach: SEC-Cartridge

- Separate Cache Silicon from CPU
  - Cache size flexibility
  - Avoid large die to maintain yield & availability
- Use memory vendor expertise
  - Specialized, high-volume memory design and manufacturing capability
- Lower the technical/cost burden on motherboard to deal with higher speeds



Dataquest Semiconductors'97 Shukla/Siu page 19

intel. Breakthrough Paradigms

- System Optimization (partitioning)
  - system cost and complexity (vertical integration approach in a horizontal food chain)
  - Substrate as extension of global routing (power, clock) for CPU, low loss high speed transmission line connection to other chips (e.g., cache)
- Area Array Interconnections
  - design and partitioning between silicon/package
  - assembly, substrates and thermo-mechanicals
- Portability
  - TCP, Direct Chip Attach?

Dataquest Semiconductors'97 Shukla/Siu page 20

intel. Summary

- Interconnects have a unique opportunity to lend foundation to growing and segmenting markets created by CPU evolution.
- Near term focus is to maximize the local integration of high speed CPU/Cache subsystem to provide headroom for performance growth in the next several years.
- Long term performance/cost optimization requires several breakthrough paradigms in partitioning and needs enabling technologies such as flip chip array interconnects, advanced substrates and performance mobile/portable solutions.

Dataquest Semiconductors'97 Shukla/Siu page 21

1997

Dataquest Predicts ...

1997 and Beyond

February 25-26, 1997
San Jose Convention Center
San Jose, California

Dataquest

Published by Dataquest, a Gartner Group Company

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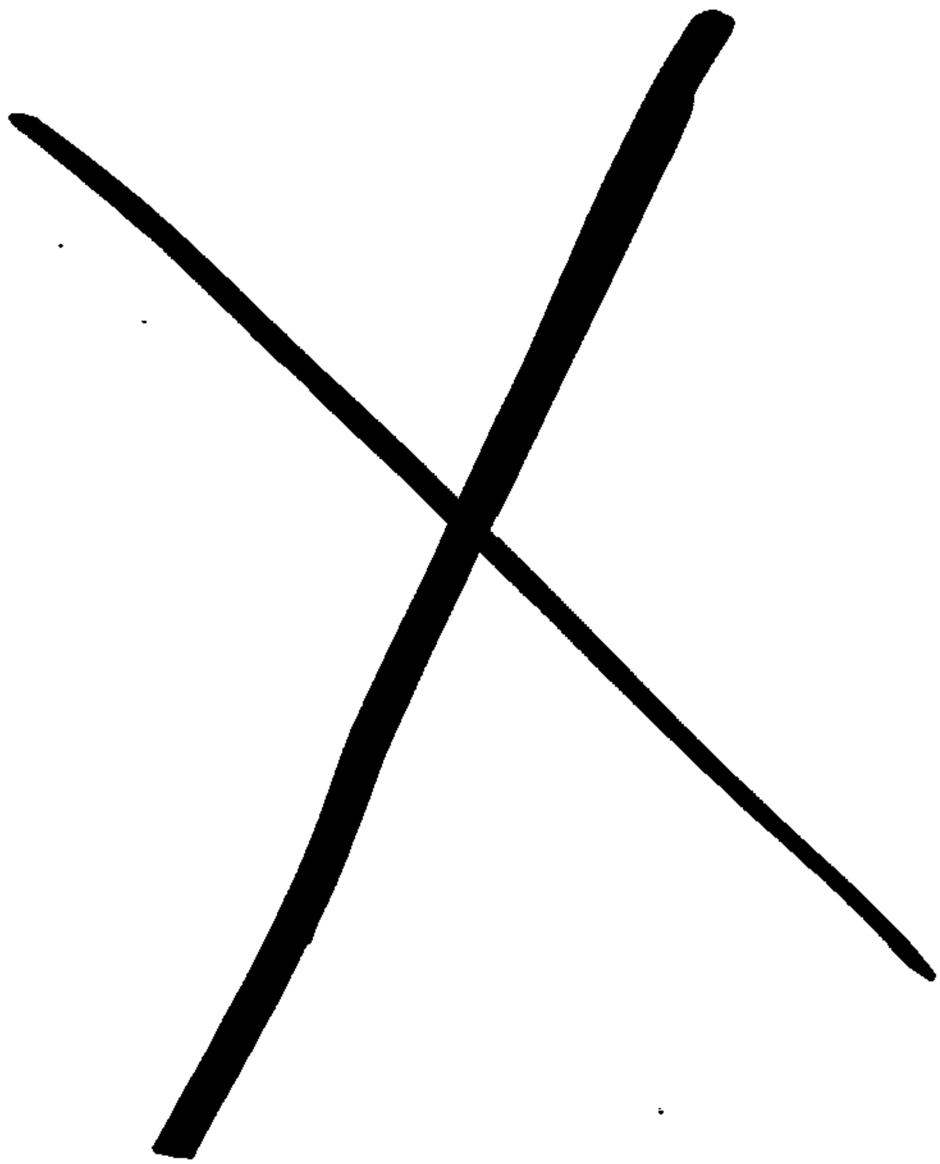

Agenda

Dataquest Predicts ...

San Jose Convention Center
San Jose, California
February 25-26, 1997

Day One: February 25

7:30 am	**Registration and Continental Breakfast**	**Concourse I (Foyer)**
8:30 - 8:45 am	**Predicts 97 Introduction** Marc C. Litvinoff Vice President and Worldwide Director, Research Operations, Dataquest	**Exhibit Hall I**
8:45 - 9:30 am	**The Internet Revolution: New Opportunities, New Challenges** Edward R. Kozel Chief Technical Officer, Cisco Systems Inc.	**Exhibit Hall I**
9:30 - 10:15 am	**The IT Industry Outlook: Fasten Your Seat Belts** W. Ladd Bodem Vice President and Worldwide Director, IT Services Group, Dataquest	**Exhibit Hall I**
10:15 - 10:45 am	**Networking Break**	**Concourse I (Foyer)**
10:45 - 11:30 am	**Leveraging Knowledge through IT:** **Lessons Learned from the Professional Services Environment** Roger S. Siboni, Deputy Chairman KPMG Peat Marwick LLP	**Exhibit Hall I**
11:30 - 12:15 pm	**A Special Predicts Panel:** **Inside the Minds of Today's CIOs** **Moderator:** Terry Waters Vice President, Executive Programs, Gartner Group **Panelists:** Peter Bakalor, Sr. Vice President, IT, EMI Music Worldwide Dean S. Sivley, Vice President, Marketing and CIO, Rosenbluth International Richard E. Nawrot, Senior Vice President-Information Systems, Payless Cashway Inc. Joseph W. Farrelly, Executive Vice President and Chief Information Officer, Nabisco	**Exhibit Hall I**
12:15 - 1:30 pm	**Luncheon**	**Exhibit Hall I Annex**

1:30-5:00 pm Analyst Tracks A-E (see pages 3-5)

5:00-6:30 pm	**Cocktail and Hors d'oeuvres Reception**	**Concourse I (Foyer)**

Agenda continues

Agenda

Day Two: February 26

8:00 - 9:00 am	**Continental Breakfast**	**Concourse I (Foyer)**
9:00 - 9:15 am	**Day Two Introduction** Marc C. Litvinoff Vice President and Worldwide Director, Research Operations, Dataquest	**Exhibit Hall I**
9:15 - 10:00 am	**Venture Capital and Emerging Technology** Kevin R. Compton General Partner, Kleiner Perkins Caulfield & Byers	**Exhibit Hall I**
10:00 - 10:30 am	**Networking Break**	**Concourse I (Foyer)**
10:30 - 11:15 am	**Convergence and the Digital Consumer** Van L. Baker Director and Principal Analyst, Distribution Channels Worldwide, Computer Systems and Peripherals Group, Dataquest	**Exhibit Hall I**
11:15 - 12:15 pm	**A Special Predicts Panel, Fitting into the Internet Food Chain: Who's Going to Find the Mass Market Sweet Spot?** **Moderator:** Daniel H. Rimer Research Analyst, Internet/Digital Media, Hambrecht & Quist **Panelists:** Hal Logan, President and Chief Executive Officer, Vicinity Corporation Nicholas A. Grouf, Chief Executive Officer, Firefly Robert Simon, Cofounder and Executive Vice President, Navitel	**Exhibit Hall I**
12:15-1:30 pm	**Luncheon**	**Exhibit Hall I Annex**
1:30-4:45 pm	**Analyst Tracks A-E (see pages 6-7)**	
3:30 - 4:00 pm	**Networking Break**	**Concourse I (Foyer)**
4:00-4:45 pm	**Conference Summary** Davis Blair Vice President , Online, Multimedia, and Software Group, Dataquest	**Exhibit Hall I**
4:45 pm	**Conference Adjourns**	

Agenda Continues

Agenda

Dataquest Analyst Tracks, Day One: February 25

1:30-2:30 pm

Track A, Online and Multimedia Services

Changing the Rules: The Internet Evolves — **Ballroom A1**

Kathryn Hale, Principal Analyst, Internet and Enterprise Strategies, Online, Multimedia, and Software Group, Dataquest

Track B, IT Services

Remote Network Management Services — **Ballroom A2**

Ellen Carney, Director and Principal Analyst, Network Integration and Support Services, Telecommunications Group, Dataquest

Track C, Telecommunications

Telecom Market Reform — **Ballroom A3**

John Dinsdale, Chief Analyst, Worldwide Public Network Program, Telecommunications Group, Dataquest

Track D, Semiconductors

Consumer Electronics: Play Hard or Die Hard — **Ballroom A4**

Dale L. Ford, Senior Industry Analyst, Semiconductor Application Markets Group, Dataquest

Track E, Computers and Peripherals

The Worldwide PC Marketplace — **Ballroom C**

William C. Schaub, Director, Quarterly Tracking Programs, Computer Systems and Peripherals Group, Dataquest

Agenda continues

Agenda

Dataquest Analyst Tracks, Day One: February 25

2:30-3:30 pm

Track A, Online and Multimedia Services

Electronic Commerce: The Gold Rush of 1997 — **Ballroom A1**

Allen Weiner, Director and Principal Analyst,
Internet and Enterprise Strategies and Digital Commerce Programs,
Online, Multimedia, and Software Group, Dataquest

Track B, IT Services

The Ongoing Revolution In Product Support — **Ballroom A2**

Eric C. Rocco, Senior Industry Analyst, Hardware Services,
IT Services Group, Dataquest

Track C, Telecommunications

The Industrial Strength Internet: Real or Imagined? — **Ballroom A3**

John Coons, Director and Principal Analyst, Wide Area
Networking Program, Telecommunications Group, Dataquest

Track D, Semiconductors

Killer Chips for the PC — **Ballroom A4**

Geoff Ballew, Senior Analyst, Semiconductor Application
Markets Group, Semiconductors, Dataquest

Track E, Computers and Peripherals

New Technologies Fueling PC Market Growth — **Ballroom C**

Martin Reynolds, Vice President, PC Technology Program,
Computer Systems and Peripherals Worldwide, Dataquest

Agenda continues

Agenda

Dataquest Analyst Tracks, Day One: February 25

4:00-5:00 pm

Track A, Online and Multimedia Services

Software Suites: New Life, or Life Support? — **Ballroom A1**

Dan Lavin, Senior Industry Analyst, Personal Computer Software and Groupware, Online, Multimedia, and Software Group, Dataquest

Track B, IT Services

The Online Revolution: A Look Ahead — **Ballroom A2**

Thomas Sweeny, Director and Principal Analyst, Software Services, IT Services Group, Dataquest

Track C, Telecommunications

High-Speed Internet Access: Cable or Copper? — **Ballroom A3**

Bobbi Murphy, Chief Analyst, Remote Access Program, Telecommunications Group, Dataquest

Track D, Semiconductors

It's a Wireless World: Digital Cellular Meets Digital Cordless — **Ballroom A4**

David Moorhouse, Associate Director and Program Manager, Semiconductor Applications Market Europe, Dataquest

Track E, Computers and Peripherals

Panel, Digital Video Disk: The Next Big Thing? — **Ballroom C**

Moderator:

Phil Devin, Vice President and Chief Analyst, Computer Storage Technologies, Computer Systems and Peripherals Group, Dataquest

Dataquest Panelists include:

Mary Bourdon, Senior Industry Analyst, Computer Storage, Computer Systems and Peripherals Group
Dale L. Ford, Senior Industry Analyst, Semiconductor Application Markets Group
Van L. Baker, Director and Principal Analyst, Distribution Channels Worldwide, Computer Systems and Peripherals Group
R. Scott Miller, Senior Industry Analyst, Advanced Desktop and Workstation Computing, Computer Systems and Peripherals Group
Mike Casey, Research Director, Distributed Storage Systems, Gartner Group

5:00-6:30 pm **Cocktail and Hors d'oeuvres Reception** — **Concourse I (Foyer)**

Agenda continues

Dataquest Analyst Tracks, Day Two: February 26

1:30-2:30 pm

Track A, Online and Multimedia Services

The Software Management Challenge in Client/Server Computing — **Ballroom A1**

Carolyn B. DiCenzo, Director and Principal Analyst, Client/Server, Software Worldwide, Online, Multimedia, and Software Group, Dataquest

Track B, IT Services

Computing Utility: A New IT Value Proposition — **Ballroom A2**

Stephen M. Clancy, Director and Principal Analyst, System Support Services, IT Services Group, Dataquest

Track C, Telecommunications

Wireless Wars: New Competition Breeds Market Battles! — **Ballroom A3**

John Ledahl, Director and Principal Analyst, Wireless Programs, Telecommunications Group, Dataquest

Track D, Semiconductors

Semiconductor Capacity: From Shortage to Glut, What's Next? — **Ballroom A4**

Ron Dornseif, Principal Analyst, Semiconductor Equipment, Manufacturing and Materials Worldwide, Semiconductors Group, Dataquest

Track E, Computers and Peripherals

Panel, Drilling into the PC Market — **Ballroom C**

Moderator:

Kimball Brown, Vice President, Desktop and Mobile PCs Worldwide, Computer Systems and Peripherals Group, Dataquest

Dataquest Panelists include:

Peter ffoulkes, Director and Principal Analyst, Advanced Desktops and Workstations Worldwide, Computer Systems and Peripherals Group

R. Scott Miller, Senior Industry Analyst, Advanced Desktop and Workstation Computing, Computer Systems and Peripherals Group

Mike McGuire, Senior Industry Analyst, Mobile Computing Worldwide, Computer Systems and Peripherals Group

James Staten, Industry Analyst, Personal Computers Worldwide, Computer Systems and Peripherals Group

Agenda continues

Dataquest Analyst Tracks, Day Two: February 26

2:30-3:30 pm

Track A, Online and Multimedia Services

Windows 95 and NT: The 32-Bit OS Transition Scenario — **Ballroom A1**
Chris Le Tocq, Director, Personal Computing Software, Online, Multimedia, and Software Group, Dataquest

Track B, IT Services

Synergistic Product and Service Brand Image: The New Schizophrenia — **Ballroom A2**
Ellen S. Kitzis, Ph.D., Vice President, Lead Analyst, IT Services Group, Dataquest

Track C, Telecommunications

The LAN Network Backbone: Where Does It Go from Here? — **Ballroom A3**
Don Miller, Chief Analyst, Networking Program, Telecommunications Group, Dataquest

Track D, Semiconductors

Semiconductor Outlook toward 2000 — **Ballroom A4**
Gene Norrett, Corporate Vice President and Director, Semiconductors Group, Dataquest

Track E, Computers and Peripherals

Successful Intranet and Web Servers — **Ballroom C**
Gregory C. Garry, Senior Industry Analyst, Client/Server Computing, Computer Systems and Peripherals Group, Dataquest
Kimball Brown, Vice President, Desktop and Mobile PCs Worldwide, Computer Systems and Peripherals Group, Dataquest

3:30 - 4:00 pm **Networking Break** — **Concourse I (Foyer)**

4:00-4:45 pm **Conference Summary** — **Exhibit Hall I**

Davis Blair
Vice President , Online, Multimedia and Software Group, Dataquest

4:45 pm **Conference Adjourns**

Dataquest Predicts: 1997 and Beyond

Thank you for attending Dataquest Predicts. Your thoughts and comments regarding this event are an important part of our process to continually improve the value provided through our conference program. Please help us by taking a few moments to complete this questionnaire.

this section is optional

Name: ______ Title: ______

Company Name: ______ Tel: ______

Nature of company's primary activity: ______

______

1. Are you a(n): ◯ IT vendor ◯ Corporate end user ◯ Other______
2. Where did you originally hear about this conference?

◯ Brochure ◯ Fax ◯ Electronic Delivery ◯ Telephone ◯ Other______

3. Were you familiar with Dataquest prior to this event? ◯ Yes ◯ No

4. How important were the following objectives for attending this conference? Please circle your rating:

	not very important				*very important*
To hear and talk to Dataquest analysts	1	2	3	4	5
To hear industry speakers	1	2	3	4	5
To attend exhibits	1	2	3	4	5
To network with conference attendees	1	2	3	4	5

5. Your primary objective(s) in attending Dataquest Predicts was: ______

______

______

	not very satisfied				*very satisfied*
6. How satisfied are you that the event met these objectives?	1	2	3	4	5

7. What changes would you recommend in terms of format/agenda?

______

______

8. Additional topics you would like included in the program:

______

______

9. Please comment on the conference organization.

______

______

______

Dataquest Predicts: 1997 and Beyond

General Comments:

■ Industry Interest Areas, please circle

Computer Systems and Peripherals

- Home Consumer Markets
- Client/Server Computing
- Advanced Desktops and Workstations
- Intranet Web Servers
- Mobile Computing
- Personal Computer
- PC Technology Directions
- PC Distribution Channels
- PC Pricing Information
- Graphics and Displays
- Computer Storage
- UNIX and Open Systems
- PC, Workstation, and Server Quarterly Statistics

Document Management

- Copiers
- Printers
- Multifunctional Products
- Printer Distribution Channels
- Printer Quarterly Statistics

IT Services

- Hardware Services
- Software Services
- Strategic Marketing and Service Partnerships
- Systems Integration
- Systems Management
- Consulting Services
- Vertical Market Opportunities
- Life Cycle Services
- Network Integration and Support Services

Online, Multimedia, and Software

- Internet and Electronic Commerce
- Multimedia
- Personal Computing Software
- Client/Server Tools
- Collaborative Computing
- AEC and GIS Applications
- Electronic Design Automation
- Mechanical CAD/CAM/CAE Applications

Semiconductors

- ASICs
- Memories
- Microcomponents
- Teardown Analysis—PCs and Electronic Equipment
- Semiconductor Applications
- Semiconductor Supply and Pricing
- Semiconductor Equipment, Manufacturing, and Materials
- Semiconductor Contract Manufacturing Services

Telecommunications

- Networking
- Personal Communications
- Public Network Equipment and Services
- Voice Communications
- Quarterly Statistics
- Internet Telecommunications

Please evaluate the sessions you attended on the next page.

Dataquest Predicts: 1997 and Beyond

Please evaluate the sessions you attended by circling your rating:	Interest Level (1 = Low, 5 = High)	Presentation (1 = Poor, 5 = Excellent)	Content (1 = Poor, 5 = Excellent)	Did not Attend
■ Day One: February 25, Morning Session				
The Internet Revolution: New Opportunities, New Challenges				
Edward R. Kozel, Cisco Systems Inc.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
The IT Industry Outlook: Fasten Your Seat Belts				
W. Ladd Bodem, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Leveraging Knowledge through IT: Lessons Learned from the Professional Services Environment				
Roger S. Siboni, KPMG Peat Marwick LLP	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
A Special Predicts Panel: Inside the Minds of Today's CIOs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

1:30-5:00 pm Analyst Tracks A-E **(see following pages)**

■ Day Two: February 26, Morning Session				
Venture Capital and Emerging Technology				
Kevin R. Compton, Kleiner Perkins Caulfield & Byers	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Convergence and the Digital Consumer				
Van L. Baker, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
A Special Predicts Panel, Fitting into the Internet Food Chain: Who's Going to Find the Mass Market Sweet Spot?	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

1:30-4:45 pm Analyst Tracks A-E **(see following pages)**

Conference Summary				
Davis Blair, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

Dataquest Predicts: 1997 and Beyond

Please evaluate the sessions you attended by circling your rating:	1 = Low 5 = High	1 = Poor 5 = Excellent	1 = Poor 5 = Excellent	
	Interest Level	**Presentation**	**Content**	**Did not Attend**

■ Dataquest Analyst Tracks, Day One: February 25

1:30-2:30 pm				
Track A, Online and Multimedia Services **Changing the Rules: The Internet Evolves**				
Kathryn Hale, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track B, IT Services **Remote Network Management Services**				
Ellen Carney, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track C, Telecommunications ***Telecom Market Reform***				
John Dinsdale, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track D, Semiconductors **Consumer Electronics: Play Hard or Die Hard**				
Dale L. Ford, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track E, Computers and Peripherals **The Worldwide PC Marketplace**				
William C. Schaub, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
2:30-3:30 pm				
Track A, Online and Multimedia Services **Electronic Commerce: The Gold Rush of 1997**				
Allen Weiner, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track B, IT Services **The Ongoing Revolution In Product Support**				
Eric C. Rocco, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track C, Telecommunications **The Industrial Strength Internet: Real or Imagined?**				
John Coons, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track D, Semiconductors **Killer Chips for the PC**				
Geoff Ballew, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track E, Computers and Peripherals **New Technologies Fueling PC Market Growth**				
Martin Reynolds, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

Dataquest Predicts: 1997 and Beyond

Please evaluate the sessions you attended by circling your rating:	Interest Level (1 = Low, 5 = High)	Presentation (1 = Poor, 5 = Excellent)	Content (1 = Poor, 5 = Excellent)	Did not Attend
4:00-5:00 pm				
Track A, Online and Multimedia Services **Software Suites: New Life, or Life Support?** Dan Lavin, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track B, IT Services **The Online Revolution: A Look Ahead** Thomas Sweeny, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track C, Telecommunications **High-Speed Internet Access: Cable or Copper?** Bobbi Murphy, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track D, Semiconductors **It's a Wireless World: Digital Cellular Meets Digital Cordless** David Moorhouse, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track E, Computers and Peripherals **Panel, Digital Video Disk: The Next Big Thing?**	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

■ Dataquest Analyst Tracks, Day Two: February 26

1:30-2:30 pm				
Track A, Online and Multimedia Services **The Software Management Challenge in Client/Server Computing** Carolyn B. DiCenzo, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track B, IT Services **Computing Utility: A New IT Value Proposition** Stephen M. Clancy, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track C, Telecommunications **Wireless Wars: New Competition Breeds Market Battles!** John Ledahl, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

Dataquest Predicts: 1997 and Beyond

Please evaluate the sessions you attended by circling your rating:	1 = Low 5 = High Interest Level	1 = Poor 5 = Excellent Presentation	1 = Poor 5 = Excellent Content	Did not Attend
Track D, Semiconductors **Semiconductor Capacity: From Shortage to Glut, What's Next?** Ron Dornseif, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track E, Panel, Computers and Peripherals: Drilling into the PC Market	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

2:30-3:30 pm

Track A, Online and Multimedia Services **Windows 95 and NT: The 32-Bit OS Transition Scenario** Chris Le Tocq, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track B, IT Services **Synergistic Product and Service Brand Image: The New Schizophrenia** Ellen S. Kitzis, Ph.D., Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track C, Telecommunications **The LAN Network Backbone: Where Does It Go from Here?** Don Miller, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track D, Semiconductors **Semiconductor Outlook toward 2000** Gene Norrett, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O
Track E, Computers and Peripherals **Successful Intranet and Web Servers** Gregory C. Garry, Dataquest	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	O

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Predicts 97 Introduction

Marc C. Litvinoff

Vice President and Worldwide Director, Research Operations
Dataquest

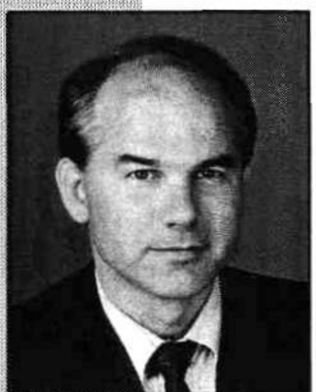
Mr. Litvinoff is vice president and worldwide director of Research Operations and has been with Gartner Group since 1992. He has management responsibility for Dataquest's data-related research in markets that Dataquest tracks worldwide. In addition, he is responsible for the Dataquest Cross-Technology program. Before this assignment, he was responsible for the direction of Gartner Group research and analysis as it applies to small and medium-size organizations as well as the fulfillment of the Gartner Group newsletter business.

Upon joining Gartner Group, Mr. Litvinoff was research director for the PC services' desktop hardware and peripheral research. Before joining Gartner Group, he was corporate manager at Automatic Data Processing with responsibilities for researching, evaluating, and procuring laser printers for use in payroll production, as well as a variety of personal computer projects. Previously, he was director of PC support and technology at Mutual of New York. He began his career at the Dreyfus Corporation as an investment analyst.

Mr. Litvinoff received a bachelor's degree in banking, finance, and investments from Hofstra University.

The Internet Revolution: New Opportunities, New Challenges

Edward R. Kozel
Chief Technical Officer
Cisco Systems



Mr. Kozel is Cisco Systems' chief technical officer and is responsible for strategic technology planning and acquisitions, strategic joint development projects, consulting engineering, and education market development. Recently, Mr. Kozel was acting vice president and general manager of Cisco's LightStream, Enterprise ATM Business Unit.

Before joining Cisco Systems, Mr. Kozel worked at Boeing, McDonnell Douglas, and SRI International. While at SRI International he participated in the early design and development of the Internetwork Protocol model and TCP/IP, packet radio networks, and highly distributed information systems.

Mr. Kozel graduated from the University of California, Davis, with a degree in electrical engineering.

Presentation not available at time of publication

Notes

The IT Industry Outlook: Fasten Your Seatbelts

W. Ladd Bodem

Vice President and Worldwide Director
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Mr. Bodem is vice president and worldwide director for the IT Services group. He has over 24 years of experience in the information technology services business, both in management and technical positions and has a strong background in all areas of IT services. He has specialized in systems integration, technology transitions, and service market trends.

As vice president and worldwide director, Mr. Bodem is responsible for ensuring the research in the IT Services group is both timely, appropriate, and consistent worldwide, and is responsible for the direction and vision of the IT Services research group. In addition, he is the publisher of the *Services Industry Newsletter* and is a member of the editorial advisory board of *Service News*. He has spoken at numerous industry and vendor conferences on topics such as IT services market trends, technology assimilation, legacy systems migration, and rapid application development.

Before Dataquest, he held a variety of services management positions at Digital Equipment Corporation, Data General, and International Software Group. He has won numerous service excellence and customer satisfaction awards.

Agenda

- ➤ How big is the market?
- ➤ What fuels the growth?
- ➤ Where are the opportunities?
- ➤ How will it affect YOU?

971383

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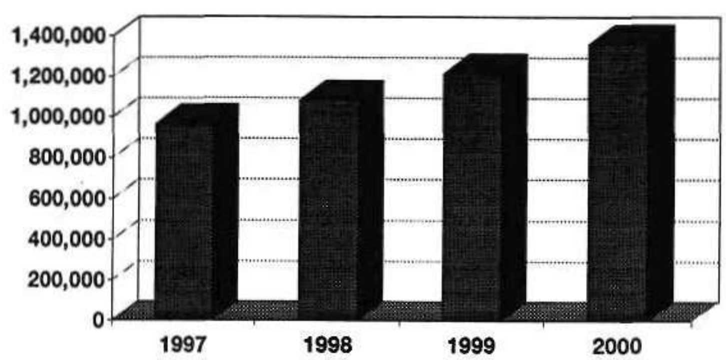
Market Size in Millions of Dollars



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$1,000,000,000,000

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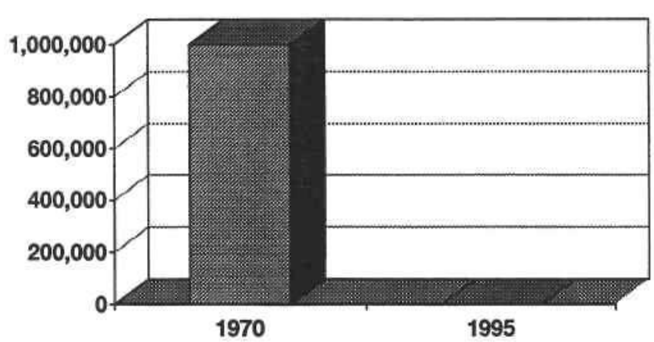
Dollars per MIPS



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Perspective

$10

971387

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The Great Paradox

How can this market continue to grow
at double digits every year
when the basic items being sold
keep getting cheaper?

971388

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The Answer

CHANGE

equals

OPPORTUNITY

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Three Keys to Success

1. Enter the market early
2. Understand the competition
3. Adapt to new conditions

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Hazards of Making Predictions

Apple's original forecast for Newton sales in 1993 was 200,000 versus actual sales of less than 50,000.

"Neural nets will soon be seen as the most important technological development since the invention of the telephone and the nuclear bomb."

Digital Review, May 1988

971391

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Hazards of Making Predictions

"Where a calculator on the ENIAC is equipped with 18,000 vacuum tubes and weighs 30 tons, computers in the future may only have 1,000 vacuum tubes and perhaps weigh 1.5 tons."

Popular Mechanics, March 1949

971392

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Dataquest's Track Record

- Success of the Pentium Pro
- NT as a dominant server platform
- 3-D graphics in consumer machines
- Ultraportables continuing to struggle
- CDMA technology as a cellular standard
- Year 2000 conversion impact
- Services as key differentiator
- Intranets

971393

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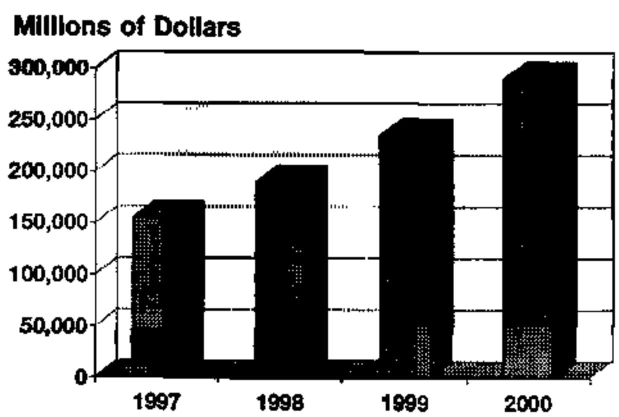
Dataquest Predicts: Semiconductor Market Growth



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971394

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Dataquest Predicts: Semiconductors

- The total semiconductor industry will grow by 13% in 1997, up from -9.4% in 1996
- Semiconductor manufacturers' capital spending on new plants and equipment will decline by 14% in 1997

971395

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Dataquest Predicts: Semiconductors

- PC semiconductor revenue will more than double over next four years
- Multimedia chips will drive PC semiconductor market
- Programmable chipsets will carve out market share

971396

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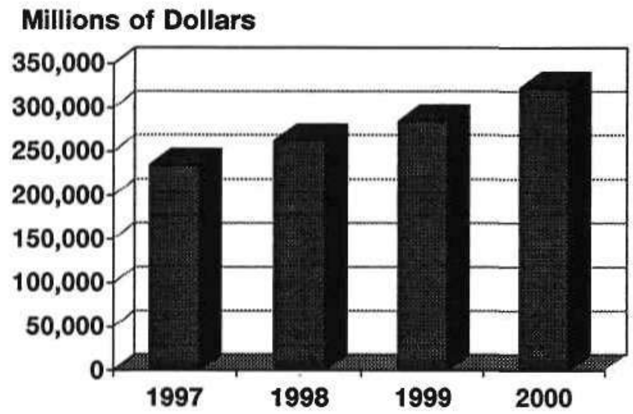
Dataquest Predicts: Computers Market Growth



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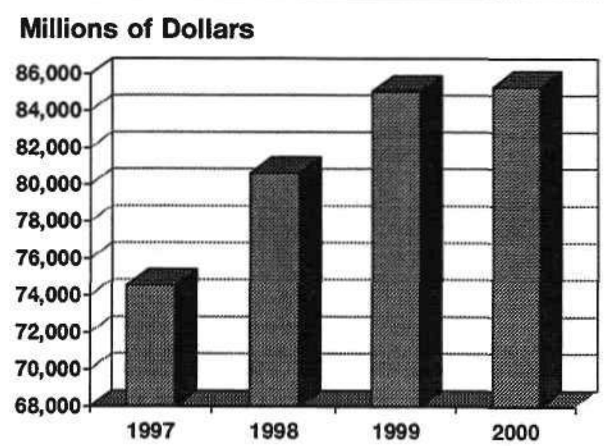
Dataquest Predicts: Peripherals Market Growth



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971398

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Dataquest Predicts: Computers and Peripherals

- Apple Computer will have a relatively strong year in 1997
- Intel will have less than 50 percent share of new Pentium-class sales in 1998
- AMD to have a hot 1998

971399

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A Gartner Group Company

Dataquest Predicts: Computers and Peripherals

- $1,000 PCs will overshadow the network PC concept in 1997
- Consumer buying of PCs will drop in the U.S., where penetration nears 36%
- Worldwide PC sales will reach nearly 85 million units in 1997, up 17.5% from 1996

971400

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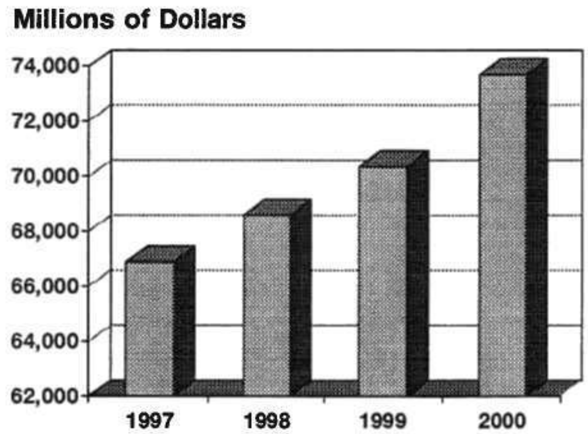
Dataquest Predicts: Telecom Market Growth



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Dataquest Predicts: Telecommunications

- Gigabit Ethernet solutions will be demonstrated at trade shows in 1997
- The old 80/20 rule of network traffic (80% local, 20% backbone) will be inverted as the result of centrally deployed intranet servers

971402

Dataquest
A Gartner Group Company

Dataquest Predicts: Telecommunications

- At least three more NSPs will announce introduction of ATM into backbone
- Almost 1 billion POTS lines by 2000
- 365 million mobile subscribers
- 1.6 billion more needed
- $900 billion services market
- Remote access end-user revenue over $12 billion by 2000

971403

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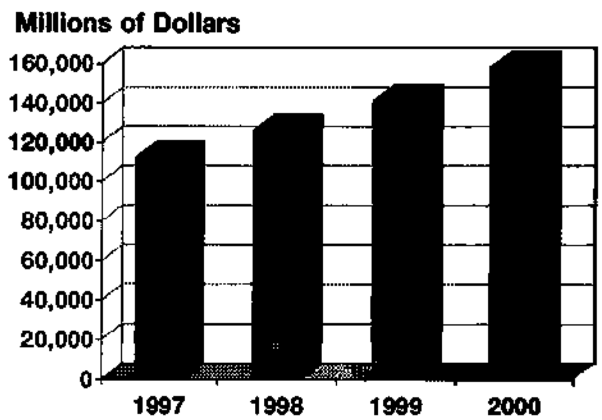
A Gartner Group Company

Dataquest Predicts: Software Market Growth



Source: Dataquest
971404

Dataquest
A Gartner Group Company

Dataquest Predicts: Software

- Software suites will be increasingly customized to address specific market segments
- Multiplatform support will make Netscape the standard for intranet browsing
- Every software vendor will embed license management within two years

971405

Dataquest
A Gartner Group Company

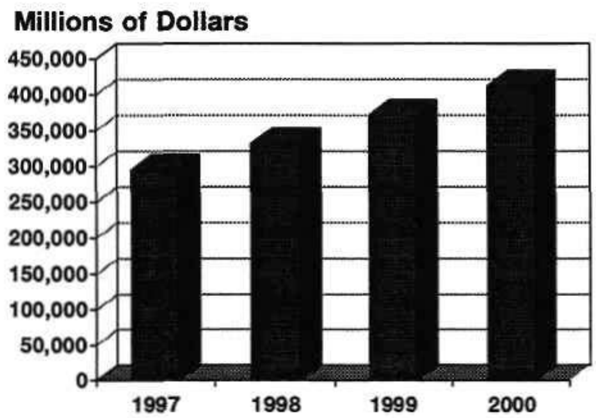
Dataquest Predicts: Internet

- Over 140 million PCs on Internet by year 2000
- Over half of Web servers in year 2000 on intranets
- Online commerce 1998 gold rush—$12 billion by year 2000

971406

Dataquest
A Gartner Group Company

Dataquest Predicts: IT Services Market Growth



Source: Dataquest

971407

Dataquest
A Gartner Group Company

Dataquest Predicts: Services

- Concept of "Computing Utility" will emerge representing over 30% of market by year 2000
- Service companies will invest heavily in the branding —VP of brand management
- Intranets will utterly transform the IT services business

971408

Dataquest
A Gartner Group Company

Dataquest Predicts: Services

- Over half of all software support transactions will be online by 1998
- Only two national independent hardware service providers by 1998
- Hardware service revenue growth and margins will continue to erode through 2000

971409

Dataquest
A Gartner Group Company

Dataquest Predicts: Services

- As the number of network management tools increases, the ability of customers to take advantage of the tools decreases
- Almost half of network professional services in year 2000 will be for management and operations

971410

Dataquest
A Gartner Group Company

Opportunities

- Development of new software channels
- Intranet-based software, services, and servers
- Overseas PC sales (especially in Asia)
- Communications hardware and services
- Partnerships

971411

Dataquest
A Gartner Group Company

My Challenge to You

- Listen
- Participate
- Network
- Take action

971412

Dataquest
A Gartner Group Company

Notes

Notes

Leveraging Knowledge through IT: Lessons Learned from the Professional Service Environment

Roger S. Siboni

Deputy Chairman
KPMG Peat Marwick LLP

Mr. Siboni is deputy chairman and chief operating officer of KPMG Peat Marwick LLP, the worldwide accounting and consulting organization. He was elected to the position in October 1996. Before being named to his current position, Mr. Siboni was director of the company's high-technology practice from 1991 to 1993. He joined Peat Marwick in 1976 and was admitted to the partnership in 1983. He was most recently national managing partner of the information, communications, and entertaining (ICE^{SM}) practice, and a member of the company's management committee. In that role, Mr. Siboni led KPMG's effort to serve clients worldwide in the fields of semiconductors, software, computers and peripherals, telecommunications, cable television, broadcasting, entertainment, publishing, and advertising.

Mr. Siboni has spent his career as an advisor to technology-based organizations, particularly in the areas of finance, strategy, and mergers and acquisitions. Also a force in the industry's legislative developments over the past decade, he has testified before the U.S. House Ways and Means Committee and the U.S. Treasury Department on behalf of the technology industry.

A frequent speaker before industry, professional, and academic groups, Mr. Siboni has addressed Technologic Partners' Digital Media Outlook, Agenda '96, the European Congress on Information Technology, World Trade Institute, Intelevent, American Electronics Association, American Management Association, U.S. Chamber of Commerce, California Society of CPAs, State Bar of California, Hastings Law School, Stanford University, and University of California at Berkeley. Mr. Siboni has written numerous articles and was most recently published in *Upside* magazine with "The Multimedia Juggling Act." He was the executive editor of *The Emerging Digital Economy, Software Revenue Recognition—A Guide to Implementation, The Semiconductor Industry, Tax and Financial Incentives for Business Around the World* and *Taxation of Corporate Capital Transactions—A Guide for Corporate Investment Banking and Tax Advisors.*

Mr. Siboni serves on the board of the Walter A. Haas School of Business at the University of California at Berkeley and is a member of the Central Park Conservancy.

Mr. Siboni is a graduate of the University of California at Berkeley.

Presentation not available at time of publication

Notes

Panel: Inside the Minds of Today's CIOs

Moderator: Terry Waters

Vice President, Executive Programs
Gartner Group

Mr. Waters is the vice president of executive programs with the Gartner Group. He has 15 years of experience in the IT industry and has responsibility for Gartner Group's worldwide executive programs efforts including marketing, research direction, and product fulfillment for the IT Executive Program (ITEP). ITEP was started in April 1994 and today has 280 CIO members worldwide. Mr. Waters has published and presented on topics ranging from CIO skills, evolving CIO roles and responsibilities, and IT management agendas for the mid- to late 1990s. In addition, he is the primary executive relationship manager for IT Executive Program members in North America.

Before joining Gartner Group, Mr. Waters spent four years at Xerox Corporation in sales and product marketing support. At Gartner Group, Mr. Waters has held several sales, product, and marketing management positions, including his most recent positions as vice president of worldwide marketing and vice president of worldwide product management for IT management practice areas.

Notes

Panel: Inside the Minds of Today's CIOs

Peter Bakalor

Sr. Vice President, IT
EMI Music Worldwide

Bio not available at time of publication.

Panel: Inside the Minds of Today's CIOs

Panelist: Dean S. Sivley

Vice President, Marketing, and Chief Information Officer
Rosenbluth International

Mr. Sivley joined Rosenbluth International in September 1995 from Duracell Corporation. As vice president of Marketing and chief information officer (CIO), Mr. Sivley is responsible for all facets of Rosenbluth International's technology products; from the identification of client needs and market opportunities, to the actual technological development and positioning of the products. He and his team are delivering enhanced decision support capabilities through DACODA and Res-Monitor and streamlined corporate operational processes through agentless reservation systems (E-Res), Expense Management, and corporate reporting (VISION Direct).

Mr. Silvey was Duracell's CIO and led the re-engineering effort for the company's European operations systems where he replaced mainframes with AS 400 technology. He established Duracell's global office systems and helped to increase the company's market share through enhanced market decision-support systems. He also led Duracell's push into electronic commerce with more than 60 percent of its orders being processed without human intervention at the time of his departure from the company.

Panel: Inside the Minds of Today's CIOs

Panelist: Richard E. Nawrot

Senior Vice President, Information Systems
Payless Cashways Inc.

Mr. Nawrot is senior vice president of Information Systems at Payless Cashways Inc., a multibillion dollar, full-line building materials retailer concentrating on tradespeople, remodelers, and do-it-yourselfers. The company, the fourth-largest building materials retailer in the United States, operates 192 stores in 22 states located in the Midwestern, Southwestern, Rocky Mountains, Pacific Coast, and New England areas.

With more than 25 years in retailing for various companies in department, specialty, mass merchandising, and building supplies, Mr. Nawrot has broad experience in mergers, acquisitions, megagrowth, downsizing, consolidation, restructuring, outsourcing, as well as extensive experience in information systems, physical distribution, merchandise planning and control, direct marketing operations, physical facilities, and office services. He has held senior management positions with companies such as General Mills, Federated Department Stores and Melville Corporation. An early proselyte of "People and Process Strategic Management," he has successfully implemented numerous progressive business systems and technologies directly accounting for increased sales, reduced costs, and/or higher customer counts and has been consistently recognized for the type of "team-centered" leadership that addressed change, innovation, and productivity within information systems as well as the total business enterprise.

Mr. Nawrot is asked to speak internationally on the subjects of IT human resource and process management strategies.

Panel: Inside the Minds of Today's CIOs

Panelist: Joseph W. Farrelly

Executive Vice President and Chief Information Officer
Nabisco Inc.

Mr. Farrelly joined Nabisco in November 1992 and is executive vice president and chief information officer. In this position, he is responsible for setting the overall direction for the company's information technology initiatives and directing its information services strategic and operational objectives.

Before joining Nabisco, Mr. Farrelly was corporate vice president of Information Systems Development for Automatic Data Processing (ADP) in Roseland, New Jersey, where he was responsible for all information systems in the Employer Services Group. While at ADP, he also served as a board member of ADP Canada. Mr. Farrelly joined ADP in December 1988.

Before joining ADP, Mr. Farrelly was corporate vice president of research and development for Applied Data Research (ADR) in Princeton, New Jersey, where he directed the development and support service activities for ADR's mainframe and personal computer product line. Mr. Farrelly joined ADR in July 1980.

A graduate of Providence College with a bachelor's degree in mathematics, Mr. Farrelly received a master of business administration degree in marketing from the University of Connecticut.

Predicts 97 Introduction

Marc C. Litvinoff

Vice President and Worldwide Director, Research Operations
Dataquest

Mr. Litvinoff is vice president and worldwide director of Research Operations and has been with Gartner Group since 1992. He has management responsibility for Dataquest's data-related research in markets that Dataquest tracks worldwide. In addition, he is responsible for the Dataquest Cross-Technology program. Before this assignment, he was responsible for the direction of Gartner Group research and analysis as it applies to small and medium-size organizations as well as the fulfillment of the Gartner Group newsletter business.

Upon joining Gartner Group, Mr. Litvinoff was research director for the PC services' desktop hardware and peripheral research. Before joining Gartner Group, he was corporate manager at Automatic Data Processing with responsibilities for researching, evaluating, and procuring laser printers for use in payroll production, as well as a variety of personal computer projects. Previously, he was director of PC support and technology at Mutual of New York. He began his career at the Dreyfus Corporation as an investment analyst.

Mr. Litvinoff received a bachelor's degree in banking, finance, and investments from Hofstra University.

Venture Capital and Emerging Technology

Kevin R. Compton

General Partner
Kleiner Perkins Caufield & Byers

Mr. Compton has been with Kleiner Perkins Caufield & Byers since January 1991. His focus has been on computer science, telecommunications, and internet investments, and presently serves on the board of 11 companies. Board commitments include Active Software, Audible Words, Citrix Systems, Corsair Communications, Digital Generation Systems, Global Village Communications, Health Systems Technologies, Positive Communications, Teloquent, VeriSign, and Wireless Access.

Before joining Kleiner Perkins, Mr. Compton was the vice president and general manager of the network systems team at Businessland and at AmeriSource, prior to its acquisition by Businessland. While in this role, the company's sales grew to over $1.4 billion and the company was recognized as the No. 1 supplier of local area networks for three straight years.

Dataquest Predicts... 1997 and Beyond

Venture Capital and Emerging Technology

Kevin Compton
Kleiner Perkins Caufield & Byers

Kleiner Perkins et, al... (KP)

250 Investments in 23 Years

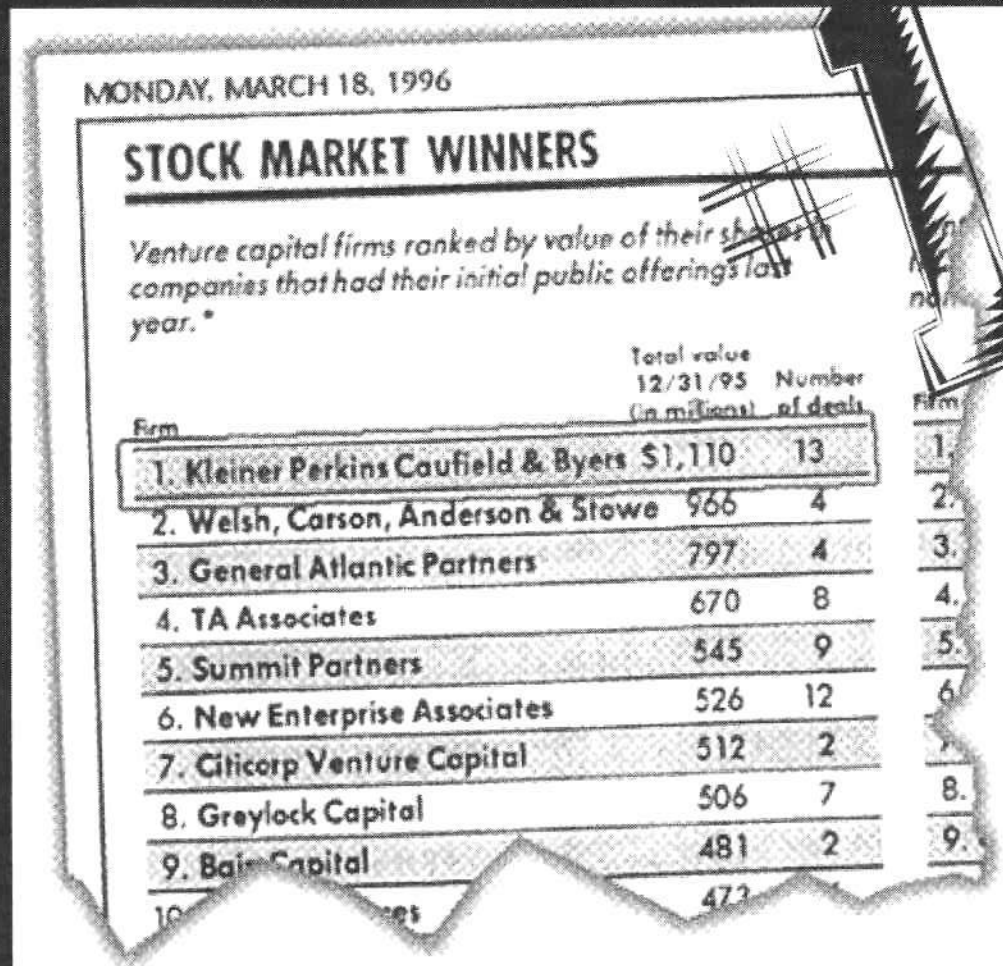
	1994	1995	Increase
Total Revenue	$33B	$44B	$11B
Total Employment	119,000	131,000	10%
Market Capitalization	$54B	$84B	$30B

Focus: Early stage Information & Life Science venture capital

Performance: Focus on creating durable value
"Billion $ Market Cap Club" - America OnLine, Ascend, Citrix, Compaq, Macromedia, Netscape, Intuit, Lotus, SUN, Genentech, VeriFone, HeartPort, PictureTel, Shiva

Industry Leadership: Founding investors in 10 of the Forbes 500

KP, by the numbers ...



MONDAY, MARCH 18, 1996

STOCK MARKET WINNERS

*Venture capital firms ranked by value of their shares in companies that had their initial public offerings last year.**

Firm	Total value 12/31/95 (in millions)	Number of deals
1. Kleiner Perkins Caufield & Byers	$1,110	13
2. Welsh, Carson, Anderson & Stowe	966	4
3. General Atlantic Partners	797	4
4. TA Associates	670	8
5. Summit Partners	545	9
6. New Enterprise Associates	526	12
7. Citicorp Venture Capital	512	2
8. Greylock Capital	506	7
9. Bain Capital	481	2
10. ...es	473	

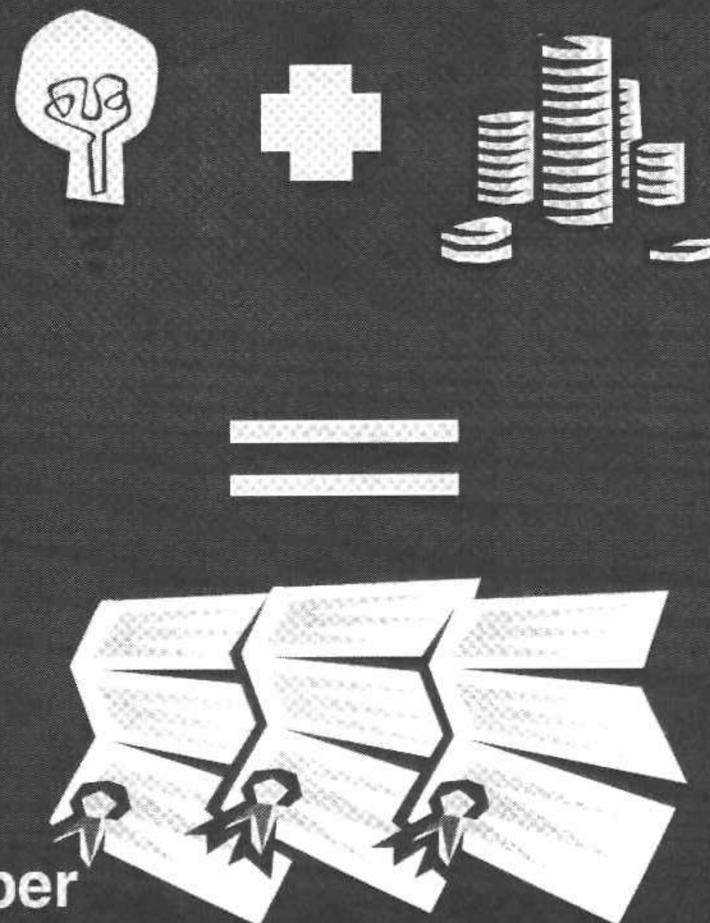
KP Market Focus

- Internet - "The Net"
- Enterprise Software
- Consumer Media
- Data Communications
- Medical Devices
- Bio-Informatics

The Net really has changed everything

What is Venture Capital?

- **Investments** (not loans) **IN new companies**
- **Technology Focus**
- **Future liquidity through public markets**



"Priceless" stock or worthless wallpaper

The "isms" of Economics

- Socialism: you have two cows - give one to your neighbor
- Communism: you have two cows - give both to the government and they may give you some milk
- Fascism: you have two cows - you give all the milk to the government and they sell it
- Anarchism: you have two cows - keep both cows, shoot at the government and steal another cow
- Capitalism: you have two cows - sell one cow and buy a bull

So, what's going on?

- Internet
- Intranet
- Extranet
- Thin Clients
- Java / ActiveX
- Two-tier
- Three-tier
- n-tier

- Client/Server is dead
- Client/Server lives
- Netscape wins
- Microsoft wins
- Oracle wins
- NC
- NetPC

So, what's going on?

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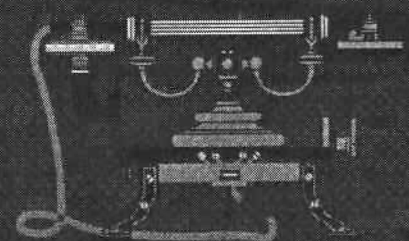
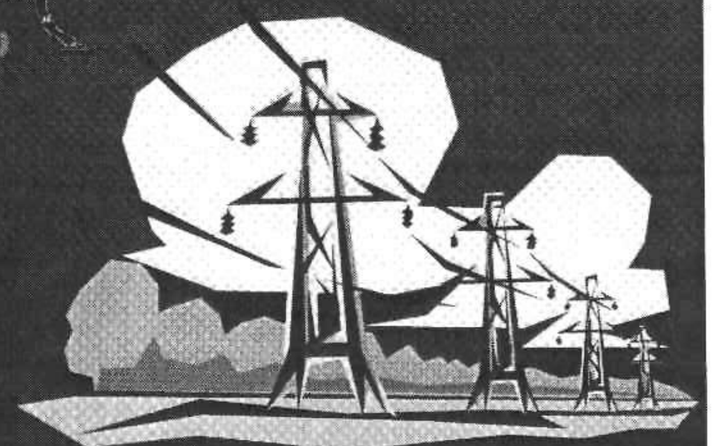
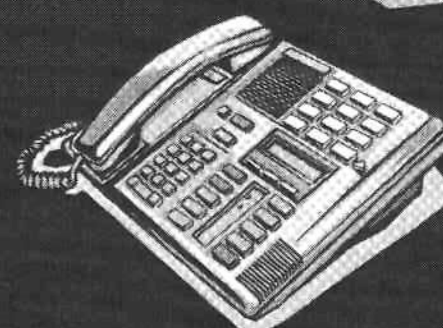
Change!!!

Change - Telephone

- Twenty-three years to install the first million phones
- Fifteen years for the next nine million





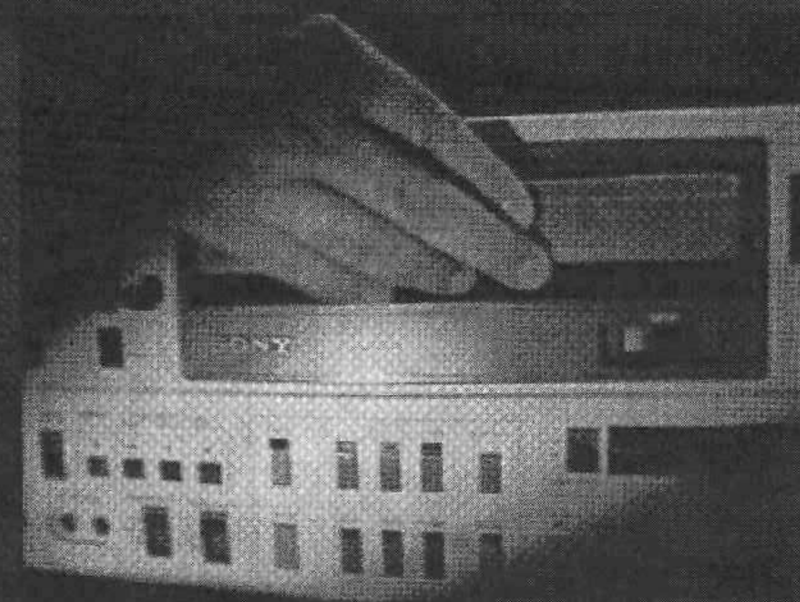


Change - Color Television

- Nine years to sell the first million sets
- Five years to sell the next nine million

Change - VCR

- Five years to reach one million homes
- Five more years to reach ten million



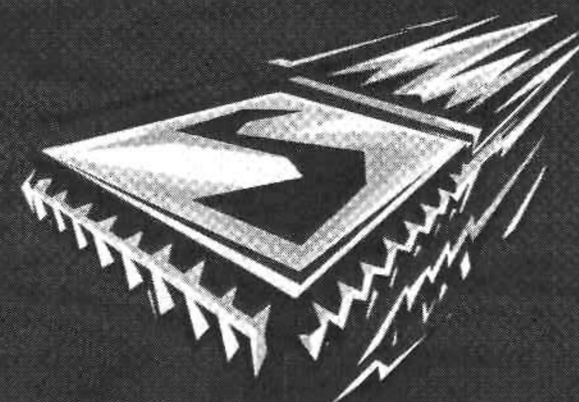
Change - Cellular Phone

- Six years to sell the first million
- Five years to sell the next nine million
- Now selling at two million a month worldwide

Change - Microprocessor

March of the Microprocessor

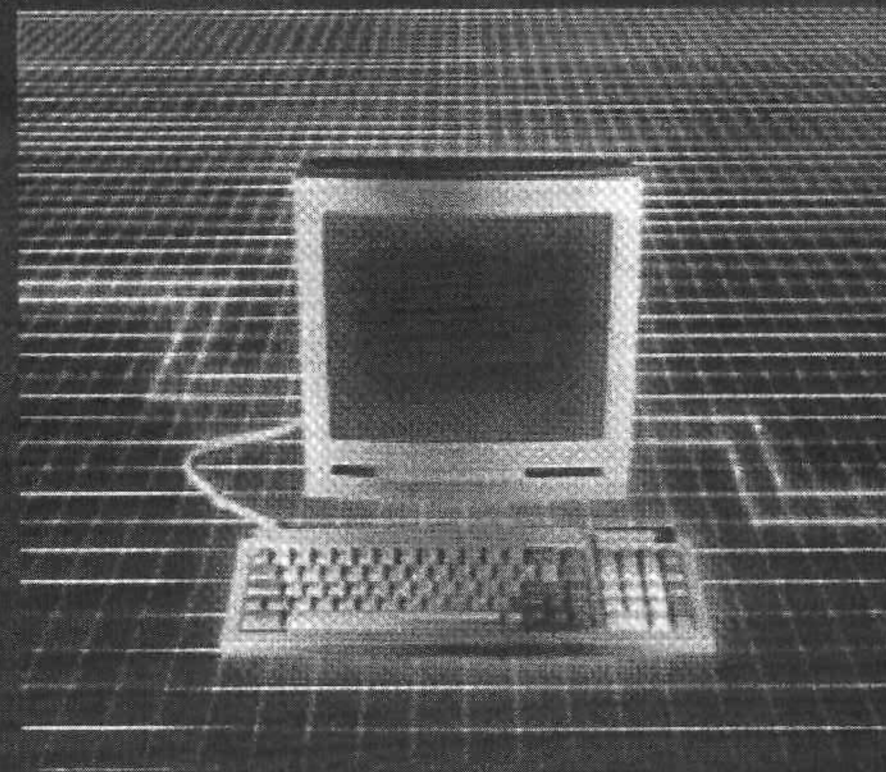
Chip	Date	Initial Cost	Transistors	Initial MIPS
4004	11/71	$ 200	2,300	0.06
8008	4/72	$ 300	3,500	0.06
8080	4/74	$ 300	6,000	0.6
8086	6/78	$ 360	29,000	0.3
8088	6/79	$ 360	29,000	0.3
i286	2/82	$ 360	134,000	0.9
i386	10/85	$ 299	275,000	5
i486	4/89	$ 950	1,200,000	20
Pentium	3/93	$ 878	3,100,000	100
Pent. Pro	3/95	$ 974	5,500,000	300
Projections				
786	1997	$1,000	8 Million	500
886	2000	$1,000	15 Million	1,000
1286	2011	??	1 Billion	100,000



Source: Intel, Dataquest, BusinessWeek

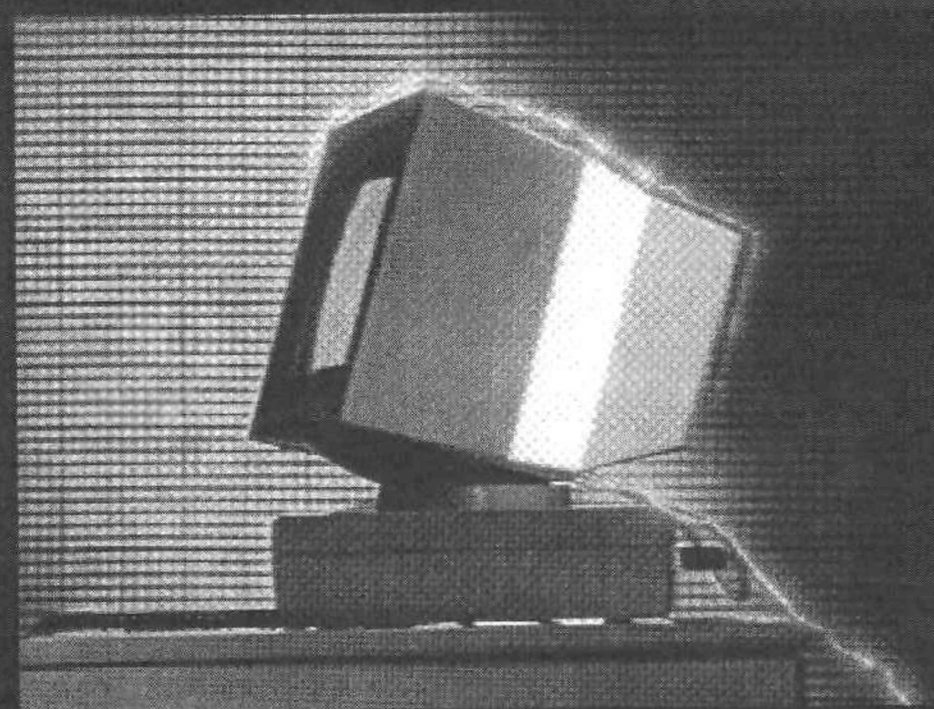
Change -Personal Computer

- Two years to sell the first million
- Three more years to sell the next nine million
- Now selling at six million a month worldwide



Change - The Internet

- The Super Bowl & "www.name.com"
- Eleven days for one million copies of Netscape to be installed

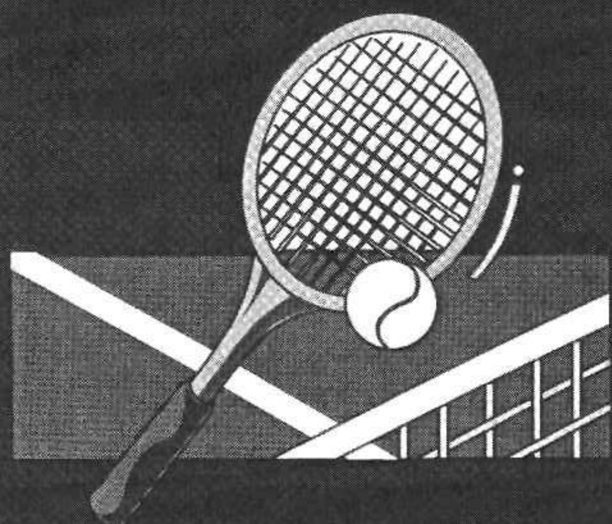


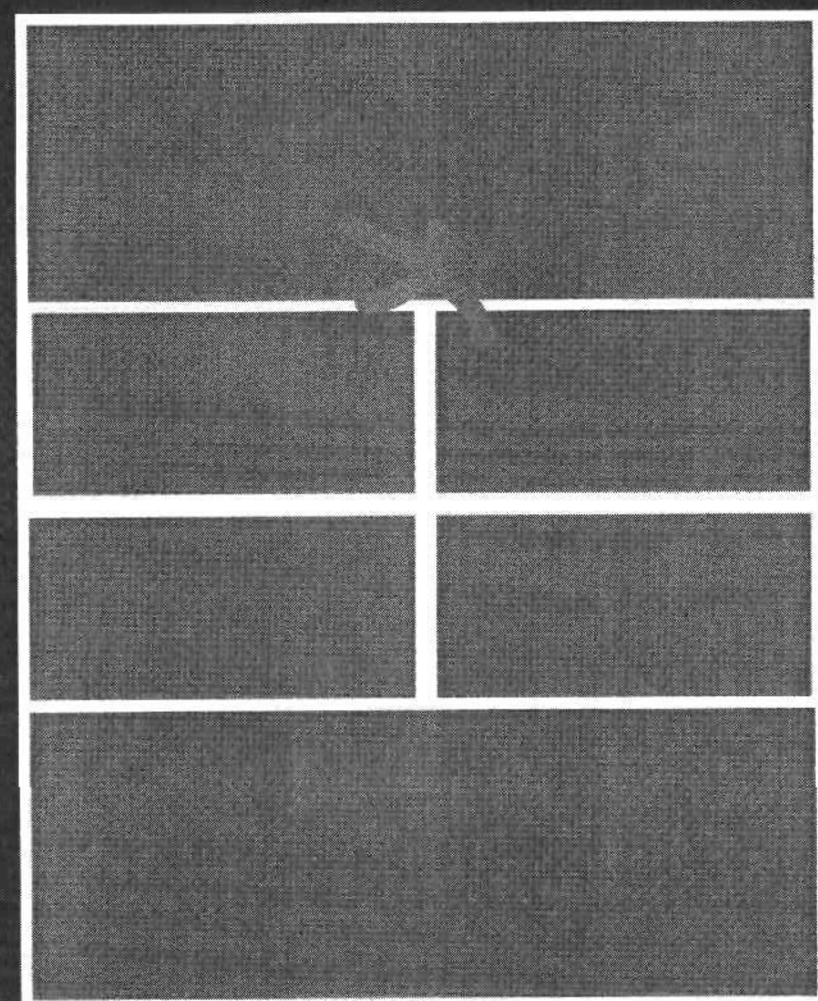
www.yourcompany.com

Change - Growth Rates

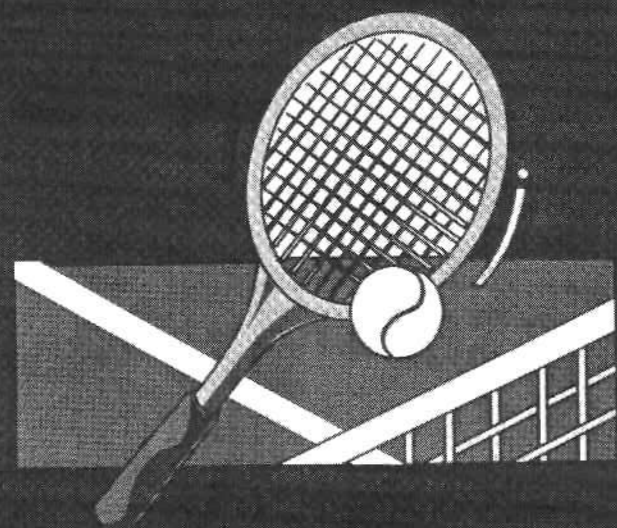
- Zero to nine million in hosts six years
- Five million "hosts" in the last six months
- Projected to cross 100 million before 2000

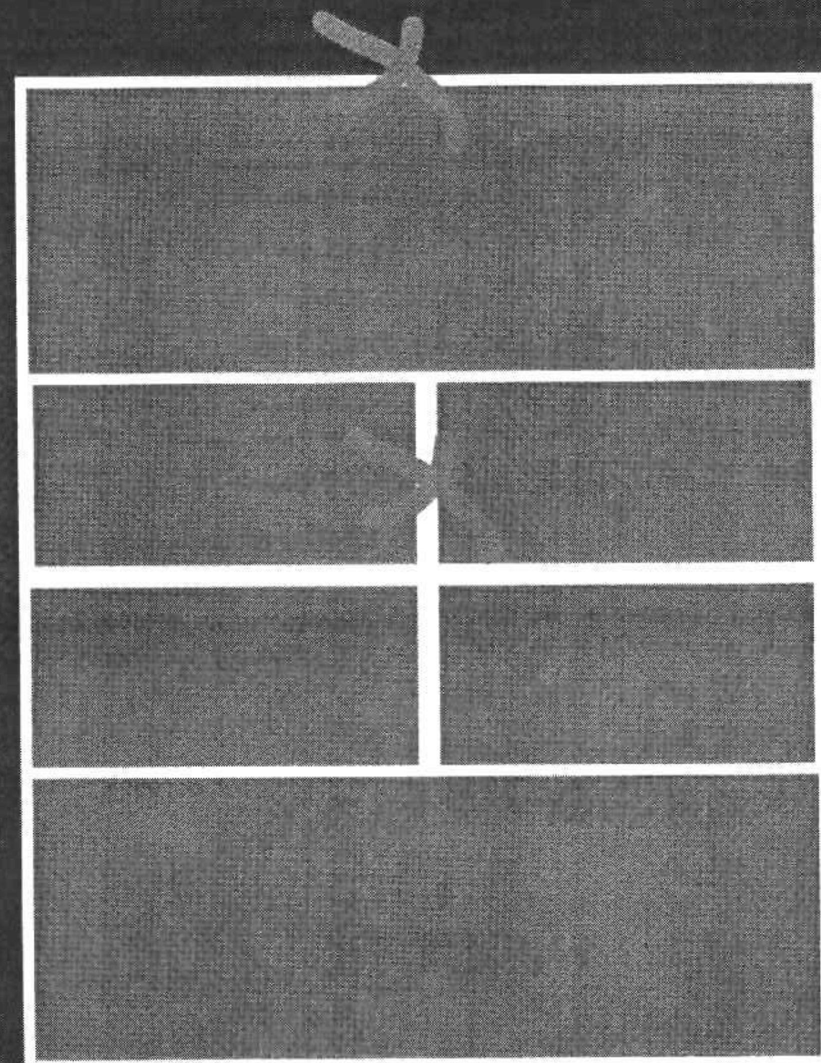
Change - Pricing Models





Change - Pricing Models



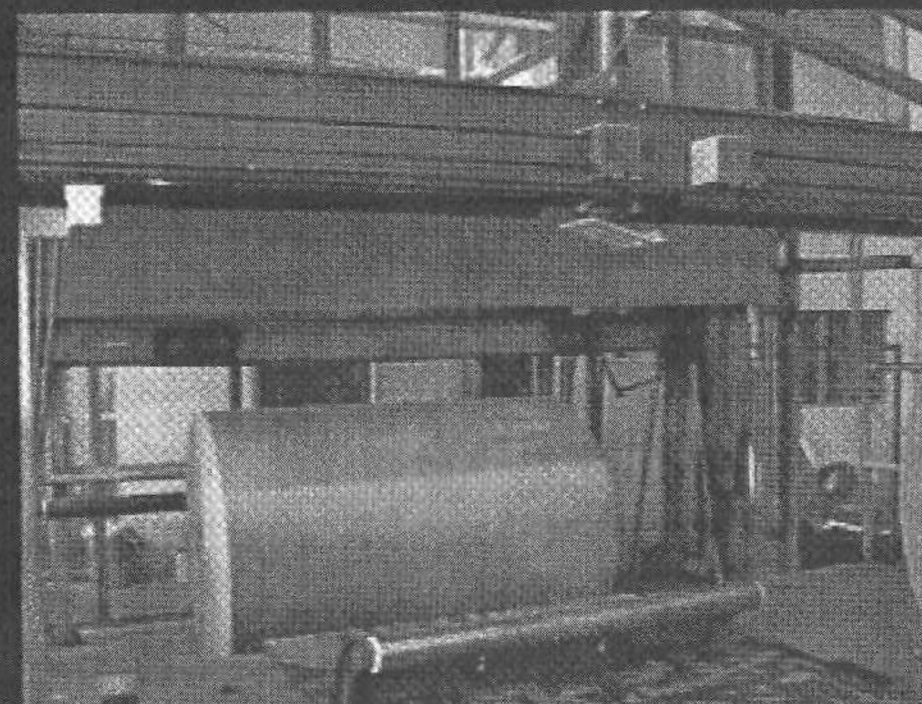


Change - Economics 101

- Transferring the cost from IS to the customer
  - When customer phones your call center
    - You pay for the 800#
    - You pay for the people and place
    - You pay everything, and it is never enough
  - When your customer "connects"
    - The economics are reversed
    - The electronic addiction begins

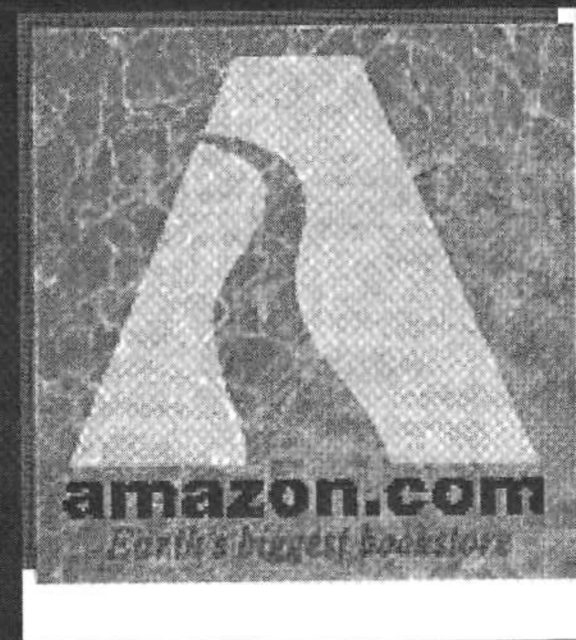
Change in Marketing - Publish vs. Transmit

- Yesterday's publishing model
- Today's Electronic Mail reach
- Maybe the "medium really is the message.."
- InBox Direct from Netscape



Change - Distribution

- The "middleman" is now FedEx or copper wire
- Customer Acquisition Cost" vs. Revenue per square foot
- Time & place utility

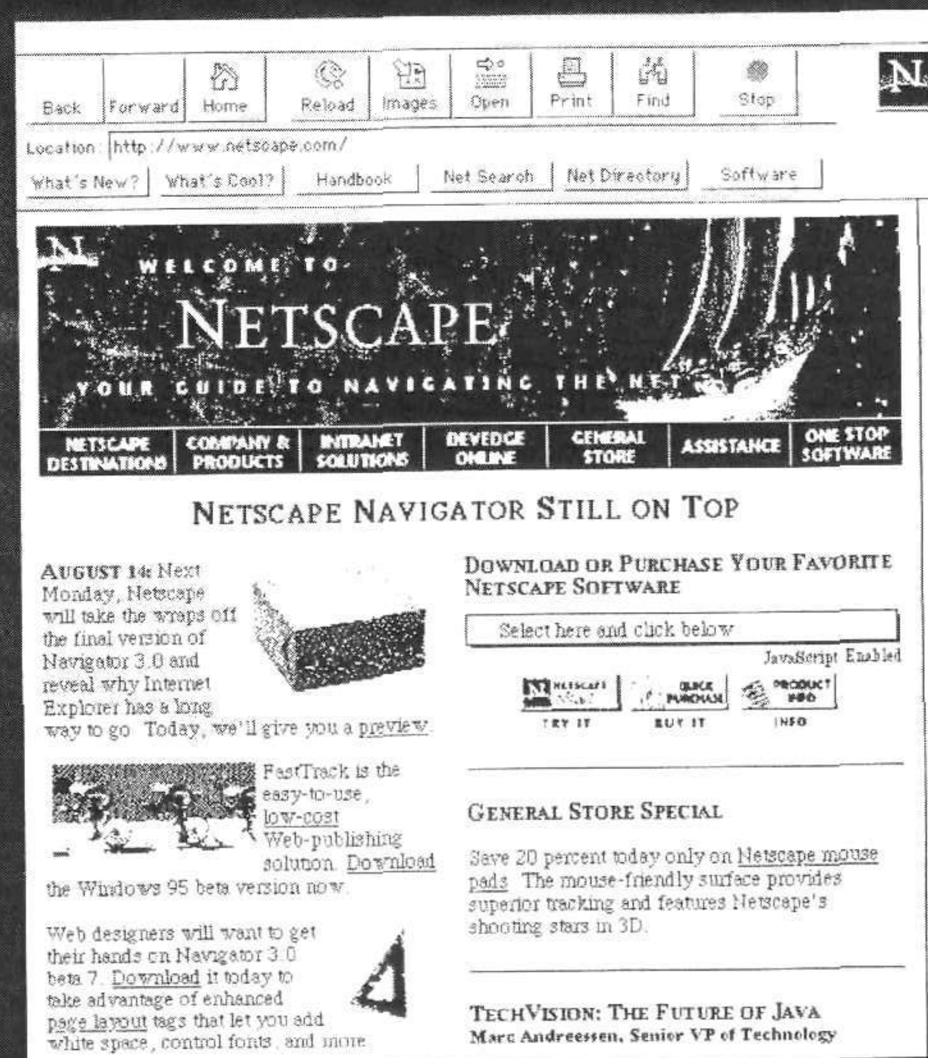


Change -Live via CNN

- "Olympic Blast" -- the *"shot heard round the world"*, now is a reality
- Desert Storm was action adventure in your living room as no one had ever imagined

Is it happening?

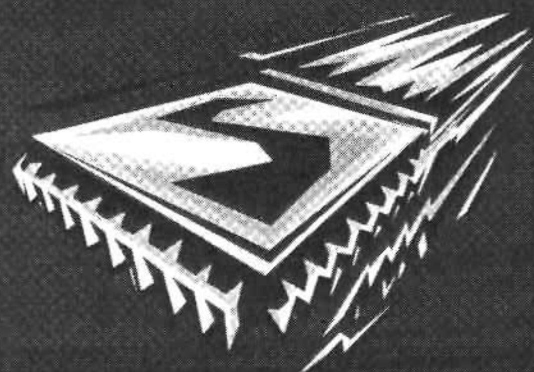
- It took twenty-three years to reach one million telephones
- Cellular telephones did it in six years
- Netscape has 35M++ "hits" per day on their Home Page



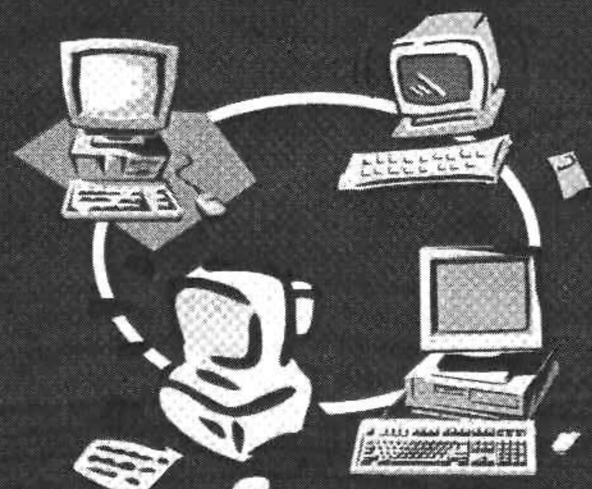
Some things don't change

- "MilSpec"
  - 4 feet 8.5 inches
  - Railroad
  - Tramway
  - Wagon
  - Rutted Roads
  - Chariots
  - Horses rear...

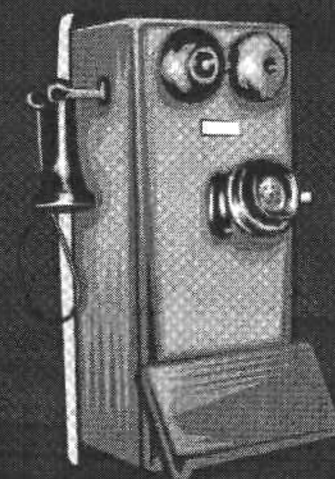
Industry Laws



Moore's Law



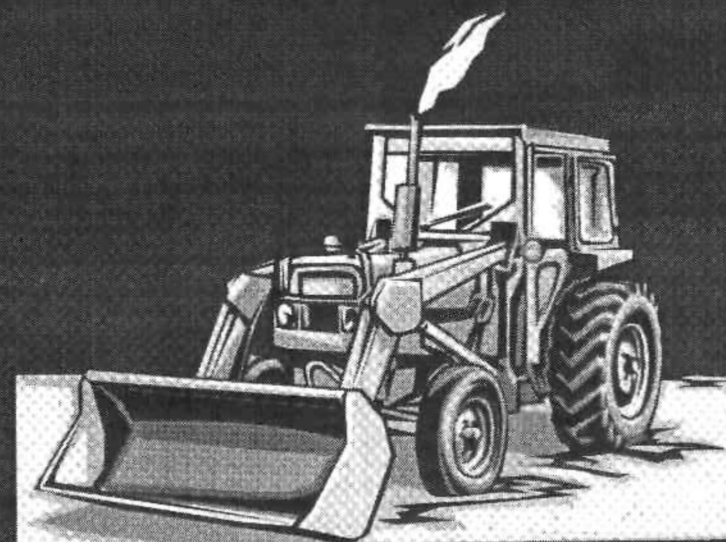
Metcalf's Law



Moron's Law

(Thanks Roger McNamee)

Exceptions -The Backhoe



Newest Rule:

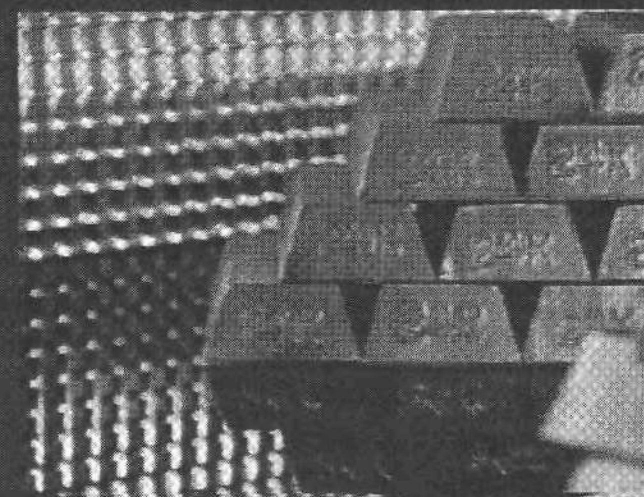
1) The MEGABIT expansion in the communication market over the next decade will (needs to) dwarf the MIPS expansion of the last decade.

2) Digging up neighborhoods takes more time than turning up silicon clock cycles

(Thanks Bill Gurley)

Where are we investing...

- Security
  - VeriSign - you are who you say you are
- Best of Breed Sites
  - Amazon.com, Preview Travel, OnSale
- Fat Pipes for thin clients
  - @Home
- Commerce on the "Net"

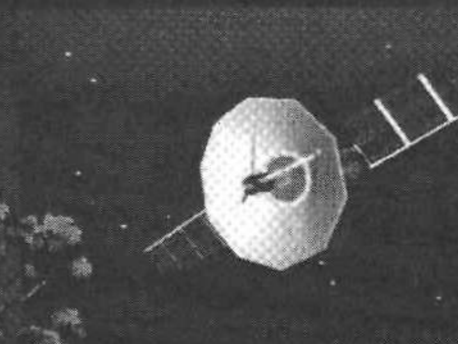


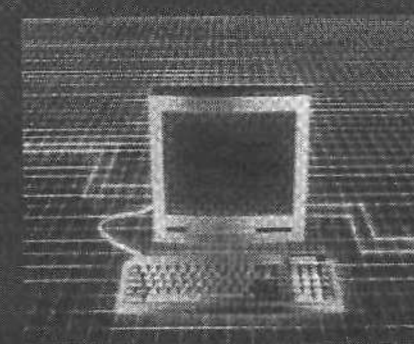
Java - $100M in Seeds

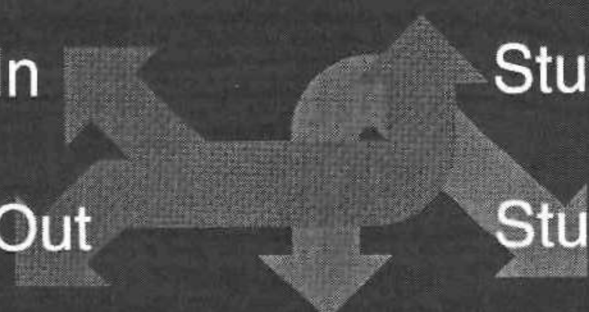
- Active Software
  - Publish / Subscribe
- Marimba
  - Cast-a-net
- Netiva
  - "Clientless"
- Calico
  - Configurations that really work...

The "Super-Switch" Theory

- The "net" gets smarter
  - Broadcast / Satellite
    - multimedia pump
  - Telecom
    - 1-1 tree and branch
  - "ISP" / VPN
    - 1-1 latency dependent





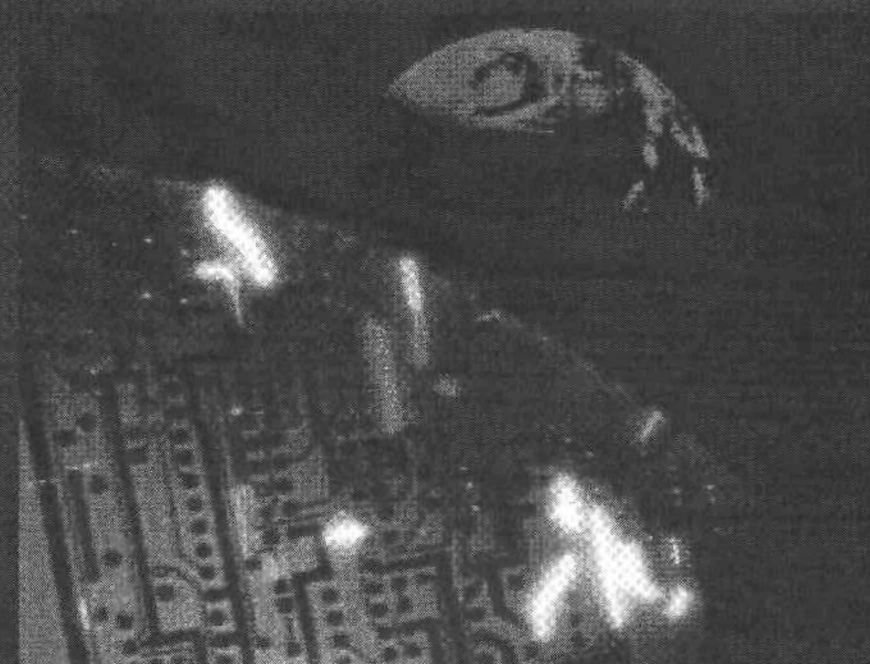


Store and Forward World

- Video Tapes
- E-mail
- Answering Machines
- Web News
- CNN Site

If you're waiting on me....

- Don't let change pass you by... you must drive the changes
- Don't change unless it really is *change....*
- *... 'cause we wont invest in anything less - on purpose...*



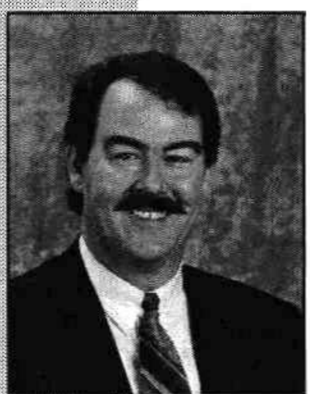
Thanks

Notes

Convergence and the Digital Consumer

Van L. Baker

Director and Principal Analyst, Distribution Channels Worldwide
Computer Systems and Peripherals Group
Dataquest



Mr. Baker is director and principal analyst of Distribution Channels Worldwide program for the Computers and Peripherals group at Dataquest. He is responsible for all facets of distribution channel research for computers and peripherals. This includes quantitative analysis of distribution channel sell-through for systems products offering shipment data segmentable by elements such as form factor and processor. Mr. Baker is also responsible for qualitative analysis of channel and vendor business models for distribution of computers and peripherals.

Mr. Baker is recognized as an industry expert in the field of computer distribution channels. He is quoted in such publications as the *Wall Street Journal, Business Week, Computer Reseller News, VARBusiness,* and local newspapers. Having spent time in industry both on the sales and manufacturing sides of the business, Mr. Baker brings to Dataquest an understanding of the reseller business as well as the manufacturer business and the constraints inherent in both.

Mr. Baker has spent more than 13 years in the computer industry and seven years in retailing before that. His most recent position was with Computer Intelligence InfoCorp where he was responsible for distribution channel research as well as distribution channel consulting. Before this he held a number of positions with Hewlett-Packard Company. These positions included dealer channel manager where he was responsible for implementation of a new dealer channel contract for Hewlett-Packard's Personal Computer Group. He also sold Hewlett-Packard PC and peripheral products for a number of years to a dealer channel and retail channel accounts.

Mr. Baker earned a B.A. degree in psychology from the University of California, Berkeley.

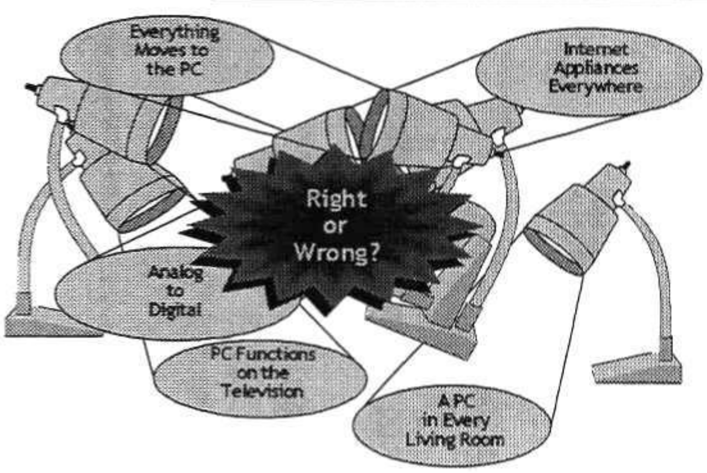
Agenda

- A look at convergence
- Barriers to convergence
- Enablers of convergence
- Information streams
- A measurement tool
- Possible scenarios
- A day in the life of the digital consumer

Dataquest
A Gartner Group Company

971521

What is Convergence?



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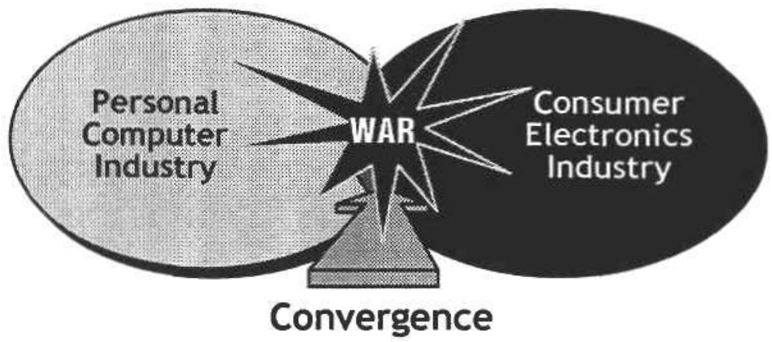
Convergence



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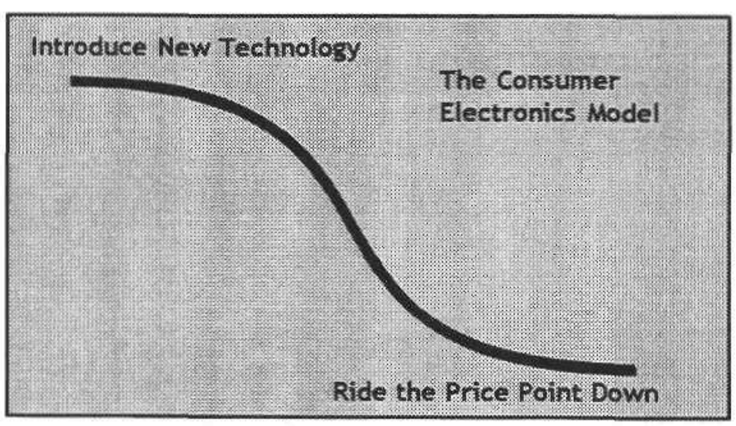
Convergence



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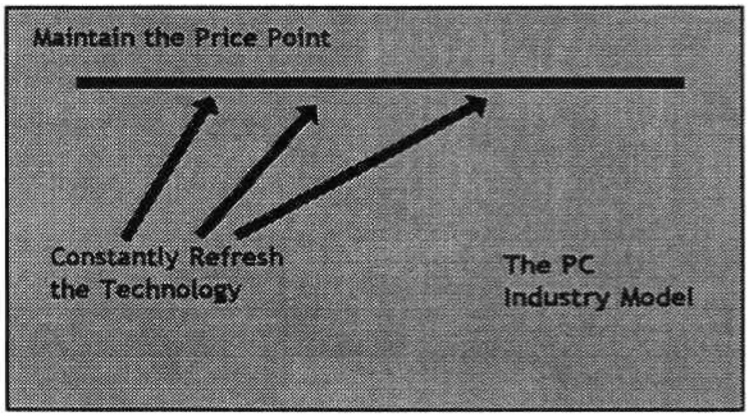
Convergence



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Convergence

- Convergence is about the impact of the conversion from analog to digital
- Convergence is about management of information/entertainment streams
- Convergence is about providing the appropriate tools to the consumer
- Convergence is a battleground between a mature slow-growth industry and a younger industry still enjoying double-digit growth

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Early Entrants

Gateway Destination

- First in the PC TV category
- Large monitor PC with TV tuner card
- Switch between TV and PC applications
- Issues of affordability and feature set

Web TV

- Television set-top box
- Internet connectivity via the TV
- World Wide Web access
- E-mail accounts
- TV optimized browser and ISP
- Issues regarding target market

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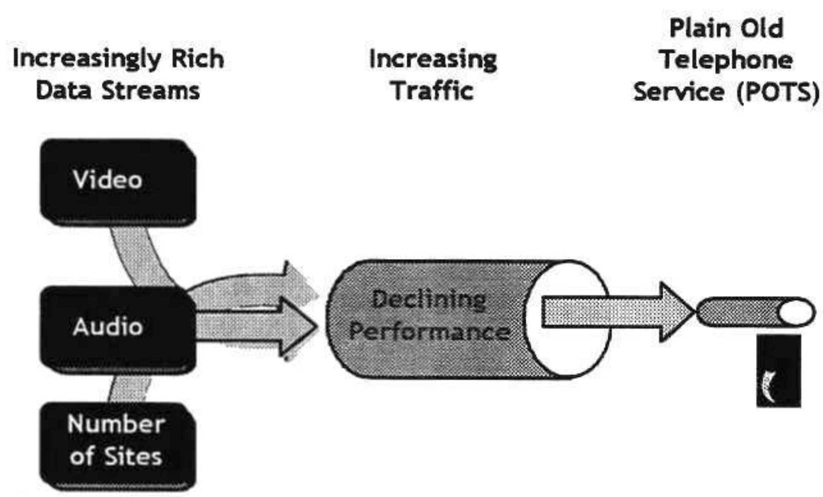
Barriers to Convergence



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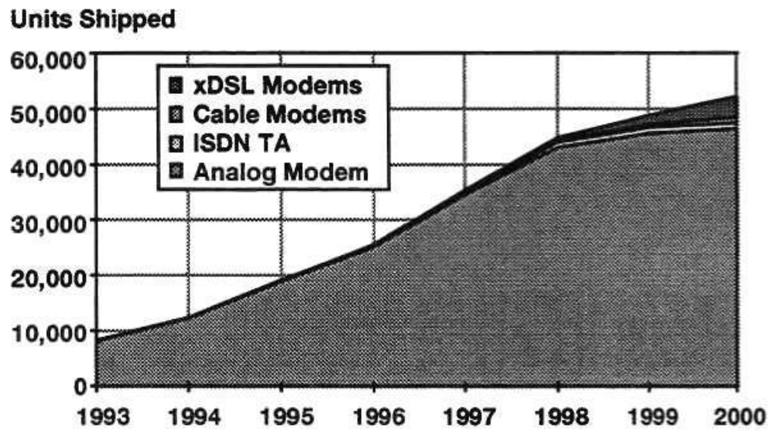
Barriers to Convergence



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Barriers to Convergence

Consumer Electronics

- Entertainment focus
- Passive
- Frequently social
- Dedicated-function devices
- Inspection usable
- Minimum functional targeted feature set
- Specific perceived benefit
- Remote

Personal Computers

- Information focus
- Interactive
- Individual
- Multifunction general-purpose device
- Complicated usage
- Rich feature set exceeding expectations
- Benefits sometimes vague
- Close proximity

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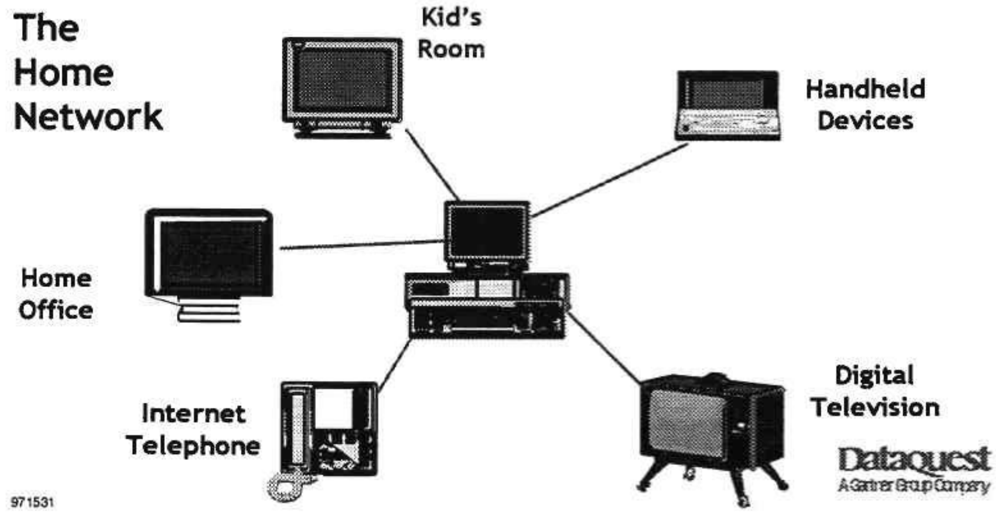
Enablers of Convergence



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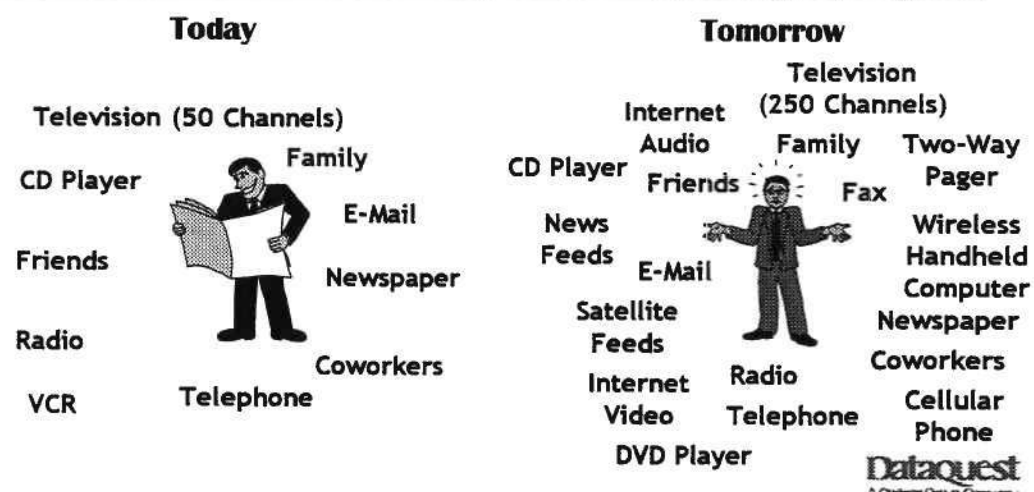
Enablers of Convergence



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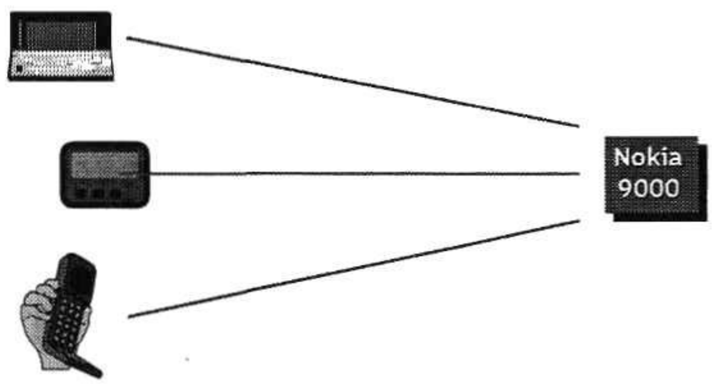
Enablers of Convergence

Dedicated Function Devices

Multifunction Device



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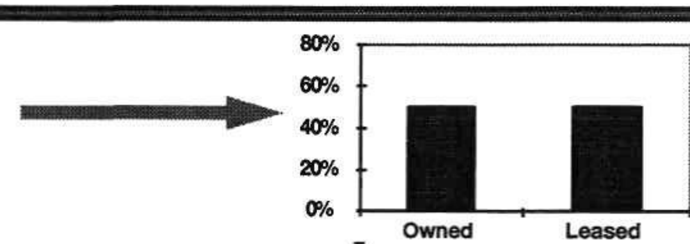
Information Streams

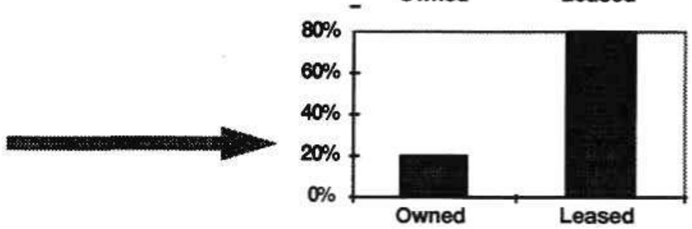
Today

Information Streams



Tomorrow

Information Streams



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A Measurement Tool

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A Measurement Tool

- Consumers have social centers
  - Living room/family room
  - Kitchen
  - Home office
  - Automobile
  - Workplace
- The social context influences how consumers interact with the devices

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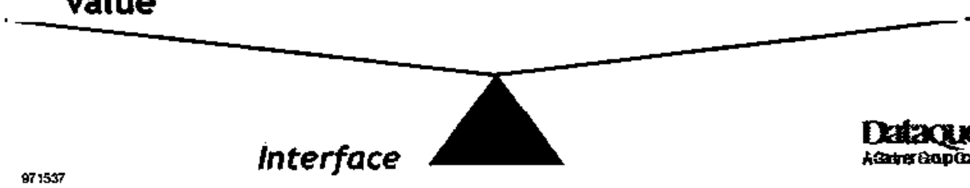
A Measurement Tool

- Interface is defined in the broadest sense
- The consumer needs to achieve the desired result in a straightforward manner
- Preference is for a device to be inspection usable
- Familiarity may dictate the interface
- The interface of the device must complement the usability
- Industrial design is a factor for both interface and value



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A Measurement Tool

- Value is a relatively straightforward measure of the consumer's willingness to buy a product
- Price measures the appropriateness of the cost of the device to the value received
- Industrial design influences the aesthetic portion of the value proposition and is very subjective

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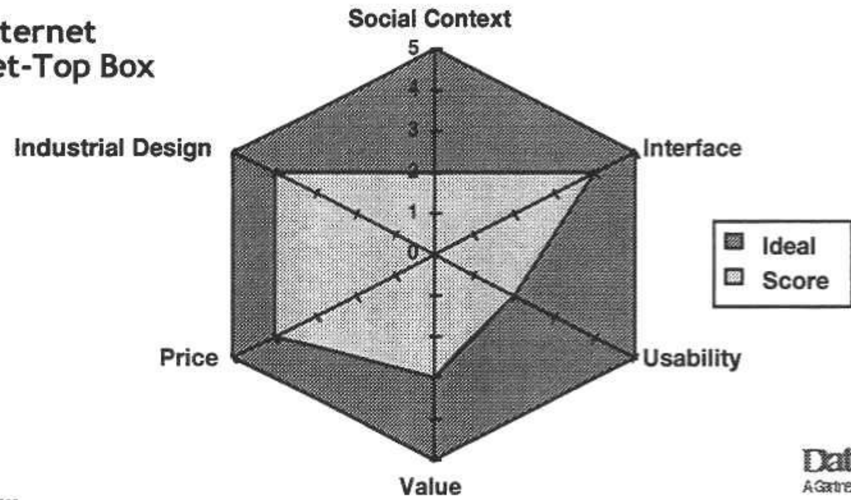
A Measurement Tool

Internet
Set-Top Box



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Possible Scenarios

- Internet - Internet - everywhere
  - Internet television adapts and penetrates the home
  - Internet telephones are positioned as enhanced telephones with prices subsidized by service providers
  - Network computers in the home give multiple points of access to leased Internet information
- Requires fat pipes to the home
- Probability is low

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Possible Scenarios

- Information furnace
  - PC on steroids becomes the information and entertainment hub
  - Television, stereo, home theater, control systems, thin client PCs all attach to the information furnace
  - Network access continues to be limited to POTS
- Requires implementation of the home network without physical wiring
- Probability is low

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Possible Scenarios

- The Slow Tech Convergence
  - POTS constrains bandwidth for the foreseeable future
  - Digital technology penetrates consumer electronics devices but they remain entertainment-oriented and in the living/family room
  - PCs continue to acquire more information/ entertainment streams that require more horsepower
  - Devices and data streams continue to proliferate
- Probability—high

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A Day in the Life of the Digital Consumer

5:00 a.m.	The digital consumer's PC dials ISP, connects to Wall Street Journal site via Webex and downloads today's edition. The digital consumer sleeps on.
6:00 a.m.	The digital consumer rises, turns on television to check local weather and upcoming theater dates via WebTV set-top box using CitySearch.
6:30 a.m.	The digital consumer sits down to breakfast and reads Wall Street Journal from PC in the kitchen.

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A Day in the Life of the Digital Consumer

7:00 a.m.	The digital consumer retrieves Audio Highway recorder from cradle and listens to news stories during commute, which were downloaded from the Internet overnight.
7:20 a.m.	A quick call to office via cellular phone to retrieve voice-mail messages.
8:15 a.m.	E-mail checked and off to first meeting.
8:45 a.m.	Two-way pager vibrates and wakes the digital consumer, who has nodded off in the meeting, with a request for a 2:00 meeting. Instant response delivered without leaving current meeting.

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A Day in the Life of the Digital Consumer

10:00 a.m.	Back at desk and NewsCatcher notifies the digital consumer of important release by a competitor.
11:30 a.m.	A quick check of the NASDAQ site via Internet reveals market down, but personal portfolio is in good shape.
11:45 a.m.	Lunch order sent in to low-tech deli via fax for pickup at 12:15 p.m.
1:15 p.m.	Message received at lunch on handheld PC about stock opportunity. Order placed from handheld, in the car, while returning from lunch.

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A Day in the Life of the Digital Consumer

1:45 p.m.	GPS system in the digital consumer's car informs him that he just missed the turn for his 2:00 p.m. appointment, and he needs to turn around.
3:00 p.m.	Speech software from Dragon systems is used to dictate memo to staff.
4:00 p.m.	The digital consumer downloads images to a PC from a Sony digital camera via infrared link to incorporate into a presentation for the next morning.
5:30 p.m.	Commute time is used to listen to books on tape downloaded from Internet.

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A Day in the Life of the Digital Consumer

6:30 p.m.	Check of phone messages tells the digital consumer about great new DVD movie available today.
7:00 p.m.	Quick scan of 250 satellite channels reveals nothing to watch. The digital consumer awaits arrival of friend with new DVD movie.
9:00 p.m.	Videoconference call reminds friend to bring movie over and pick up munchies on the way.

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A Day in the Life of the Digital Consumer

10:30 p.m.	DVD movie in player, home theater AC3/MPEG-2 system on full, the digital consumer wakes the neighbors.
11:30 p.m.	The digital consumer turns in as PC utilizes IBM's Home Director system to turn off home theater system and switch off the lights before it starts the sprinkler system.

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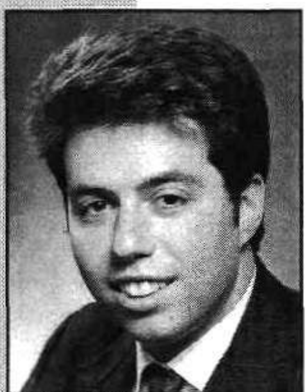
Notes

Panel: Fitting into the Internet Food Chain: Who's Going to Find the Mass Market Sweet Spot?

Moderator: Daniel H. Rimer

Research Analyst
Internet/Digital Media, Hambrecht & Quist



Mr. Rimer is a research analyst at Internet/Digital Media and covers content-related Internet and software companies in H&Q's research department. He joined the company to focus on Internet research and has worked on underwritings of numerous companies including UUNet, Netscape, Verity, and C-NET.

Mr. Rimer cochairs the H&Q plaNET.wall.street conferences, speaks frequently on panels of industry conferences focusing on the Internet, and writes a biweekly column for CMP publications. He initially joined H&Q as a research associate in the Internet and Enterprise Software Groups.

Before joining Internet/Digital Media, Mr. Rimer worked in the development group of an Internet start-up based in Berkeley, California, which he started working with while completing a B.A. degree at Harvard University.

Notes

Panel: Fitting into the Internet Food Chain: Who's Going to Find the Mass Market Sweet Spot?

Panelist: Hal Logan

President and CEO
Vicinity Corporation

Mr. Logan is president and CEO of Vicinity Corporation and is responsible for the strategic direction of the company.

With more than 15 years of experience in the electronic publishing industry, he most recently held the position of vice president and general manager of Pacific Telesis Electronic Publishing Services. He was a founder and President of Third Set Partners, a consulting and market research firm specializing in companies using the Internet and other emerging technologies as publishing or marketing platforms. Mr. Logan has also held an executive position at Dow Jones & Company and was Manager of Electronic Publishing for the *Washington Post*.

Mr. Logan holds an M.B.A. from Stanford University and a B.A. degree from Harvard University.

Panel: Fitting into the Internet Food Chain: Who's Going to Find the Mass Market Sweet Spot?

Panelist: Nicholas A. Grouf

Founder, Chief Executive Officer, President
Firefly Network Inc.

Mr. Grouf is founder, chief executive officer, and president of Firefly Network Inc.

Mr. Grouf's professional experience includes an associate position at Goldman, Sachs & Co. in its Mergers and Acquisitions department, where he focused on communications and technology clients. In addition, he worked for two years as a business analyst at McKinsey & Company, where he worked primarily for broadcast, media, and telecommunications clients.

Mr. Grouf received a master's degree in business administration from the Harvard Graduate School of Business in June 1995. Before Harvard, he graduated with a bachelor's degree from Yale College in 1990 where he received the Holmes Pearson Prize for Best Thesis.

Panel: Fitting into the Internet Food Chain: Who's Going to Find the Mass Market Sweet Spot?

Panelist: Robert Simon

Cofounder and Executive Vice President
Navitel

Mr. Simon is the cofounder of Navitel and serves as executive vice president.

Previously, Mr. Simon founded Virgil Corporation, an Internet software company that provides financial information and software applications to several hundred thousand personal investors from the Internet site StockCenter.com. Before that he was the director of Lotus West for Lotus Development Corporation after it purchased PS Publishing, a graphics software company that Mr. Simon founded in 1989.

Mr. Simon holds a bachelor's and master's degree from Stanford University.

Conference Summary

Davis Blair

Vice President, Online, Multimedia, and Software Group
Dataquest

As vice president of the Online, Multimedia, and Software group, Mr. Blair is responsible for planning and execution of Dataquest products in the Online Strategies (Internet), Multimedia, and Software areas, including Desktop Software, Client/Server Software, Workgroup Computing, EDA, MCAD, AEC and GIS offerings worldwide. Having over 14 years of experience as both a user and an analyst of technology, and several years of international experience, Mr. Blair can offer some unique perspectives to Dataquest clients.

Before joining Dataquest, Mr. Blair served as the vice president and general manager of Asia/Pacific for International Data Corporation. During a seven-year tour in the region, he founded the regional headquarters and helped to make it IDC's largest international subsidiary within a five-year period. In addition to management of 10 offices, Mr. Blair was responsible for product and service development covering all important areas of the IT industry for the region. He was on the founding team of IDC Korea and is fluent in the Korean language.

Before market research and consulting, Mr. Blair was an MIS manager and systems analyst responsible for development and implementation of an online hospital management solution covering integrated billing, inventory management, patient and medical history management, and other areas.

Mr. Blair received a B.S. degree in information systems.

Notes

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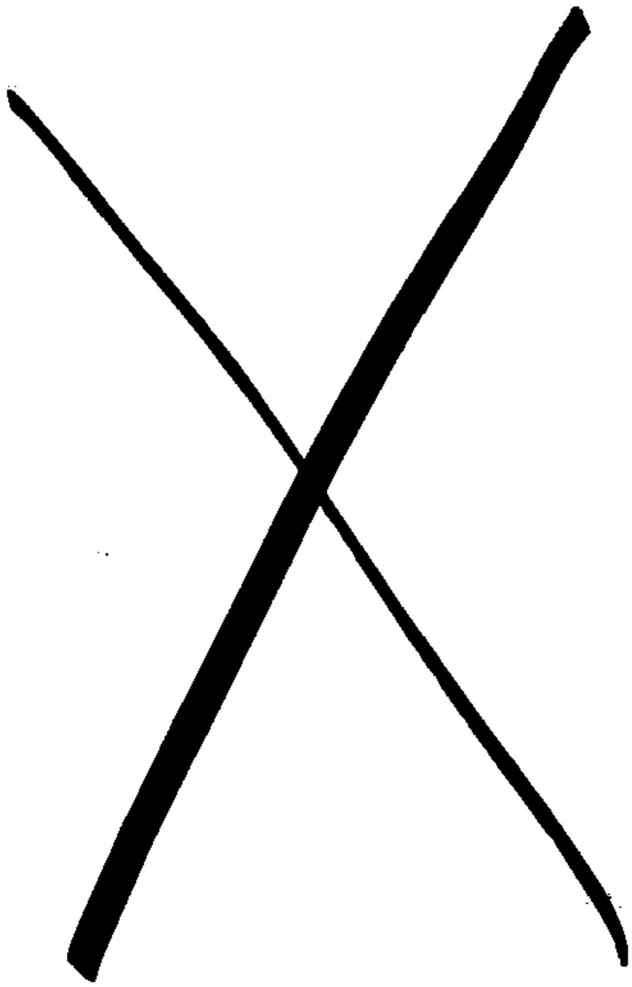

Changing the Rules: The Internet Evolves

Kathryn Hale

Principal Analyst, Internet and Enterprise Strategies
Online, Multimedia, and Software Group
Dataquest

Ms. Hale is a Principal Analyst in the Internet and Enterprise Strategies program of the Online, Multimedia, and Software Worldwide group at Dataquest. She provides insight, analysis, and advice about high-growth markets and companies within the rapidly developing electronic Internet and intranet markets. Ms. Hale is also responsible for developing a quantitative worldwide model of the Internet market as it emerges from the converging computing and communications industries.

Since joining Dataquest in 1986 as a software analyst in technical markets, Ms. Hale has helped a wide variety of clients with assessing market trends and opportunities, positioning products, analyzing competition, and strategic partnering. Ongoing research in the Internet market includes analysis of key industry trends and events, studies of end-user satisfaction and requirements, detailed assessment of worldwide market segmentation, market sizing and growth rates, and analysis of individual vendor market share and market strategy.

In addition to her responsibilities to ongoing clients, Ms. Hale develops analysis on a custom consulting basis for vendors' end users to set strategies and make tactical decisions, and for the financial community as part of due diligence on major transactions. Recent assignments include developing a scenario for the future of the information superhighway and developing qualitative analysis tools for evaluating content suppliers in the online market.

Ms. Hale has authored articles for several different trade journals, is frequently quoted in the business and trade press, and has spoken at numerous software industry shows. Before joining Dataquest, Ms. Hale worked for a technical publications company, writing and editing operating and field service manuals for several high-technology companies. She has also worked as a marketing consultant for small service business, and in sales and marketing for a heavy equipment OEM.

Ms. Hale received a B.A. degree in psychology from the University of California at Berkeley.

Agenda

- ➤ The view from the stratosphere
- ➤ Key trend: Changing boundaries (convergence)
- ➤ Timeless values: What works online
- ➤ Dataquest predicts Internet space
  - Robust efforts
  - Shaky ground
  - The sleepers

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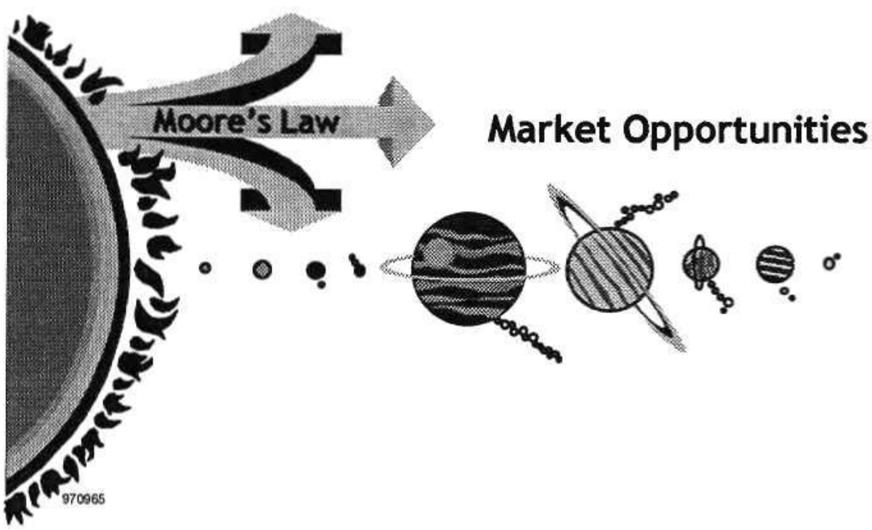
The Old World



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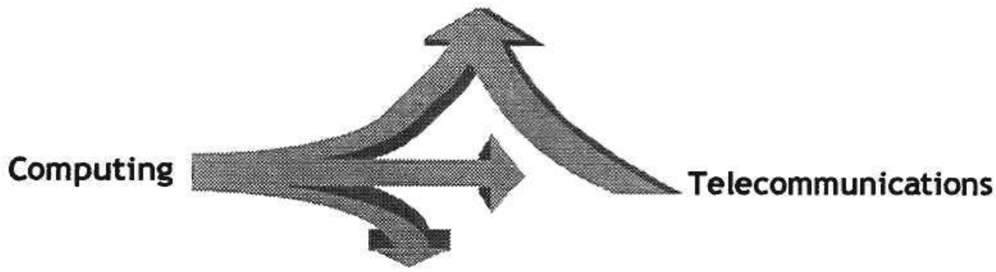
The Sea Change



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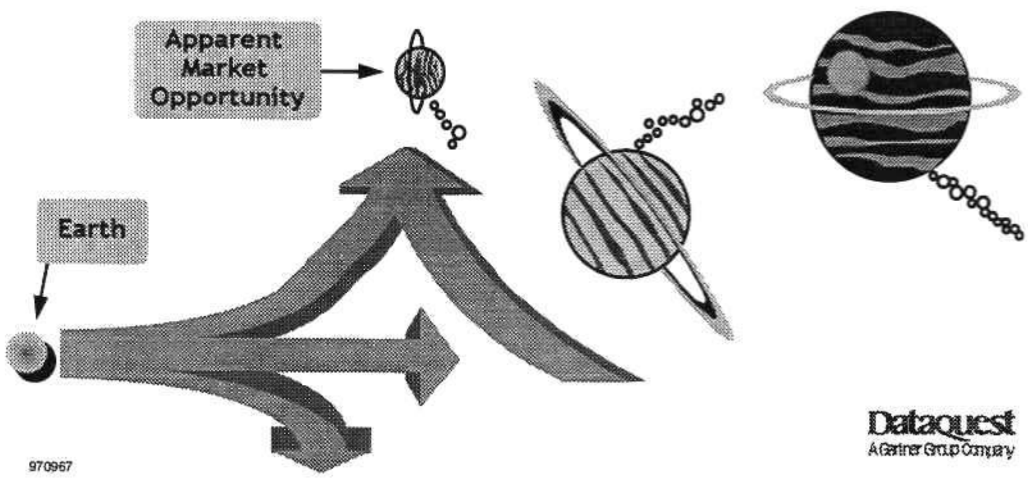
You Are the New Magellans



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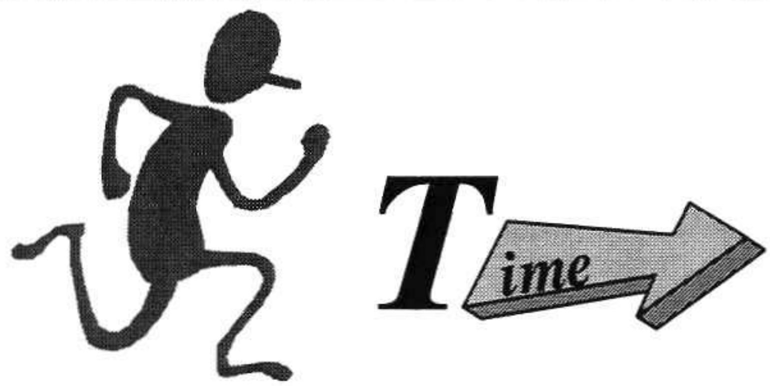
... Magellans with Shorter Lives



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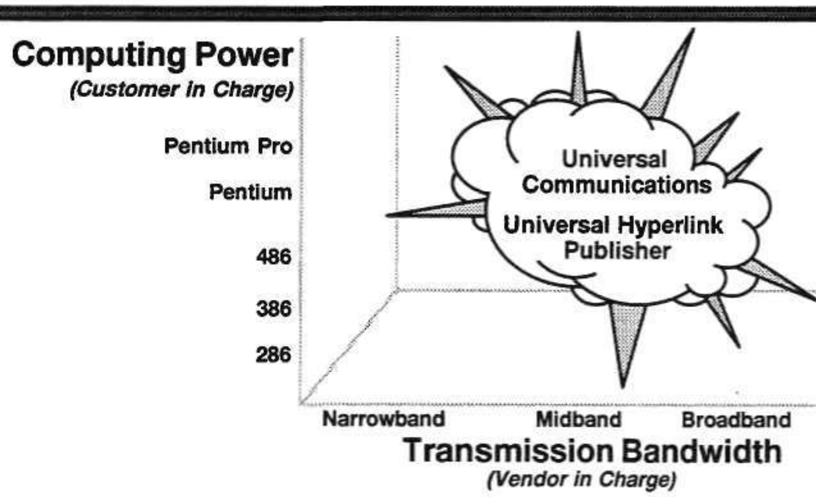
The Sparks: The Internet and the Worldwide Web



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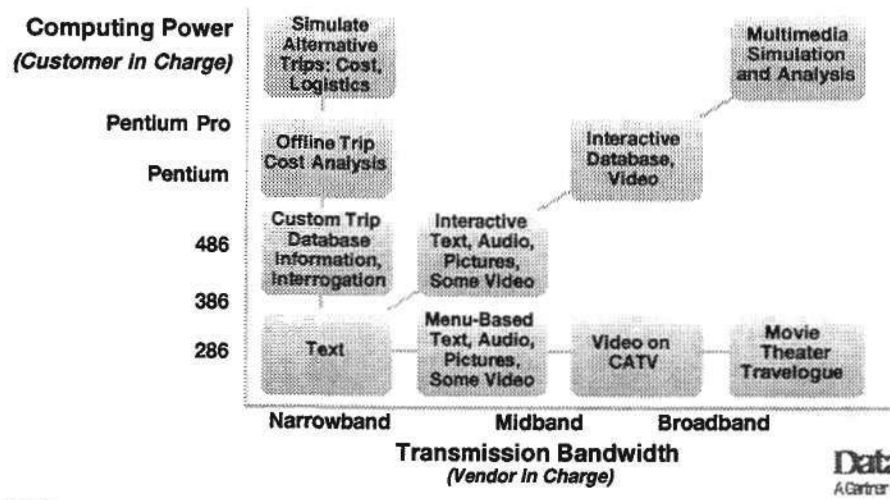
The Content Evolution



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Agenda

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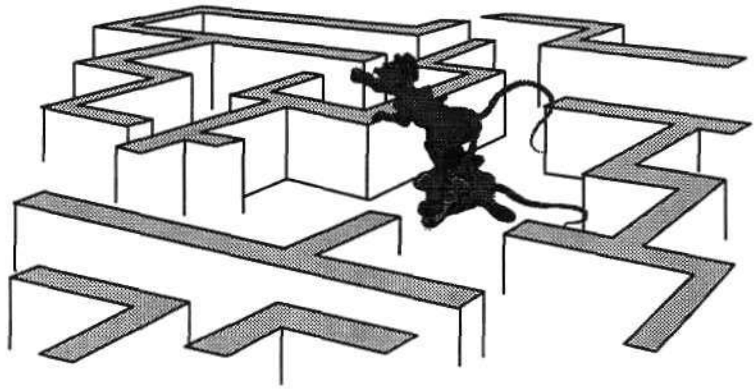
The Revolution Is Happening in a World with Walls



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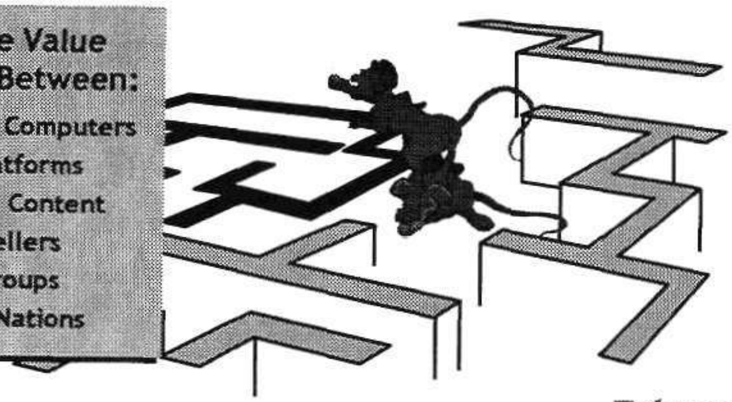
... Where Boundaries Just Keep Dropping

Changing the Value Proposition Between:
- ➤Telecom and Computers
- ➤Computer Platforms
- ➤Software and Content
- ➤Buyers and Sellers
- ➤Functional Groups
- ➤"Sovereign" Nations



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The Protective Walls Are Dropping for:

- Software companies: Embrace, extend, or quickly sneak out the back door
- Publishers: No turning back
- Information intermediaries (Wall Street, real estate, middle management)
- Customer service departments: In transformation
- Distributors, retail: Pioneers and ostriches
- Advertising agencies: Facing accountability
- Trade shows: Testing the water
- Sales: Learning a new game
- Colleges and universities: Ostriches

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Agenda

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Timeless Values: What Works Online

- Collaborative design and discovery
- Knowledge worker productivity
- Bringing buyers and sellers together: remove intermediaries, expand the message
- Communities based on events, interests, beliefs, or geography
- Recreation/entertainment (waiting for bandwidth)
- Feeding addictive behavior (waiting for bandwidth)
- Empowerment

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Timeless Values: What Works Online

Collaboration	➤ Collaborative design and discovery
Productivity	➤ Knowledge worker productivity
Commerce	➤ Bringing buyers and sellers together: remove intermediaries, expand the message
Community	➤ Communities based on events, interests, beliefs or geography
Fun	➤ Recreation/entertainment (waiting for bandwidth)
Addiction	➤ Feeding addictive behavior (waiting for bandwidth)
Power	➤ Empowerment

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Agenda

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  - **Robust efforts**
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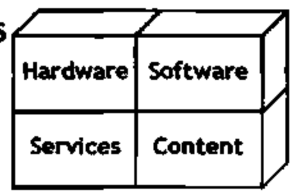
  - **The sleepers**



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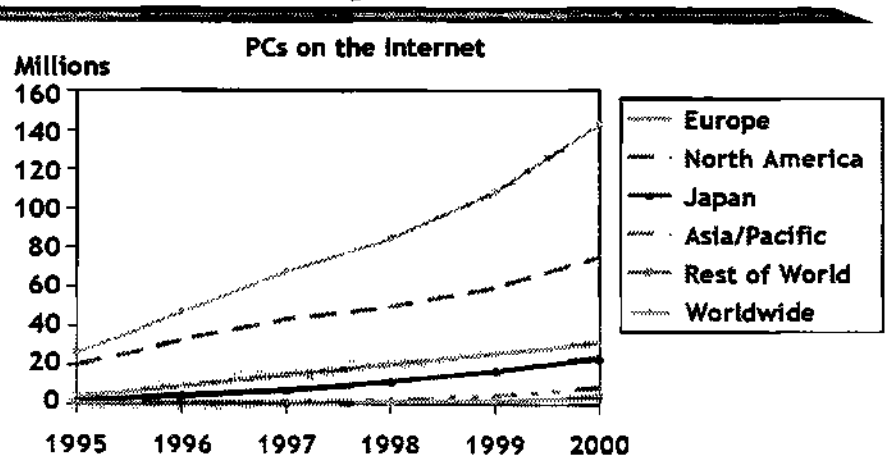
Worldwide Internet Forecast— Traditional Desktop Access



Source: Dataquest
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Devices: Getting from Here to There

- PCs are a knowledge worker's tool
- PCs alone will not allow the Internet to reach its worldwide destiny
- Internet capability will be incorporated into telephones and televisions by the end of the decade
- The drive to access the Internet via alternative devices will be at an accelerated rate in Japan and Asia/Pacific
  - Governments will follow the Minitel model
- Households will migrate into distinct classes of Internet use—one-device households vs. multidevice households

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Why the Web Will Not Work on TV

- Check the ratings: TV is entertainment
- TV creates habits: Regularly scheduled
- Streaming video helps, bandwidth problem remains
- Lean forward versus lean back

Are We Having Fun Yet?

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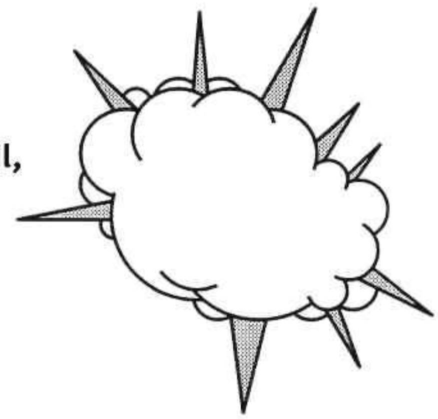
The Browser War: An Architectural Battle

- Netscape: Network-centric
- Microsoft: Computer-centric
- The battlefront
  - Surround the browser: E-mail, news, conferencing, collaboration
  - Content alliances
  - Plug-ins, Java
  - Leveraging legacy data and applications



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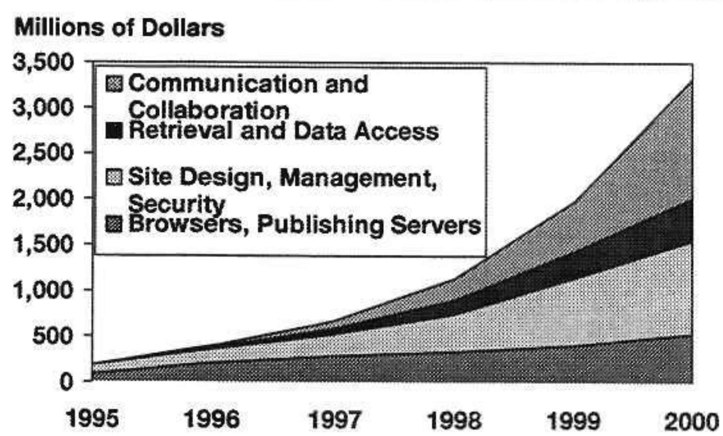
The Internet-Centric Software Opportunities



Source: Dataquest
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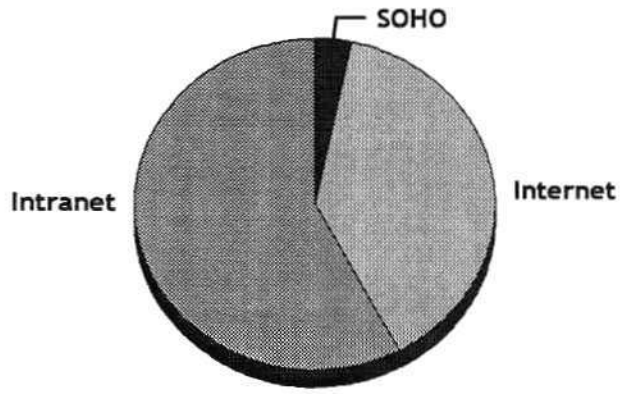
Intranets: Not a Flash in the Pan

Web Server Installed Base: Year 2000



Total = 1 Million Units

Source: Dataquest

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Intranets: Cheap, Fast Rethinking of How Value Is Created

- Fewer meetings, more collaboration
- Co-design
  - Engineering and marketing
  - Hardware and software
- More timely and accurate
  - Marketing material
  - Technical support
- Lots of village nice-to-haves: HR, Who's Who, CEO broadcasts, input from legal
- The next test: Europe

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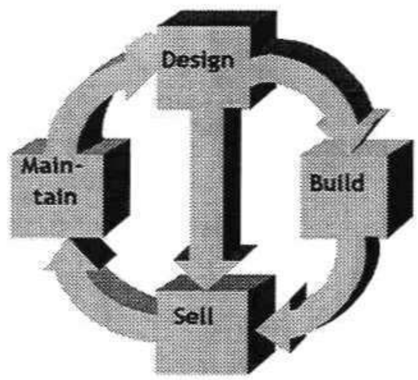
Engineering the Core Process: Better, Faster, Cheaper Products

Must Have



Nice to Have

- ➤ What's in my 401(k)?
- ➤ Which dentists are on the plan?
- ➤ Is there a policy on this?
- ➤ How do I fill out the expense form?
- ➤ I need to order a new calendar

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The Next Generation of Software

- ➤ Technology-based business process engineering
  - Cheap, fast, good enough, familiar paradigms
  - Reducing time and risk to market
  - Understand information: make your customer wise
  - Collaboration and commerce with partners worldwide
  - If you want to sell it, you've got to live it
- ➤ Software built on a converged telecom/computing model
  - A challenge to Microsoft, Oracle
  - An opportunity for Cisco, AT&T

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Online Services 1997

- Circling the wagons: The Internet quietly privatizes
  - $20 unlimited access means you're shopping at Kmart
- AOL's 8 million wooed from all sides
  - Content providers
  - ISPs
  - Web aggregators
- The ISP bloodbath gets real
  - The top tier (UUNet, BBN Planet, PSInet, Netcom) well groomed for acquisition
  - The other 3,000?

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Direction of Internet Service Providers

Focus	1997	2000
Telcos	Core businesses	Internet growth
Top-Tier ISPs	Selling out, business customers	Business customers, threat from telcos and data centers
Second-Tier ISPs	Consumers; a viable business model	Mostly extinct except brand like AOL
Loss Leaders	Dial-up Internet access	Dial-up Internet access
Premium Services	15% of revenue	35% of revenue
Differentiators	Service guarantees, 24x7 support	Performance growth, partner quality

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A New Aggregator Example: Local Content

- The players:
  - Microsoft: Cityscape; AOL: Digital City; CityScape; AT&T's Hometown Network; newspapers; telcos (At Hand), Mining Company, LookSmart
- The concept:
  - Become the end user's content source of choice by providing/packaging the "information" that has highest impact. Focus on localization and convenience
- Business models:
  - Advertising, subscription, transaction, service bureau

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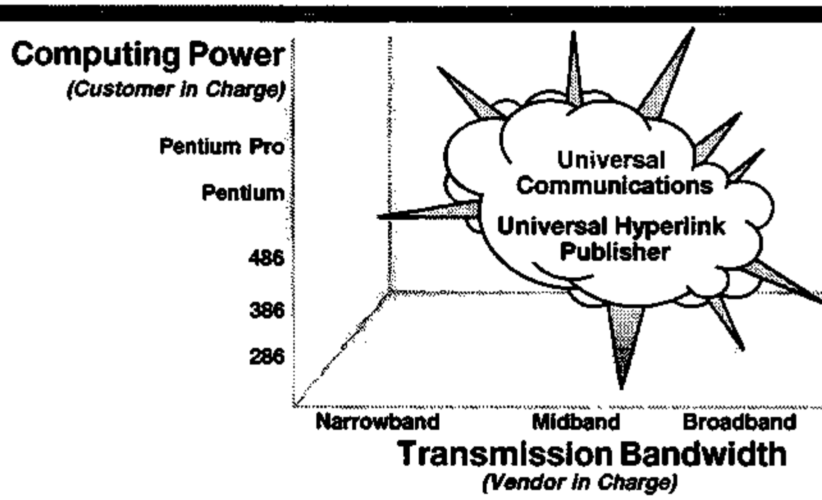
The Web: Built on Content Pull



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The Frenzy to Push Content

- Built on interesting technology and some initial success
  - Pointcast, Marimba, Intermind, Cognisoft, Ifusion, Backweb, inCommon, offline browsers, and more
- Both Microsoft and Netscape channels as a core GUI component
- If pull is good, push is even better

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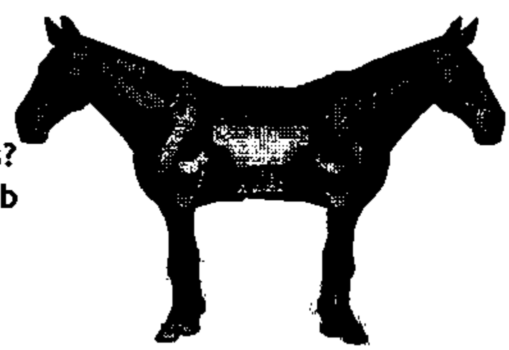
A Good Idea, but the Story Is Thin

- We're not getting enough information?
- We know what we want?
- We have consistent interests?
- Receiving information is a job function?
- Our existing electronic channels—voice and e-mail—are mere streams?
- Web content is entertaining?
- Access will stay unlimited?



The Push-Me-Pull-You

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You Own the Stage: Hold the Audience in 1997

- So far, the Internet and intranets actually work—giving users cheaper, better solutions
- Failures really do slow markets
- IS backlash to Pointcast is a key indicator
- Keep timeless values in the forefront: better collaboration, productivity, commerce, community; more fun and power
- Leverage early adopters in the telecom/computing convergence
- Leverage customers who uncover those values: widespread media coverage builds a strong 1998

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Notes

Electronic Commerce: The Gold Rush of 1997

Allen Weiner

Director and Principal Analyst, Internet and Enterprise Strategies and Digital Commerce Programs
Online, Multimedia, and Software Group
Dataquest

Mr. Weiner is the director and principal analyst for Dataquest's Internet and Enterprise Strategies program and Digital Commerce program in the Online, Multimedia, and Software group. The Internet and Enterprise program includes consumer and business online services and the Internet and other emerging digital superhighways.

Mr. Weiner heads up Dataquest's research efforts in the areas of consumer online services, Internet software, Internet demographics, and such related areas as electronic commerce, security, broadband services, and interactive advertising. Mr. Weiner is a frequent speaker at Internet conferences worldwide, addressing such issues as industry trends and issues. In addition, he is among the most-quoted analysts in the industry, having been cited in such publications as *Time, US News and World Report, PC Week, The New York Times, The Washington Post,* and *The Wall Street Journal.* Mr. Weiner also is a frequent guest on CNBC and CNN.

Mr. Weiner previously was a manager in the Electronic Information Services Department for the San Francisco *Chronicle and Examiner* newspapers, one of the 10 largest in the United States. He was involved in every aspect of new product development for *The Gate*, an online service that was introduced in May 1994. His responsibilities included developing the business plan, the capital/operational budget process, technological development, editorial coordination, and new product marketing. He also developed a World Wide Web home page for *The Gate* on the Internet and was responsible for its design and maintenance.

Mr. Weiner's career experience also includes past positions with Virgo Publishing Inc. as editor and publisher for the company's group of new technology magazines such as *Interactive World,* which covered the vast array of interactive services ranging from the pay-per-call audiotext market to early interactive television magazines; *Newspapers & Voice,* which provides a look at newspapers and their new media applications; and *International Telecom,* a publication that looked at interactive media from a global perspective.

Mr. Weiner was a media critic for seven years at *The Everett* (WA) *Herald*, covering the Seattle television scene as well as the emergence of the cable television and video industries. He also served as a reporter and columnist for *The Allentown* (PA) *Morning-Call*. A frequent television and radio guest, he hosted a weekly cable program, *On Video*, which appeared on the Tempo Network in 1989, and later was a regular on ABC-TV's *Home*, covering new video releases.

As a business entrepreneur, Mr. Weiner, along with his wife Kathleen, was founder of a chain of retail stores that sold informational videocassettes.

Mr. Weiner received a B.A. degree in American studies from Muhlenberg College and an M.A. degree in Radio-TV-Film Department from Temple University, School of Communications and Theater.

Agenda

- What's all the hoopla about: Setting the scene
- Electronic Data Interchange: The impact of the Internet holds promise
- Where does the consumer fit in?
  - Attitudes, opinions, and future trends
- Online banking
  - Will it happen; who will make it happen?
  - Separating technology from marketing

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The Time for Talk Is Over

- The Internet becomes the channel, network, software engine, and marketplace to facilitate the end-to-end solution
- The Internet has the ability to empower EDI usage
- The Internet fosters interaction and disintermediation
- The Internet holds the promise for a worldwide marketplace
- Internet technology can bring trading partners together
- Internet technology can create new buying efficiencies

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The Need for an End-to-End Solution

- Too many halfway measures in the market
- The need for a solution that incorporates:
  - Electronic Data Interchange
  - Corporate purchasing
  - Links to inventory, databases
  - Web presence

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Understanding EDI

- Defined as the application-to-application transfer of business documents between computers
  - Fast, inexpensive, and safe method of sending purchase orders, invoices, shipping, and business documents
- The value proposition for EDI
  - Saves time and money
  - Improves customer service
  - Ends repetition
  - Expands customer base

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Value-Added Network Service Providers

➤ 1996 Worldwide Market Share

• General Electric Information Services	30.18%
• IBM Global Network Services	29.63%
• Sterling Commerce	17.26%
• Kleinschmidt	4.08%
• Harbinger	3.01%
• Others	15.85%

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EDI and the Gold Rush

➤ EDI has threatened to become an explosive force but is often costly and difficult to use

➤ EDI is accompanied by serious acceptance issues of security, loss of data, third-party reading of sensitive information, and repudiation

➤ The Internet can solve cost and ease-of-use issues, but requires uniform security and repudiation measures
- MIME enhancements proposed: Allows the transmission of data to be encoded in a mail message

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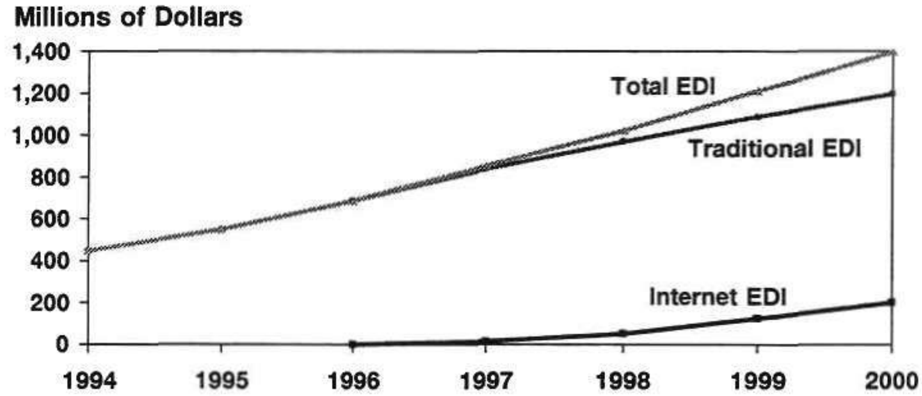
Forecast for Electronic Data Interchange



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Moving EDI to the Internet: Major Initiatives

- CommerceNet: Internet EDI Interoperability Pilot
  - Goal: Evaluate software products, develop security standards, promote usage
- MasterCard/Actra
  - Goal: Demonstrate feasibility of Actra OrderExpert System (global corporate purchasing)
- United States Government (Department of Defense)
  - Goal: Meet the objectives of the Federal Acquisition Streamlining Act of 1994 requiring broad use of electronic commerce and electronic data interchange by federal agencies

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On the Leading Edge: Who's Moving EDI to the Internet

- Actra Business Systems
- Atlas Products International
- AT&T/Nets Inc.
- CyberPath
- EDS
- Harbinger
- IBM/Lotus
- Premenos
- Sterling

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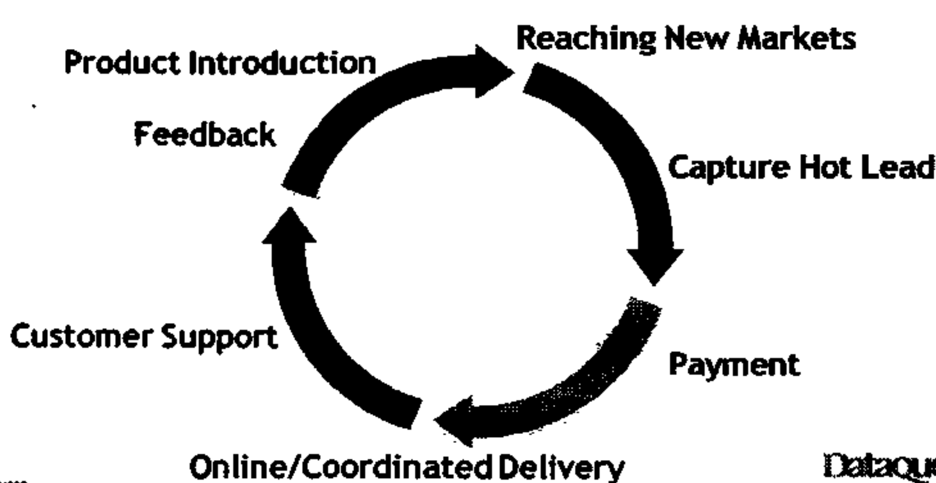
An Emerging Commerce Value Chain



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DQ Predicts: What the Future Holds for Businesses

- A vast marketplace where Internet technology assists in locating and connecting suppliers of products and services
- Virtual storefronts
- Lower purchasing costs due to new procurement models
- Shrinking development cycles through EDI, other communications channels
- New age of corporate communications
  - Odwalla takes to the Net

971098

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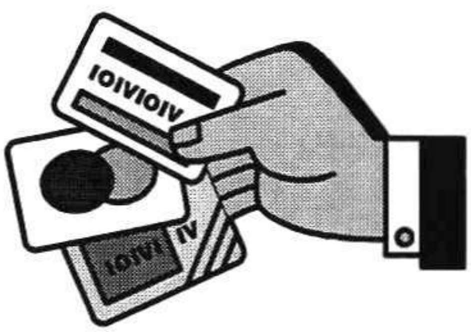
Shopping Online: Getting Ready for Prime Time

- Security issues are even less of an issue
- The three-stage rollout
  - Pure play
  - Direct marketers
  - Heavy iron
- Giving consumers a reason to change behavior
- Replacing business processes online



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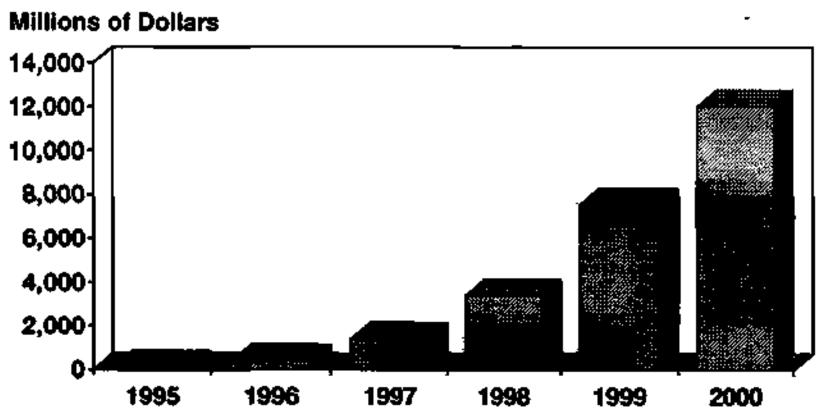
The Growth of Shopping Online



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What Consumers Will/Won't Buy Online

- Will buy low involvement goods
  - Travel
  - Financial services
  - Music
  - Computers/computer products
  - Books
  - Some clothing
  - Stereo/camera equipment
- Won't buy high involvement goods
  - Furniture
  - Artwork
  - Perishable foods
  - High-end clothing and jewelry
- New category: Lead generation
  - Autos and real estate

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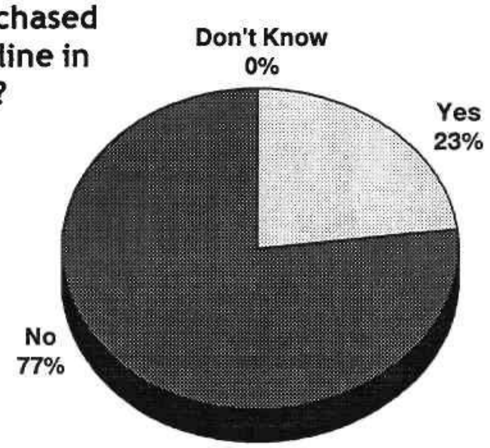
Online Shopping: Are They Buying?

Have you purchased something online in the past year?



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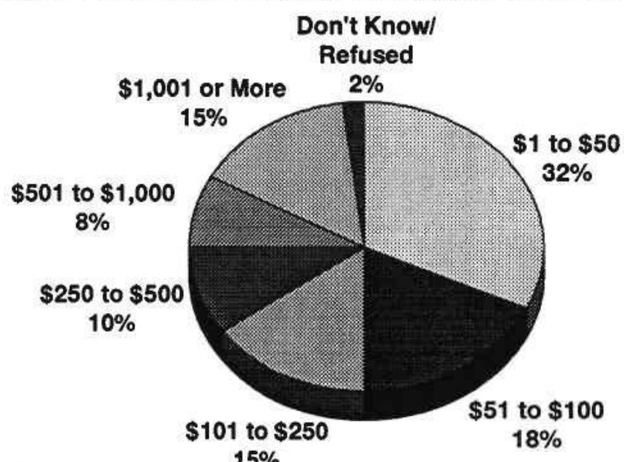
Online Shopping: How Much Are They Spending?



Source: Dataquest
971103

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Online Shopping: Current Contenders

- Microsoft
- Netscape
- OpenMarket
- IBM
- Icat
- ISPs/Web hosting companies
- NetConsult/Intershop
- GTE, VeriSign, Nortel
- Visa, MasterCard, banks
- Oracle
- Services companies
  - The nimble are better positioned
- Onsale
- Targeted device manufacturers
- TV shopping leaders

971104

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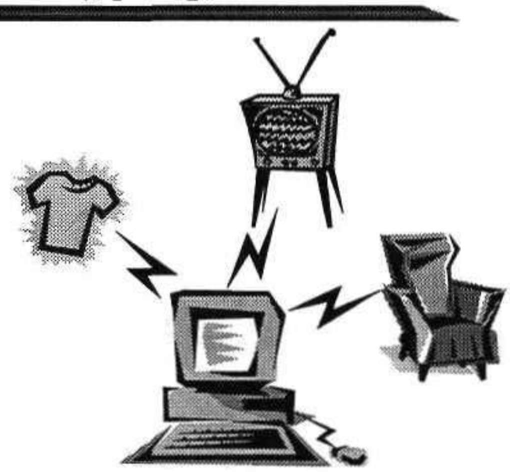
Dataquest Predicts: The Future of Online Shopping

- Retailers are still feeling their way
- Mid-1997, phase three of the rollout will start; follow the leader will ensue
- The value proposition will take focus: choice, expedience, price, driving retail (cross promotion)
- The REAL goldrush will be in 1998



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Banking on the Internet: Benefits

- To the customer
  - Convenience
  - Direct link to bank allows access to information
  - Bank can react quickly to offer products and services requested by customers
- To the financial institution
  - Low-cost acquisition channel
  - Expands geographic reach
  - Cross-sell other products
  - Credibility as gateway provides new business opportunities

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Key Players in Internet Banking

- Microsoft
- Intuit
- CheckFree
- IBM (Integrion)
- Vertigo Development
- Wells Fargo
- First Security National Bank
- Toronto-Dominion Bank
- Bankers Trust NY

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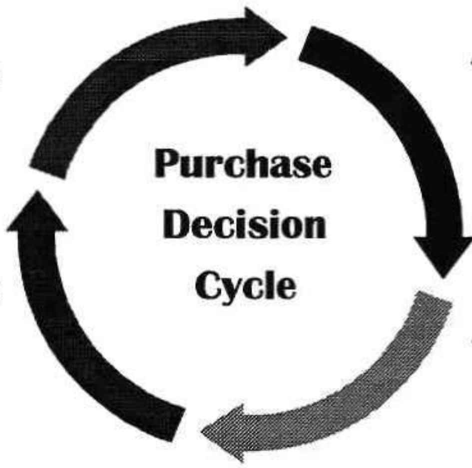
The Online Banking Value Chain



971108

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Dataquest Predicts: Online Banking Faces Slow Growth, Market Challenges

- Online banking will continue to grow, but at a modest rate
  - Issues of security, marketing, creating online brand identity, and ease of use are obstacles
- Integrion and Open Exchange provides uniform standards
- The need for personalized services
  - Vertigo Development's One on One Banking
- Pressure from financial services expanding
- Social acceptance stands in the way (Europe, Asia will accelerate faster)

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Notes

Notes

Software Suites: New Life, or Life Support?

Dan Lavin

Senior Industry Analyst, Personal Computing Software Worldwide
Online, Multimedia, and Software Group
Dataquest

Mr. Lavin is a senior industry analyst responsible for analysis of a broad range of software companies and products for the Online, Multimedia, and Software group at Dataquest. He is currently focusing on multimedia hardware and software. Mr. Lavin will be doing specialized research in 1997 in business and consumer software, the Java language, and Microsoft Corporation.

Before joining Dataquest, Mr. Lavin was a journalist covering the high-technology sector. He has been a regular contributor to a number of publications, including *Fortune*, *The Hollywood Reporter*, *Computer Retail Week*, and *Computer Reseller News*. Mr. Lavin was editor/Reviews for NeXTWORLD magazine. He was a founding contributing writer on the masthead of *Wired* magazine and was also on the masthead of *PC World* magazine.

Before entering journalism, he was a product manager for Brief, a market-leading program editor at The Software Developers Company, Weymouth, Massachusetts, and was a product development manager in the software division of Addison-Wesley, Reading, Massachusetts.

Mr. Lavin has also been a strong voice in the computer user group community as a member of the executive board of the Boston Computer Society and founder of NOIR, the international NeXT Users Group Association.

A Telling Indicator in the Suite Market

- These presentations in Microsoft PowerPoint 4.0
- Microsoft PowerPoint 95 installed by some analysts, but the art department is still a few months away
- Microsoft Office 97 versions at least a year away

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Agenda

- Suite baseline
- Predictions
- Opportunities

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Predictions—Suites

- Suite sales continue to slow
- Microsoft continues hegemony
  - But Microsoft Office 97 sales will disappoint
- Supersegmentation becomes prevalent

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Baseline

- Used here, suites refer to productivity bundles
  - Include word processing, spreadsheet, various other items
- Most important packaged software category
  - Over 30% of packaged software sales
  - Total of $3.7 billion in sales in 1996
  - Absurdly profitable, Microsoft's most profitable business

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Only Three Players

- Microsoft's Office with 85.3% market share by revenue
- Lotus' SmartSuite with 7.4%
- Corel's WordPerfect with 6.4%
- Unit share number substantially different, but this is misleading

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Then Why Should You Care if You Aren't One of the Three?

- Suite sales affect total retail traffic
- Increasingly, many other categories use suite as a platform
  - Example: utilities, graphics
- Users tend to add increased third-party functionality at time of upgrade
  - No upgrade, no third-party software purchased
- Suite upgrade often driver for hardware upgrade

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Predictions

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Suite Sales Slowing

- Dataquest predicted slowing years ago, has come true
- 30+% growth in 1995
- 20+% growth in 1996
- 10+% predicted for 1997
- SINGLE DIGIT growth likely in 1998

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Factors in Slowing Sales

- Market saturation
- Upgrade cycles
- User contentment/no compelling reason

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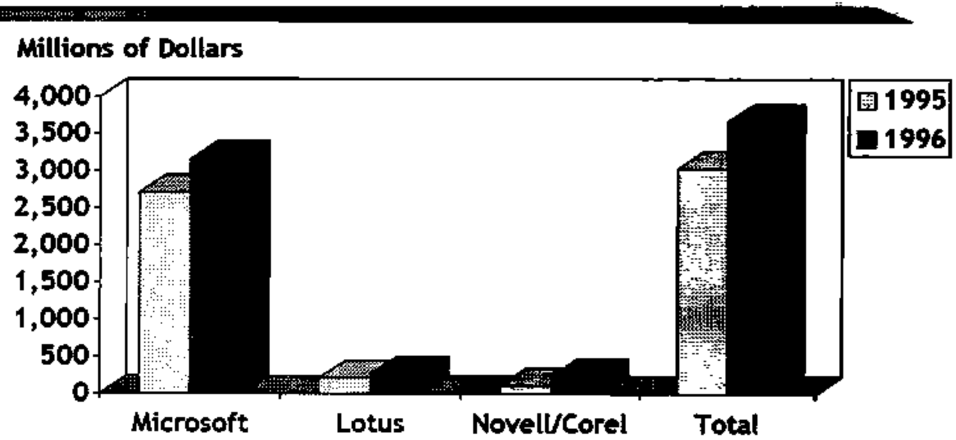
Suite Sales for 1995-1996



Source: Dataquest

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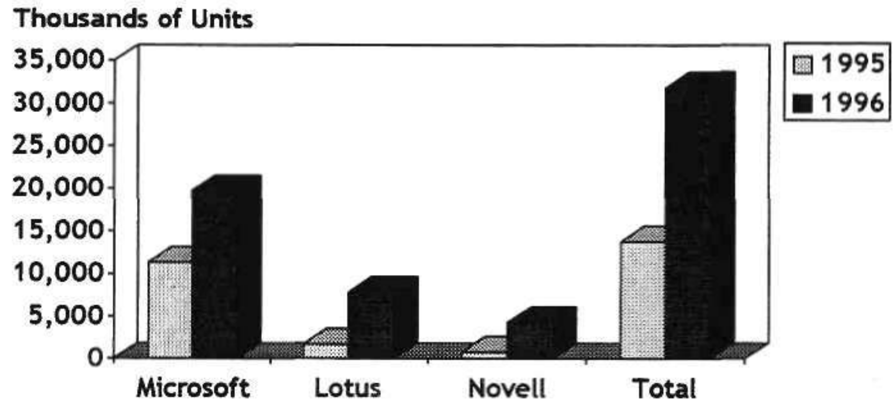
Suite Unit Shipment for 1995-1996



Source: Dataquest

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Market Saturation

- Find me a business user without a word processor
- World markets, once promising, are nearing capacity
  - Europe slowing more than North America
  - Rest of world not big enough to make a difference
  - Asia/Pacific biggest opportunity

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Upgrade Cycles

- Businesses take a year to upgrade and do so every two years at most
- Home users upgrade sporadically, if ever
- Products, however, are released every year
- Something has to give; and sales are giving
- OS change drove Office 95 upgrades—nothing similar in offing

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User Contentment/No Compelling Reason

- Congratulations, software industry!
- You did the job
- Now go home
- Unfortunately, most users think suites are pretty good
- Despite being technological marvels, suite makers are making few compelling business cases for upgrading

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Microsoft Continues Hegemony

- Microsoft's 85-93% share is unassailable in near and midterm
- No major chinks in product offering, marketing efforts
- Customers would require big deltas in capabilities to switch; none are evident
- Good news for Microsoft. Even with slowing rates, line is hugely profitable

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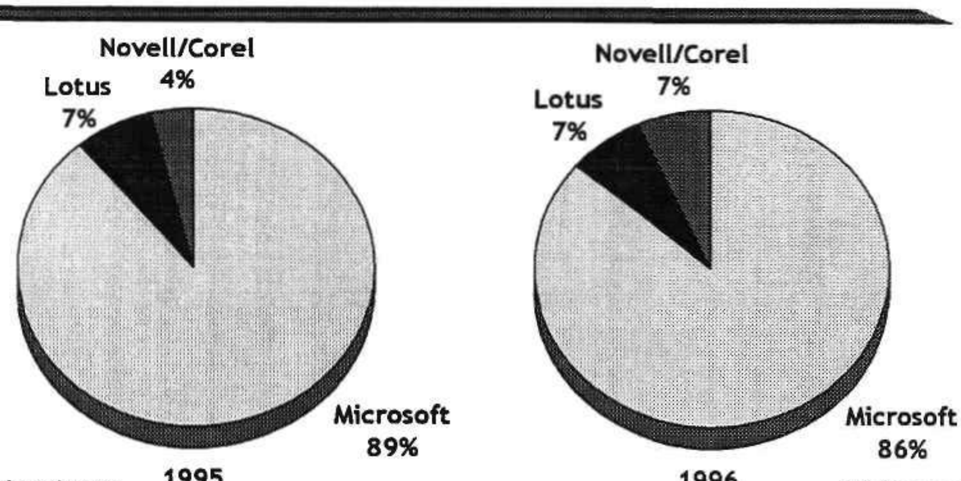
Suite Sales (Dollar per Share)



Source: Dataquest

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But Microsoft Office 97 Sales Will Disappoint

- Upgrade is right on heels of Office 95 upgrade
- Ramp is likely to be quite slow
- Current sales blip due to early adopters, but enterprises have other issues
- Next upgrade due too soon, will overlap Office 97, so sales not delayed, actually lost
- Incompatible file formats, perceived complexity
- Weak product launch

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Super Segmentation

- Ray of hope
- Silly to have $3 billion in one SKU
- Technological job is done, time for marketing to get busy
- We suggest a proliferation of SKUs
  - Suite for accountants, suite for volunteers, suite for electricians ...
  - We predict explosive proliferation of these at the end of 1997

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Side Note: Web Suites

- Excellent technology
- Extremely limited market
- Just a calling card for sales calls, no real impact

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Opportunities

- If Microsoft—hunker down, change business models
- If Corel or Lotus—execute well, defend share
- If anyone else—do not enter the suite market
- BUT if anyone else, feast on rich opportunities using Office as a platform
  - Add-on products
  - Aid supersegmentation

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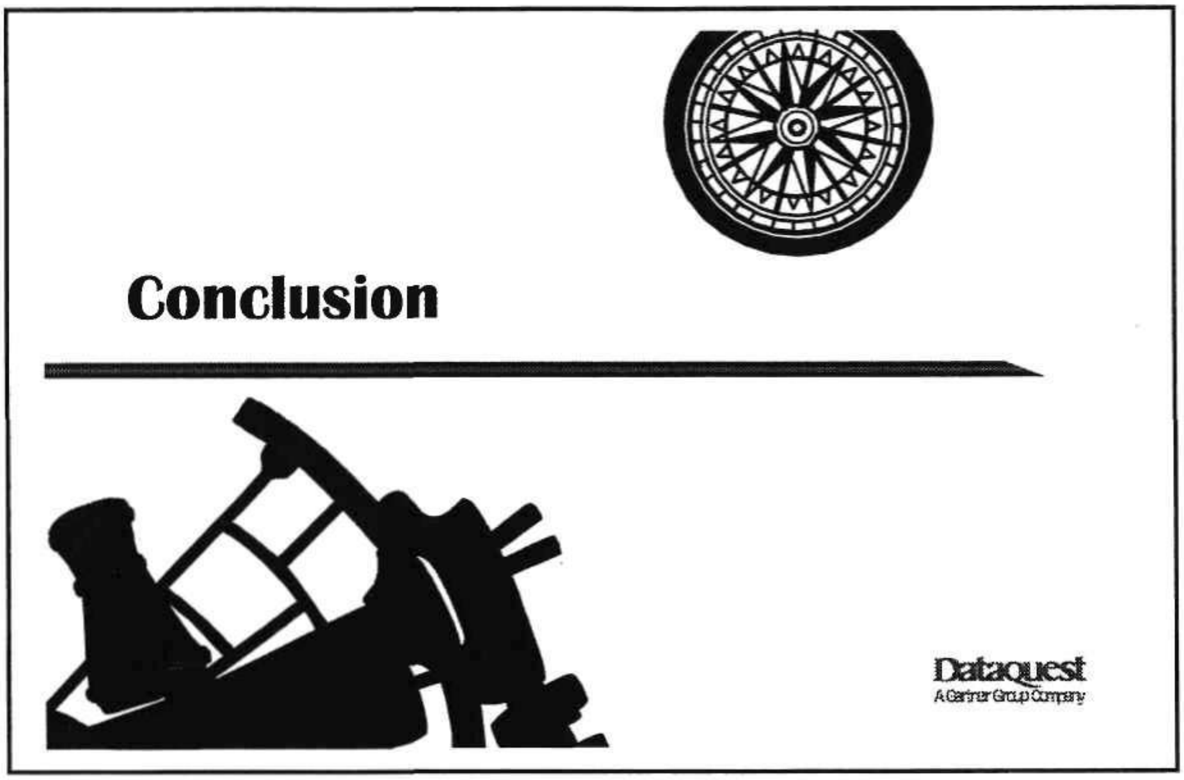
Conclusion
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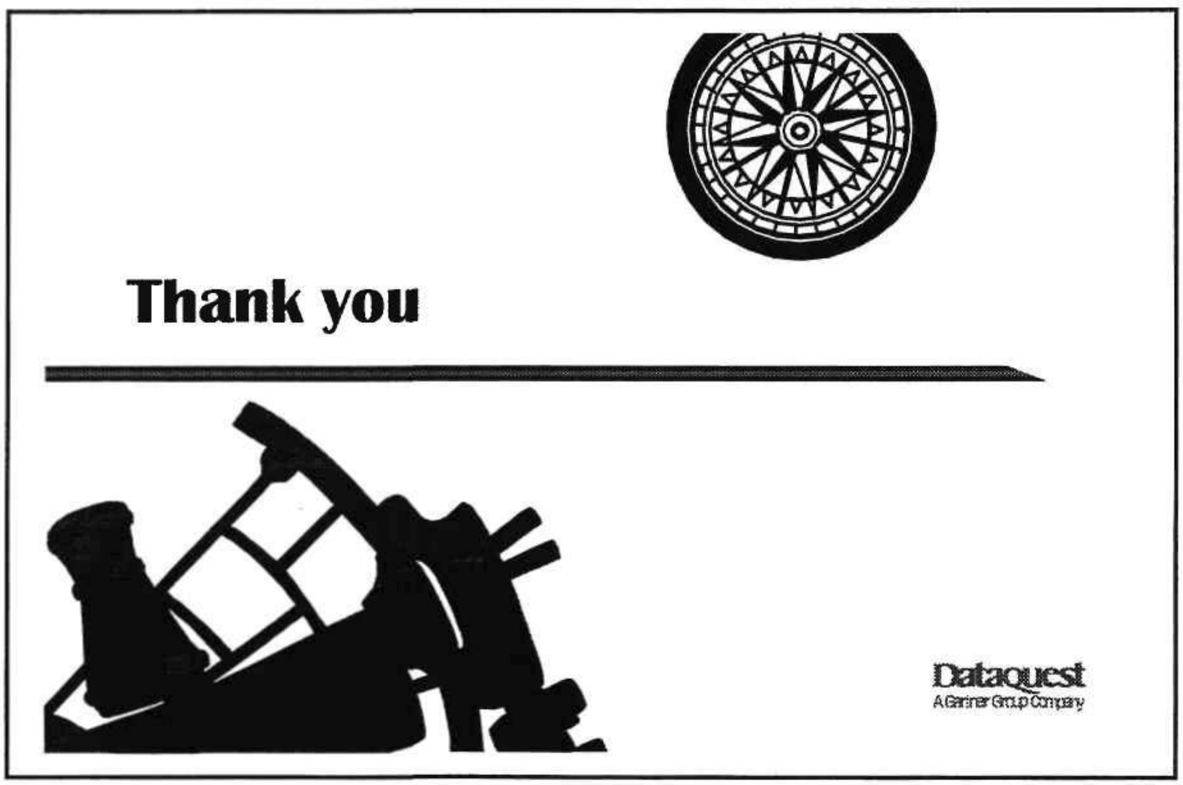
Thank you
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Notes

Notes

The Software Management Challenge in Client/Server Computing

Carolyn B. DiCenzo

Director and Principal Analyst
Client/Server Software Worldwide
Online, Multimedia, and Software Group
Dataquest

Ms. DiCenzo is director and principal analyst for the Client/Server Software program at Dataquest in San Jose, California. She has more than 30 years of industry experience in software and systems before joining Dataquest in 1996 and has worked extensively with software developers and business development managers within the software industry. Her major areas of responsibility include research and analyses of databases and data warehousing tools, application development and testing tools, network, system management, and storage management software on platforms from the mainframe to the desktop.

Before joining Dataquest, she was director of pricing at Sybase Inc. and a consultant to small and medium-size high-technology companies in Silicon Valley. She spent 14 years at Digital Equipment Corporation in marketing, sales, software services, software engineering, and corporate pricing, and was involved in several major pricing initiatives that spanned the range of Digital and Sybase's pricing efforts, including the pricing and positioning of product, services, channels, and country-specific pricing practices. A computer science professor and trained teacher before entering the business world, she believes that software companies need to focus on not only good technology but also on strong business practices that allow them to better partner with customers and to realize a fair return on their engineering investment.

Ms. DiCenzo received a B.S. degree in mathematics from the University of Michigan and an M.S. degree in computer science from the University of Massachusetts.

Dataquest Predictions

- Components, objects, and applets will be the "sea change" that changes the business model for the whole software industry
- Pricing "simplification" is a dead issue
- Every software vendor will embed license management into its products within the next two years

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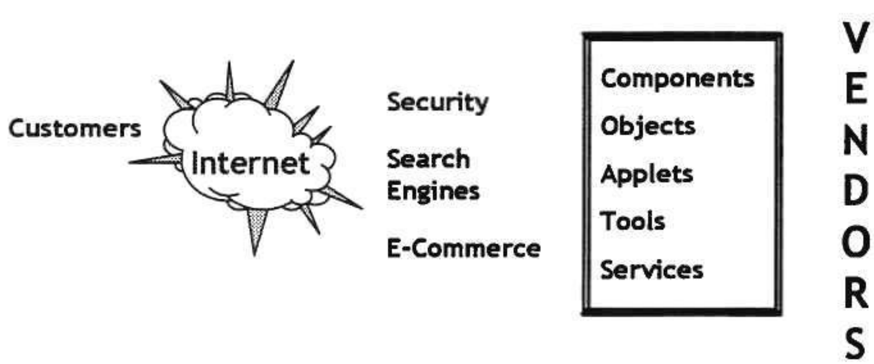
Internet, Security, Search Engines, and the Year 2000



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The Price Point Limits the Options for Selling/Distributing

Sheridan Domestic Order Form

Product	Qty (in units)	Price (per unit)	Total
VBAssist 3.5	______	$99	______
VBAssist 3.5 Upgrade	______	$59	______
Calendar Widgets	______	$109	______
3-D Widgets 1.0	______	$99	______

Shipping and Handling Charges:

UPS Ground: $7 for each unit purchased
Fed Ex 2nd Day: $14 for the first unit, $7 for each additional unit purchased
Fed Ex Overnight: $21 for the first unit, $7 for each additional unit purchased

Shipping and Handling Charges for the Sheridan Components Suite

UPS Ground: $14 for first unit purchased, $7 for each additional unit
Fed Ex 2nd Day: $21 for first unit purchased, $7 for each additional unit

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Not Just an Applet Issue

- Emergence of tool "suites" from multiple vendors
- Network and systems management suites with modules from multiple vendors
- Storage management with modules for multiple devices/multiple platforms
- Data warehousing tools for data cleansing, data movement, data reporting

Many of the same volume issues but Internet distribution not a viable option yet

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The Model Had to Break for Change to Happen

- Shrink-wrapped packaging/pricing too expensive for components/applets
- Internet download too slow for larger applications
- CD-ROM potential not realized
- Retail value of pirated software reached $13.2 billion
- Viruses and E-commerce require the passing of codes for security
- Some companies are succeeding with technology but not making money!

970916

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And:

A single price won't work anymore

- it never did

970917

Flexibility, not Simplification

- Those "secret deals" aren't secret anymore
  - Site licenses, floating, run-time
- More vendors are starting to enforce their terms
- Customers want terms they can live with
- Vendors want value for the product use
- Competitive alternatives are easier to find

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All Products Will Require Multiple License Types

- Site
- Developer/person
- Machine
- Concurrent
- Seat
- Floating

Some will have all,
Some will have two
or three types

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Most Products Will Require Multiple Packages—Pricing

- ➤ Basic
- ➤ Expanded
- ➤ Professional

- ➤ Oil and gas
- ➤ Banking
- ➤ German commercial
- ➤ Japanese technical

With a price to upgrade to the next level

Different documentation, service, training, channels

970920

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"We trust our customers"

"Too difficult to administer"

"Don't Talk to Me about License Management"

"We're waiting for a standard to emerge"

"Didn't work for..."

970921

Wrong Time, Wrong Technology

Highland Software Store

FlexLm

LMF

OSF/DCE

NetLS

- Management focus on hardware
- Control moving to desktop
- License keys but no management tools
- Limited platform support
- Paper key distribution

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But the Times, They Are A-Changing

- License reporting tools widely available
- Management is being recentralized
- Software is a growing company expense/focus
- E-commerce tools provide broad coattails to ride in on

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Customers Also Looking for a Solution

- Want more control, not just reporting
- Want control over in-house developed applets, components, objects, and applications
- Want control over deployment of site licenses

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New Players/New Tools

- Elan Computer Group—Elan License Manager
- Globetrotter—FlexLM
- Gradient—iFOR/LS
- Wyatt River Software—LicenseServ
- Release Software

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Vendor Challenge

Can't computerize business practices that don't exist or that change quarterly

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Vendor Opportunities

- New sales channels
  - Internet
  - Framework partners
- Profitable model for components, applets
- Controlled electronic/CD-ROM distribution
- Controlled evaluation distribution
- Higher margins for add-on, update business
- Profitable geography/industry packaging model

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Texas Instruments

Compuware

Computer Associates

BMC

The software vendors with us in the year 2000 will be the ones that focus on the changing business model as well as the evolving technologies

Liant

Objectivity

Platinum Technology

Cayenne

Rational

Mercury Interactive

Cabletron

Cognos

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Questions?

Notes

Notes

Windows 95 and NT: The 32-Bit Transitions

Chris Le Tocq

Director
Personal Computing Software
Online, Multimedia, and Software Group
Dataquest

Mr. Le Tocq is the director of the Personal Computing Software program including Operating Systems of the Online, Multimedia, and Software group. Before joining Dataquest, Mr. Le Tocq was the owner and principal analyst for SoftTracks Software Research, a private consulting and market research practice for clients in the software industry.

Previously, he was director of Software Research for Computer Intelligence InfoCorp. At CII he was responsible for managing the in-depth analysis and forecasting of the PC software marketplace. Earlier in his career, Mr. Le Tocq held senior marketing positions with Software Publishing Corporation, Symantec, ShareBase, ITT, and National Semiconductors Datachecker division.

Mr. Le Tocq earned a master's degree in computer science from London University.

A Look at PC Platform Migration Challenges and Opportunities

- Key challenges—ISVs
  - Take advantage of Microsoft's misstep
  - Assess the opportunity to be positioned as 16/32 "cross platform"
- Key challenges—Microsoft
  - Accelerate migration
  - Defend 16-bit platform
- Operating system forecasts size this opportunity and are available through Dataquest's Client/Server Software program

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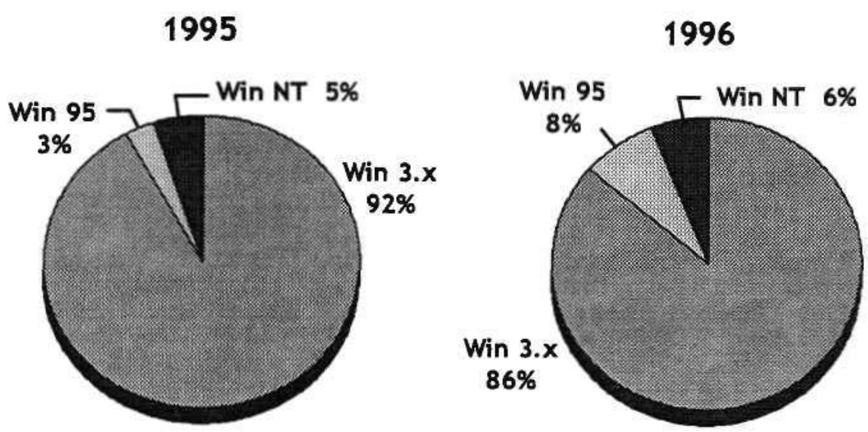
Looking Back to End 1996 vs. 1995 Worldwide Large Site (1,000+) Installed Base



Source: Dataquest
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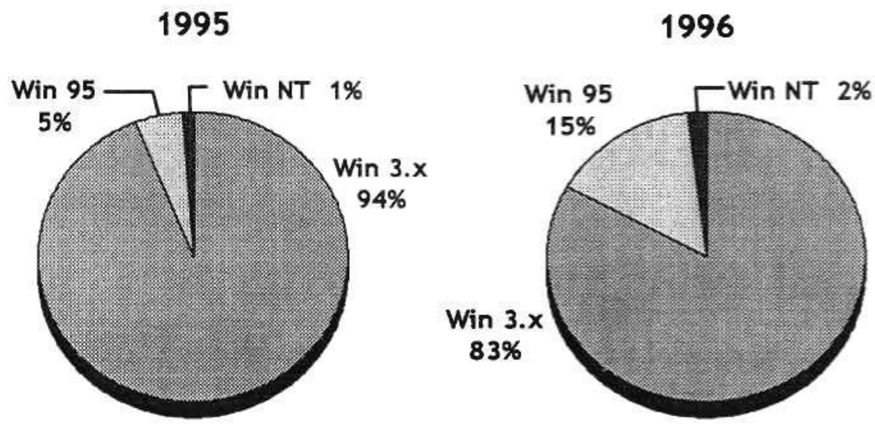
Looking Back to End 1996 vs. 1995 Medium Site (100-999) Installed Base



Source: Dataquest
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Business Desktop OS Wants/Needs

- ✓ Reliable desktop OS
- ✓ Manageable desktop OS
- ✓ More usable/productive OS
- ✓ Lower training costs
- ✓ Lower support costs
- ✓ Platform support for next-generation applications

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32-Bit OS Reality—What Did We Learn? Windows 95

- Improves:
  - Configuration complexity, PnP, Upper Memory, 640K
  - Central control UI, applications
  - GDI limitations removed, descriptive file names
  - Networking built-in
- Doesn't improve:
  - Reliability if any 16-bit applications/drivers running
  - Performance without RAM cost
  - Configuration problems
  - Systems management without central tools investment

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Windows 95 OSR2 (7.1) The Hidden Release—October 1996

- FAT32 file system
- DriveSpace 3, (from Plus! for Windows 95), CDFS
- Internet Explorer 3.0, Internet Mail and News, NetMeeting
- Microsoft Peer Web Server
- OpenGL (and screen savers), DirectX 2.0, ActiveMovie
- Online services: AOL, CompuServe, new MSN
- PCCard32, enhanced socket services, power management
- WANG Imaging Program and Fax Viewer
- Dial-up networking: enhanced UI, scripting, TAPI
- Windows NT 4.0 messaging system client
  - Was "Microsoft Exchange," now "Windows Messaging System"

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32-Bit OS Reality
Windows NT

- Improves:
  - Reliability/security
    - No application access to hardware
    - All applications run in own VM
  - Support for multiprocessor and graphics intensive applications
  - Performance with added memory
  - Network OLE (DCOM support)
- Doesn't improve:
  - Compatibility with:
    - Any real-mode drivers
    - Run all Win 16 applications (no hardware access-VxDs)
  - Installation

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Windows NT Server

- Improves:
  - Server configuration and installation
  - Departmental applications services
  - (Accelerates) Intranet services
- Doesn't improve:
  - Manageability in a WAN
  - Replace NDS or StreetTalk directory services
  - Scale over four CPUs

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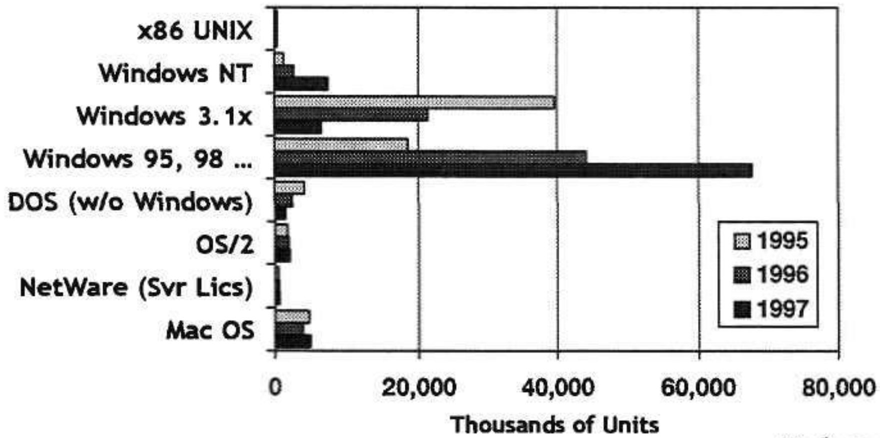
Worldwide Units 1995, 1996, 1997



Source: Dataquest
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Transition Influences

- ➤ New platform investment
- ➤ Applications cost-stay with 16
- ➤ 16-bit applications fully functional
- ➤ Lower long-term support costs
- ➤ Network OLE future application architecture
- ➤ Mixed environments
  - Application file compatibility—good
  - File-naming compatibility—problem
  - A continuing issue

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Win 95 Transition Status

- ➤ Upgrade cycle terminated early
- ➤ Upgrading users faced unexpected challenges
- ➤ Preinstalled users pleased
- ➤ Win 95 perceived as "stepping stone" to NT
  - Microsoft commits to NT as business desktop
  - Microsoft Positioning NT 5 as "zero-admin service"
  - Windows 95 providing a more stable desktop
  - NT perceived as even better
- ➤ Organizations deferring decisions

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Windows NT Transition Status

- ➤ Reliability carrot vs. compatibility stick
- ➤ High proportion (27%) of all NT units are servers
- ➤ Client transition ramped up moderately H2/96
- ➤ New 4.0 release—much better graphics performance
- ➤ Upgrade install not as reliable as Windows 95
- ➤ Directory management a challenge for distributed LANs
- ➤ Some reliability/security issues slowing adoption
- ➤ Service Pack 2 a reliability problem

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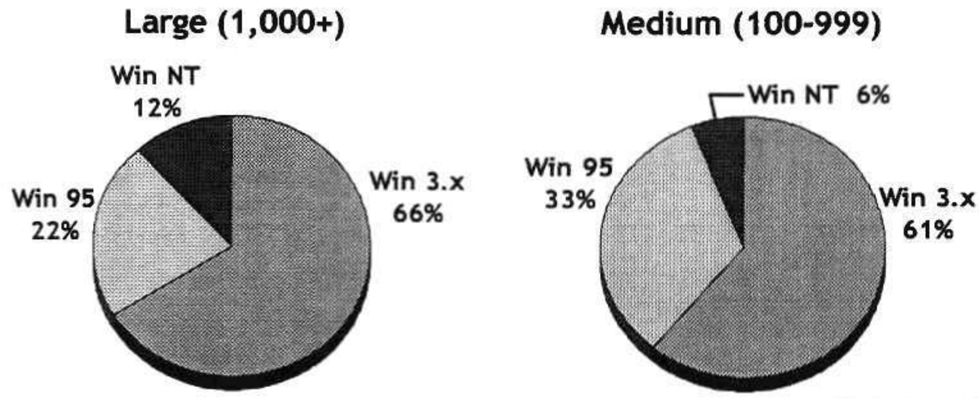
Worldwide Installed Base CY97 Large vs. Medium Sites

Thousands of Units



Source: Dataquest
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Transition to Date—Bottom Line

- Organizations continuing with Win 3 purchases
- Windows NT the target desktop over time
- OS transitions look like hardware replacement cycle transitions
- Windows 3.1 here for a while
- Plan to manage mixed environments
- Customers selecting vendors who understand mixed environments

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OS Road Map

- ➤ Office 97 now driving sales
- ➤ "Cairo" DNS preview end CY96
- ➤ WDM Windows Driver Model H1/97
- ➤ Summer 1997—Windows 98 "Memphis"
  - IE 4.0
  - Fully integrated shell/browser
  - Corporate reaction "Yet another UI"
- ➤ Q1/98 NT 5.0 "Cairo"

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Platform Release Timeline

	Current	*1996*	*1997*
Internet Explorer	3.0		IE 4.0
Windows NT W&S (and IIS)	4.0	IIS 3.0 Transactions Clusters	NTW 5.0 Beta
Windows 95	95		"Memphis" Beta
Windows CE		Handheld PC 1.0	

Source: Microsoft
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Windows 98: "Memphis"

- Easy upgrade to Windows 95
- Latest Internet technologies (Internet Explorer 4.0)
- Improved performance
- Improved administration
- Windows NT consistency
  - WDM class drivers
- Latest hardware support: OnNow, USB/1394, advanced graphics bus, etc.

Sets up Microsoft for future migration where it will build versions of Windows 95 using the same kernel technology found inside Windows NT

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Windows NT 5.0

"Distributed System"

- Directory service
- Distributed filing system
- Active server
- "Zero Admin"
- Enterprise features: Hierarchical storage management, 64-bit, etc.

"Win 9x Superset"

- Consistent user interface and hardware support with "Memphis"
- Plug-and-play
- Power management
- Latest DirectX
- Latest Internet technologies

Microsoft's goal is to remove any question of Windows NT scalability by end CY 1997

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On the Horizon

- IE 4 as desktop UI alternative
  - Bottoms-up demand for information sharing
  - Java/ActiveX applications platform
- IE 3 for Win 16 with 16-bit JVM now available
- Microsoft will try to market application upgrades via the Web
- ISVs targeting Web as sales channel for new desktop applications
- Windows NT positioned for all business desktops

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OS Positioning
Zero Admin Windows

- Depends only on functionality in NT 5.0 server
- Server maintains all user state
  - "Roaming users" have access to all data, configurations
- Automatic system updates, application installation, and rollback
- Central administration and lockdown
- Does not require a Win 95 to 98 upgrade on the client
- Does not require NT 5.0 on the client
- Cross-product initiative (NT, Win 95)
- Yet another cause for deferring, slowing, transition

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Transition Characterization

- For many organizations "cross-platform"
  - Means 16-bit vs. 32-bit
- Difficulties with mixed 16/32 environments
  - Management
  - Application deployment
- Driving IS to look at Java VMs, Java applications
- Microsoft itself the reason for an 18-month window for Java

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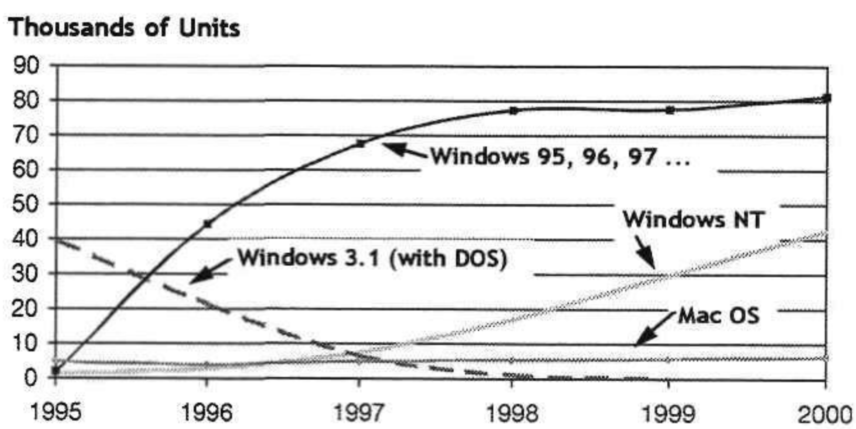
Forecast through 2000
Worldwide New and Upgrade Units—PC Platform



Source: Dataquest
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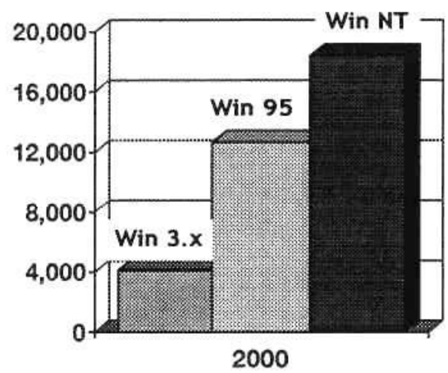
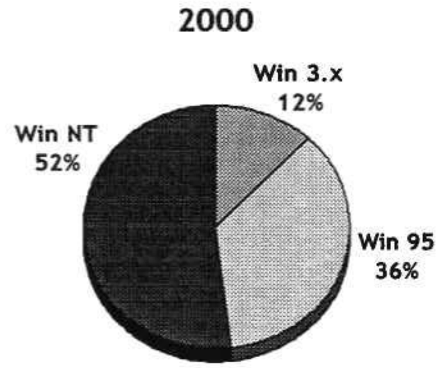
Looking forward to 2000

Worldwide Large Site (1,000+) Installed Base

Thousands of Units





Source: Dataquest
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Dataquest Perspective

- Plan for a mixed environment for two years+
- When in doubt, organizations take longer
- Wait for the systems/asset management tools
- UI changes need management/ understanding
- Information sharing needs guidance/ assistance
- No tools yet to manage the "information space"
- The world is 16-bit for a long while yet

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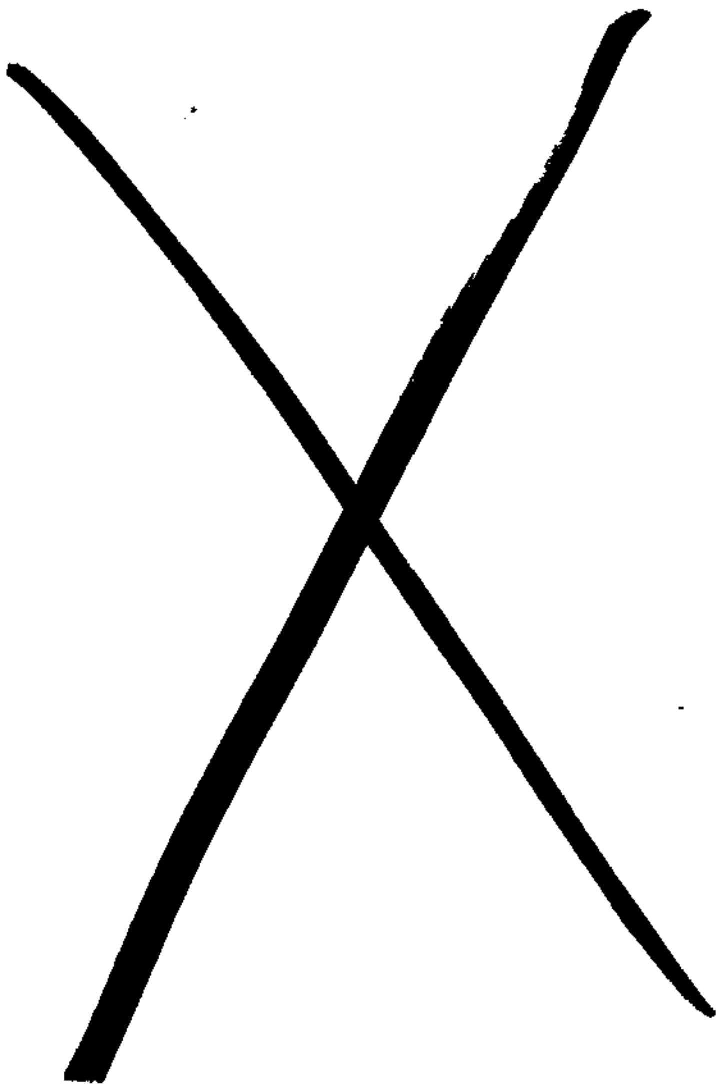

Remote Network Management Services

Ellen Carney

Director and Principal Analyst
Network Integration and Support Services
Telecommunications Group
Dataquest

In her role as director and principal analyst for Network Integration and Support Services, Ms. Carney is responsible for managing the sector program and client inquiry support functions. In addition to these activities, she is also responsible for conducting ongoing market research and analysis, specifically in the network support areas as well as custom research and consulting. This includes life cycle services associated with network architecture and design, implementation, operation, and maintenance; outsourcing and outtasking services, and remote management and electronic service delivery systems.

Before joining Dataquest, Ms. Carney spent seven years as the manager of Network Project Services for Cabletron Systems. In that capacity, she provided the management of the network engineering and design functions, installation project management, and custom network service programs.

Ms. Carney received a B.S. degree in economics from New Hampshire College and has participated in a number of industry and international trade seminars.

Agenda

- Introduction
- What's driving clients to remote network services
- Market size and forecast
- What's the competitive landscape like?
- Companies to watch
- What will they think of next!—Dataquest predicts

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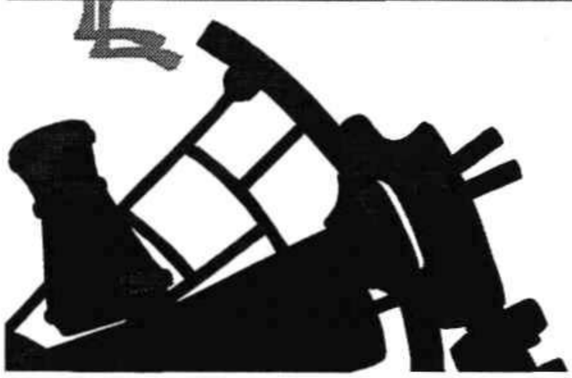
What's Keeping Your Customers Up at Night



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What's Keeping Your Customers Up at Night?

- Troubleshooting—the single most significant concern for all LAN customers
- Management and administration for all LAN customers and large WAN customers
- Finding and retaining staff
- Supporting emerging network technologies
- Multivendor/interoperability

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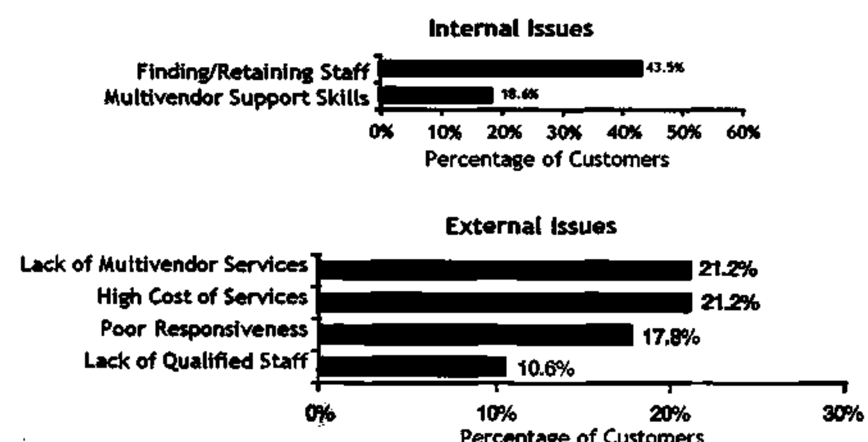
Biggest Networking Issues Facing Customers



Source: Dataquest
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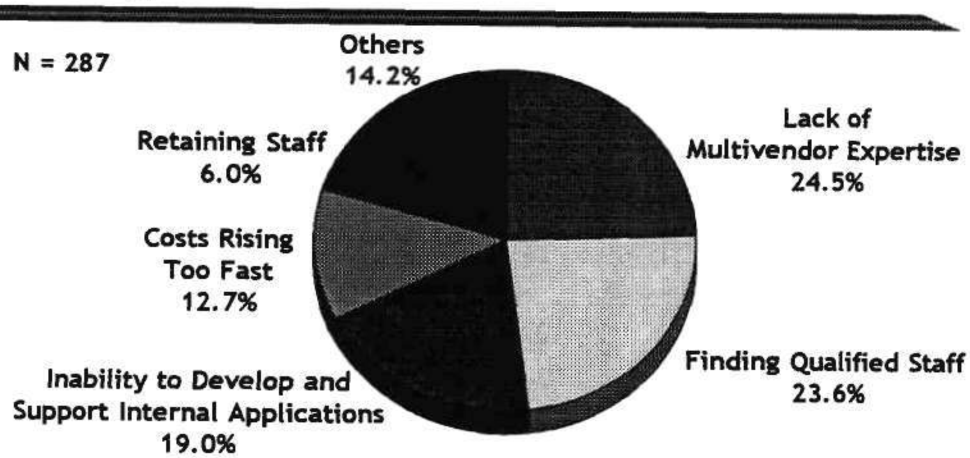
A Future View of Remote Network Management Services



Network Support Challenges

Source: Dataquest
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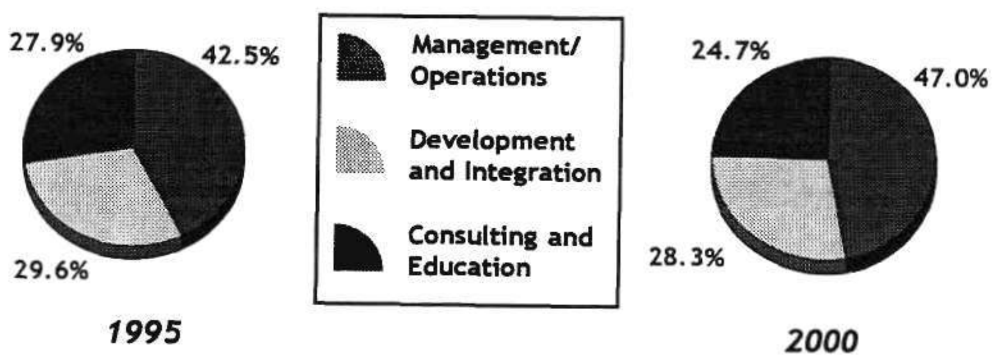
U.S. Network Professional Services—1995 and 2000



Source: Dataquest
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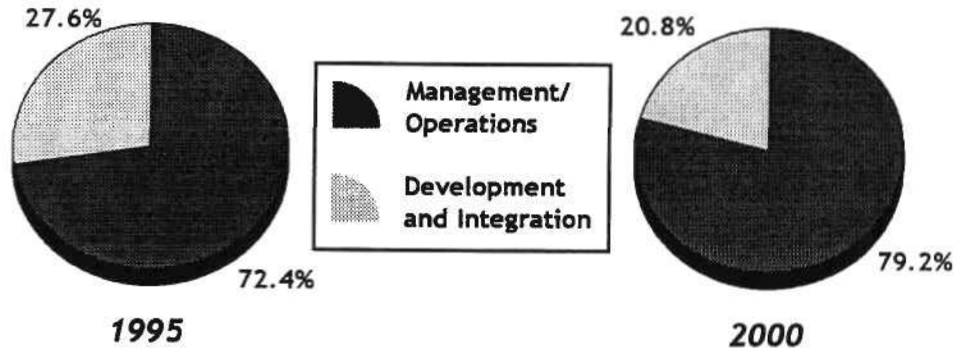
U.S. Network Customer Support versus Professional Services, 1995 to 2000



Source: Dataquest
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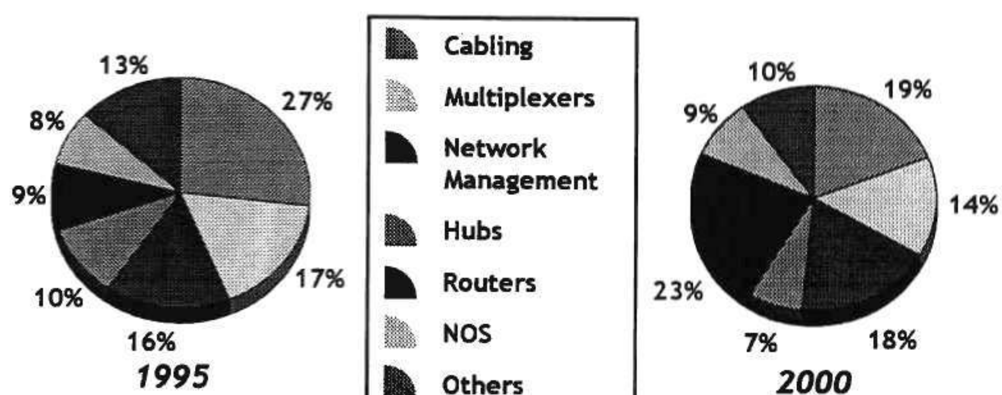
U.S. Data Communications Market Size and Forecast, 1995 and 2000



Source: Dataquest
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Tools versus Services

As the number of network management tools increases, the ability of customers to take advantage of the tools decreases

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Tools versus Services

Network managers must:

- ➤ Evaluate tools
- ➤ Determine best tool for their needs
- ➤ Install and configure tools
- ➤ Use resulting data to optimize network performance

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Tools versus Services

On the other hand, remote services provide ability to ...

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Tools versus Services

- Gain network management experience and expertise without adding costly staff
- Leverage network management technology
- Faster response to network configuration changes
- Optimize network performance
- Convert capital expense to operational cost

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Competitive Environment

What does the competitive landscape look like

?????

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Competitive Environment

Factors for success:

- Multivendor support
- Flexible packaging
- Web-based access for real or near-real-time reporting
- LAN, WAN, transport management
- Ability to manage applications

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Companies to Watch

- Bay Networks
- Comdisco Network Services
- ESSC
- GE TMS
- INS
- MCI/Systemhouse

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What Will They Think of Next ...

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Dataquest Predicts

- Web-based report delivery
- Starter-level reactive services
- The service-level agreement
- Network optimization and the role of automated network simulators
- Mobile (and wireless!) user network impact will reach critical mass

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A Few Closing Remarks ...

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Notes

Notes

The Ongoing Revolution in Product Support

Eric C. Rocco

Senior Industry Analyst, Hardware Services
IT Services Group
Dataquest

Mr. Rocco is a senior industry analyst for Dataquest's Worldwide IT Services group's Hardware Services program. He joined Dataquest in 1990 and his main area of expertise is in all aspects of multivendor/multiplatform hardware services, including maintenance, repair, and logistics. His ongoing research focuses on the independent/multivendor services marketplace.

Before joining Dataquest, Mr. Rocco was a parts logistics coordinator at IBM and later performed service market research at IBM's National Service Division. His responsibilities included primary and secondary competitive research in the service and support market.

Mr. Rocco received a B.A. degree in economics and a B.S. degree in marketing from Rutgers University in New Jersey, and an M.B.A. from Bentley College, Waltham, Massachusetts.

Agenda

- Hardware product support market trends and dynamics
- Changing customer support demands
- New competitive support practices
- Revolutionary support methodologies
- Dataquest predicts

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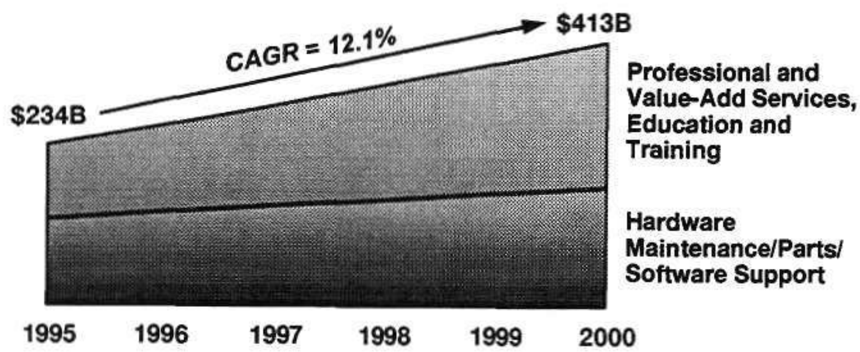
How Big Is the Opportunity?



Source: Dataquest
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Worldwide Hardware Maintenance Market Size and Forecast ($M)

Product Category	1995	1996	1997	1998	1999	2000	CAGR (%) 1995-2000
Supercomputer	613	689	760	821	858	876	7.4
Mainframes	3,389	3,114	2,761	2,389	2,033	1,725	-12.6
Midrange	12,051	12,058	12,695	13,361	14,121	14,723	4.1
Workstations	3,105	3,556	3,919	4,181	4,611	5,048	10.2
Personal Computer	8,175	9,119	10,378	11,447	12,150	12,413	8.7
Telecom Equipment	4,340	4,697	4,990	5,272	5,559	5,854	6.2
Datacom Equipment	6,102	6,956	7,816	8,760	9,696	10,556	11.6
Copiers	23,468	23,953	24,445	24,918	25,009	25,180	1.4
Printers	6,248	6,409	6,620	6,786	7,057	7,312	3.2
Terminals	1,031	960	878	797	727	656	-8.6
DASD	14,126	14,693	15,715	16,585	17,399	17,923	4.9
Tape Drives	4,805	4,742	4,737	4,654	4,525	4,304	-2.2
Total Maintenance	87,452	90,946	95,714	99,972	103,745	106,571	4.9

970635 Source: Dataquest

The Changing Model of Product Support

The Old Model

- Service was an afterthought in product development
- OEMs built internal service infrastructures
- OEMs owned their own service parts
- Emphasis was on on-site repair

The New Model

- Serviceability is built into the product
- OEMs leverage partners for service delivery
- OEMs leverage external parts networks
- Emphasis is on remote/ electronic support

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Major Industry Trends

- Users are spending more on IT and IT services (including external hardware support)
- The proliferation of desktop and network technology continues—technology is a utility
- More and more players continue to enter the services market (dealers, resellers, superstores, local/regional independent service companies)
- There continues to be consolidation among the largest hardware service firms
- Mobile computing has changed the service delivery model

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How Important Is Good Product Support to Your Company?

The Importance of Quality Support in the Product Purchase Decision Process (N = 251)

	Ranked First (%)	Ranked Second (%)	Ranked Third (%)	Ranked Fourth (%)
Vendor Reputation for Quality Service	54.7	28.4	11.4	5.5
Price	17.9	37.3	26.4	18.4
Features	13.1	17.1	38.7	31.2
Product Performance	14.7	17.3	24.4	43.7

Source: Dataquest
970638

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The Changing State of Customer Demands of Product Support

The Old Customer

- Purchased service contracts from many vendors
- Worried about critical uptime of the data center
- Viewed desktop hardware maintenance as a necessity
- Didn't care about three-year warranties

The New Customer

- Purchase service contracts from one or few vendors
- Worries about critical uptime of the desktop
- Views desktop hardware maintenance as a commodity
- Views three-year warranties as a given

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Where Must PC Service Providers Improve?

Percentage of End-User Responses (N = 100)

Response Time	25.5%
Improving Support Value vs. Price	18.4%
Service Quality	14.3%
Support Personnel Technical Skills	13.3%
Knowledge of My PC Requirements	8.2%
Knowledge of My Business	8.2%

Source: Dataquest
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And Just to Make Things Interesting — The Needs of Home Users Are Different

- Expect the product not to break in the first place
- Look to place of purchase for service
- Not buying service contracts
- Require much more "hand-holding"
- Typically best served through a remote repair location for in-warranty service

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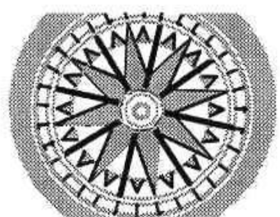

So What's the Industry's Plan for the Future?

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Industry Players Will Respond to Changes by ...

- Exploring partnering and service outsourcing arrangements
- Employing new service technology in their products and support operations
- Using the Internet to deliver customer services
- Finding unique service delivery methods

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Strategic Service Partnering

- Allows OEMs to focus on core competencies
- OEMs may outsource many service functions, including:
  - Parts logistics/repair
  - On-site maintenance
  - Depot repair
  - Technical telephone support
- But ... service quality is in the hands of the partner

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Major Players Are Using Service Partners

Product Vendor	Service Partner(s)
3Com	IBM, TSS, Data General
Acer	TSS, Genicom
Apple	Kodak, FedEx
Cisco	IBM, DecisionOne
Compaq	BancTec, Xerox, DecisionOne, Digital, Unisys
CompUSA	DecisionOne
Dell	BancTec, Digital
Lexmark	DecisionOne
Packard Bell	Wang, Techforce, DecisionOne, Digital
Sun	Kodak, DecisionOne

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New Advances in Service Technology

The tools of service technology

- Data management
- Knowledge management
- Communications
- Remote monitoring and diagnostics

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Data Management Functions

- Service entitlement and contract management
- Problem reporting
- Dispatching/scheduling/escalation
- Logistics (parts ordering/ warehousing/ distribution/inventory)
- Billing/time logs

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Knowledge Management Technologies

- Artificial intelligence (expert systems, fuzzy logic, etc.)
- Hypermedia and multimedia
- Case-based reasoning
- Text retrieval technology

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Communications Technologies

- Voice (call center technology and automatic call distribution)
- Fax technology (fax-back systems)
- Wireless technology
- BBS and EDI

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Remote Monitoring and Diagnosis Technologies

- Self-diagnosing and correcting
- Remote monitoring and repair
- Remote software management

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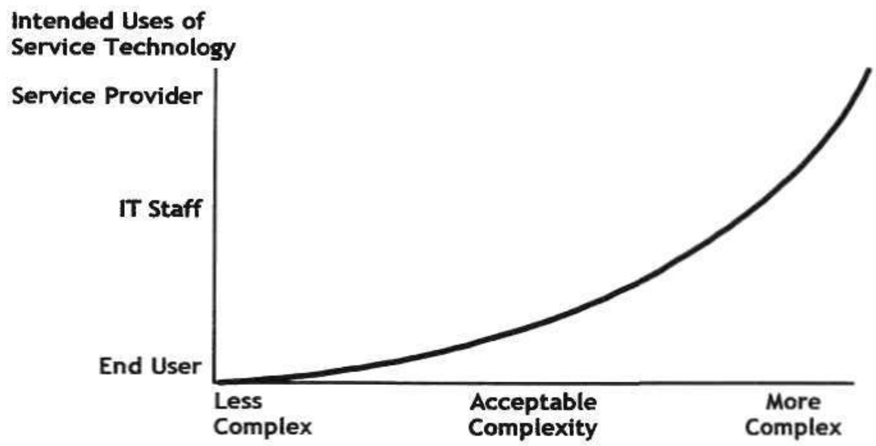
User Acceptance of Service Technology Complexity



Source: Dataquest
970650.1

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The Real and Imagined Benefits of Service Technology

- Expensive cost savings
- Hard to use, hard to swallow
- Real benefits:
  - Call avoidance
  - Operating efficiency
  - Increased productivity
  - Increased customer and employee satisfaction

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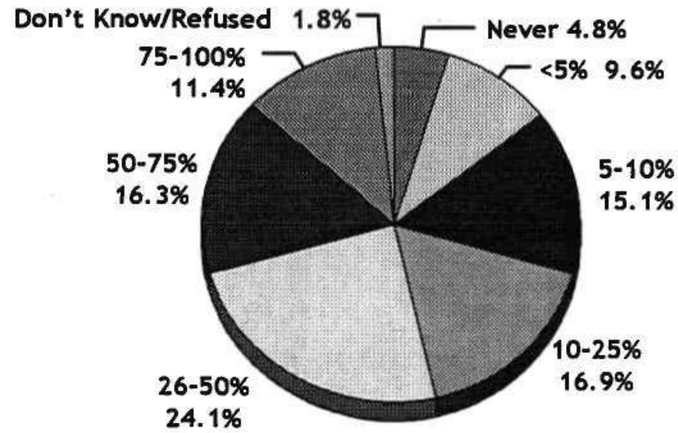
The Percentage of Problems Known to Be Resolved through Service and Support Technology



Source: Dataquest
970652

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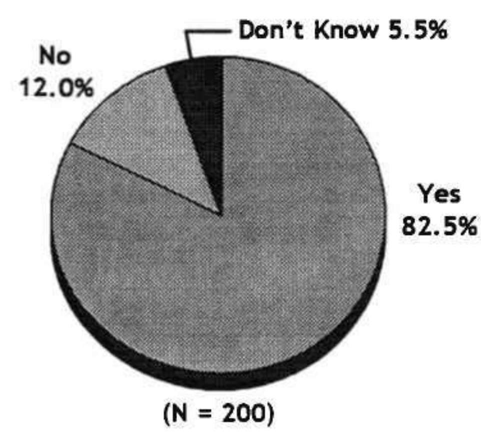
End-User Belief That Service Providers Save Money through Implementation of Service Technology

Percentage of Respondents



Source: Dataquest
970653

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Using the Internet to Deliver Customer Services

The Internet is effective at delivering the following customer service functions:

- Electronically submit a service request
- Download bug fixes and workarounds
- Remotely diagnose hardware problems
- Access a comprehensive knowledge base of service information
- Find product usage and service tips
- Deliver/download software upgrades

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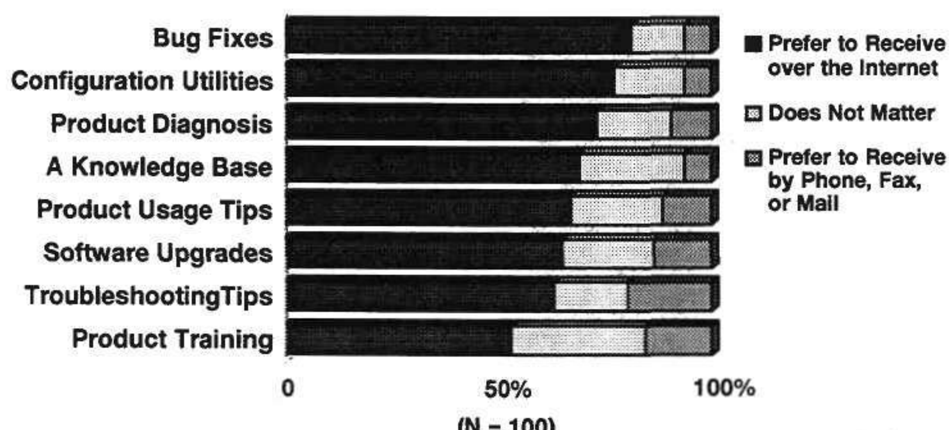
Preferred Sources of Customer Services



Source: Dataquest
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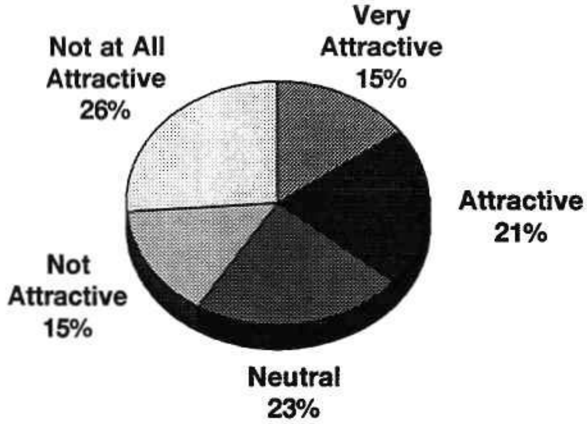
Attractiveness of the Internet to Replace Telephone Support



(N = 100)

Source: Dataquest
970656

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Service Delivery Models of the Future That Are Here Today

- Using "smart" couriers for basic repairs (AST/FedEx)
- Creating "end of runway" support models to satisfy the growing demand for overnight repair
- Building serviceability into the product to empower self and end-user repair
- Tapping into a virtual parts network as opposed to owning financially burdensome parts inventories

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Dataquest Predicts

- Hardware service revenue growth will slow and margins will continue to erode through 2000
- The industry will continue to consolidate: There will be only two major national independent hardware service providers by 1998
- End users and service providers will continue to benefit from various service technologies, although much of this technology has much room for improvement
- Partnering will continue, but with much more emphasis on account control and quality
- The Internet will only enhance, not replace, the telephone in customer support

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Notes

The Online Revolution: A Look Ahead

Thomas Sweeny

Director and Principal Analyst, Software Services
IT Services Group
Dataquest

Mr. Sweeny is director and principal analyst of the Software Services research program for Dataquest's Worldwide IT Services Group. In this position, he is responsible for the strategic direction of the research to ensure that the program provides essential competitive information and strategic intelligence to accurately forecast and report on the dynamics that shape the software services industry.

Before joining Dataquest, Mr. Sweeny was senior manager and chief technologist for Lotus Development's Worldwide Services organization. In this capacity he was responsible for many of the innovations that established Lotus as a recognized leader in service delivery. Mr. Sweeny led Lotus Support into a new era of information management and publishing by establishing systems and process to assure consistent customer access to Lotus product knowledge and expertise. He was the principal architect for Lotus' award-winning Automated Support Center and directed the design and development of the Lotus Support's state-of-the-art intelligent information retrieval system in cooperation with the Center for Intelligent Information Retrieval.

Mr. Sweeny has spoken at a variety of industry conferences on topics such as advanced call center technologies, service and support quality metrics, and electronic document management. He formerly held the position of chairman of the Industrial Advisory Board at the Center for Intelligent Information Retrieval.

Mr. Sweeny received a B.A. degree in economics from the University of Massachusetts, Amherst, in 1985.

Agenda

- Dataquest predicts—the Online Revolution!
- Key trends
- Implications and opportunities
- Emerging online service strategies
- Key attributes of effective online services
- A new model for service profitability: Continuous Customer Connections
- Summary, conclusions, and recommendations

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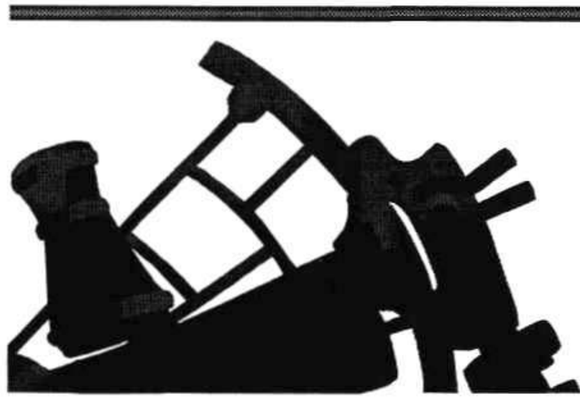
Dataquest Predicts— The Online Revolution



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Dataquest Predicts...

- ➤ Create significant opportunities to reduce service delivery costs
- ➤ Present new opportunities to generate service revenue
- ➤ Require a new model to maximize service profitability

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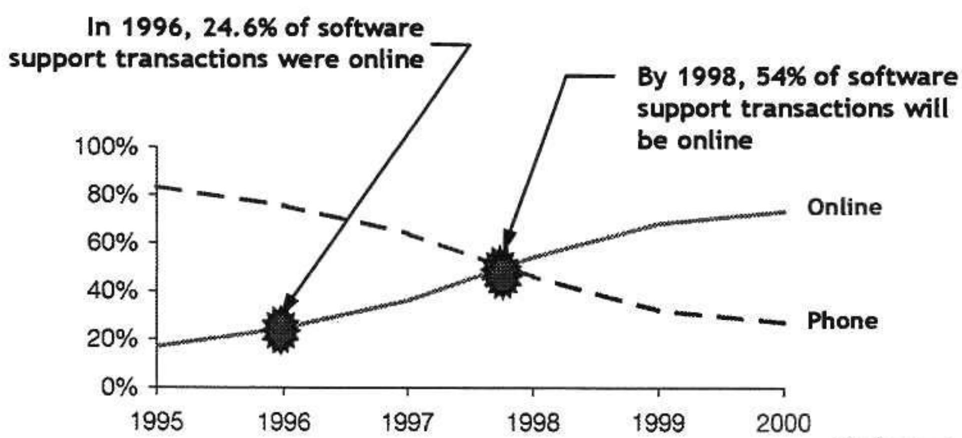
By 1998 Over Half of All Software Support Transactions Will Be Online



Source: Dataquest
970593

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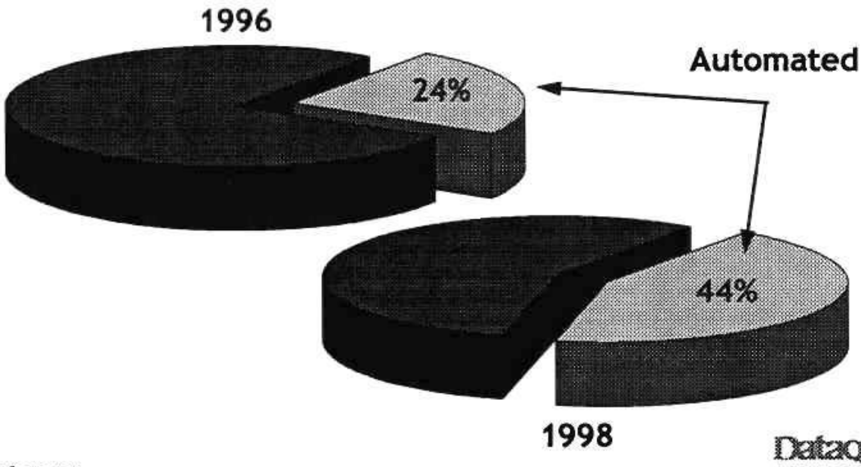
By 1998, Online Automated Transactions Will Nearly Double



Source: Dataquest
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Impact of the Online Revolution

- 54% of all software support transactions will be conducted online
- 44% of users will attempt to find their own answer
- Over half of the time users will find the answer
- One quarter of users will contact support
- 20% of all software support transactions will be resolved online without direct service provider involvement

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Key Trends

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Five Key Trends Fueling Online Growth

- Growing global Internet population
- Commitment by service providers to offer new online services
- Increasing availability and effectiveness of online content
- New enabling technologies to deliver just in time, proactive services
- Self help services presented in the context of support requests

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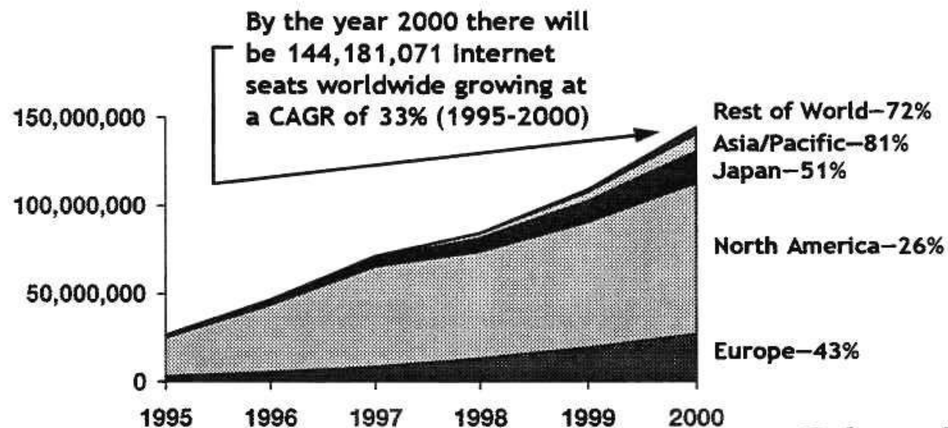
Trend 1: Growing Global Internet Population



Source: Dataquest
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Trend 2: Commitment of Service Providers to Offer New Online Services

Internet Service Delivery Capability	1996	1998
Knowledge Base	80%	100%
Remote Diagnostics	25%	70%
Download Library	80%	100%
Incident Submission	75%	100%
Relationship Management	52%	100%
Peer-to-Peer/Forums	20%	60%

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Trend 3: Knowledge Creation and Availability

- Increased awareness of the value of implementing effective knowledge management strategies
- Expanded commitment of resources to the discovery, development, and transfer of knowledge to customers and partners
- Increased volume of online content, both text and binary
- Significant enhancements to knowledge access technologies

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Trend 4: Proactive Services

- Agents
  - Proactive profile-based publishing
- Wizards
  - SystemSoft—System Wizard
  - Cybermedia—Oil Change and First Aid
  - Symantec—Handiman
  - Help Wizards
- Just in Time Learning
  - Online Instruction
  - Concept-based

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Trend 5: Self Help Services Presented in the Context of Support Requests

- Delivery request launched from business application
- New technologies will significantly enhance the process of collecting user information
- Presentation of possible answers in the context of requesting support
- The right question

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Implications and Opportunities

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Opportunities Created by the Online Revolution

- Lower cost service delivery
- New value, new revenue opportunities
- Long term customer relationships

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Lower Cost Service Delivery

- Enables the customer to do more
- Creates a more efficient exchange of information
- Solution multipliers
- Extends geographic coverage with existing resources

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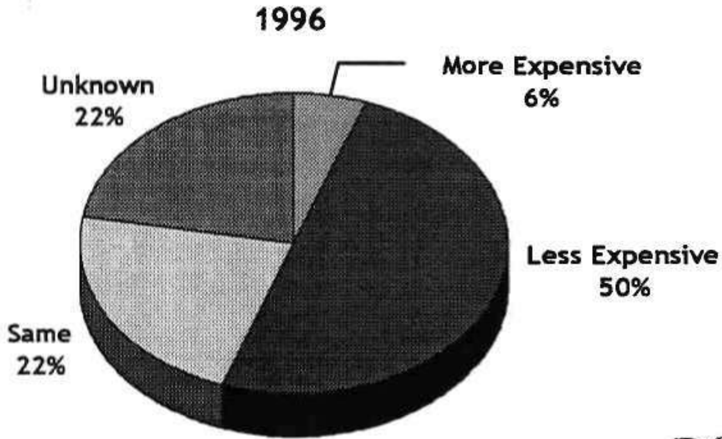
Service Providers' Experiences with Online Services



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New Value, New Revenue Opportunities

- Internet
  - Remote monitoring
  - Remote management
  - Remote diagnostics
  - Remote solutions
- Telephone
  - Real time
  - Interactive

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Long Term Customer Relationships

- The Internet: A link between the users of technology and the developers and markets of these products
- Relationships will range from initial product registration to ongoing support and account management
- Opportunity to implement a total customer management strategy across all customer-facing organizations

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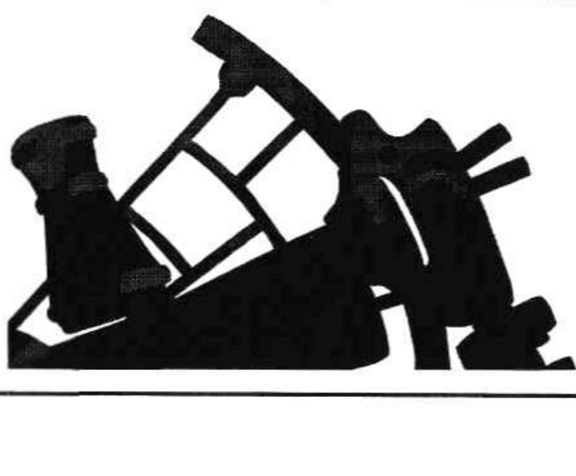
Emerging Online Service Strategies



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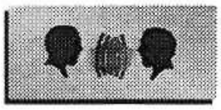
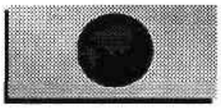
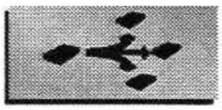
Emerging Online Service Strategies


Low Cost, High Value Services


Virtual Service Delivery


Knowledge Creation and Transfer


Increase Customer Self-Sufficiency

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Low Cost, High Value Services

Strategy
- Leverage online connections with customers to deliver proactive, preventive, and maintenance services

Investment
- Desktop-to-desktop communications infrastructure
- Staff and customer education and training

Return
- Diagnostic and resolution time significantly reduced for certain interactions
- High customer satisfaction
- Revenue from premium services

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Virtual Service Delivery

Strategy	■ Capitalize on global online community to support established and emerging global markets with existing resources
Investment	■ Appropriate look and feel for target markets ■ Skills to deliver services to new markets ■ Promotion of service capabilities
Return	■ Low cost, means to support new markets ■ Follow-the-sun service capabilities

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Knowledge Creation and Transfer

Strategy	■ Leverage organizational knowledge assets through creation and reuse resulting in higher service delivery efficiency and effectiveness
Investment	■ Knowledge creation and management costs ■ Delivery technologies
Return	■ Up to triple-digit return on knowledge creation costs ■ Minimize knowledge drain due to attrition

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Increase Customer Self-Sufficiency

Strategy
- Enable customers to diagnose and resolve problems through effective knowledge transfer

Investment
- Knowledge publishing and delivery systems
- Product usability and serviceability (i.e., dynamic help)

Return
- Up to 70% per-incident savings

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Key Attributes of Effective Online Service Strategies

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Key Attributes of Effective Online Service Strategies

- Proactive
- Preventive
- Sustaining

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Proactive

Objective
- Fix it before it breaks
- Provide timely access to important information

Approach
- Leverage online connections with customers to deliver timely relevant information
- Implement service such as proactive profile-based publishing

Impact
- Significantly reduce customer incidents about problems previously reported and resolved
- Increase customer satisfaction

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Preventative

Objectives

- Prevent system down time and assure optimal performance

Approach

- Monitor the ongoing performance of a system
- Adjust and optimize to assure optimal performance

Impact

- Establish high customer satisfaction through reliable system performance
- Minimize costs associated with priority reactive services

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Sustaining

Objectives

- Enable systems to self-diagnose problems and initiate self-healing and problem resolution transactions

Approach

- Incorporate diagnostics engines into products and connect to up-to-date knowledge repositories

Impact

- Significant return from incident avoidance
- Ability to capture product usage and performance statistics

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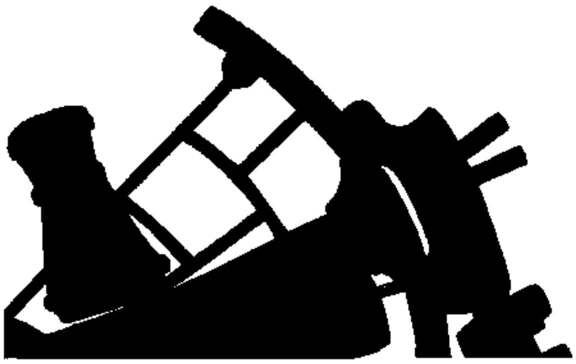
A New Model for Service Profitability: Continuous Customer Connections



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Key Elements

- ➤ Initiate connections
- ➤ Engage in dialogue
- ➤ Create value from customer interactions
- ➤ Deliver value to meet customer expectations
- ➤ Manage the customer relationship though the entire technology life cycle

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Key Benefit

- ➤ Reduce service delivery costs
  - Increased customer self-sufficiency
  - Efficient service interactions
  - Maximum leverage of knowledge assets
- ➤ Increase service (and product) revenue
  - Creation of premium services
  - Value-based pricing of offerings
  - Resource allocation to high margin activities
  - Long term relationships

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Summary, Conclusions, and Recommendations

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Summary and Conclusions

- The worldwide online community is growing rapidly
- Dataquest predicts rapid acceptance and usage of online services
- Increasing online usage will create significant opportunity to reduce costs and generate revenue from new premium services
- The ability to capitalize on online revolution will enable efficient allocation of resources to high-value, high-margin services
- Adoption of new service delivery models will positively impact profitability

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Recommendations

- Get connected with customers
- Invest in creation of knowledge
- Enable customers through effective knowledge transfer
- Incorporate serviceability into products
- Look for opportunities to allocate resources to high-value, high-margin services
- Define and adopt service delivery models that capitalize on the online revolution

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Notes

Computing Utility: A New IT Value Proposition

Stephen M. Clancy

Director and Principal Analyst
System Support Services
IT Services Group
Dataquest

Mr. Clancy is the director and principal analyst for the System Support Services of the Worldwide IT Services group. Mr. Clancy joined Dataquest in 1986 and is responsible for the direction of the research for the Desktop Support Services and Strategic Services Partnering/Alliances programs. He is directly involved in all program activities including market research, client inquiry services, and other related consulting assignments. Mr. Clancy makes regular contributions to Dataquest's Worldwide IT Services group newsletters. He spoke at Dataquest's ServiceTrends Conference on VAR/Reseller support and was a speaker at Frost & Sullivan's Third-Party Maintenance Conference: The Dealers Perspective.

Before joining Dataquest, Mr. Clancy was with MBI Business Centers/MicroSource Financial, where he was the hardware service director and major account sales representative. Mr. Clancy was responsible for building MicroSource's Service Center into a $1 million-a-year operation. This responsibility included setting all service support strategy and service pricing methodology. In addition to these positions, he has previous experience with two other computer retail organizations.

Mr. Clancy received a B.S. degree in business administration from Southeastern Massachusetts University. He is also a member of the ABCD Industry Research Council.

Agenda

- What is a utility?
- What is a Computing Utility solution?
- What are the Computing Utility service needs of today's IT environment?
- What are some of current Computing Utility solutions?

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Agenda

- Who are the current players in today's Computing Utility service business?
- How big are these emerging markets?
- Why could Computing Utility solutions control 30% to 50% of the IT market's revenue in the next two years?

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What Is a Utility?

A dictionary definition:

"A public service or a *commodity* (as electricity or water) provided by a public utility"

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What Is a Utility?

Typically a utility product/service is thought of as electrical power, water, telephone service, etc.

- Commodity business value
- Pay-as-you-go/use
- Business expense item
- Limited customer capital asset ownership
- Single-source solution
- Enterprisewide service
- Publicly regulated monopolies

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Dataquest's Definition of Today's Computing Utility Solution

Dataquest Definition

A Computing Utility solution is the management and possibly the ownership of key components of a customer's IT environment. The goal of a Computing Utility service engagement is to manage IT technology and resources to deliver cost-effective and reliable computing power across the business enterprise.

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Comparison of a Traditional Public Utility vs. Today's Computing Utility Solution

Traditional Public Utility

- Electrical power, water, or telephone service
- Commodity business value
- Pay-as-you-go/use
- Business expense item
- Limited customer capital asset ownership
- Single-source solution
- Enterprisewide service
- Publicly regulated

Computing Utility

- Compute, storage, network capability, and management
- Moving to a commodity business value
- Some pay-as-you-go/use
- Business expense item
- Some customer capital asset ownership
- Single source, enterprisewide
- Comparatively limited regulation

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What Challenges Are Driving the Need for a Computing Utility Solution

- Accelerating rate of change in the IT Industry
- Limited resources and time for strategic IT focus
- Poor control of IT assets and data in new distributed computing practices and environments
- Need for better financial management of IT investments
- Productivity achieved from investments lackluster

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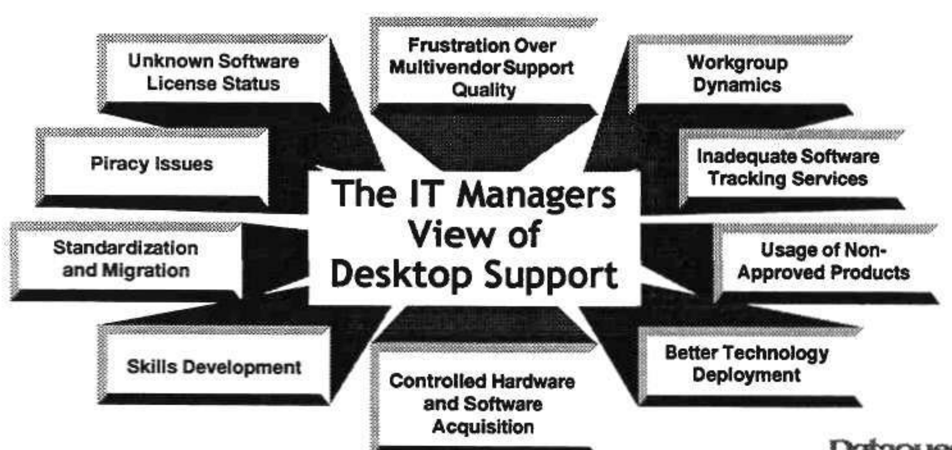
Challenge: Managing the Desktop



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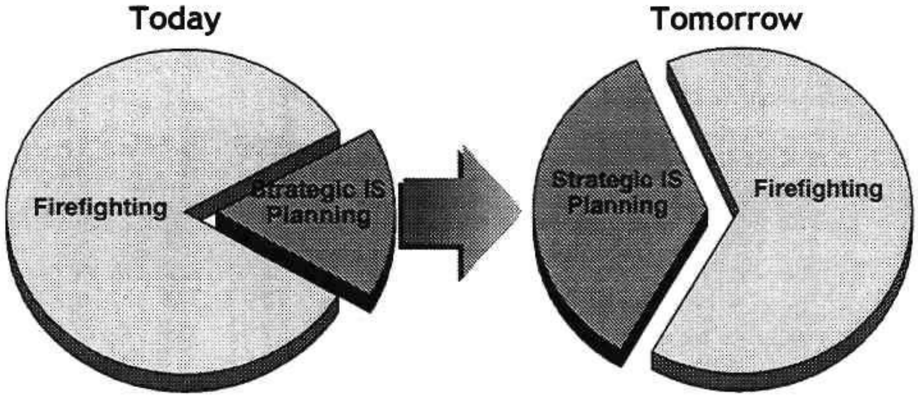
Challenge: Productively Allocating Limited IT Resources from Reactive to Proactive



Source: Dataquest
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Customer's Current Reaction to Today's Major IT Challenges

- Outsourcing is now "a good thing!"
- Single source continues in importance and is building real incremental value for managing customer's computing environments
- Standards are in; heterogeneous is still "a good thing," but wild cowboy technologies are out
- Implementing IT strategies enterprisewide for biggest productivity impact and strategic leverage of IT investments

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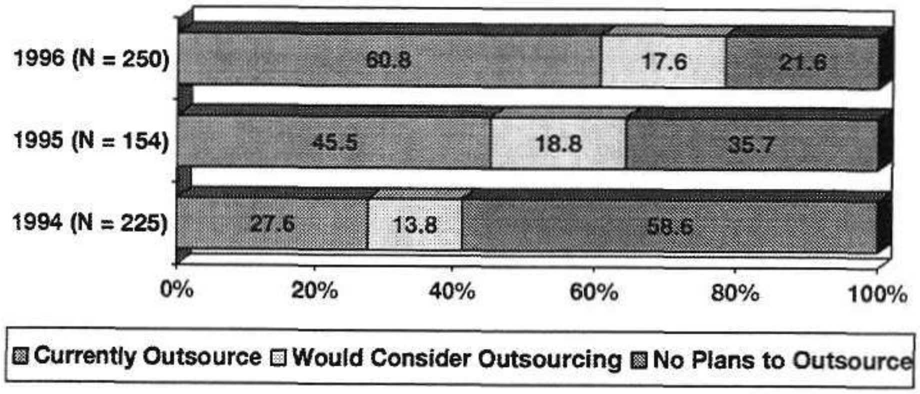
Users Increasingly Outsource to Support Their IT Needs



Source: Dataquest
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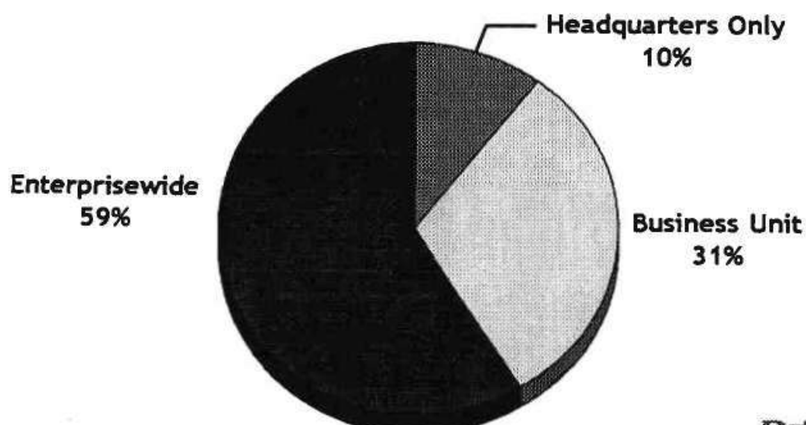
Outsourcing Users Are Demanding Enterprisewide Coverage



Source: Dataquest
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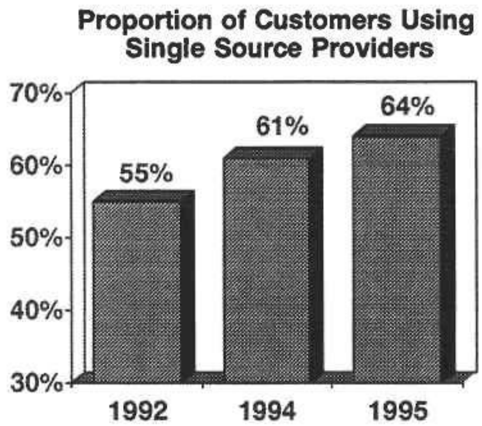
Customers Continue to Move to a Single Services Supplier



"Over the past five years customers increasingly are seeking a single provider that can deliver services to cover multiple products and platforms."

Source: Dataquest
970895

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Benefits of Single Source Enterprisewide Coverage

- Partnership investment in new applications of technology
- Rapid deployment of new technology and process standards
- More rapid implementation of new systems
- Optimization of network and infrastructure
- Reduced deployment and administrative costs
- Lower life cycle management costs

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Computing Utility Value Proposition

Customers' Challenges

- Managing the rate of IT change
- Building and managing a "migration ready" infrastructure
- Implementing a enterprisewide, worldwide, IT management strategy
- Improving budgeting and cost control of the new distributed IT computing infrastructure
- Managing multitechnologies, vendors, and sources
- Keeping a strategic IT business focus

Computing Utility Solution

- Provides predictable computing power when and where the customer needs it
- Manages computing power and infrastructure as a reliable commodity business value
- Allocates critical IT resources to key business value creation activities—reactionary to proactive roles
- Manages computing power as a business expense
  - — Predictable computing budgets and computing expenses
- Delivers enterprisewide, migration-ready IT environment

970897

Key Components of Today's Computing Utility Business Solution

Standard Features

- ➤ Infrastructure management
- ➤ Single-source value
- ➤ Integrated service package
- ➤ Comprehensive environment service
- ➤ Managed as a monthly or annual expense item
- ➤ Long-term, multiyear engagement

Optional Features

- ➤ Provider asset ownership
- ➤ Pay-as-you-go/use
- ➤ Lease financed solution

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What Are the Major Computing Utility Solution Opportunities Today?

Multivendor Maintenance

Remedial multiplatform support of hardware, software, and network products, as well as limited value-added services

Distributed Systems Management

Ongoing services in support of desktop and network operations, including custom applications mgt., help desk, business continuation services and systems and security services

Life Cycle Services

Typically a combination of tools and services to track and manage technology over the full life of the IT solution

Data Center Outsourcing

Ongoing services in support of data center environment

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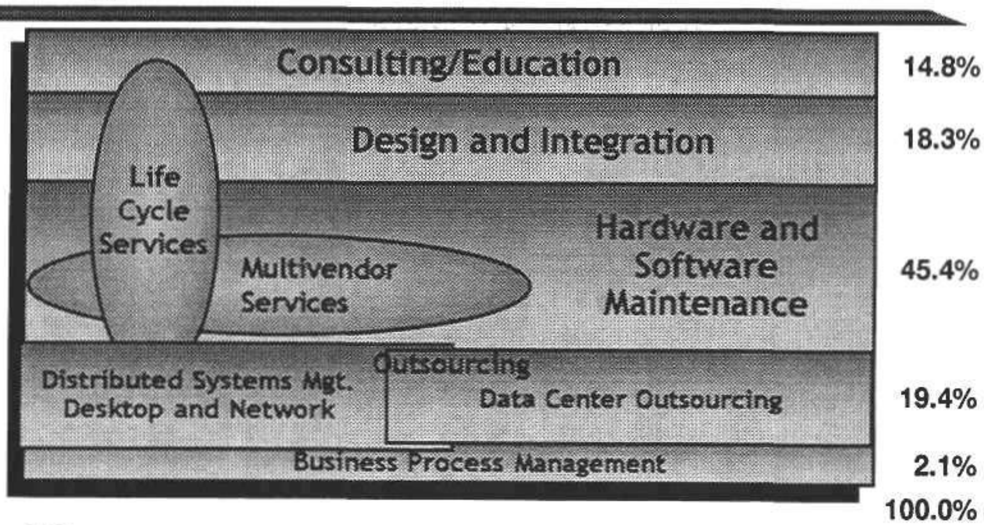
Major Computing Utility Solution Segments



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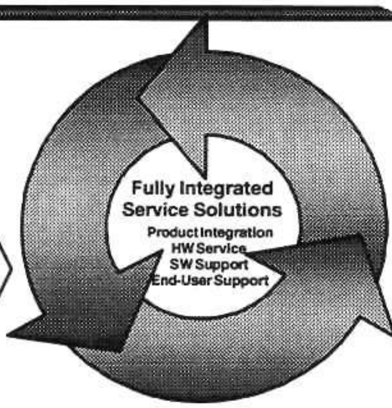
Life Cycle Service Solutions

- Product acquisition
- Relocation/cabling
- Hardware integration
- Software integration
- Network integration
- Asset management
- Training
- Help desk
- Software support
- Product maintenance



- Complexity
- Accountability
- Partner relationship

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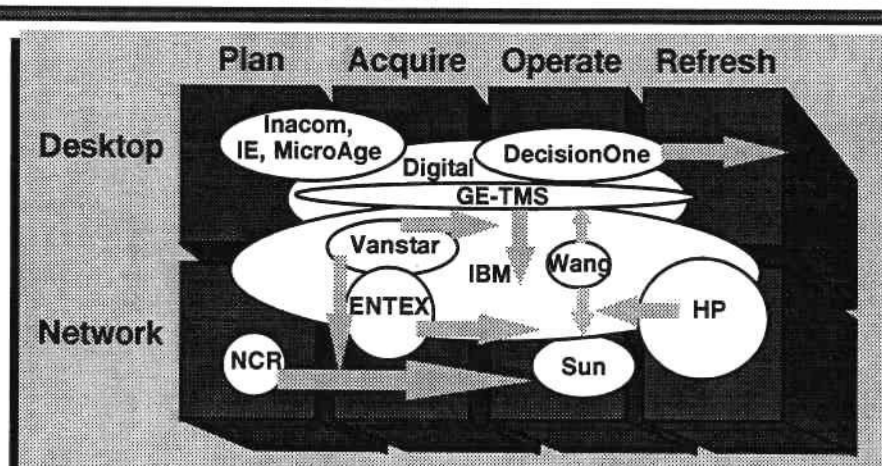
Positioning in the Life Cycle Services Market and Players



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Examples of Current Computing Utility Market Offerings

IBM—Network Station Management
- Emphasizes global infrastructure, consistency, capabilities, standardized processes
- Customers can pick and choose
- Four key areas: Deployment, user support, network services, management

Digital—PC Utility Custom Service Offering
- From planning to technology refreshment
- Multivendor in nature

HP—Enterprise Desktop Management
- A set of integrated services that help organizations take control of their desktop environments

Entex—Lifecycle Services
- All services fit into life cycle offering
- Three levels: Basic, enhanced, and advanced

GE TMS
- Offers a suite of planning, acquisition, management, and technology refresh services that are integrated into a technology management solution
- Emphasizes asset management, integrated service management, product procurement, and leasing strengths

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Emerging Computing Utility Offerings

PC Utility	Information Utility
Software Utility	Storage Utility
Network Utility	Acquisition Utility

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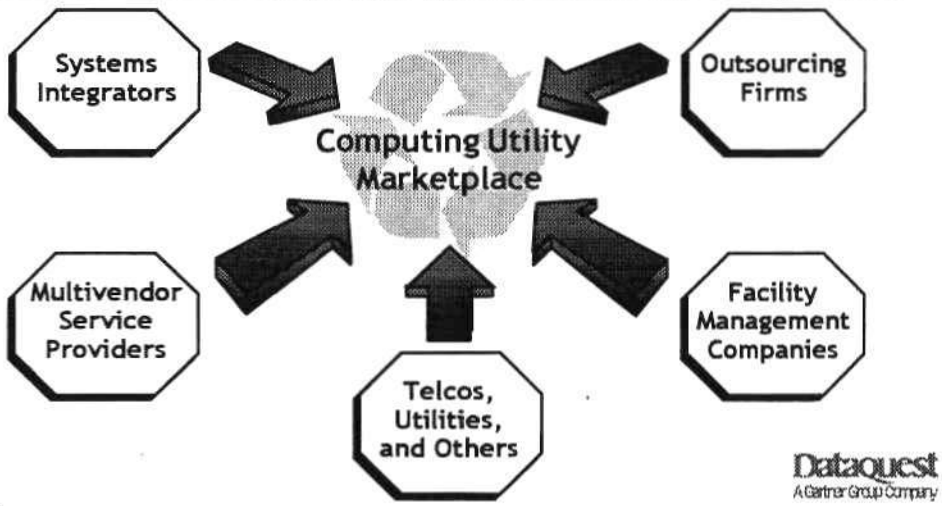
Who Else Is Targeting This Computing Utility Market?



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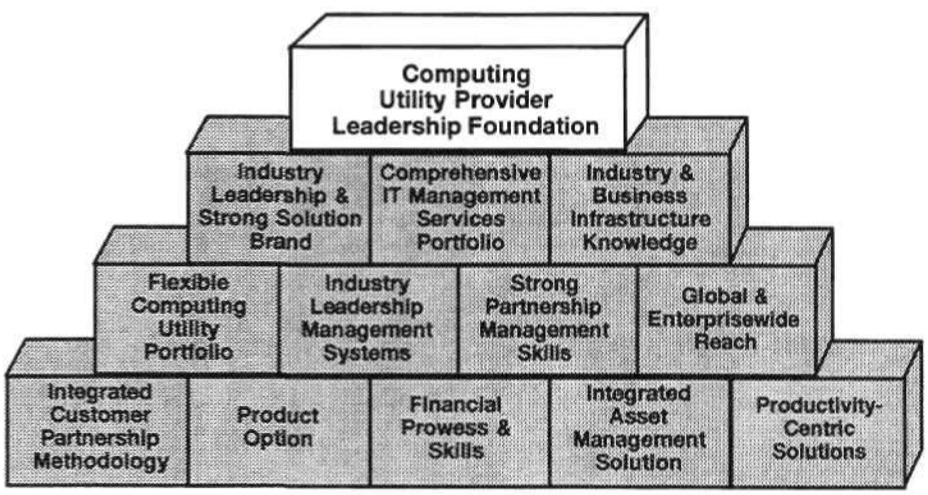
Computing Utility Leadership Foundation



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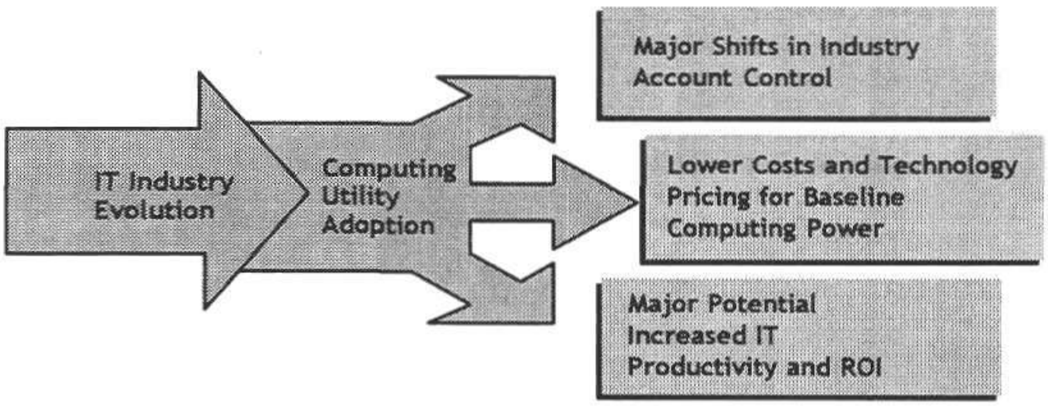
Dataquest Predictions: Key Consequences of the Computing Utility Phenomena



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Dataquest Prediction: Year 2000 Forecast of the IT Service Utility Market

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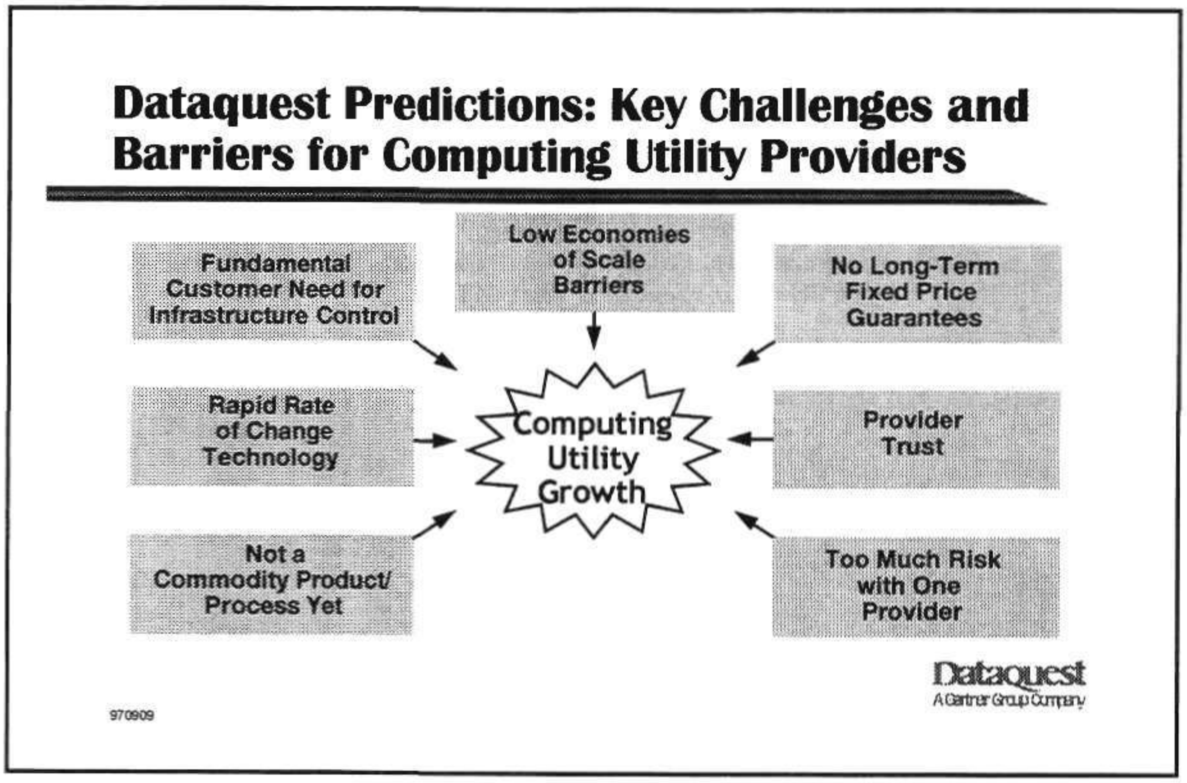
Dataquest Predictions: Key Challenges and Barriers for Computing Utility Providers
Fundamental Customer Need for Infrastructure Control
Low Economies of Scale Barriers
No Long-Term Fixed Price Guarantees
Rapid Rate of Change Technology
Computing Utility Growth
Provider Trust
Not a Commodity Product/ Process Yet
Too Much Risk with One Provider
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Notes

Synergistic Product and Service Brand Image: The New Schizophrenia

Ellen S. Kitzis, Ph.D.
Vice President, Lead Analyst
IT Services Group
Dataquest

Dr. Kitzis is vice president and lead analyst for Dataquest's Worldwide IT Services group. Her primary responsibility is to ensure that the research delivered by the IT Services programs presents a comprehensive and integrated view of the services industry to our clients. As the lead analyst, Dr. Kitzis is charged with identifying new opportunities in the services industry and helping our clients build competitive value, revenue growth, and market differentiation. Her key operational responsibilities include: refining the IT Services group's forecasting and user research methodologies, authoring Perspectives, and Alerts, and serving as a spokesperson at key industry events and conferences.

Before her current position, she was vice president of Gartner's Service, Support and Operations Consulting Practice. In this capacity, Dr. Kitzis had responsibility for the management and technical oversight of all custom studies conducted for services clients. These engagements ranged from strategic planning, acquisition and diversification strategies, to new product introductions, competitive analysis, and brand management. Typical engagements included: assessing user reaction to new hardware, software, and professional service offerings, portfolio and point product pricing, identifying opportunities in emerging markets in Europe and Asia, as well as helping clients identify and develop strategic partnering opportunities.

On behalf of Dataquest, she has also appeared as a speaker at numerous industry conferences, customer forums, and vendor-sponsored conferences on topics ranging from quality principles and practices, global services trends to professional service opportunities in the education and training arena. Before joining Dataquest, she held senior management positions at the Ledgeway Group, International Data Corporation, Consulting Statisticians Inc., Crowntek, and Contract Research Corporation. Over the past 15 years, Dr. Kitzis has executed major studies for clients in both the public and private sectors.

Dr. Kitzis is a graduate of Boston University and received a Ph.D. in sociology from Tufts University. She is also a member of the American Marketing Association (AMA).

The Power of a Brand

- Sustains and increase customer loyalty
- Creates differentiation
- Facilitates more flexible pricing
- Defines, creates, or transforms markets
- Defies aging or market maturity
- Creates new identity
- Defeats reality

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What Does a Brand Imply?

Value 1+1=3

Vision

Experience

Promise

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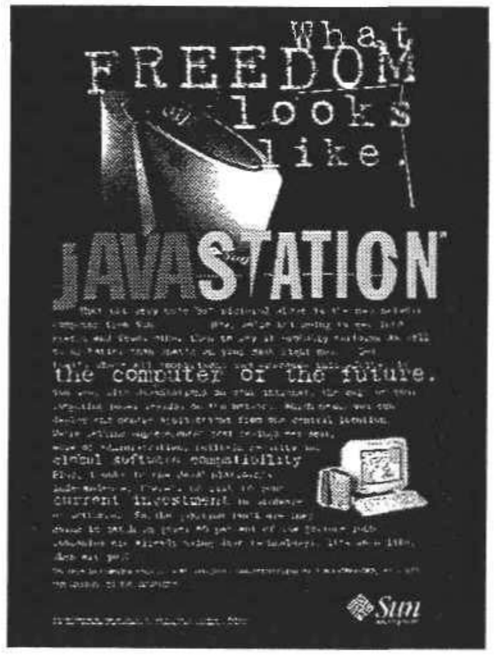

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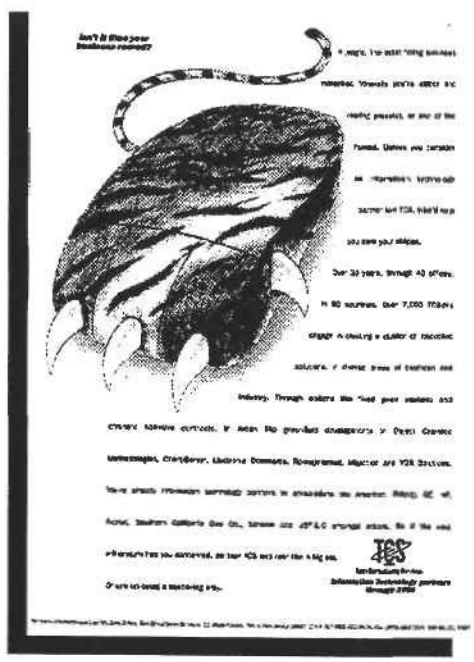

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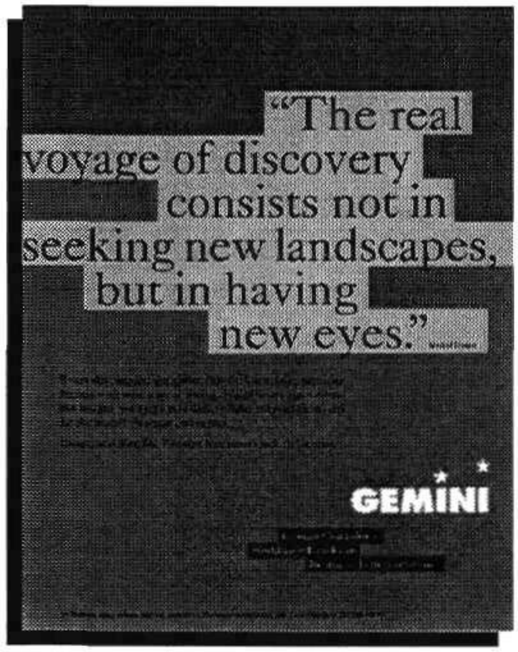

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Brand Association Creates Value

- Help process/retrieve information
- Differentiate/position
- Reason to buy
- Create positive attitudes/feelings
- Basis for extensions

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A Successful Brand Value

- Delivers functional benefits
- Offers intangible benefits over and above the product or service—security or confidence
- Provides a clear and consistent value over time
- Meets customer wants and needs

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Key Questions about Your Choice of Image

- What kind of company do you want to be?
- Will this remain a sustainable image over time?
- Does this image maximize mind share, market share, and profit?
- Does this image support a "best in class" positioning?
- Is this image consistent with the corporation's mission and values?
- How distinctive is our image relative to the rest of the industry?
- Can a competitor easily substitute this image with something else to offset the advantage?
- Is this image too similar to a competitor's image; and conversely can a competitor imitate this image?

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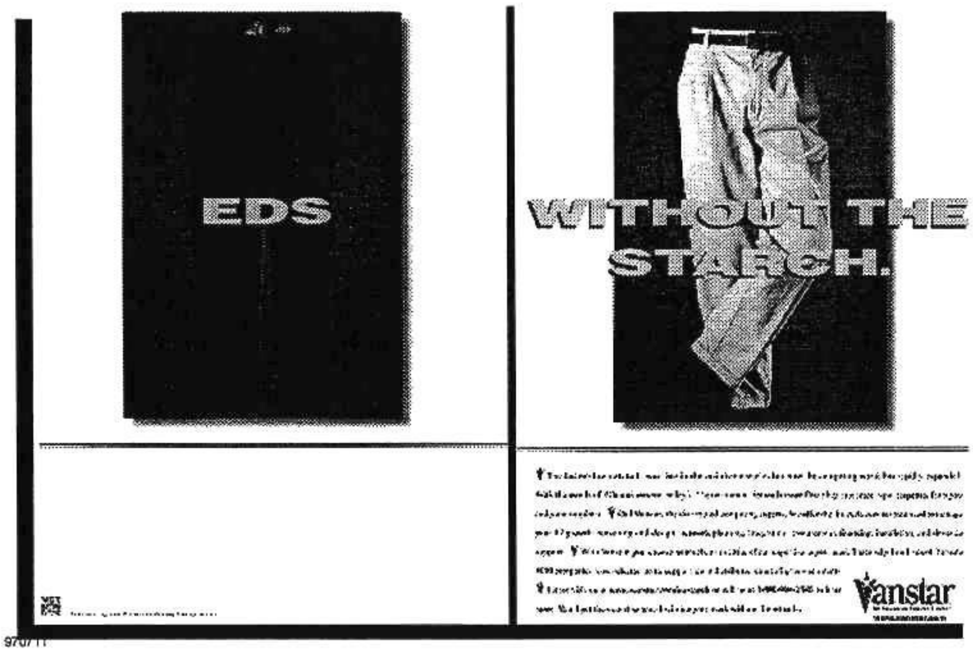

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Service Branding Differs from the Product Branding

	Products "Suppliers of Technology"	Services "Appliers of Technology"
Reputation	Quality Leadership	Relationship Management
Promotion	Broadcasting	Narrowcasting
Target Buyer	IT Managers	IT Managers, Business Managers, and Executives
Loyalty	Market Share	Mind Share
Differentiation	Technology Leadership and Price	Technical and Business Knowledge

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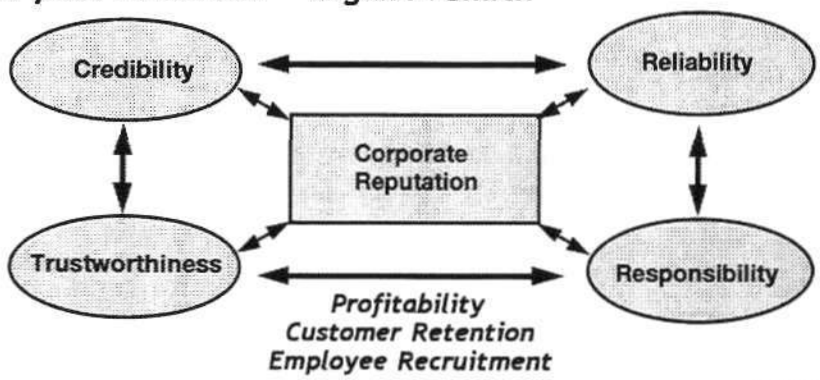
Reputation: "What's in a Name?"

"Our name is labels, plainly printed on the bottled essence of our past behavior." *Logan P. Smith*



Source: *Reputation: Realizing Value from the Corporate Image*, Charles J. Fombrun

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Reputation

Product	Service
➤ Performance	➤ Competence
➤ Features	➤ Credibility
➤ Conformance with specifications	➤ Standardization with expectations
➤ Reliability	➤ Reliability
➤ Durability	➤ Responsiveness
➤ Serviceability	➤ Empathy
➤ Fit and finish	➤ Tangibles

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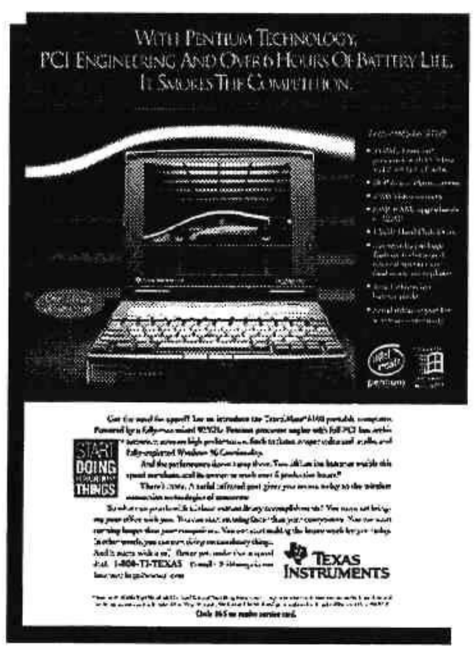

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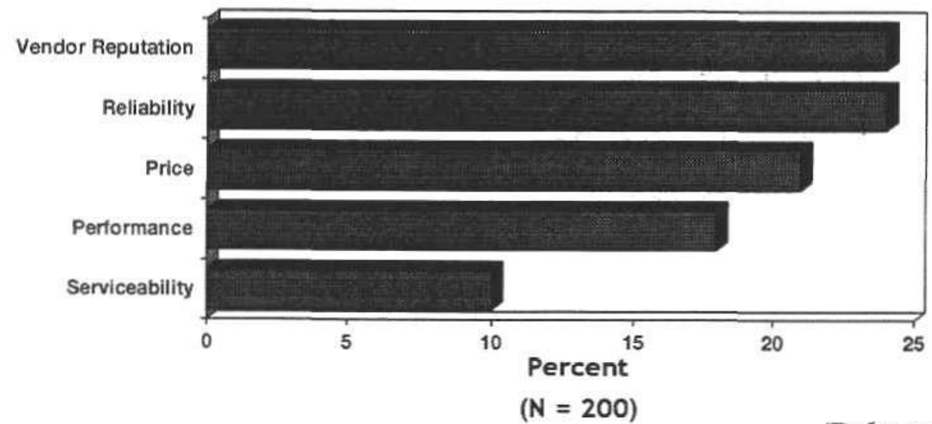
Five Most Important Features in Selecting a Server



Source: Dataquest
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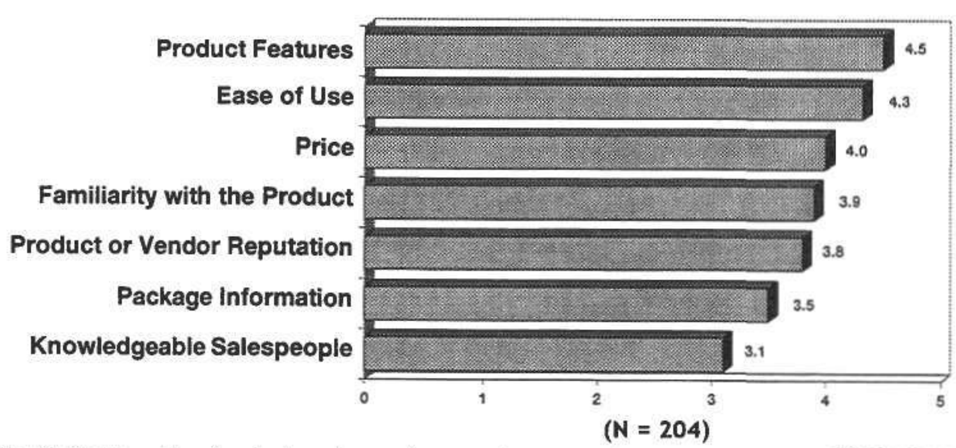
Key Factors in Choosing a Software Title



Note: Mean importance is based on a 5-point scale where 1 = not at all important and 5 = very important.
Source: Dataquest
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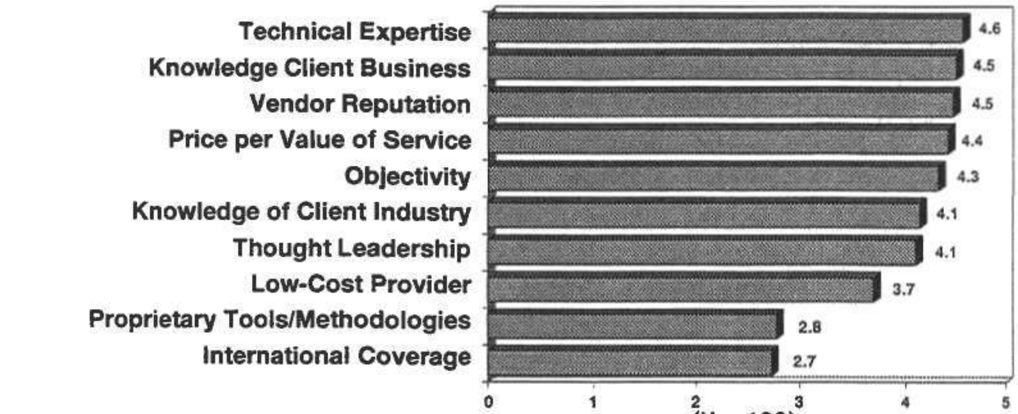
How Customers Select Service Providers



Note: Mean importance is based on a 5-point scale where 1 = not at all important and 5 = very important.
Source: Dataquest
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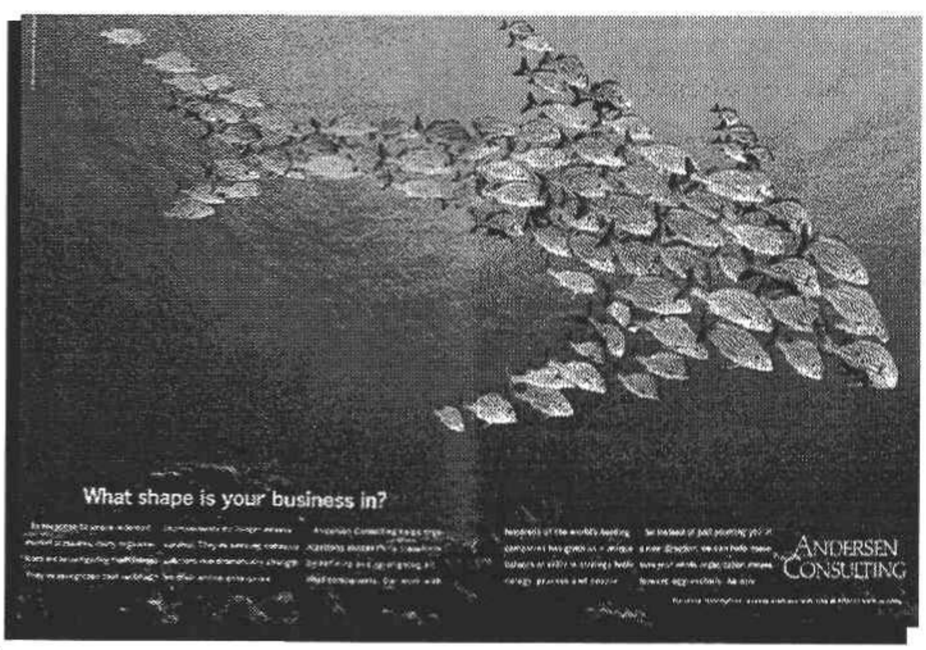

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Promotion

Product	Service
➤ Broadcasting	➤ Narrowcasting
➤ Sell to many	➤ Sell to one
➤ High-volume media channels	➤ Conferences/seminars
➤ Price, discounts, volumes	➤ Relationship management

Word of Mouth

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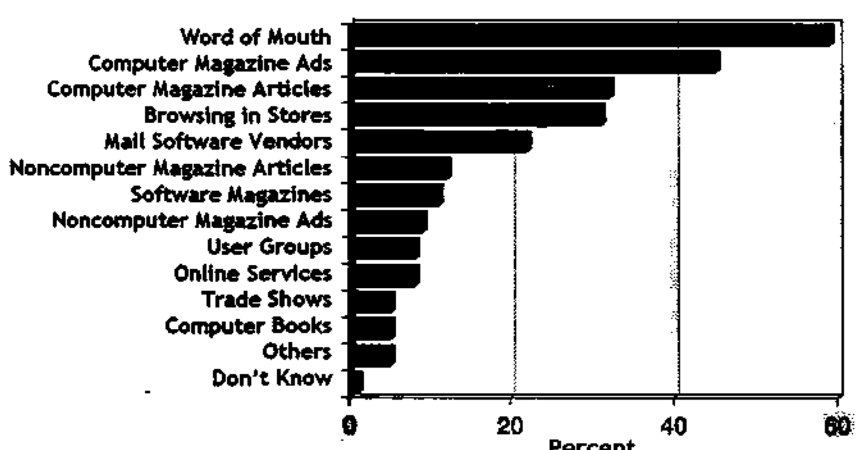
How Consumers Learn of New Products



Source: Dataquest
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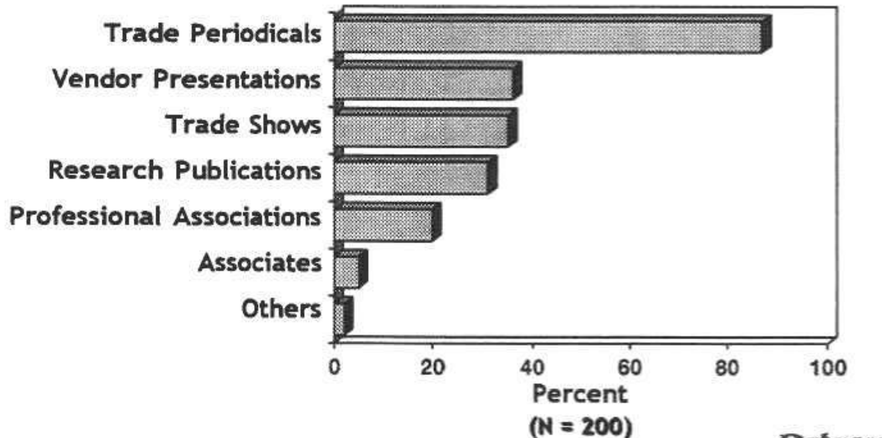
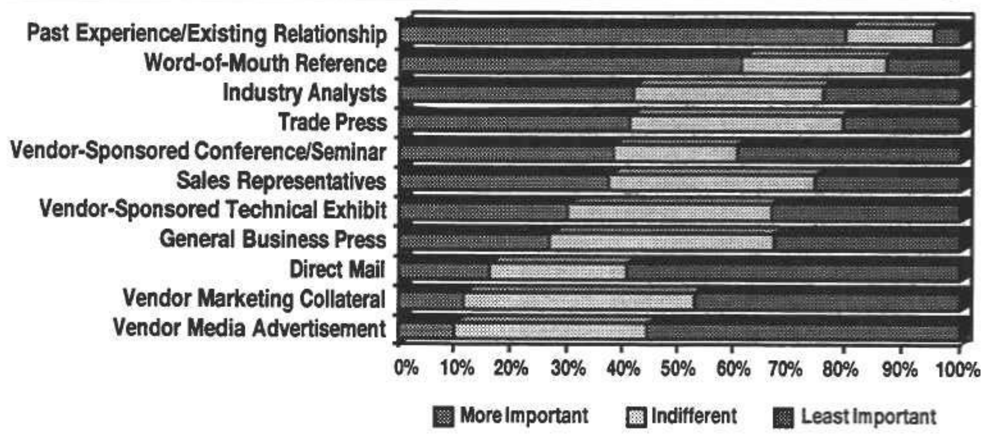
Information Sources for Multimedia Products



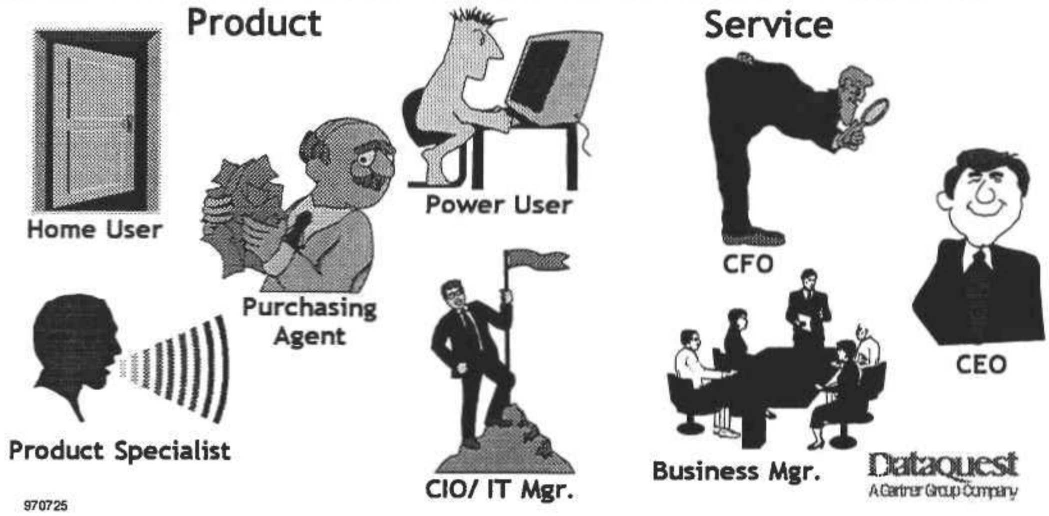
Source: Business Use of Multimedia 1995
970723

How Customers Learn about Service Providers



Source: Dataquest
970724

Target Buyer



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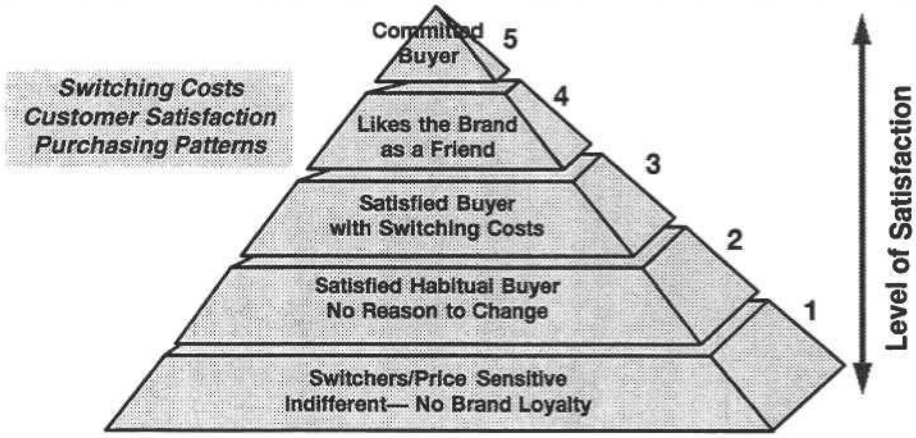
Loyalty: A Brand Becomes a Friend



Source: David A. Aker, *"Managing Brand Equity"*
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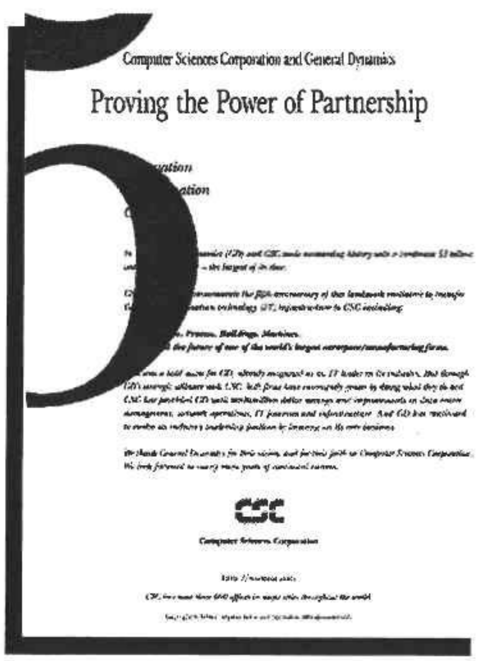

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Loyalty

Product

- ➤ Market share
- ➤ Market leadership
- ➤ Price/value
- ➤ Technology prowess
- ➤ Repeat purchases

Service

- ➤ Mind share
- ➤ Customer leadership
- ➤ Value add
- ➤ People/relationships
- ➤ Contract renewals and multiyear agreements

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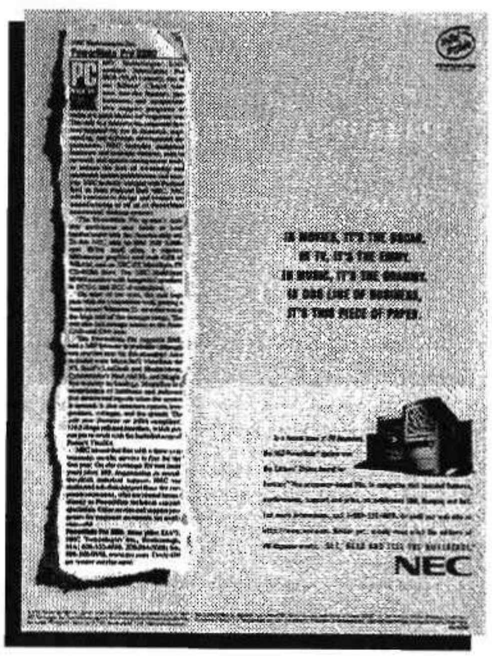

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Differentiation

Product

- Features
- Mass customization
- Niche focus
- Market segments
- Price
- Codevelopment

Service

- Methodology
- Breadth of coverage
- Specialization
- Industry segments
- Value
- Alliances

Shared Strategies

- Personality
- Culture
- Cobranding

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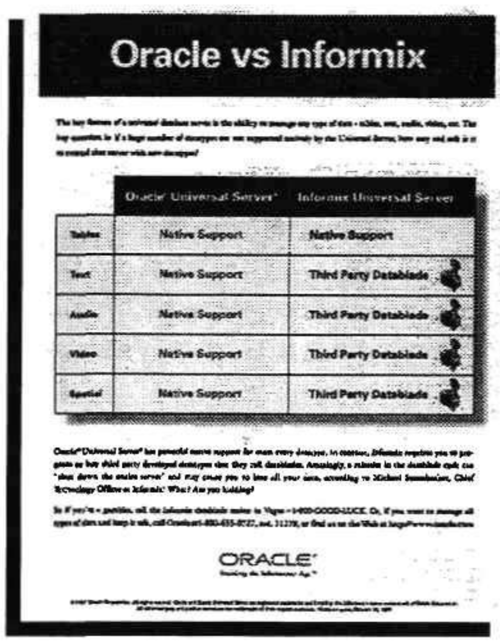

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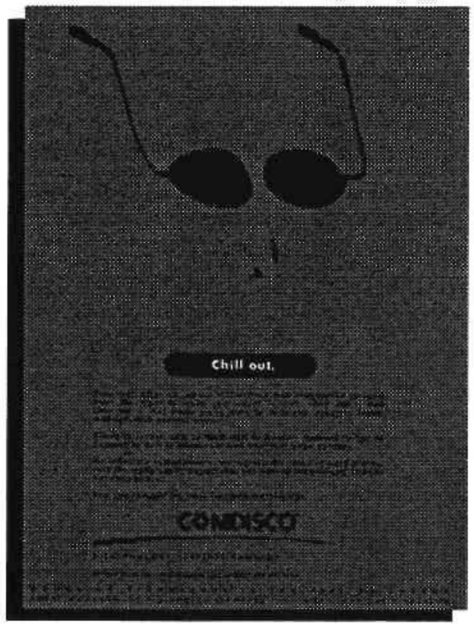

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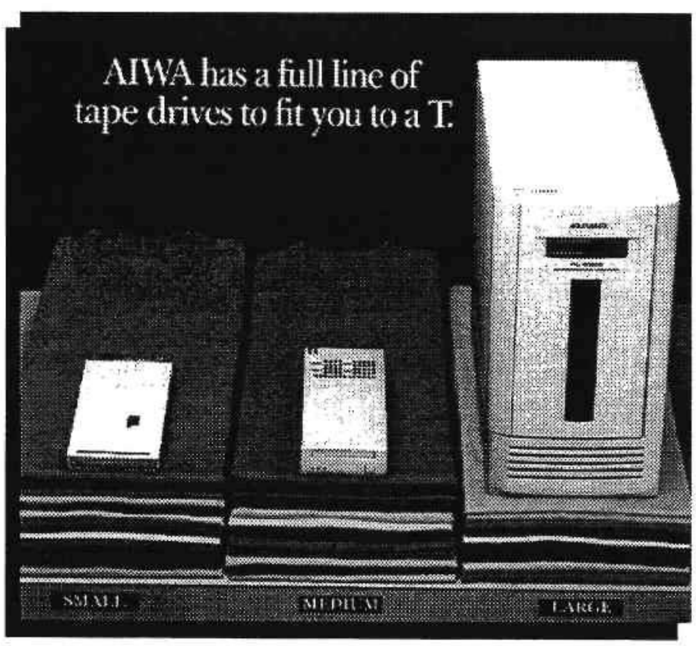

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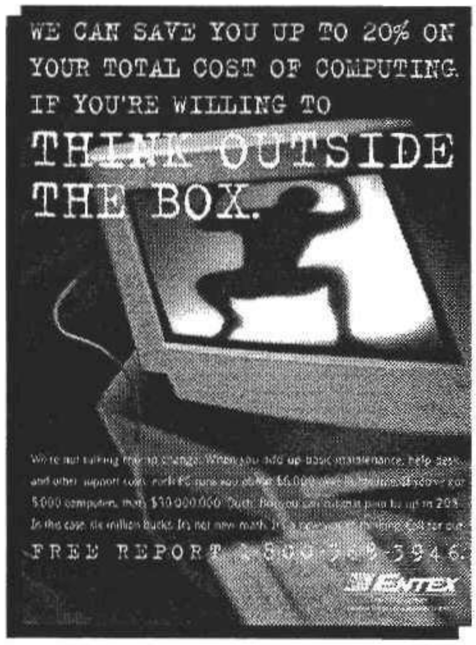
Synergistic Product and Service Brand Image: The New Schizophrenia



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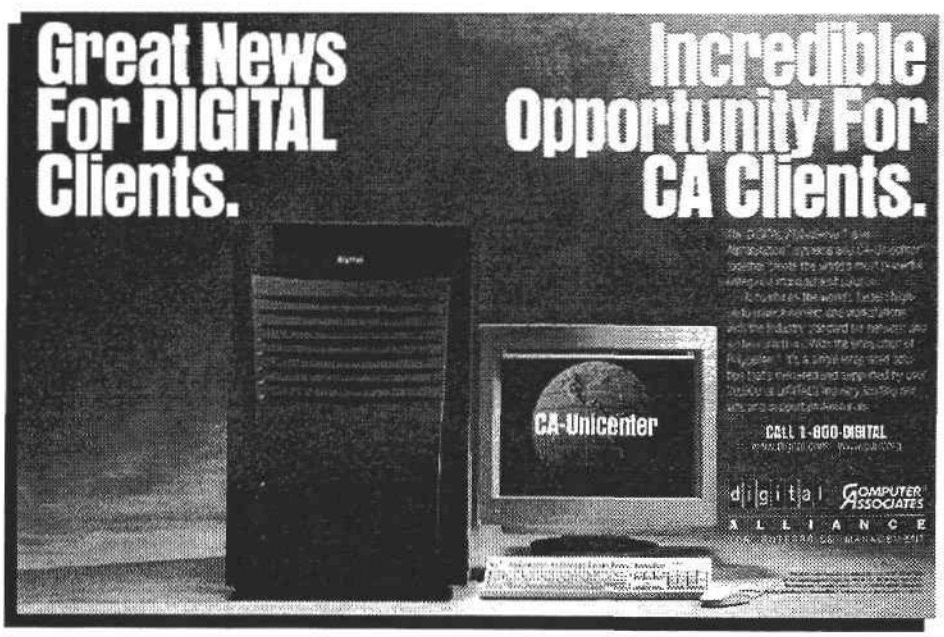

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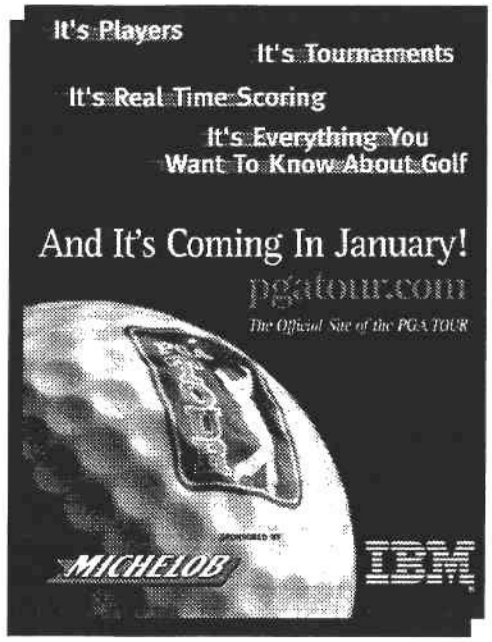

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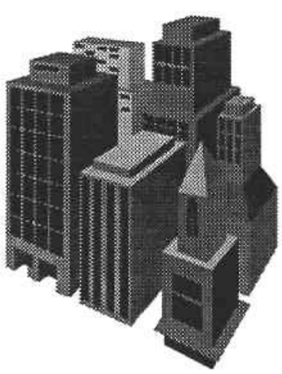
Brand Value Can Be Created at Different Levels



Corporate

Division/Practice

Product/Service

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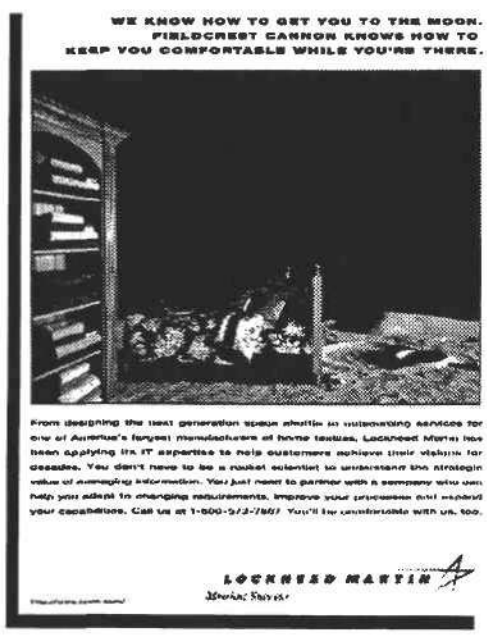

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At What Level Do You Brand?

	Products	Services
Corporate	Quality or personality	Experience or vision
Division	Product line or subbrand	Specialization, practice, or service family
Product	Point product	Offers

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Pros and Cons of Level Branding

	Pros	Cons
Corporate	Distributes investment Sustainability	Longer ramp-up Mistakes are costly
Division	Opportunity for product line extensions	Compete with corporate identity Must support a variety of products/services
Product	Multiple branding options	Lose accumulated benefits

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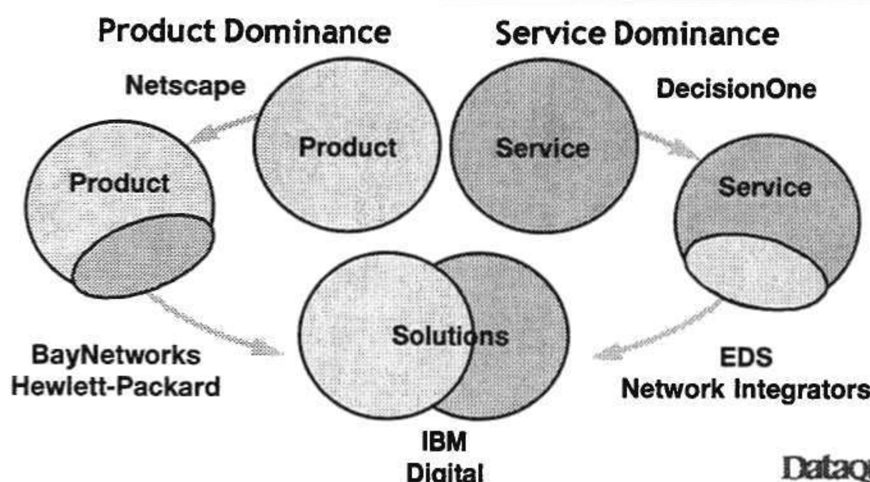
Dominance and Brand Focus



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Branding Options

	Technology Provider	Solutions Provider
Service-Centric	*Product Only*	*Service Encapsulates Product*
Product-Centric	*Product Encapsulates Service*	*Service Only*

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Encapsulation Strategies

Product Encapsulates the Service

- Product positioning leads
- Service expertise supports product brand positioning
- Service and R&D knowledge completes the solution
- Proprietary service business or delivery service partner

Service Encapsulates the Product

- Service positioning leads
- Product knowledge supports service brand positioning
- Product objectivity enhances credibility
- Ownership of specialized skills and marketing service partnerships or alliances

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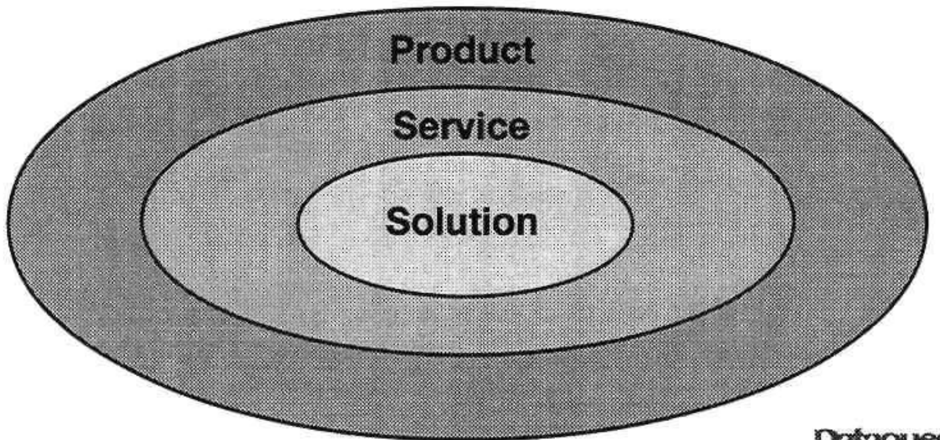
Third Option: Brand as a Solutions Company



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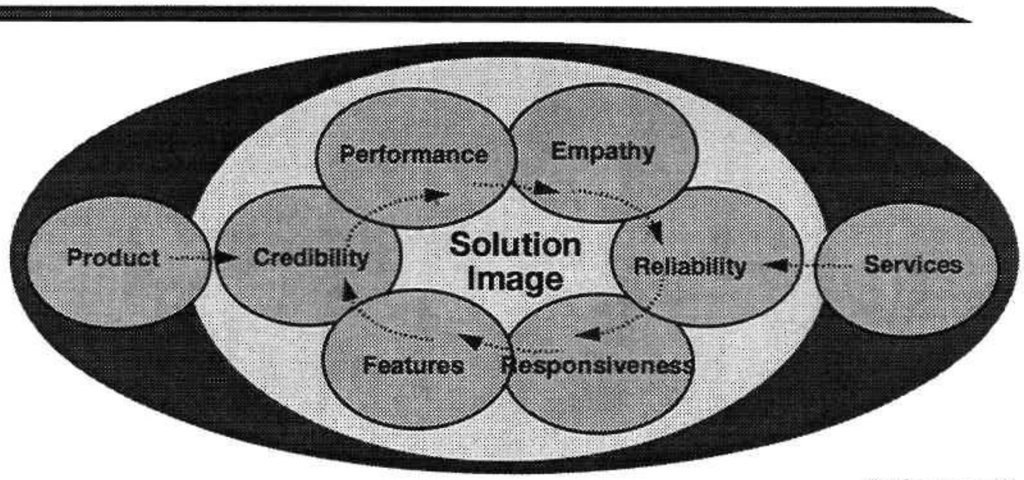
A Solution Brand Image Is the Integration of Product and Service Attributes



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Key Assumptions

- It is increasingly difficult for companies to lead in both products and services
- The industry is clearly separating into two camps: Suppliers of technology and appliers of technology
- Solution providers are integrators of technology that enable and are integral to customers' business processes
  - Thought leadership and vision
  - Methodologies make solutions for predictable and reliable
  - Technical excellence ensures best-of-breed results

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Solution Providers Brand Their Value Propositions

	IBM	EDS	CSC	Andersen Consulting	AT&T Solutions
Thought Leadership	Technology	Cosourcing	BPR, Change Management	Business Integration	Future Competitiveness
Methodologies			Catalyst	Foundation	
Practice Areas	Product & Support Professional Services	(Industry) SBUs, SSUs	CSC Index TMG	(Global) Industry Units	Customer-Centric Teams
Service Offerings	NetWork-Station Management	Renascence	BPR	Business Integration (BI), BPM	Global Customer Support Center
Technology Focus	Network-Centric Computing	Client/Server		Client/Server	Networking Backbone
Vision	Solutions	Value Creation		Enable Change	Futurize

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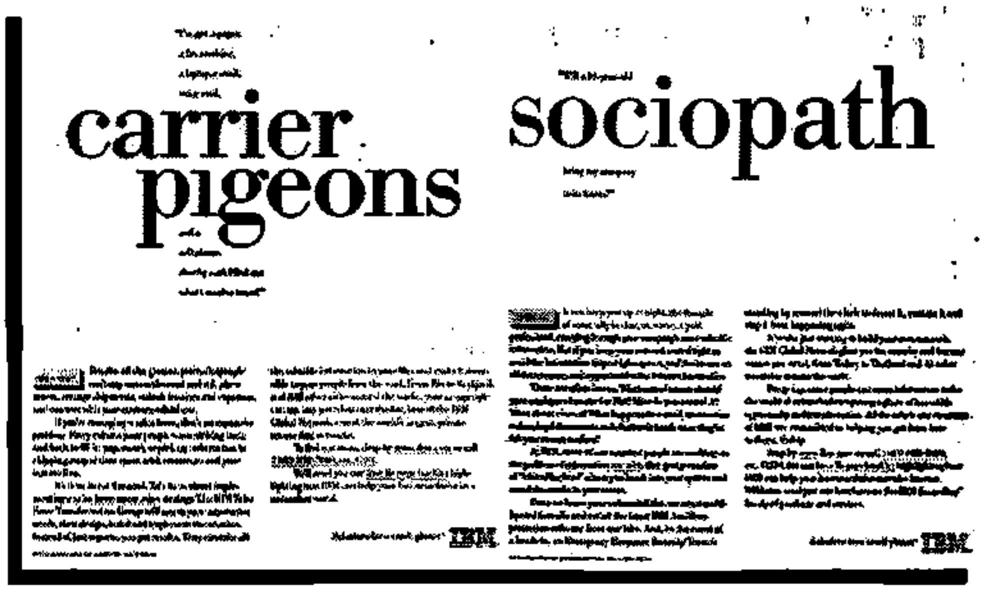

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Dataquest's Recommendations

- ➤ Decide who you are and make sure that your message is consistent across all branding efforts
- ➤ Develop promotion campaigns that reflect the customer-preferred channels for receiving information
- ➤ Make sure brand value is also tied to customer values rather than service capabilities or product features
- ➤ Create brand messages that embrace customers' business objectives rather than their IT objectives

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Dataquest Predicts

- IT companies will test and adopt more commercial approaches to branding and brand management
- Companies will create new executive-level positions—V.P. of Brand Management
- Branding at the corporate level will increase as companies try to leverage and spread their investments
- Brand value will be strongly tied to experience and vision as companies try to reach out to the business needs of customers
- More companies will try to integrate their product and service branding strategies either through encapsulation or complete solutions integration models

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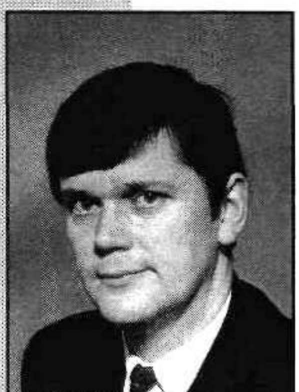
Notes

Telecom Market Reform

John Dinsdale

Chief Analyst
Worldwide Public Network Program, Telecommunications Group
Dataquest



Mr. Dinsdale is a chief analyst in Dataquest's Worldwide Telecommunications group, based in San Jose, California. He specializes in the market for public network equipment and services with a strong focus on transmission and switching systems. In addition, he is responsible for researching and analyzing worldwide markets for public telecoms systems and services.

Through both his work at Dataquest and his career before joining Dataquest, Mr. Dinsdale has developed a very strong understanding of the telecoms markets and the major companies that are active in that market. He has given many presentations and run seminars on the subject of telecoms market trends and industry restructuring. He is now a well-known and respected figure in the industry, with a strong reputation in most of the leading companies.

In addition to running one of the most successful services in Dataquest, Mr. Dinsdale has also carried out or contributed to many custom consulting projects. In this role he often presents to senior managers from the industry.

Mr. Dinsdale joined Dataquest in 1990 and before that had 10 years of experience in the telecommunications industry. Before joining Dataquest he was product/marketing manager with STC Telecommunications in its transmission systems division, where he was responsible for business planning in a £70 million business. Before STC, he was marketing information and planning manager within BT, specializing in marketing planning for BT's business services division. He started his career with Plessey as a planning manager within the company's public switching division.

Mr. Dinsdale received a B.A. honors degree in business studies. He specialized in marketing and he also holds both a Market Research Society Diploma and a Diploma of the Institute of Production Control.

Agenda

- The market today and in 2000
- Market drivers
- Dataquest predicts
  - Worldwide
  - United States
- Vendor opportunities and issues
- Conclusions

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The World's Telecommunications Market

- More than $800 billion in 1996
- 78% services; 22% equipment
- 735 million POTS lines, 127 million mobile subscribers, and 16 million ISDN B-channels
- Well-developed economic regions have 17% of the world's population but 68% of its telephone network
- Worldwide, still only 13 telephone lines per 100 population

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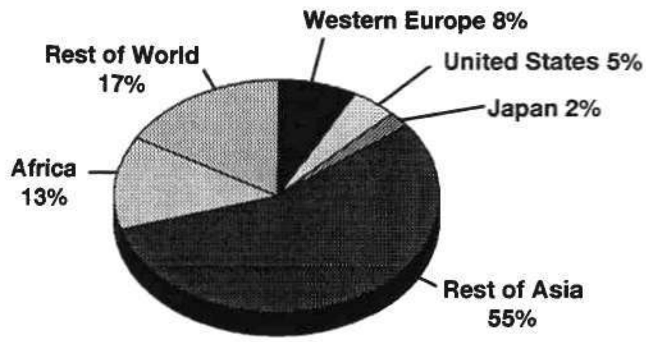
Some Demographics



1995 World Population
5.8 Billion

Source: Dataquest (October 1996 Estimates)
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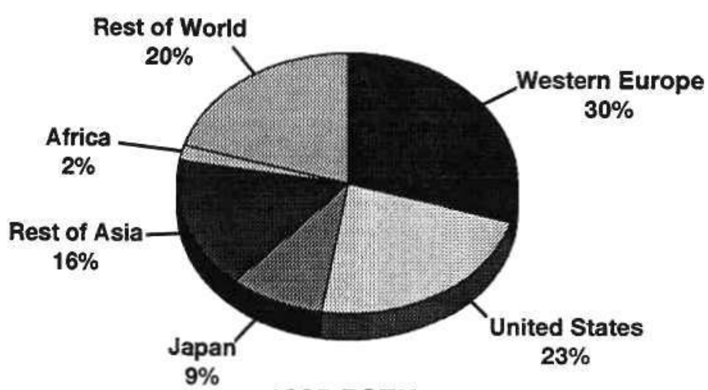
What about the Telephone Network?



1995 PSTN
681 Million Lines

Source: Dataquest (October 1996 Estimates)
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Growth, Growth, Growth ...

- Enormous potential for future market growth
- Network development in many developing economic regions has hardly started
- Basic PSTN development will take many decades
- OECD growth driven by different factors
- Social, technological, political, and commercial factors all driving the market

Market growth in dollar terms guaranteed for decades to come

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1996 to 2000

- During a four-year period:
  - 240 million more POTS lines in use
  - 240 million more mobile subscribers
  - 50 million more ISDN B channels
- Still only scratching the surface!
- Another *1.6 billion* telephone lines/mobile connections needed in underdeveloped regions ...
- ... And still a huge gap with "the West"

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Forces for Change

- Economic situation
  - Macro level—Growth in output
  - Micro level—Competition and economies of scale
- Political and social issues
- Changes in business practice
  - Mobility, teleworking, move to SOHO, and internationalization of businesses
- Technology and applications advancement
  - ATM, SDH/SONET, Internet, PCS, and IN
- Liberalization and privatization

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Major Market Trends

1990		2005
Monopoly Domination	→	Open Markets, Many New Players
Market Centered on United States/Japan/ Western Europe	→	Rapidly Developing Economies, Many New Markets

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Rapid Rise of Developing Economies

- Much higher economic growth
- Desperate need for telecommunications to support business growth
- Political and social pressure

- Huge increase in telecommunications activity
- For example, In some markets, China is now bigger than the United States

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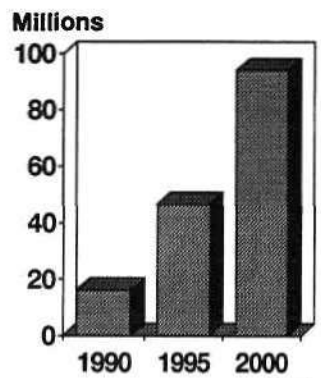
Growth, Growth, Growth—An Example

- Annual volume growth of 12-25% per year
- Guaranteed long-term growth
- Basic network development programs that will take decades to complete
- Compared with volume reductions in United States/Japan/ Western Europe

Central Office Line Shipments: Developing Economies



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Growth Potential in Developed Economies:
Market Comparison to the United States (1995)

	Western Europe	United States
Population (M)	448	261
Telephone Lines (M)	202	158
Telecommunications Services Market ($B)	157	203
Lines per 100 Population	45	61
Service Revenue per Line ($)	777	1,285
Revenue per Capita ($)	350	778

Western European market still has a long way to go!

Source: Dataquest
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Why Is Liberalization Happening?

- ➤ Improves service levels
- ➤ Governments want privatization
- ➤ PTOs want more freedom
- ➤ End users are increasingly powerful
- ➤ PTOs in open markets are becoming more powerful
- ➤ The process is irreversible

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Effects of Liberalization and Privatization

- Increased competitive pressures
- More responsiveness to end users
- Drive for improved return on investment
- Focus on increased efficiency
- Choices for end users

A positive force—no turning back

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More Specifically— Impact on Existing Telcos

- Changing ownership/privatization
- Changing organization structure
- Cost cutting/downsizing
- Tariff rebalancing (mainly reductions)
- Improved service levels
- Introduction of new services
- Expansion into other markets
- Formation of international alliances

971124

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U.S. Telecom Reform Act

- Lots of hot air
- Little noticeable benefit to consumers
- IXCs cannot bundle RBOC services until RBOCs enter in-region long distance
- RBOCs cannot share local and long distance facilities
- Ameritech is first RBOC to file for long distance authority

971125

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A Worldwide Phenomenon—Not Just Western Europe and the United States ...

Liberalization in:	Privatization in:
Australia	Indonesia
New Zealand	Argentina
Chile	Malaysia
Japan	Japan
Mexico	India
Hong Kong	Hungary
Malaysia	Pakistan
China	Singapore
Philippines	Czech Republic
and Others	and Others

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Dataquest Predicts ...

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Dataquest Predicts— Worldwide Market, 2000

- 975 million POTS lines
- 365 million mobile subscribers
- 65 million ISDN B channels
- $900 billion services market
- 140 million central office line shipments per year
- Telecommunications equipment sales of $80 billion per year to public network operators
- Highest growth segment—local loop/access systems

971128

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Dataquest Predicts— Worldwide Market Structure

- Huge influx of new players
- ... to be followed by rapid industry consolidation
- The formation of a two-tier market
  - Industry giants consolidate further
  - A plethora of new niche players
  - Disappearing middle ground
- Gradual splitting of wholesale and retail functions
- Many more international alliances and acquisitions
- Focus on cost control and headcount reduction

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Dataquest Predicts— U.S. Market Highlights

- Only one RBOC will enter in-region long distance market by end of 1997
- ... the rest will follow by end of 1998
- Service bundling will be a big market feature in 1998
- Acquisition of two major IXCs by end of 1999
- No further consolidation of RBOCs in 1997/98, but watch out in 1999
- Convergence with cable TV industry a nonstarter

971130

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Dataquest Predicts— U.S. Market Highlights

- Two different battlefields
  - RBOCs/IXCs/GTE in the consumer mass market
  - RBOCs/IXCs/niche players in the corporate market
- RBOCs losing out in the latter
- Industry giants will all lose market share—but much slower than most expect
- Increasing influence of non-U.S. players—e.g., BT Deutsche Telekom, France Telecom
- Little or no cost benefit to residential consumers until late 1998

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Dataquest Predicts— U.S. Market Highlights

- Who wins?
  - Lawyers
  - Vendors (short term)
  - Business customers
  - Consumers (eventually)
- RBOCs/IXCs fighting like hell to stand still
- Aggressive growth only by:
  - U.S. acquisition
  - International expansion

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Dataquest Predicts— Impact of Internet Telephony

- ISPs will never have to pay usage-based fees
- Despite this, little impact on major telcos in next five years
- Minimal market share erosion
- Low adoption rates because of:
  - Poor quality
  - Network congestion problems
  - Fragmented market
  - Early adopter problems
- But the telcos will make a lot of noise!

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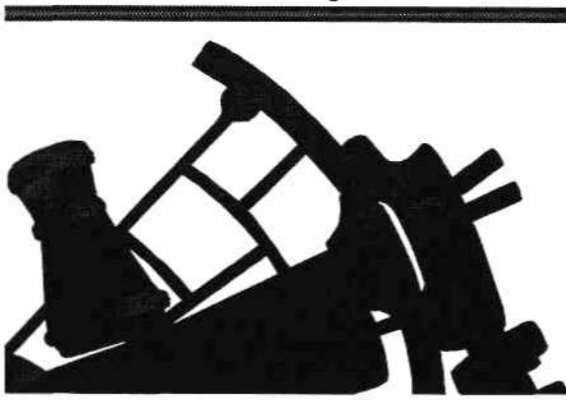
Summary and Conclusions



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Summary for Telecommunications System Vendors

Opportunities

- Many new markets
- International expansion easier
- New operators, new suppliers
- Market entry barriers falling
- Competition provides market stimulus

Threats

- Difficult to target new operators
- Resulting market share loss
- Fierce competition
- Declining margins
- Low sales level per new operator
- Radically new organization required

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Examples of Product Opportunities

- RBOC investment in long distance network
- Fiber, copper, and radio access systems
- Solutions to gridlock problems
- Internet access products
- Local number portability systems
- Network management investment
- WDM/high-bandwidth optical networks

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Summary and Conclusions

- A truly huge market!
- Guaranteed long-term growth (decades, not years)
- Dramatic changes happening worldwide
- Market entry barriers are falling
- Traditional telcos must change radically or die
- Abundance of new market opportunities

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Summary and Conclusions

- Many start-up opportunities for new operators
- Many market development opportunities for vendors
- Major U.S. market restructuring in next three years
- RBOCs and IXCs fighting like hell just to stand still
- Internet provides boost to telco revenue
- Don't believe everything you hear!

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Notes

The Industrial Strength Internet—Real or Imagined?

John Coons

Director and Principal Analyst
Wide Area Networking Program
Telecommunications Group
Dataquest

Mr. Coons is the director and principal analyst for the Wide Area Networking program of Dataquest's Telecommunications group. In this capacity, he directs the collection, analysis, and dissemination of information relative to the data networking marketplace in North America and worldwide. His current research focus is wide area networking, including equipment such as multiplexers and switches, and services such as frame relay and ATM.

Mr. Coons joined Dataquest in 1994 and brings with him over 20 years of experience in the computer industry, with over 15 years in data communications. His career includes key positions in development, product management, and marketing of British Telecom's Tymnet equipment and services including the rollout of BT's Global Frame Relay services. Before joining Tymnet, he worked with IMSAI, a pioneering microcomputer manufacturer, and Siemens.

Mr. Coons studied electrical engineering at Clarkson University, computer science at Tulane University, and music at City College of San Francisco. Continuing education has included the AEA/Stanford Executive Institute program for management of high-technology companies.

Agenda

- What do we mean by "Industrial Strength Internet"?
- How are enterprise wide area network (WAN) service requirements changing?
- What connectivity options exist?
- How do commercial IP services and the Internet fit together?
- Hot opportunities for equipment suppliers

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The "Old" Internet

- Resources contributed by diverse organizations
  - Academia
  - Government
  - Industry
- No overall management
- Not run by professional service providers

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The Industrial Strength Internet

- Utility-like dependability
- As much performance as you're willing to pay for
- Secure
- Appropriate for critical applications
- Professionally managed and supported

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How Enterprises Use WAN Services

- LAN interconnect dominates
  - Legacy environments today
    - IBM, DEC, Novell, among others
    - Assume high-performance LANs
  - LAN interconnect has stringent requirements
    - Protocols "time out" unless:
      - Low delay
      - Adequate throughput
      - Low frame loss

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Today's WAN Services of Choice

- Private lines
  - Router-based networks for LAN interconnect
  - Multidrop SNA networks for IBM environments
  - Most expensive bandwidth source
    - —Continuous, dedicated
- Frame relay
  - Lower cost than private lines (~20-40% less)
    - —Statistically multiplexed, connection-oriented
  - Nearly equivalent performance for data
  - Handles both LAN and SNA on one network
  - Service-level agreements being negotiated

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Tomorrow's LAN Environment

- Intranet model will be widely adopted
  - A more efficient enterprise information model
  - Intuitive, familiar user interfaces
  - Lower support costs
- WAN performance requirements less stringent
  - Internet-developed protocols/applications assume unpredictable WANs

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Tomorrow's WAN Service of Choice

- Commercial IP services
  - Statistically multiplexed, connectionless
  - Intranet dedicated connectivity
  - Separate from Internet traffic
  - Secure gateways to the Internet
- The first "Industrial Strength" pieces of the Internet
  - The Internet is a "network of networks"
  - Commercial IP subnetworks are leading indicators of future Internet architecture and performance
- The difference is mainly parametric
  - Less oversubscription on IP services

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How Does the Internet Fit In?

- Outsourcing of enterprise dial-up
  - Road warriors, telecommuters, small offices
  - Tough application for enterprises to support
  - Expensive
    - —Impractical to provide ubiquitous local dial access
    - —Topologies becoming unpredictable
  - Internet is "good enough" today

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Today's Internet Services

- A single "best-efforts" class of service
  - Adequate for most consumer uses
  - Security is a major concern for everyone
  - Commercial users really need predictable:
    - —Reliability
    - —Availability
    - —Throughput
    - —Delay
    - —Packet loss

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VPNs Provide Internet Security

- Virtual private networks
  - Data privacy
    - —Authorized access only
    - —Data not visible to outsiders
  - Data integrity
    - —Data not altered in transit
  - Authenticity
    - —Assurance of sender identity
- IETF proposal for IPsec (IP Layer Security Protocol)

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VPNs Come in Two Flavors

- Do-it-yourself hardware/software
  - Standalone boxes for central sites
  - Client software for remote and mobile PCs
  - Examples: VPNet, DEC, TradeWave, Cylink
- VPN services such as:
  - UUnet Extranet
    - —99.9% availability guarantee
    - —20% less expensive than frame relay
  - PSINet SecureEnterprise
  - MCI SafeNet

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Remaining Internet Issues

- Capability to provide reliable:
  - Availability
  - Throughput
  - Delay
  - Packet delivery
- Increasing capacity with increasing Internet usage
- Comprehensive service-level guarantees

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Internet Core Migration

- From routers
  - Reaching throughput and scalability limits
- To switches
  - Frame relay
  - ATM
- To "routing systems"
  - Combine the attributes of routers and switches

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Frame Relay in the Internet

- Improved performance characteristics over routers for backbone transport
- Cascade is leading supplier
  - PSInet in 1992
  - UUNet
  - Netcom

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ATM in the Internet

- Improvement over frame relay for streaming applications
  - Backbone: MCI, ATMnet
  - NAPs: PacBell (2), Ameritech
  - NSPs: CompuServe, UUnet
  - ISPs: AT&T WorldNet

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But ATM Is Not Enough

- ATM is a Layer 2 (data link layer) protocol
  - Layer 2 devices build flat networks
  - Transparent to Layer 3 (network layer)
  - Cannot participate in routing hierarchy
- Router adjacency problem
  - Flat router nets should not exceed 50 to 100 boxes
    - —Routing protocol updates overload network
  - Hierarchical architectures solve this problem
    - —Every router does not need to know about every other router

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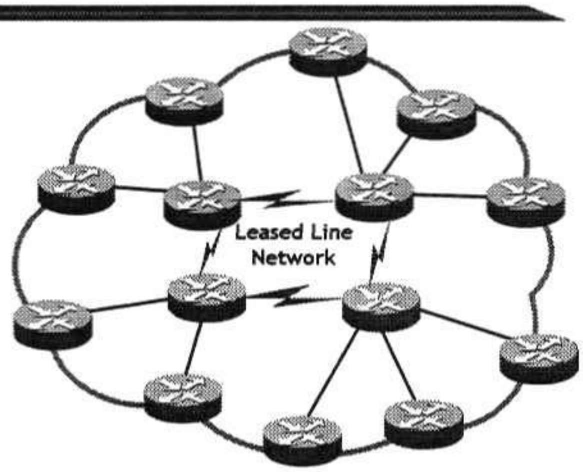
Hierarchical Routed Network

- Each router need only know about a subset of other routers
- But router performance limits backbone capacity



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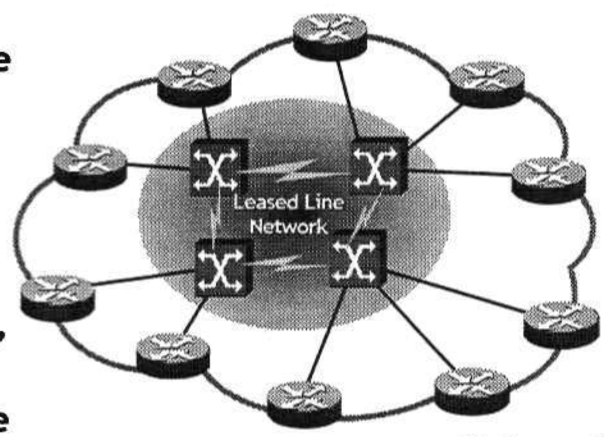
Layer 2 Switched Core

- Switches deliver higher performance
- Switched core is transparent to routers
- Every router must know about every other router
- Potential "peering" problems without Layer 3 intelligence



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ATM Routing System Proposals

- MPOA and I-PNNI
  - ATM forum: 1997
- IP switching: Shipping today
  - Ipsilon and partners
  - IETF contributions (IFMP, GSMP)
- Tag switching
  - Cisco
  - IETF working group: 1998
    —MPLS (Multi-Protocol Label Swapping)

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Internet Service-Level Agreements

- To support SLAs, ISPs must:
  - Upgrade a "critical mass" portion of the network infrastructure to be capable of providing agreed service levels
  - Instrument their networks to anticipate problems, measure and maintain service levels, and bill for multiple service levels
  - Contractually agree among themselves to enforce service levels

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The Internet Business Model Challenge

- All of this new capital equipment and software development costs big bucks
- The current "all you can eat for $20 a month" revenue stream is not sufficient
  - Several ISPs are now "business only" because of high overhead of supporting consumer business
- Higher-priced, business-class services must be successfully developed and offered to augment revenue and margins

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Opportunities for Equipment Vendors

- VPI access hardware/software
- IP/ATM routing and switching systems
  - Internet savvy will be key for existing carrier suppliers to penetrate Internet service providers
- Back-office systems for provisioning and billing multiple service classes

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Dataquest 1997 Predictions

- After a few rocky trials in 1996, ISPs will announce the first major enterprise dial-up outsourcing deals
- At least three more NSPs will announce the introduction of ATM into their backbone networks
- Cisco's dominant Internet position will be challenged
  - IP switching beats tag switching into the Internet
  - Cisco's BFR late, others step up

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Notes

High-Speed Internet Access: Cable or Copper?

Bobbi Murphy

Chief Analyst, Remote Access Program
Telecommunications Group
Dataquest

Ms. Murphy is chief analyst for the Remote Access program of Dataquest's Telecommunications group and has more than 15 years of industry experience in data communications. Ms. Murphy's marketing and product management experience includes a diverse set of technologies including ATM, routing, hubs, SNMP, wireless, and SNA protocols. She is responsible for the new Remote LAN and Internet Access program launched in August 1996.

Ms. Murphy joins Dataquest from RadioLAN, a wireless LAN start-up, where she was vice president of marketing. Before joining RadioLAN, Ms. Murphy was vice president of marketing for Hughes LAN Systems, a division of GM/Hughes Electronics. Other experience includes 3Com Corporation, where Ms. Murphy was director of marketing for their SYSTEMSGroup, which comprises routers, bridges, and communications servers.

Ms. Murphy has an M.B.A. from Texas Tech University and an undergraduate degree from Carnegie Mellon.

Agenda

- High-speed access: Is faster in your future?
- Bigger is best: A look at trends in access concentrators
- Service providers: The 21st century channel

971201

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Remote Access

- Fastest-growing application today
- Driven by the Internet, intranets, telecommuting, and entertainment
- Companies are re-engineering business practices with remote access
  - Disintermediation in insurance, banking, and brokerages
  - Reduce cycle-time ordering, payables, and receivables
- Competitive commercial advantage for companies that successfully exploit remote access

971202

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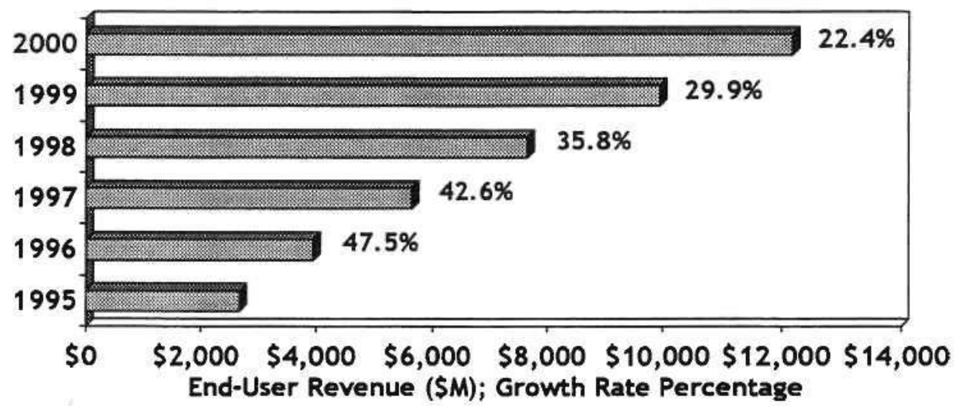
Remote Access Systems Forecast



Remote Access Systems—1995-2000

Source: Dataquest
971204

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Network Bandwidth

- Rapid expansion of bandwidth in LANs
  - 10-Mbps shared
  - 10-Mbps dedicated
  - 100-Mbps shared/dedicated
  - 1,000-Mbps shared
- Matched by growth in the WAN lease lines
  - 56 Kbps
  - T1
  - DS3
- Dial-up access is the next key bandwidth growth area
- Multimedia over IP (RSVP) is coming

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High-Speed Access: Is Faster in Your Future?

Dataquest

Customer-Premise Technologies

- Analog modems
  - 56K upper limit, asymmetric bandwidth
- Fiber to curb or home
  - Wonderful, but too expensive (more than $50 billion in United States)
- Cable modems
  - Capital constraints for plant upgrades (10% upgraded)
- xDSL
  - Elegant architecture
  - Real data rate over copper plant TBD

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Modems Take Center Stage

- 1995 sales reached almost $5 billion worldwide
- Central site sales skyrocket with remote access growth
- Buying frenzy for central site modem vendors with DSP technology
  - Bay/Penril
  - Cisco/Telebit
- USRX suprises the industry and unites Lucent and Rockwell with 56-Kbps announcement
- Yet another round of product upgrades

971209

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56K Offers Some Relief

- Most consumer modems will have 56K at no extra cost (checklist feature) by late 1997
- 45 to 53K performance because of line conditions
  - Improvement over 33.6K on same lines
  - Restrictions because analog to digital conversions
- ISPs will be forced to offer 56K lines to compete
  - No wholesale upgrade
  - Will not defect from their system vendors
- Most modems will ship with 56K by year end

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ADSL: A Definition

- High-speed access using existing telco twisted-pair copper infrastructure—digital subscriber loop
- Asymmetric bandwidth
  - Downstream to customer at 1.5 Mbps to 6.2 Mbps
  - Upstream to CO at 160 Kbps to 640 Kbps
- Data and POTS coexist on same line with lifeline service
- Other variants of DSL technologies possible
  - Symmetric (SDSL)
  - Very high speed (VDSL)
  - HDSL
  - IDSL
  - RADSL

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xDSL Technologies

Technology	Speed	Mode	Distance Limitations (24-gauge wire)
IDSL	128 Kbps	Duplex	18,000 feet
ADSL	1.5 to 9 Mbps 176 to 640 Kbps	Downstream Upstream	18,000 feet (12,000 feet for fastest speeds)
HDSL	1.54 Mbps (T1) 2.048 Mbps (E1)	Duplex Duplex	15,000 feet
SDSL	1.54 Mbps (T1) 2.048 Mbps (E1)	Duplex Duplex	12,000 feet
VDSL	13 to 52 Mbps 1.5 to 2.3 Mbps	Downstream Upstream	1,000 to 4,000 feet depending on speed

Source: Dataquest
971212

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ADSL Advantages

- ➤ POTS and data channels broken down in CO
  - Voice through PSTN, data through packet network
- ➤ Advantages for telco:
  - Data calls do not congest the CO switch
  - New data users added without impacting CO switch
  - Incremental dollars for existing infrastructure
- ➤ Advantages for consumer
  - Lifeline support for phone
  - Multiple channels in future

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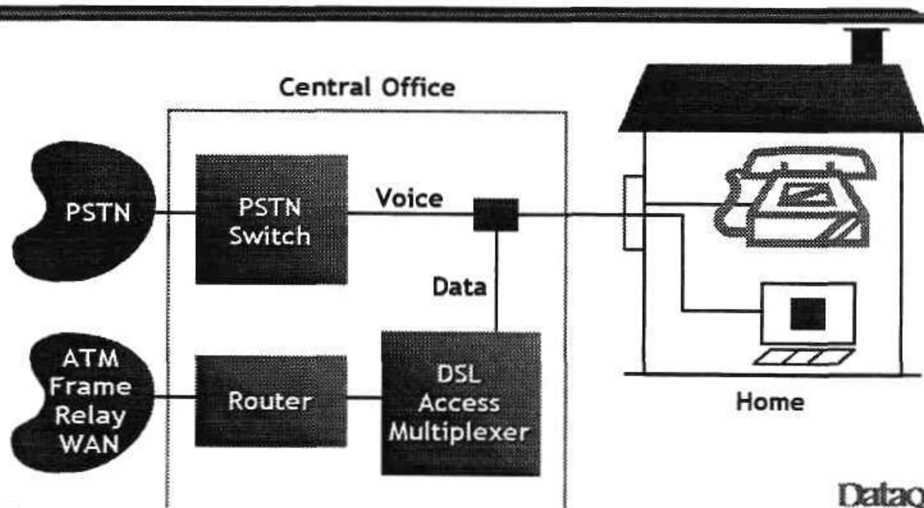
ADSL Infrastructure



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ADSL Trials

- 1997 trials begin in earnest worldwide with some limited commercial availability
- United States primarily focused on data applications for the home—Internet and entertainment
- Europe focused on multimedia to the home—video phones, entertainment, and Internet
- Emerging countries focused on extending POTS lines and leased lines for voice and data—Internet just beginning

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Reality Check

- Field trial information scarce
- Limitations of existing copper plant
  - Percentage of plant not usable?
  - Lower speeds to accommodate noise
- Power requirements/noise in bundles
- Competing modulation schemes
  - CAP (Paradyne and its licensees)
  - DMT (Amati, Aware, Orckit, etc.)
  - QAM (Broadband Technologies)
- DMT and QAM silicon not available yet (soon?)
- ISPs expect to be installing in 1997

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ADSL Predictions

- Initial market is businesses and subsidized telecommuters with ISPs investing in infrastructure
- 1997 to 1999—Low-speed ADSL and SDSL (2 Mbps or less)
  - Cost per line
  - Power requirements
  - Tariffing
- Residential market will be slow in evolving—2000 and beyond
  - RBOC tariff negotiations and foot dragging
  - Consumers unwilling to pay for higher speeds

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ADSL Predictions

- Winners will be system vendors
  - Incremental infrastructure solutions
  - Telco management, billing, and administrative interfaces
- Spur new alliances and acquisitions between telecommunications and data communications vendors
- Subjected to "marketecture" wars

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Cable Modems

- Residential modem providing data connection over broadband cable TV plant
- 97% of U.S. homes passed by cable—63 million households (source: A.C. Nielsen)
- High-speed service with data rates of 10 to 36 Mbps in each 6-MHz channel
- Data coexists with existing video channels
- Upgradable to multimedia distribution system
  - Cable telephony
  - Integrated multimedia applications
  - Home monitoring

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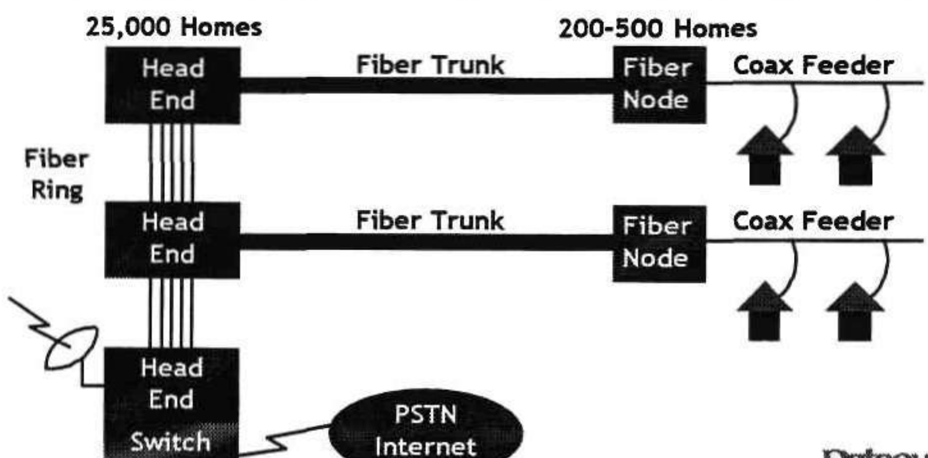
Hybrid Fiber Coax Infrastructure



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Bad News for U.S. Cable TV Industry

- Overextended and in debt
- Cable TV market under attack by DSS
- Installation and field service requirements more expensive than anticipated
- Consumer is unwilling to pay big money
- Break-even point is estimated at 7 to 10 years
- Aggressive plans for cable modems have been delayed or scrapped entirely

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U.S. Rollouts

- Major trials throughout the United States in high-density areas
  - Time/Warner in Ohio
  - Continental Cablevision in Boston
- Product works, but there are continuing problems with upstream path quality (noisy frequencies)
- Strong penetration in education-subsidized NCTA and vendors
- Many plant upgrades delayed for lack of capital, most notably TCI
- Very regionalized availability through 2000

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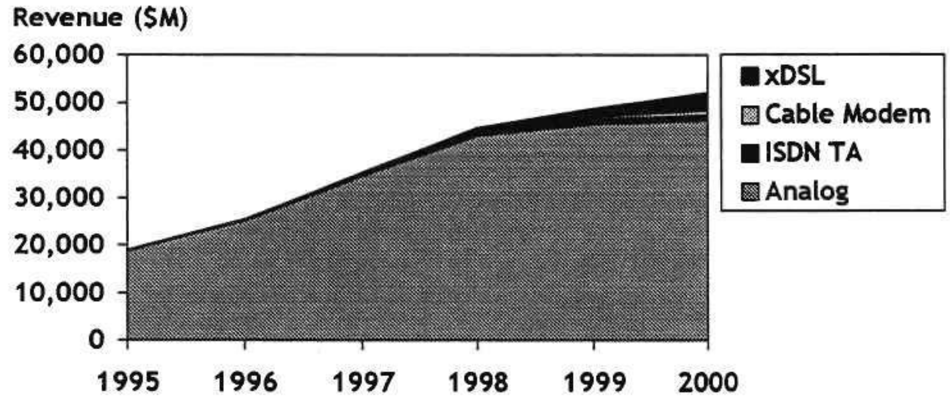
Modem Forecast—1995 to 2000



North America End-User Modem Forecast

Source: Dataquest
971222

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Modem Outlook

- ➤ We are on an analog bridge to the 21st century
- ➤ A few lucky individuals will have 128K or greater speeds to the home
- ➤ xDSL will outperform cable modems and ISDN
  - Under 2 Mbps
  - Primarily business users

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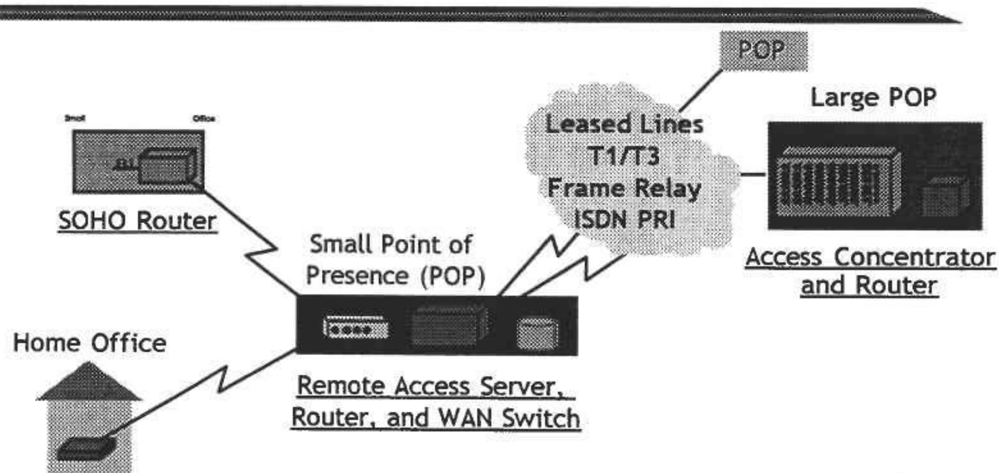
Service Providers: The 21st Century Channel

Dataquest

ISP Remote Access



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Remote Access Channel Shift

- 1980 to 1995—enterprise sale
- 1995 to 200X—service provider sale
- Three service provider selling opportunities
  - Internal infrastructure/WAN backbone
  - Public network outsourcing
  - SOHO channel
- Vendors must be one of the top five service provider suppliers or be relegated to niche status

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Outsourcing

- Remote access is difficult and labor-intensive application
  - High percentage of cockpit errors
  - 7 days x 24 hours
- Economies of scale—equipment and personnel
  - Able to handle peak loading
  - Excess capacity for spikes in usage
- Lower WAN costs with national footprint
- Service providers well positioned long term

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Challenges to Outsourcing

- Talent—wide disparity in quality between POPs
- No service guarantees available yet
- Service agreements not in place
- Billing and administration software systems not in place
- VPNs need large-scale trials
- Healthy skectipism in customer base

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Service Provider Challenges

- Scaling networks
- Scaling operations
- Multivendor integration
- "Commoditization" of services
- New competitors
- Managing 100+% growth

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Bigger Is Best

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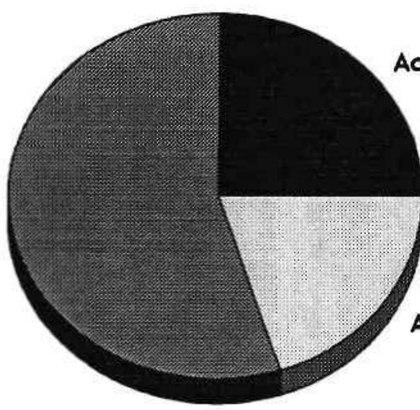
Concentrators Are Smallest Segment in 1995



1995 Remote Access Revenue by Segment

Source: Dataquest
971231

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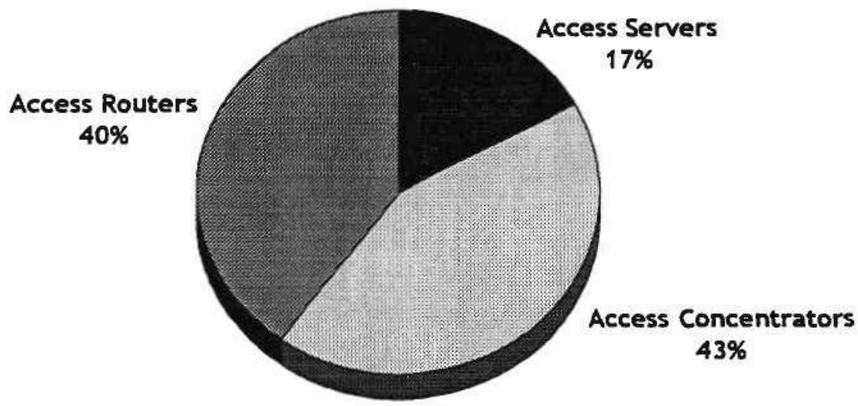
Concentrators Dominate Market in 2000



2000 Remote Access Revenue by Segment

Source: Dataquest
971232

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High-Density Concentrators

- POP in a box
  - Modem pool
  - Access server
  - Frame relay switching
  - Accounting, authentication, and security
- T1/T3 channelized interfaces with 100 to 2,000 calls
- Supports multiple-access types
  - Analog
  - ISDN
  - Frame relay
  - xDSL

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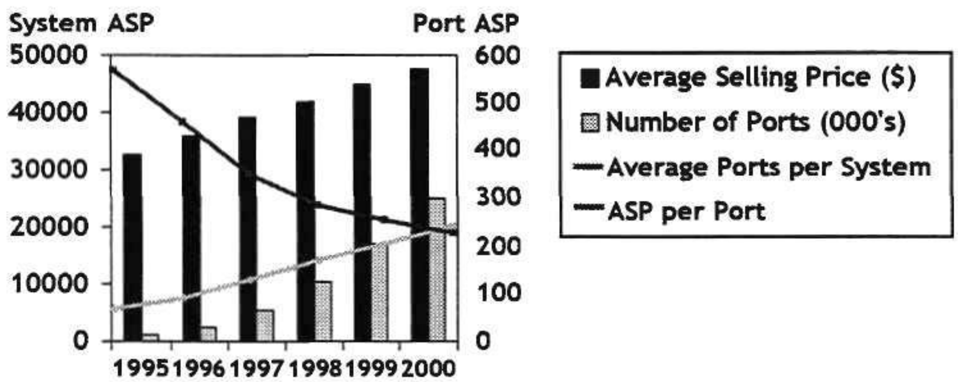
Pricing and Density



Average Selling Price as a Function of Density

Source: Dataquest
971234

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How ISP Rate Vendors

Company	Technology	Service and Support	Complete Solution
Ascend	4.03	3.78	3.99
Bay (Xylogics)	3.79	3.69	3.59
Cascade	4.07	4.0	4.0
Cisco (Access)	4.19	4.08	3.92
SHIVA	3.61	3.3	3.41
3Com	4.14	3.82	3.87
U.S. Robotics	3.94	3.38	3.55

Scale = 1 to 5, 5 being best

Source: Dataquest
971234a

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Concentrator Vendors

- Ascend has a bull's-eye on their back
  - First out with high-density platform
  - ISP installed base
  - Good router, unproven frame relay
- U.S. Robotics has a bow and arrow
  - Tied for top spot with Ascend
  - Leveraging modem strength
  - Unproven networking and systems technology
- Cascade is new kid on the block
  - ISP frame relay leader
  - Unproven dial technology
  - Networking expertise
- Cisco turns the battleship
  - Aggressive investment in ISP/carrier market
  - Lacks high-density platform
  - Two- to three-year threat

971235

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What's Ahead for Remote Access

- High-speed access remains a Porsche through 2000
- Tracks hub/switch/router market evolution
  - Consolidation of top tier
  - Brand and share
- Aggressive deal making for service provider wins
- New round of acquisitions for technology portfolio
- Evolution of the carrier class remote access company
  - Dominant market share
  - Systems expertise
  - Global presence
  - Deep pockets

971236

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Notes

Wireless Wars: New Competition Breeds Market Battles!

John Ledahl

Director and Principal Analyst, Wireless Programs
Telecommunications Group
Dataquest

Mr. Ledahl is director and principal analyst in the Wireless programs area of Dataquest's Telecommunications group. Primary responsibilities include directing and analyzing the market research and forecasting efforts in wireless communications across the board. His areas of focus related to wireless programs include: wireless service providers such as cellular, emerging personal communications services, paging and advanced messaging, and wireless data providers; wireless infrastructure equipment and technology; plus related sales, marketing, and distribution processes for wireless services.

Before joining Dataquest, Mr. Ledahl worked for 14 years for various Pacific Telesis-connected companies such as Bellcore, Telesis Technologies Laboratory, and Pacific Bell Mobile Services, where he served in product development, market and competitive analysis, public policy, and business development roles. He began his telecom career with AT&T in 1981.

Mr. Ledahl holds an M.B.A. in telecommunications, and he teaches wireless communications part-time in the Golden Gate University graduate program.

Today's Agenda

- ➤ Current U.S. wireless market conditions
- ➤ U.S. wireless market and technology trends
- ➤ DQ U.S. wireless forecasts
- ➤ DQ predicts
- ➤ Summary

General Confusion versus Major Competition

970755

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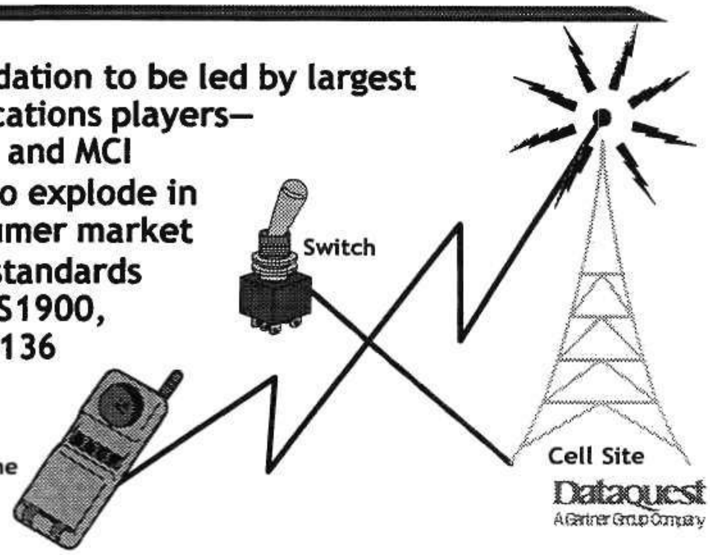
Major Themes of U.S. Wireless Market

- ➤ Major consolidation to be led by largest telecommunications players—AT&T, Sprint, and MCI
- ➤ Cellular/PCS to explode in 1998 to consumer market
- ➤ Three major standards to prevail—PCS1900, CDMA, and IS-136



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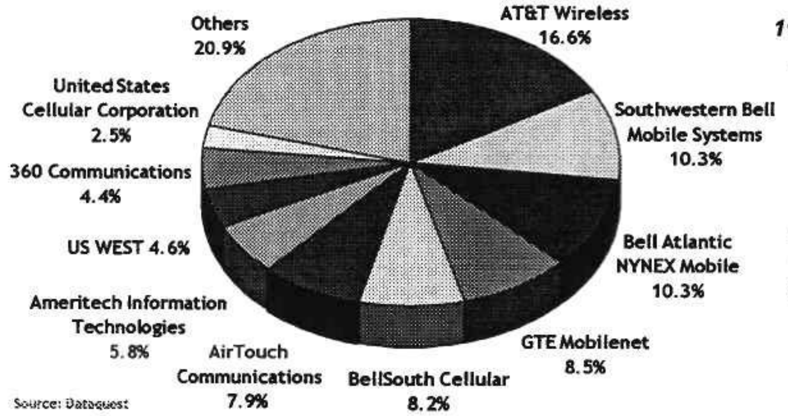
Current U.S. Wireless Market Conditions—Fresh Data on 1996 EOY Cellular Service Market Share



1995-96 Growth Rate: 30.1%

EOY 1996: 42 Million Subscribers

Source: Dataquest

➤ Cellular: Analog/digital 2-way wireless, voice dominated, available everywhere @ 800 MHz

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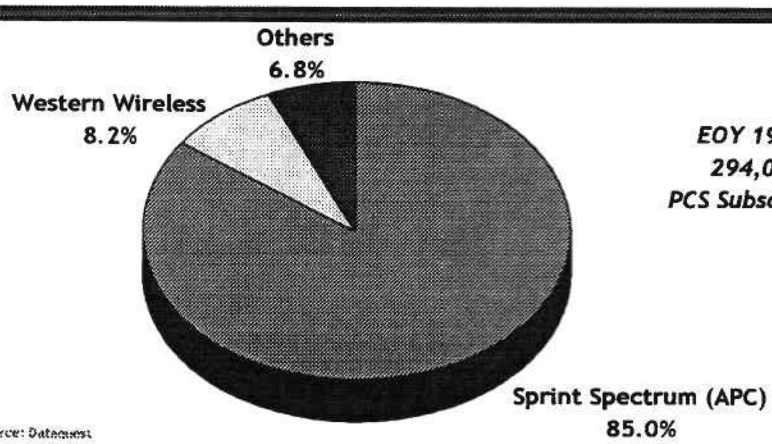
Current U.S. Wireless Market Conditions—Fresh Data on 1996 EOY PCS Service Market Share



EOY 1996: 294,000 PCS Subscribers

Source: Dataquest

➤ PCS: New, digital 2-way wireless, voice dominated, starting to deploy @ 1900 MHz

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Current U.S. Wireless Market Conditions—Major Alliances, Mergers, and Acquisitions

- MCI and Next*Wave*
  - Risk vs. reward
- "PCS1900" alliance
  - First to market
- Universal Wireless Communications
  - AT&T Wireless gets serious on IS-136
- Sprint PCS and cable companies
  - Some deployment trouble
- Pacific Bell and SBC
  - PBMS a "jewel"

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Current U.S. Wireless Market Conditions—Market Drivers and Trends

- New competitors—six new licenses in every area
  - Three new 30-MHz and three new 10-MHz licenses
- New market segment—consumer market
- Telecom Act of 1996
- Three strongly backed digital standards
  - CDMA, IS-136, and PCS1900
- Three national brands
  - AT&T, MCI, and Sprint

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Current U.S. Wireless Market Conditions—Technology Trends

- GSM continues No. 1 worldwide
- CDMA becomes globally viable
- IS-136 pushes the envelope
- Smart phones push voice-centric handsets design
- Wireless local loop is next focus of vendors worldwide

Gen. George Patton said, "If everyone is thinking alike, then somebody isn't thinking!"

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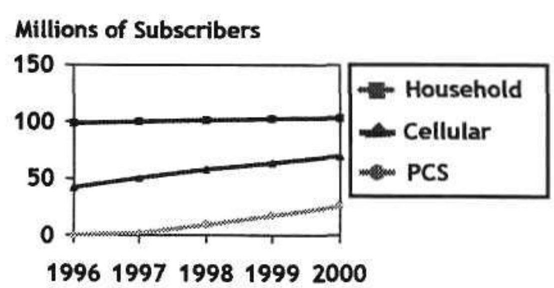
Dataquest Wireless Market Forecasts—Top Five U.S. Cellular/PCS Carriers

- Top five cellular/PCS carriers
  1. AT&T Wireless
  2. Sprint Spectrum
  3. PCS PrimeCo
  4. Next*Wave*/MCI
  5. PCS1900 alliance



Source: Dataquest
970762

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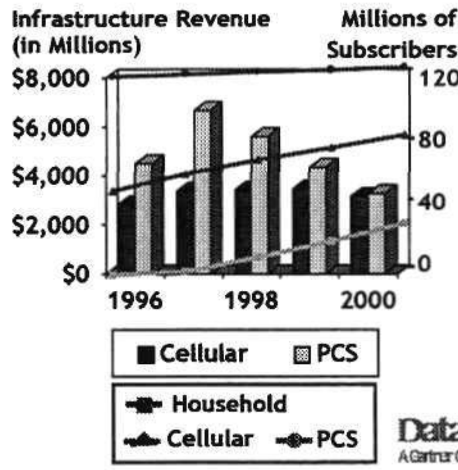
Dataquest Wireless Market Forecasts— Top Five U.S. Cellular/PCS System Vendors

➤ Top five cellular/ PCS system vendors
1. Lucent
2. Ericsson
3. Nortel
4. Motorola
5. Nokia



Source: Dataquest
970763

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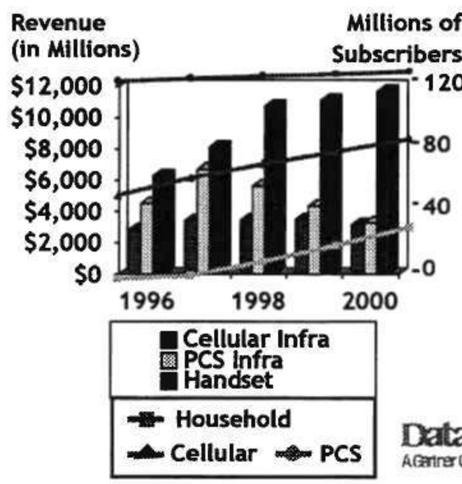
Dataquest Wireless Market Forecasts— Top Five U.S. Cellular/PCS Carriers

➤ Top five cellular/ PCS handset vendors
1. Motorola
2. Nokia
3. Ericsson
4. QUALCOMM
5. Lucent



Source: Dataquest
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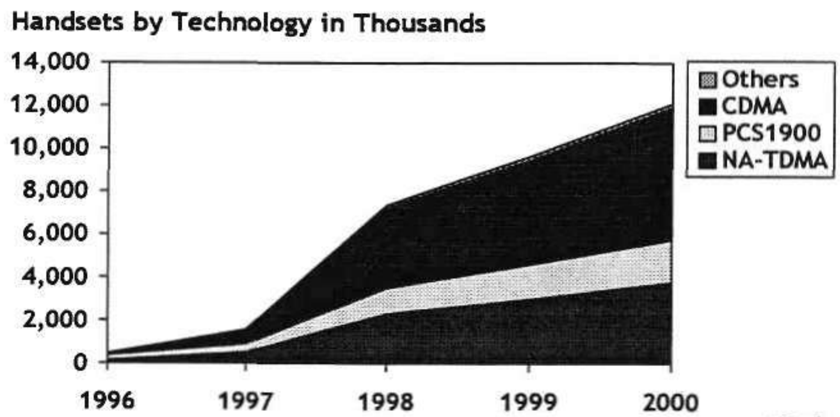
U.S. PCS Technology Forecast by Standard



Source: Dataquest
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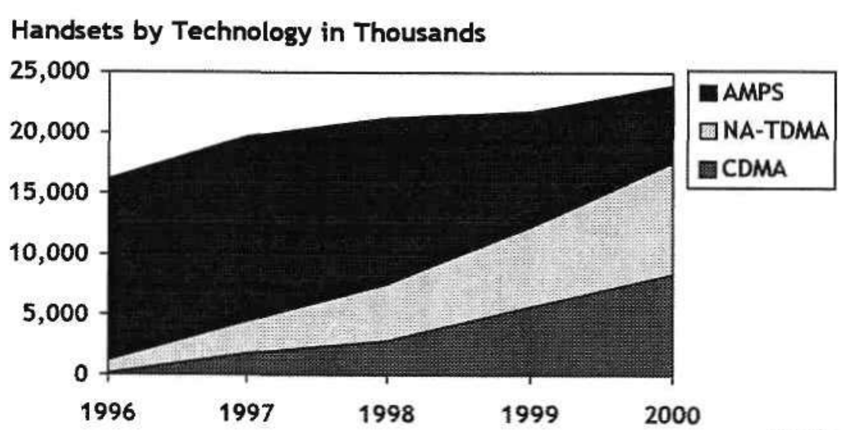
U.S. Cellular Technology Forecast by Standard



Source: Dataquest
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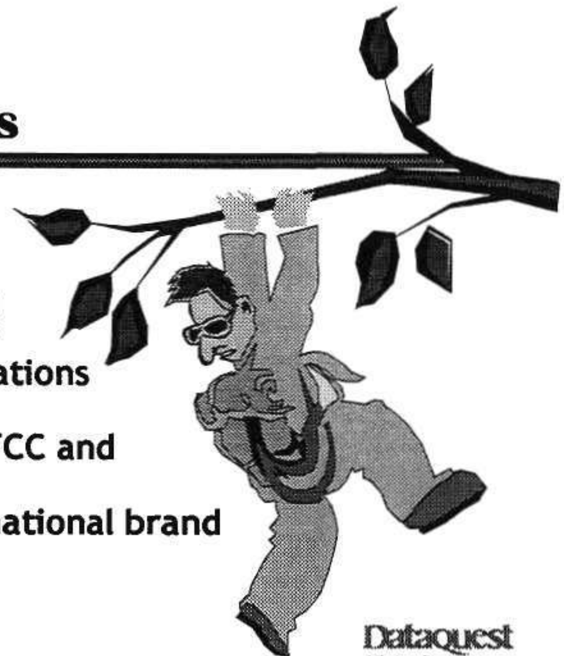
Dataquest Predicts—U.S. Wireless Markets



- The services market:
  - AT&T Wireless, MCI, and Sprint PCS to begin "nasty" promotions for national telecommunications packages (ML)
  - Next*Wave* overcomes FCC and money obstacles (ML)
  - PCS1900 struggles for national brand (ML)

970767

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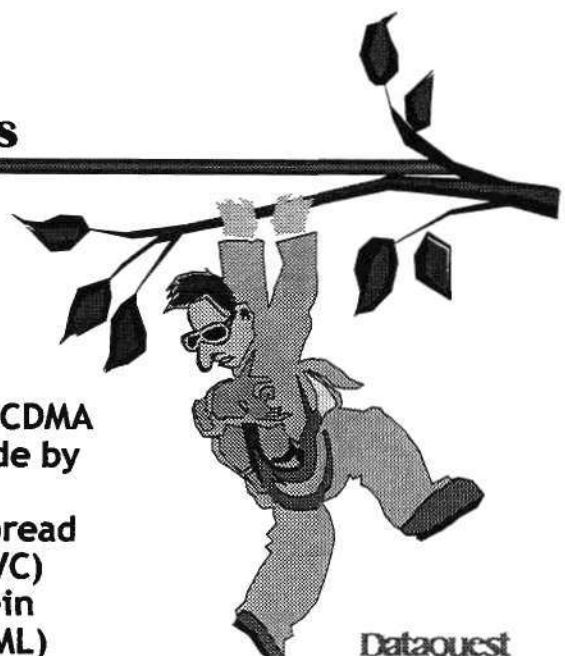
Dataquest Predicts—U.S. Wireless Markets



- The systems equipment market:
  - Nortel becomes second U.S. wireless network vendor (CH)
  - GSM remains No. 1 and CDMA is viable (15%) worldwide by year 2000 (CH)
  - Ericsson creates own spread spectrum technology (WC)
  - IS-136 and CDMA prove-in commercially in 1997 (ML)

970768

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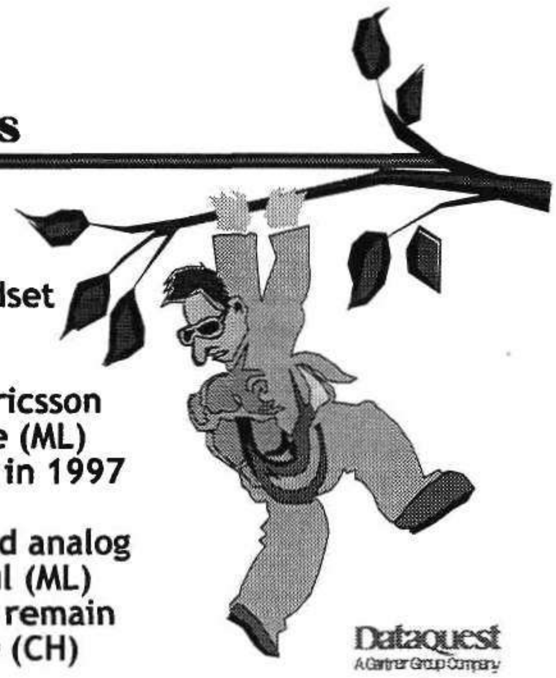
Dataquest Predicts— U.S. Wireless Markets



- The handset market:
  - QUALCOMM will garner 10% of U.S. digital handset market by 1999 (CH)
  - Motorola and NEC lose analog market share; Ericsson and Nokia pick up share (ML)
  - Lucent to sell handsets in 1997 (ML)
  - Small, reasonably priced analog phones prove successful (ML)
  - PCS handset prices will remain constant—$150 to $200 (CH)

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Summary

- Major consolidation led by largest telecommunications players
  - AT&T, Sprint, and MCI
- Cellular/PCS to explode in 1998 to consumer market
- Three major standards will prevail—PCS1900, CDMA, and IS-136
- Fastest-growing wireless players
  - Carrier: AT&T Wireless
  - System vendor: Nortel
  - Handset vendor: QUALCOMM

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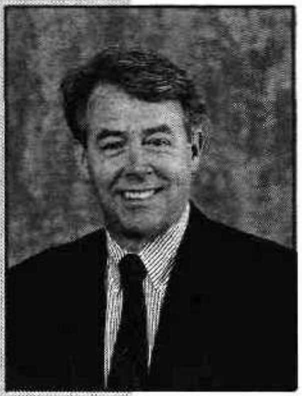
Notes

The LAN Network Backbone: Where Does It Go from Here?

Don Miller

Chief Analyst, Networking Program
Telecommunications Group
Dataquest



Mr. Miller is the chief analyst of the Networking program of the Telecommunications group. He oversees the company's research in networking worldwide and personally contributes as the analyst focused on the router industry.

Mr. Miller has more than 25 years of experience in the networking and telecommunications industry worldwide. His knowledge spans a wide variety of networking technologies including voice, wide area, and local area networks. Experienced at creating and implementing effective channel and distribution strategies, Mr. Miller has gained international experience while successfully launching new products and technologies worldwide.

Mr. Miller joined Dataquest from Asante Technologies, an Ethernet networking company, where he was vice president of sales, The Americas. At Asante, he was responsible for sales in the Western Hemisphere, Japan, Australia, and New Zealand. Additional responsibilities included management of a customer support, channel marketing, and training organization. Before joining Asante he held various senior management positions including vice president of sales, The Americas at Retix, and director of marketing for SynOptics Communications (now Bay Networks).

Agenda

- ➤ What is putting pressure on LAN backbones?
- ➤ The battle between Gigabit Ethernet and ATM
- ➤ Is IP Switching real or just a flash in the pan?
- ➤ The fate of the traditional router
- ➤ Where are the biggest opportunities for networking vendors?

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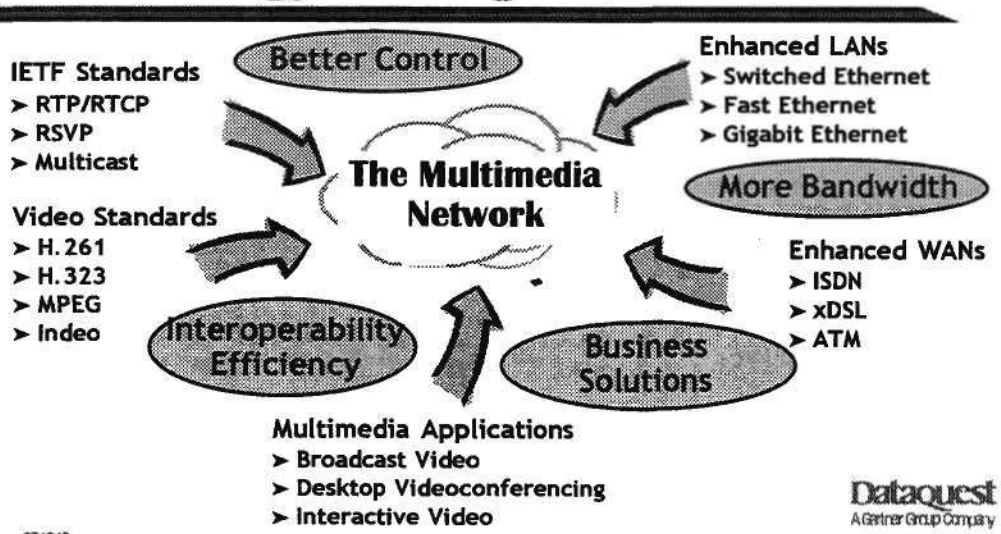
Today's Networking Environment— A Technology Convergence



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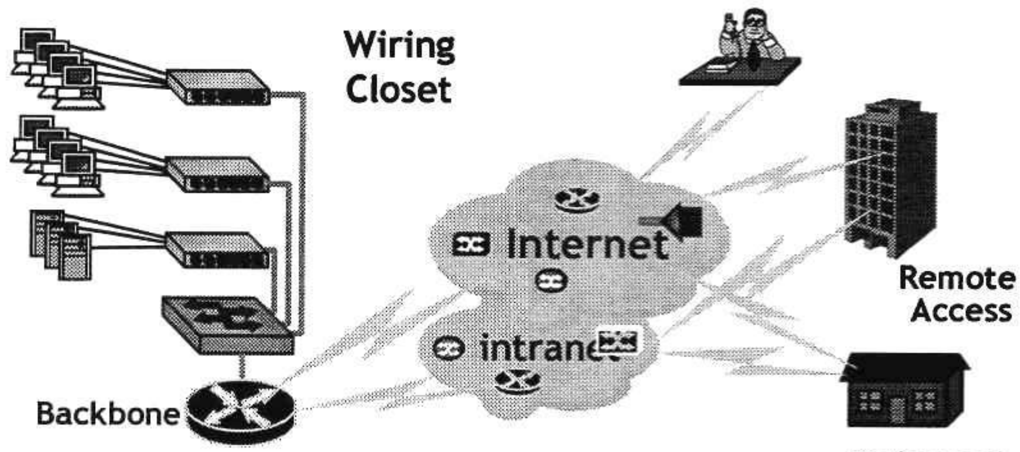
Network Hot Spots



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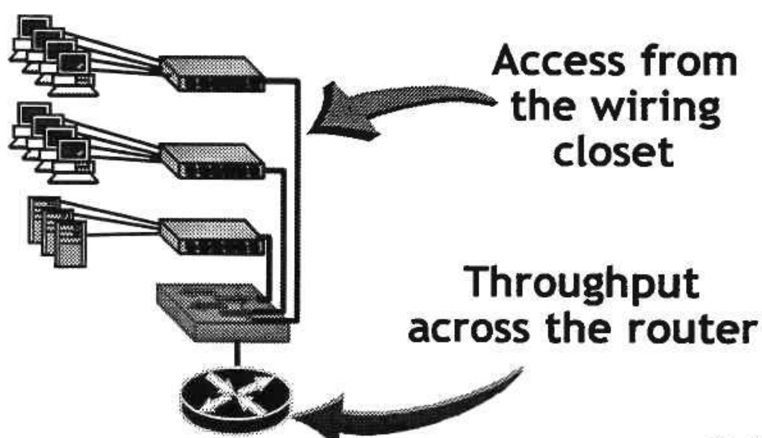
LAN Backbone Bottlenecks



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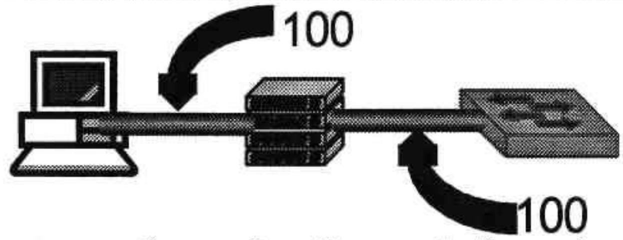
LAN Backbone Congestion



- ➤ Desktop connections migrating to dedicated 10-Mbps at the desktop or ...
- ➤ Shared 100-Mbps Fast Ethernet
- ➤ 100-Mbps "Fat Pipe" connects to servers or backbone switches

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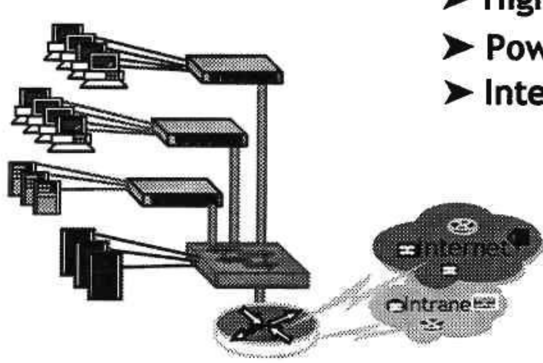
Pressure on the Backbone

- ➤ High-speed workgroups
- ➤ Powerful servers
- ➤ Internet/intranet



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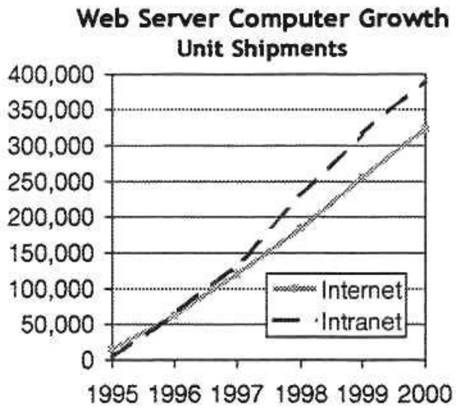
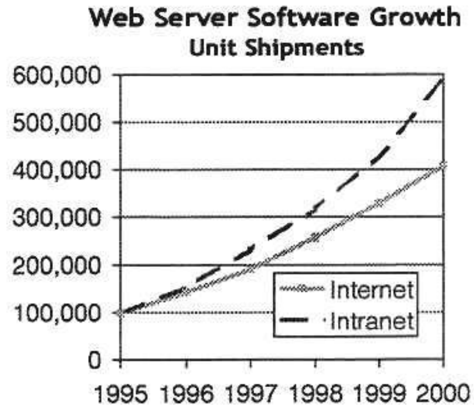
Intranet Growth Explodes





Source: Dataquest Online Strategies Worldwide
971245

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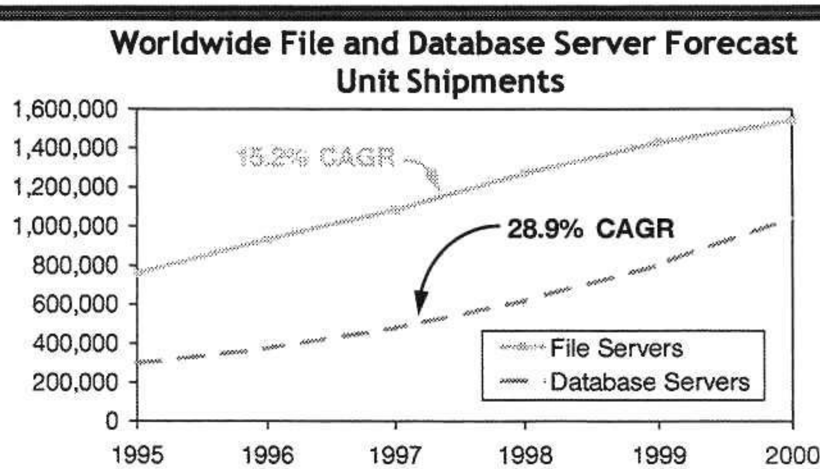
High-Performance Servers Hammer the Backbone



Source: Dataquest Client/Server Computing Worldwide
971246

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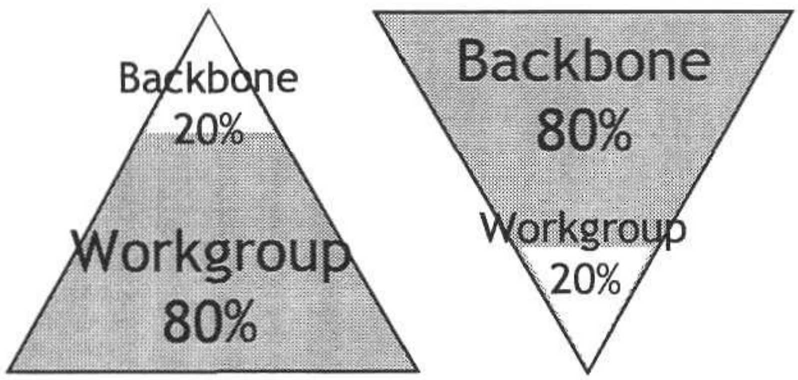
80/20 Rule Is Inverted



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Higher-Speed Backbones— Which Technology?

- ➤ Older technologies are unsuitable for next-generation networks
  - FDDI, shared and switched Fast Ethernet
- ➤ Gigabit Ethernet
  - 100 times faster than Ethernet
  - Emerging standard
- ➤ ATM
  - Switching hardware readily available
  - Software standards (MPOA, PNNI) approaching final stages

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Gigabit Ethernet—What Is It?

- Extension of 10-Mbps and 100-Mbps Ethernet
- 100 times faster than Ethernet!
- Full- and half-duplex modes supported
- Proposed distances
  - Cat 5 unshielded twisted pair—25M to 100M
  - Multimode fiber—500M
  - Single-mode fiber—2 to 10km
- Gigabit Ethernet Alliance has more than 90 members
- Draft standard by early 1997, final in 1998

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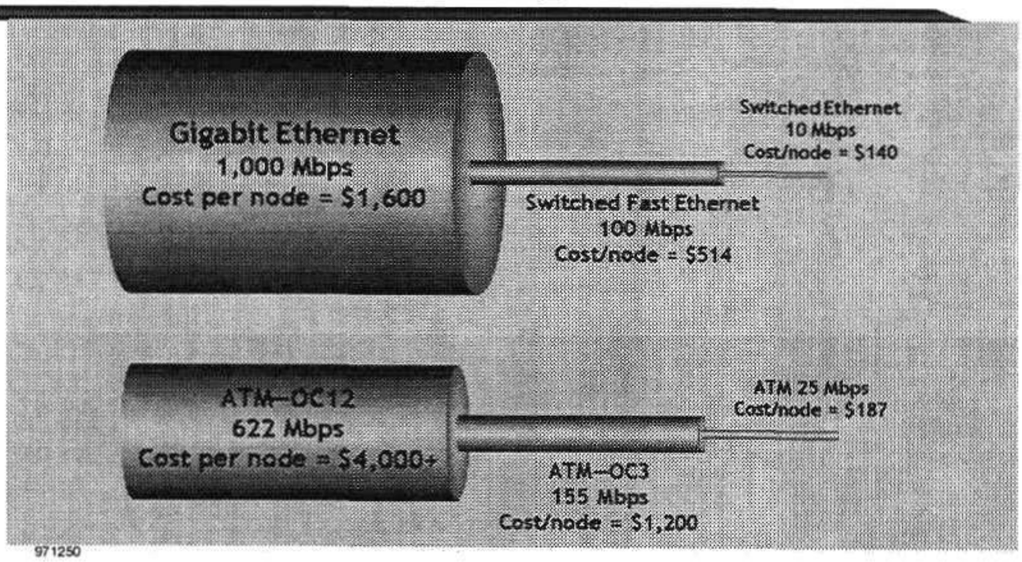
Gigabit Ethernet Why Is It So Interesting?



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Gigabit Ethernet in the Backbone—Pros and Cons

Pros

- Very fast
- Less complex than ATM
- Natural extension of Ethernet

Cons

- Standard still emerging
- Needs robust redundant link solution

971251

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ATM in the Backbone—Pros and Cons

Pros

- Scales to very high speed
- Designed for multimedia
- Link redundancy

Cons

- Ongoing standards activities
- Radically different from Ethernet
- Expensive

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LAN Backbone Forecast Approach

- Based on existing Dataquest forecasts for all LAN technologies
- Backbone applications for each LAN technology were estimated
- The impact of Gigabit Ethernet on the backbone market was estimated
- Prices were cross-indexed against Dataquest's semiconductor research
- Dataquest's client/server computing research consulted for input on high-speed bus development
- Additional input on pricing and product availability derived from vendor interviews

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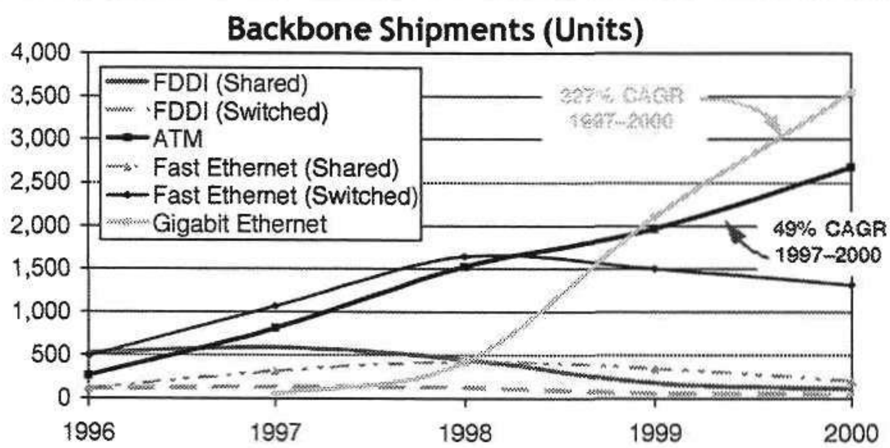
LAN Backbone Technology Forecast



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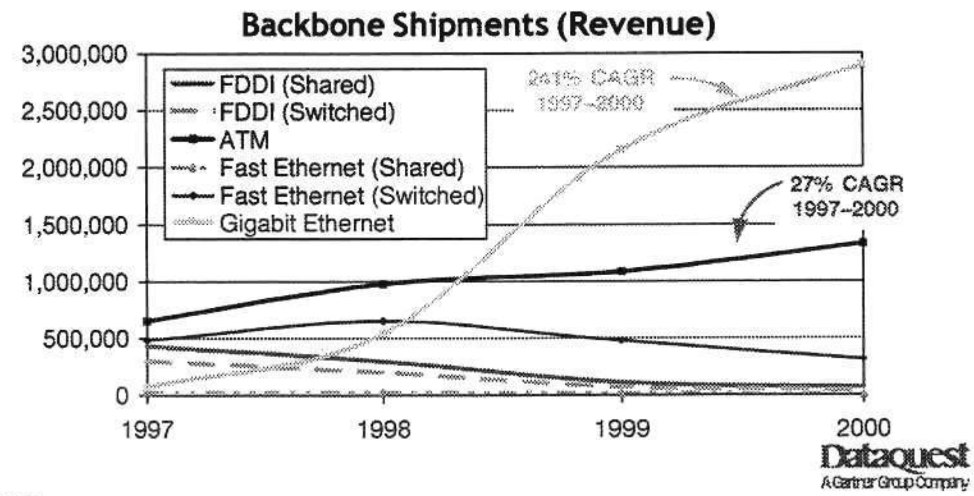
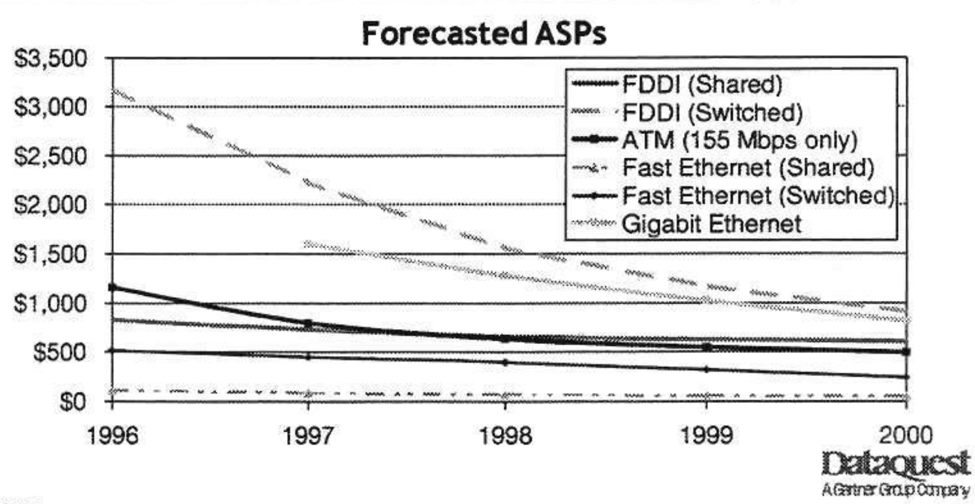
LAN Backbone Technology Forecast



971255

Gigabit Ethernet— A Premium-Priced Solution



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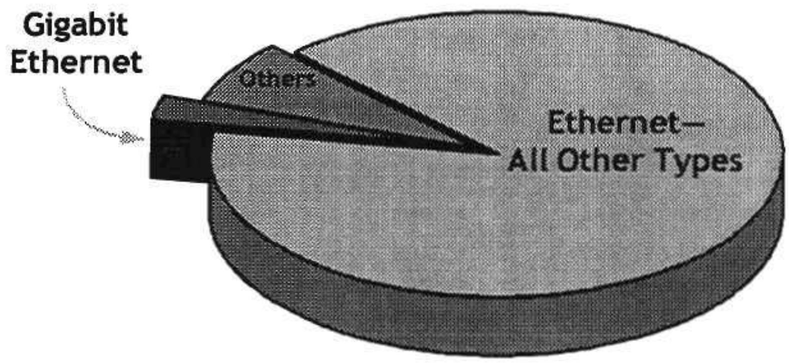
Technology Mix in 2000— Putting Things in Perspective



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Dataquest Predicts ... Outlook for LAN Backbone Technologies

- FDDI will begin to fade away
- Fast Ethernet will become stronger on the desktop
  - Some switched Fast Ethernet will be used in smaller networks
- ATM and Gigabit Ethernet will share center stage
  - Finalization of MPOA in early 1997 will help ATM vendors
  - Prestandard Gigabit solutions will compete with ATM

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Meanwhile at Layer 3 ...
Routed Networks Are Under Pressure

- Layer 2 switching is being widely deployed, but ...
  - Lack "finesse" of routed networks
- Backbones are becoming flooded
  - Shift in network traffic patterns
  - Older routers can't keep up
- Traffic content is shifting toward multimedia and streaming data applications

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Routing—
Why Does Anyone Care?

- Layer 2 technology enhancements aren't enough
  - All brawn, no brain
- Layer 3 policy controls are needed to move to the next level of performance
- Routing plays a critical role, but traditional routers are a bottleneck
- Solutions are needed to improve network performance while maintaining policy and control

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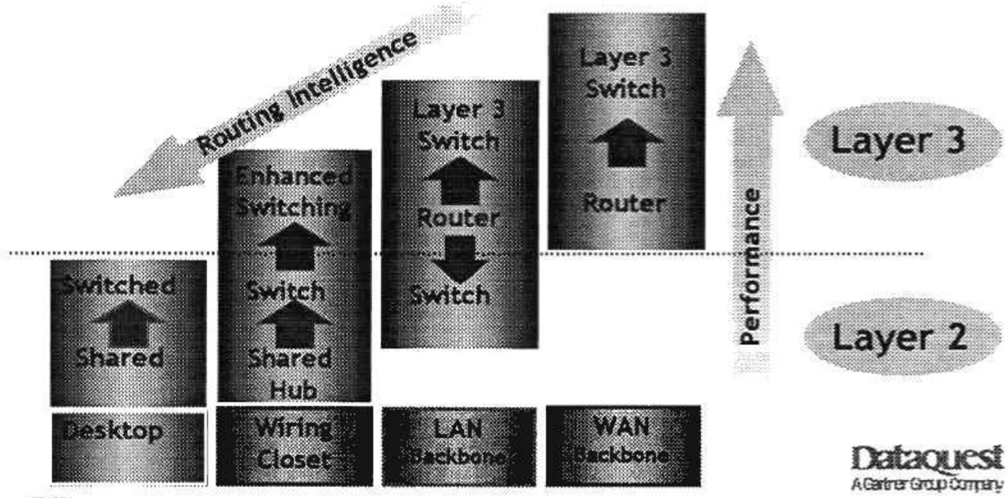
Technology Migration



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Routing Systems—
A Solution for the Late 1990s

- Shift away from centralized router to distributed Layer 3 intelligence
- Components of a routing system
  - Existing routers
  - Layer 3 switches
    - —IP switches
    - —ATM switches running MPOA, I-PNNI
  - Layer 2 "plus" switches
    - —Lower cost
    - —Limited Layer 3 smarts, i.e., multicast control
  - Routing software

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Layer 3 Switching

- Combination of routing and switching
  - Offers the best of both worlds—high performance with Layer 3 controls
- Multiple variants announced, few shipping
  - 3Com—Fast IP—not shipping
  - Cisco—Tag Switching—not shipping
  - Bay—Enterprise Intranet Switching—not shipping
  - HNS—not shipping
  - IBM—ARIS—not shipping
  - Ipsilon—IP Switching—shipping

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Dataquest Predicts ... IP Switching Outlook

- IP switches will be widely available in 1997
- Ipsilon's approach will be the most popular
  - Partners already include DEC, GDC, NEC, Hitachi, ATML, and others
- Some larger vendors will offer their own version
  - Support for Ipsilon protocols will be offered as an option
- Cisco's Tag Switching will create confusion
- ATM switch vendors will benefit
  - Enables high-performance routing without ATM forum code

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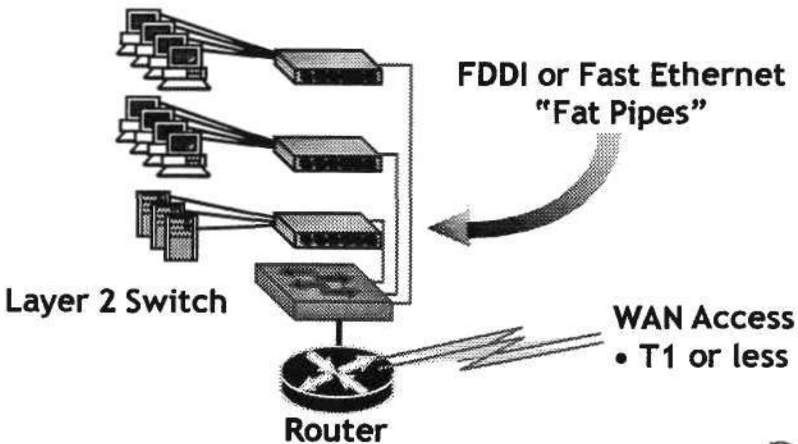
Today's LAN Backbone



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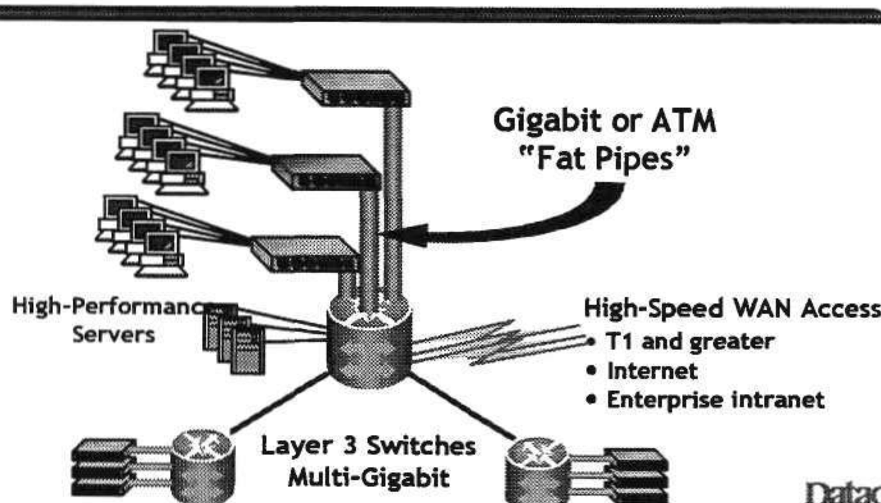
Tomorrow's LAN Backbone



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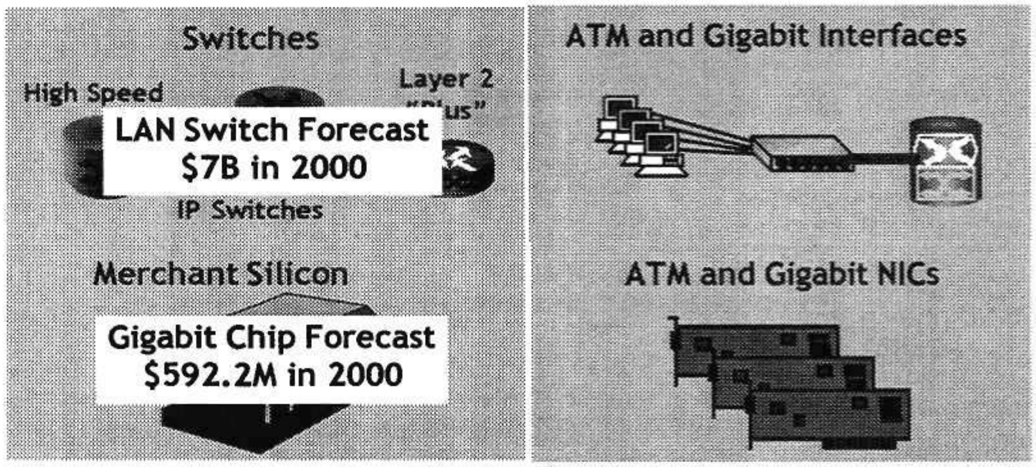
Vendor Opportunity



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Summary

- LAN backbones are a big market!
  - $4.6 billion is up for grabs
- Backbones will move to higher speeds
  - ATM and Gigabit Ethernet are dominant
- Backbone routers will be replaced with Layer 3 switches
  - Multiple vendor-specific variants will be available
  - IP Switching will have the broadest multivendor support
- Layer 3 smart switches move closer to the desktop
- More robust protocols, e.g., IP Multicast, RSVP begin to take hold

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Notes

Notes

Semiconductors

Consumer Electronics: Play Hard or Die Hard

Dale L. Ford

Senior Industry Analyst, Semiconductor Application Markets Group
Dataquest

Mr. Ford is responsible for conducting market research and analysis for the Semiconductor Application Markets group at Dataquest. He is a specialist on the end use or application of semiconductors with the scope of analysis including both economic and technical trends regarding the semiconductor content of electronic equipment. His work also includes contributions on client-specific consulting projects.

Mr. Ford is the program manager for the Consumer Multimedia Semiconductors and Applications program and also has primary responsibility for Dataquest research in wireless communications and mobile computing semiconductor applications. In addition, he contributes to the general semiconductor applications research.

Before his current role, Mr. Ford completed major consulting projects in the telecommunications, mobile computing, and multimedia industries for Dataquest. His work included the development of forecasting models to project the development of new technologies and the growth of emerging markets. He also led the launch of Dataquest's successful teardown program, where in-depth analysis is performed on electronic equipment, including PCs, workstations, cellular phones, set-top boxes, and video games.

Before joining Dataquest, Mr. Ford was employed by Sun Microsystems in its product marketing organization where he created and implemented marketing plans and joint development agreements with third-party vendors. Earlier, he was a design engineer working with real-time image processing technologies and computer-aided-engineering systems for Evans & Sutherland, a producer of graphics workstations and high-performance flight simulators.

Mr. Ford has an M.B.A. in strategic management from The Wharton School, University of Pennsylvania, and a B.S.E.E. degree in electrical engineering from Brigham Young University.

Agenda

- ➤ The state of the industry
- ➤ The stars of the show
  - Digital satellite set-top boxes and digital cable
  - DVD
  - Digital still cameras
  - Desperately seeking the Internet
- ➤ The converging/compressed universe
- ➤ The crystal ball

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1996: Reality Bites Consumer Electronics Industry

- ➤ Manufacturers/retailers fail to stay ahead of the curve
  - Overall industry revenue flatlines
  - First decline in core products in eight to 10 years
  - Shining stars: DBS, digital cameras, Video CD
  - Renewed hope: Video game consoles, HDTV
  - Missing in action: DVD, digital cable
- ➤ Chip companies all dressed up with nowhere to go

971054

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Strategies for Reinventing the Industry

Systems Companies

- Invest in renaissance (rebirth) of core products
- Cultivate nascent next-generation products
- Create interactive/Internet consumer enhancements
- Engage in partnerships/alliances with services and software companies

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Strategies for Reinventing the Industry

Semiconductor Companies

- Core technology development/acquisition and leverage
- Products and processes that are responsive and flexible
- Prioritize cost reduction
- Build OEM partnerships
- Research end users to guide product development

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"[Television] won't be able to hold on to any market it captures after the first six months. People will soon get tired of staring at a plywood box every night."

—Darryl F. Zanuck
Head of 20th Century-Fox
1946

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Dataquest Predicts

- Monday morning quarterback: What did Dataquest predict a year ago?
- The industry captures that growing feeling by Q4/97
  - A scramble/shakeout in software/services
  - Looking for Mr. Internet
  - Guess who's coming to dinner? (Asia/Pacific companies earn a place at the table)
- A rapid shift to second-generation chips/products

971057

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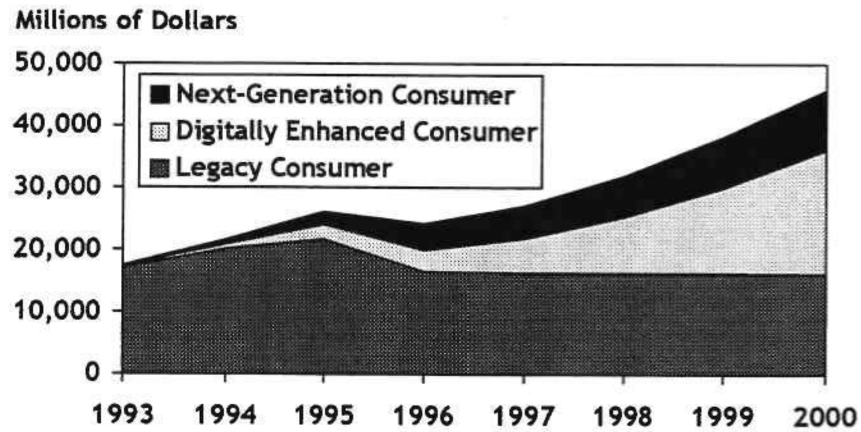
The Chip's Performance Will Be Rewarded with Strong Growth in Consumer Electronics Chip Market



Source: Dataquest
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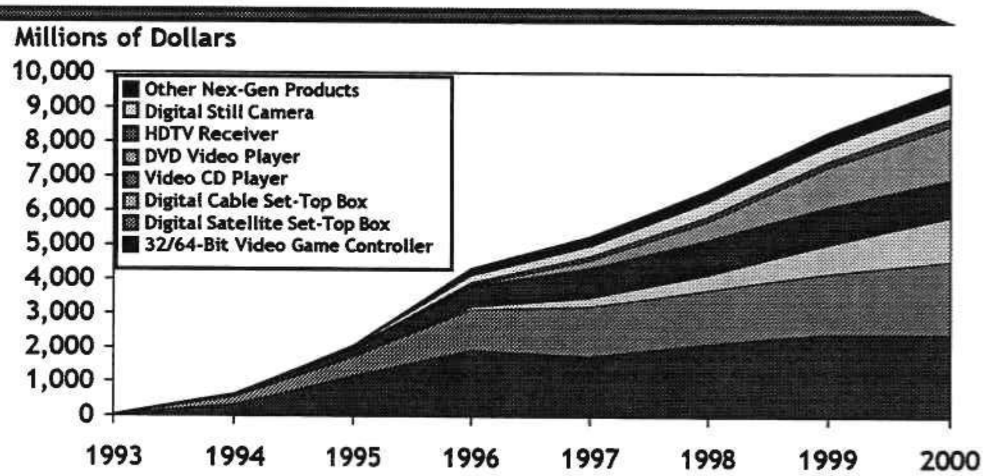
The Chip Market for Next-Generation Consumer Electronics Will Top $9.6 Billion by 2000



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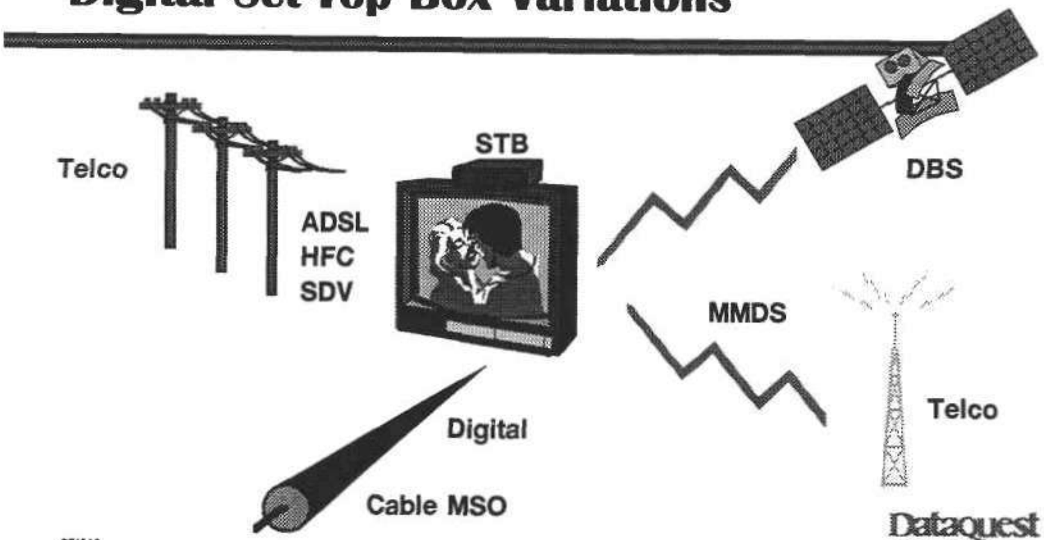
Digital Set-Top Box Variations



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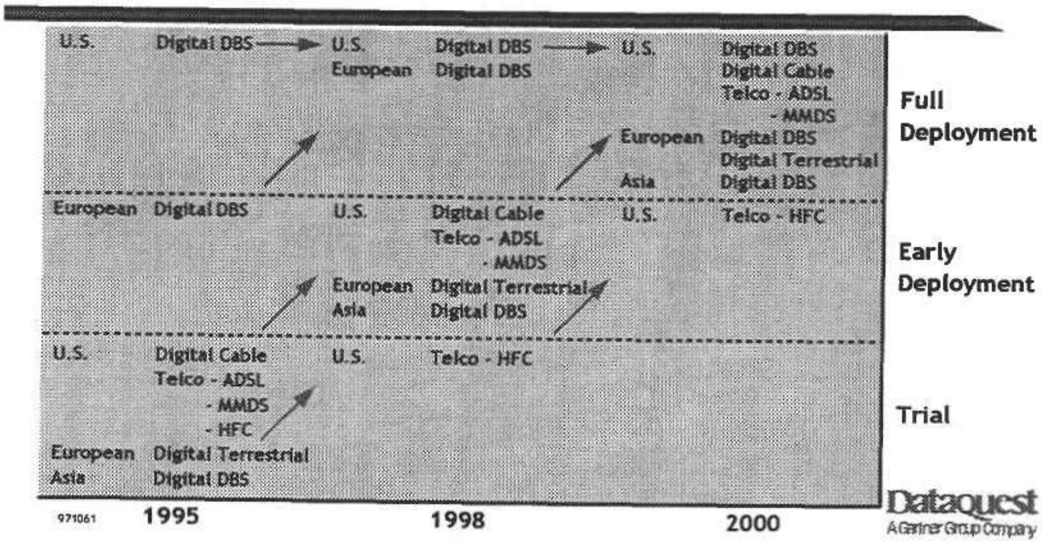
Digital Set-Top Box Market Time Line



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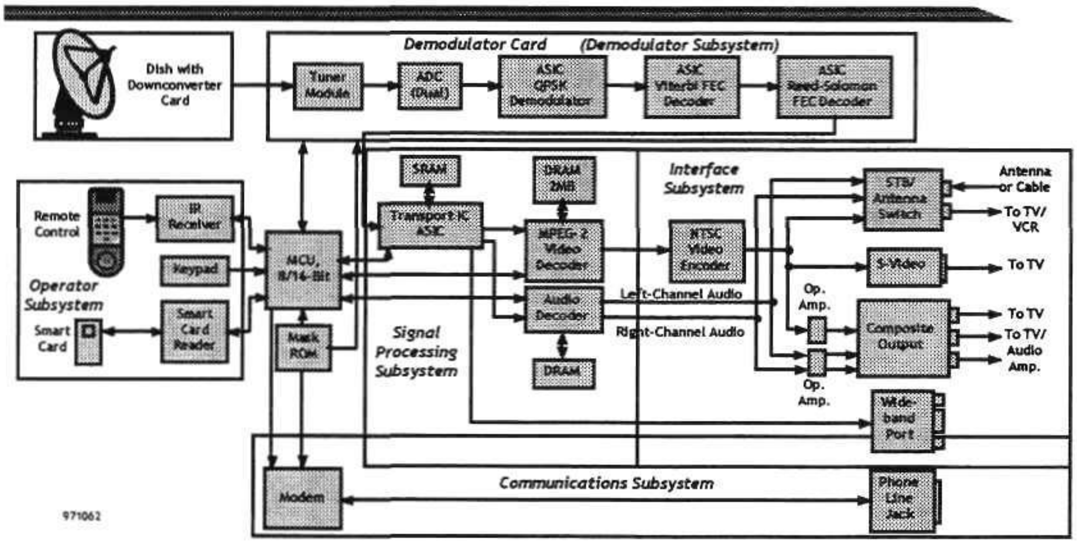
RCA DSS Block Diagram



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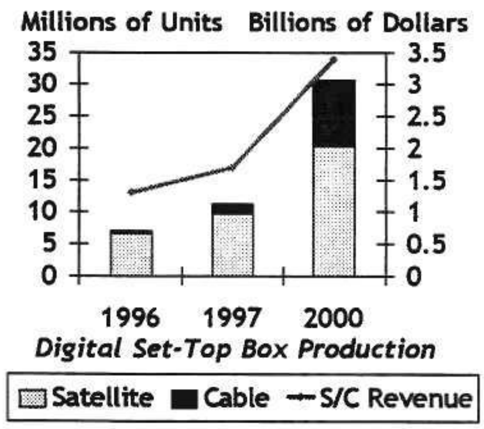
The Set-Top Box Stars Come Out

- DBS increases growth in 1996
- New service providers arrive
  - AlphaStar and EchoStar
  - Telcos not ready to play
- Digital cable becomes a reality in 1997
- The markets go international
- The chip competition heats up



Digital Set-Top Box Production

Source: Dataquest
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Hurdles on the DVD Path: Past, Present, and Future

- Technology development
- Standards unification
- Intellectual property struggles
- Software and content creation
- Infrastructure development
- Hardware costs and consumer price points
- Writing and encoding technology

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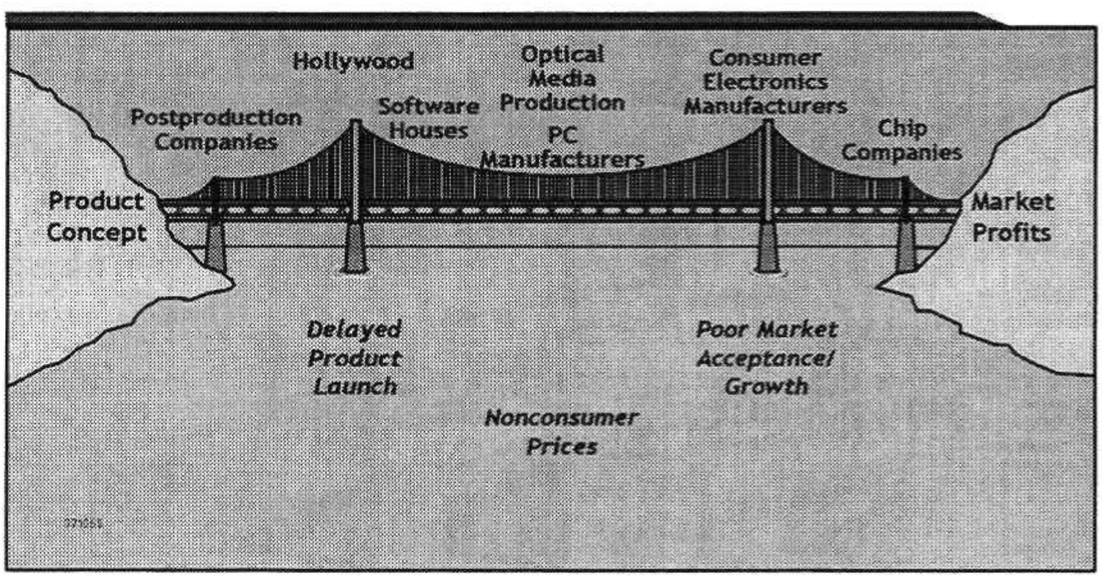
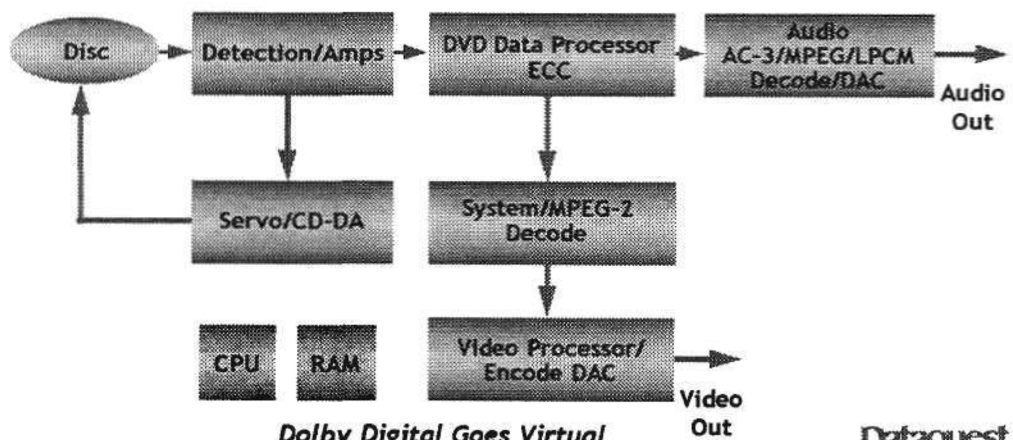
The Golden Gate to DVD Success



DVD Technology Opportunities



Dolby Digital Goes Virtual

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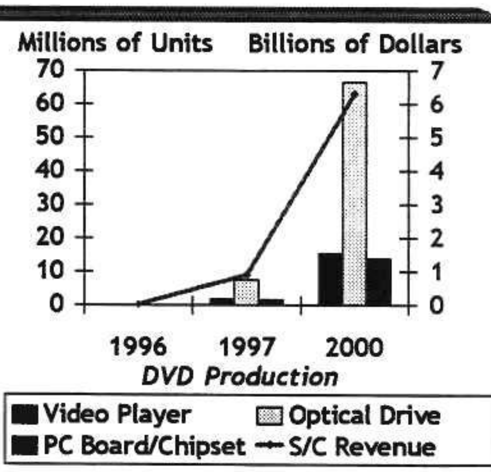
The DVD Destiny

- DVD disappointments plague 1996
  - Product delays
  - Weak Japan launch
- The United States: Land of opportunity
- The Devil is still in the details
- Aggressive pricing: How low can they go?
- Who are the winners?



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Digital Still Cameras: Framing Expectations

The Positive Image

- Elimination of film
- Immediately view photos
- Import images into PC
  - Editing and publishing
  - Electronic delivery
- Record moving image sequences and audio

The Negative Image

- Educating the consumer (high return rates)
- Resolution limitations
- High prices
- Developing infrastructure

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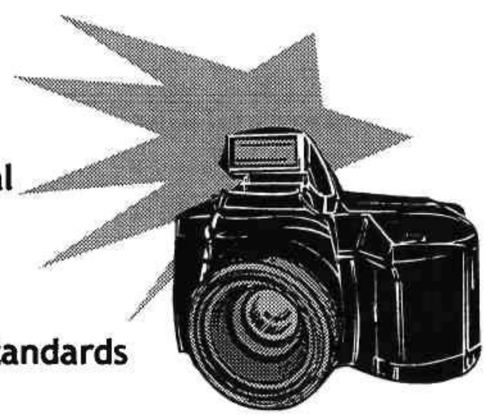
Picturing the Chip Opportunities in Digital Cameras

- Imaging technologies
  - CCD
  - CMOS sensor
- Microcontrollers and digital processing ASICs
- Embedded memory
- Storage
  - Three competing flash standards
  - Hard disk drives
  - MiniDisc



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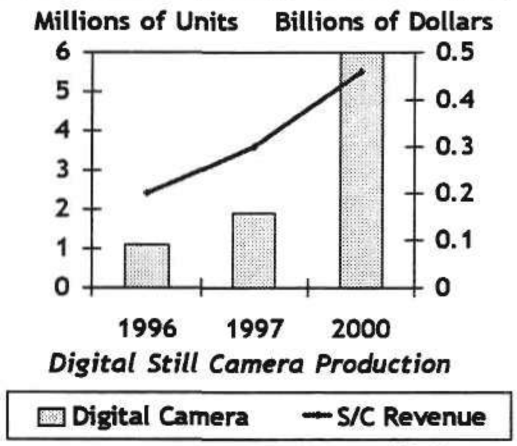
Digital Cameras: A View to the Future

- Over 50 models from more than 20 companies
- Prices plummet amid chaos
- Two forecast scenarios
  - PC peripheral
  - Film camera replacement
- Removable storage offers additional chip opportunity



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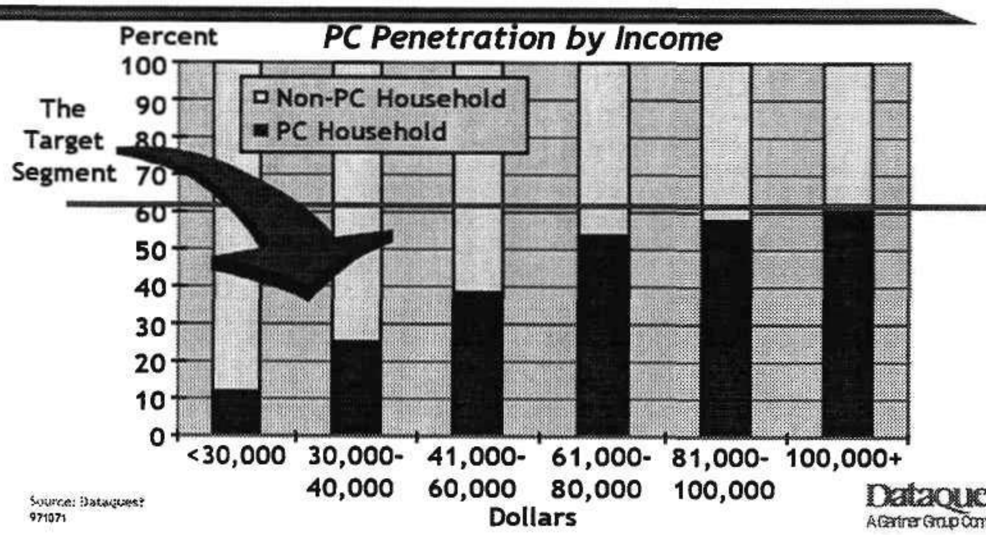
The Network PC Market Concept



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A High Barrier to Market Success

The Network Computer

- Display Quality and Cost
- Communications Technology
- Fixed Function Obsolescence
- Noninteractivity with installed base of PCs
- Compelling Content on Internet for Home User
- Basic Consumer Demand

Markets

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So, What Does Dataquest Predict?

- ➤ Can Oracle, Apple, IBM, Sun, Netscape, and others be wrong?!
  - Yes. Pick your example.
- ➤ In Sum:
  "I don't get it." and "What's fun about that?"

Network Computer Forecast

- ➤ Hype and publicity levels: Extremely High
- ➤ Actual market growth: Minimal
- ➤ However ... The concept of offering cost-effective access to the Internet with leveraged products has merit.

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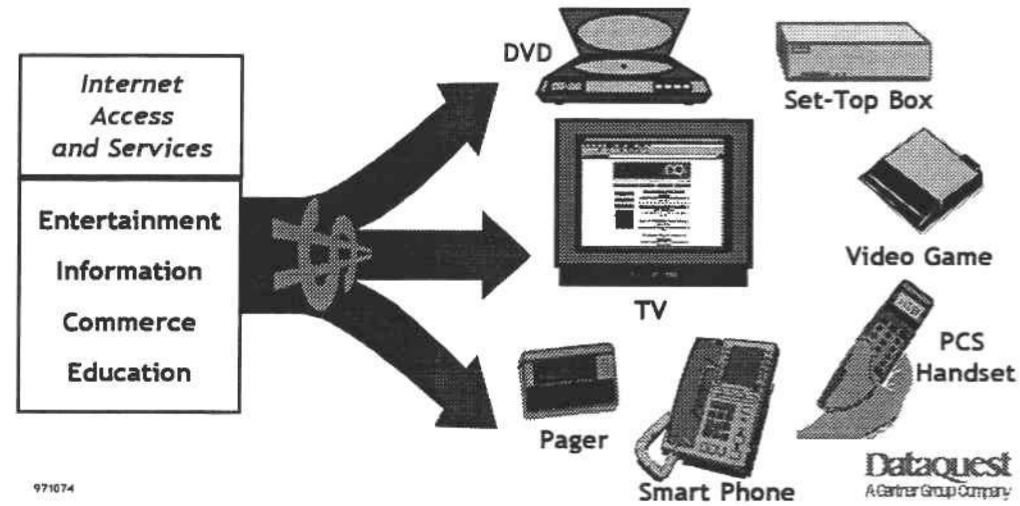
Internet Access Can Offer Enhanced Value and Differentiation in Consumer Electronics



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Imitation: The Most Sincere Form of Flattery

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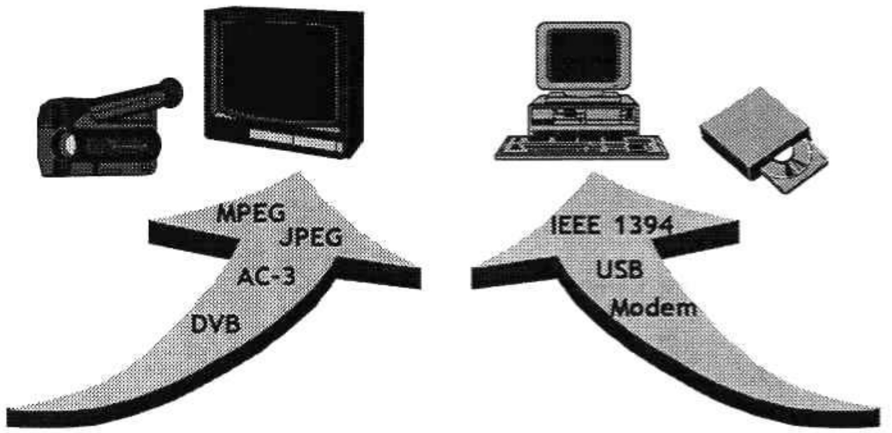
Converging Technologies and Standards Provide Foundation for Leveraged Growth



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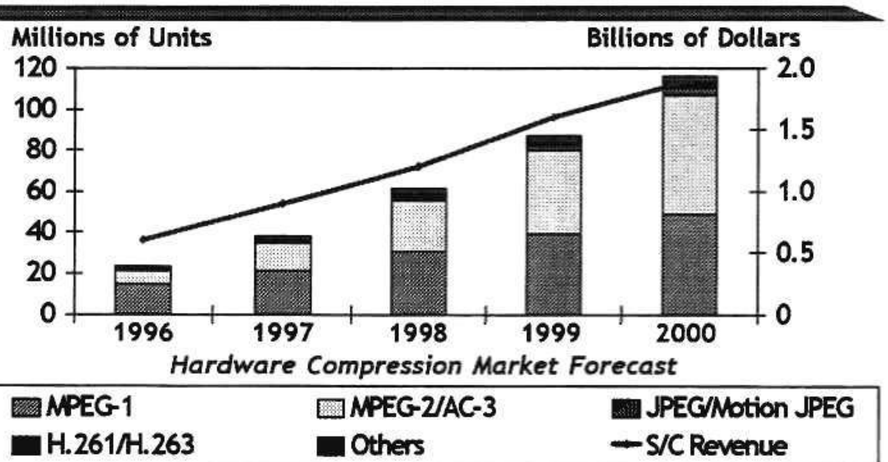
The Expanding Compression Market



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Summary

- Consumers return to the store in Q4/97
- Network computer misses the target
- First-generation Internet products experience trial by fire
- Major consumer players retrench and refocus
- Chip companies deliver strength to second- and third-tier systems players
- Competition heats up among semiconductor players
- A consumer odyssey: Something wonderful is about to happen

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Consumer Electronics: Play Hard or Die Hard

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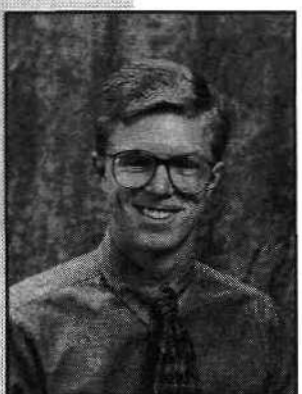
Notes

Killer Chips for the PC

Geoff Ballew

Senior Analyst, Semiconductor Application Markets Group
Semiconductors
Dataquest



Mr. Ballew is a senior analyst in Dataquest's Semiconductor Application Markets group. He is a specialist on the end use or application of semiconductors with the scope of analysis including both technical and economic trends. Mr. Ballew is primarily responsible for the PC Semiconductors and Applications program, which includes research and analysis for semiconductor devices as well as their implementation in personal computers. His areas of specialization include overall semiconductor device and technology trends within the PC market, graphics controllers, audio chipsets, modem chipsets, and memory in PCs.

Mr. Ballew was previously employed by two San Francisco Bay Area start-up manufacturing companies where he was involved in cost modeling, reliability testing, and process development. As an industrial engineer, he was responsible for manufacturing process development as well as cost modeling. Mr. Ballew also worked as a manufacturing and reliability engineer at a company making commercial-grade gyroscopes.

Mr. Ballew earned a B.S. degree in industrial engineering from Stanford University.

Killer Chips for the PC

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Dataquest Predicts

- Multimedia chips will drive PC semiconductor growth
- Survival of the fittest
- Programmable chipsets will gain market share
- Peripheral chipset market will thrive in an MMX-based world

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Agenda

- PC forecast
- PC semiconductor forecast
- Market trends for PC multimedia chipsets
- Competitive environment for PC multimedia chipsets
- Growing emphasis on programmability
- Impact of Intel's MMX on PC semiconductor market
- Convergence

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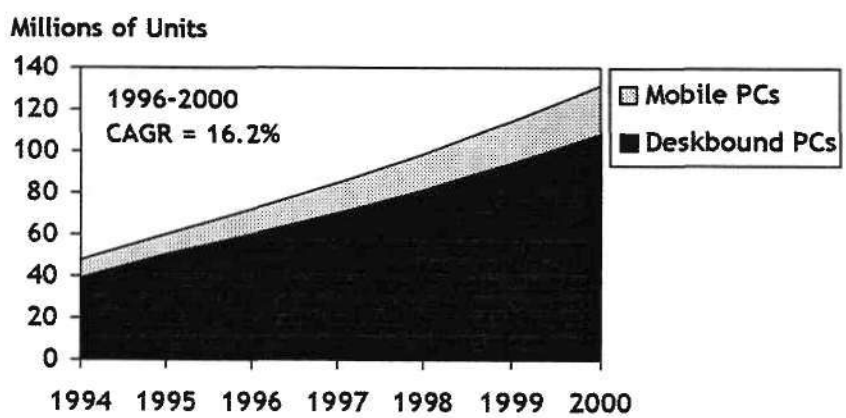
PC Forecast—A Smooth Road to 130 Million Units



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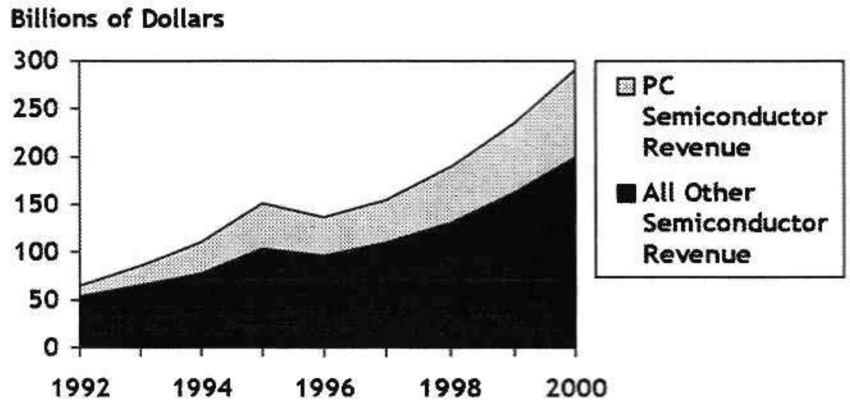
PCs Soak Up Almost One-Third of the Total Semiconductor Market



Source: Dataquest
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What Is the Growth Scenario for PC Semiconductors?

- PC semiconductor revenue will more than double over the next four years
- Market will top $90 billion by 2000
- Over a 22% CAGR for 1996 to 2000
- Drivers
  - Typical PC gets more semiconductor content
  - PC shipments grow at over a 16% CAGR

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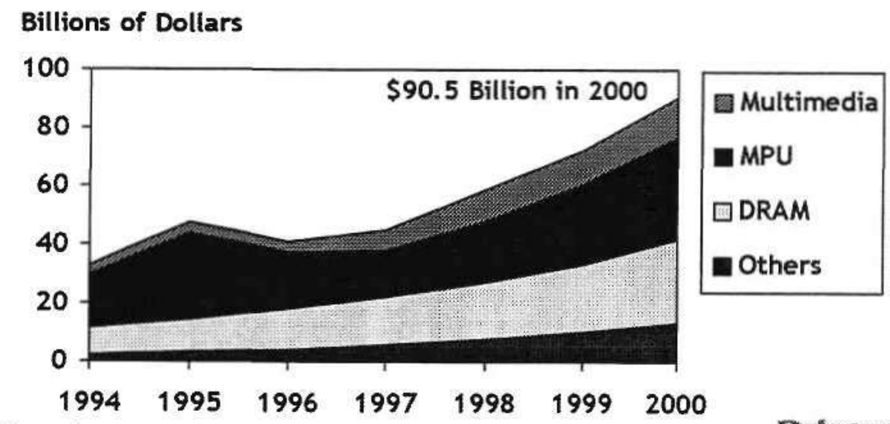
PC Semiconductor Market Forecast



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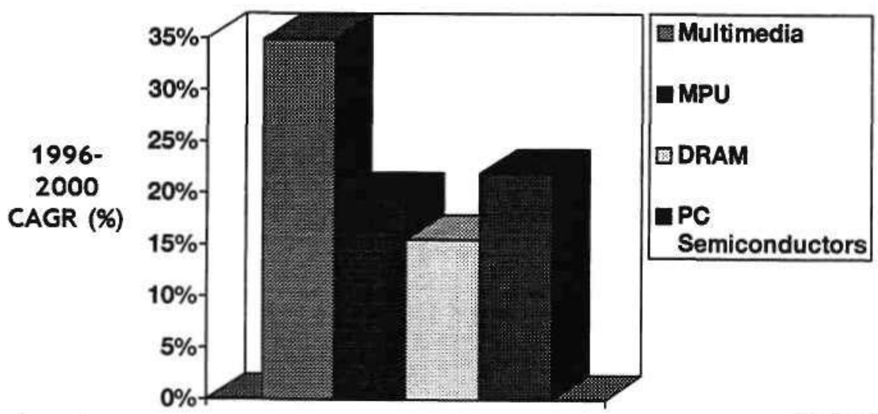
Multimedia Leads PC Semiconductor Revenue Growth



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Key Areas for Growth

- ➤ Visual
  - 3-D graphics, TV features, better digital video
- ➤ Communications
  - 10/100-Mbps Ethernet, 56-Kbps analog modem chips
- ➤ Audio
  - Wave table, codec quality, positional 3-D
- ➤ Input/Output
  - USB (now) and 1394 (later)
- ➤ Others
  - Voltage regulation, DC-to-DC conversion

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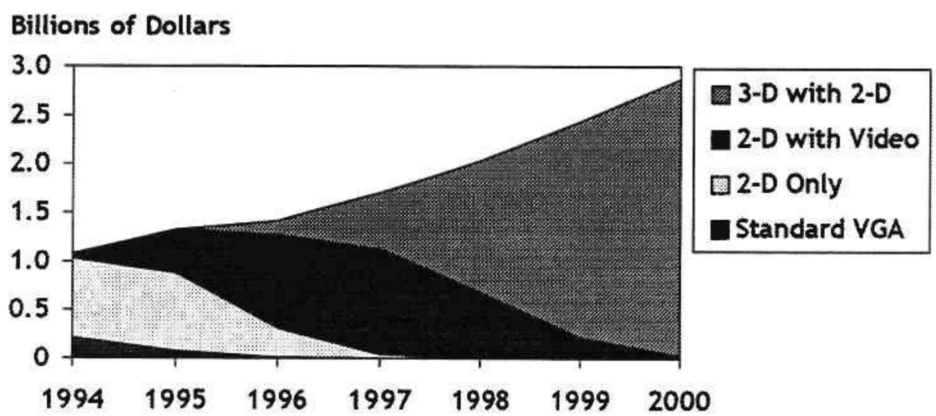
PC Graphics Controller Forecast



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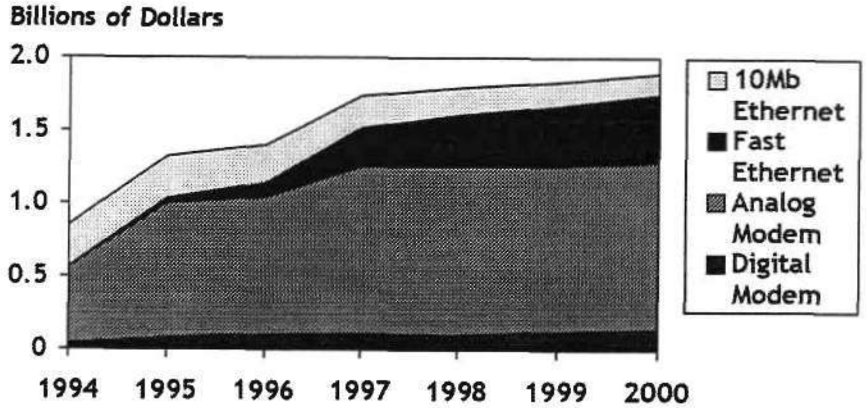
Communications Chip Forecast—Network and Modem



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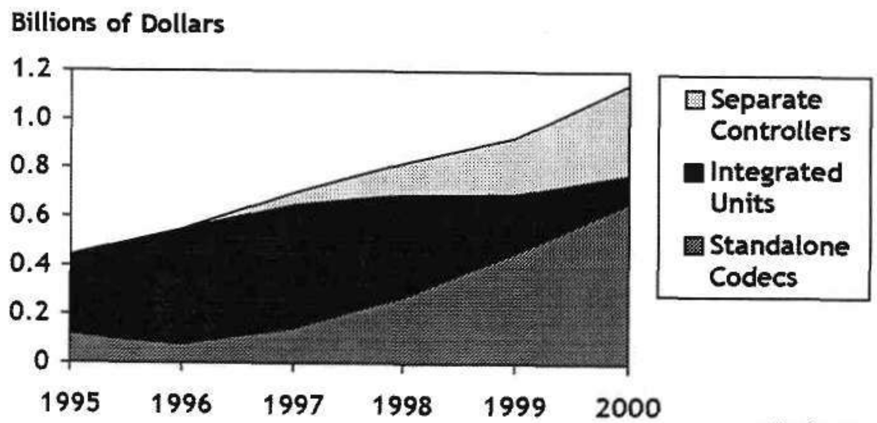
PC Audio Chip Forecast



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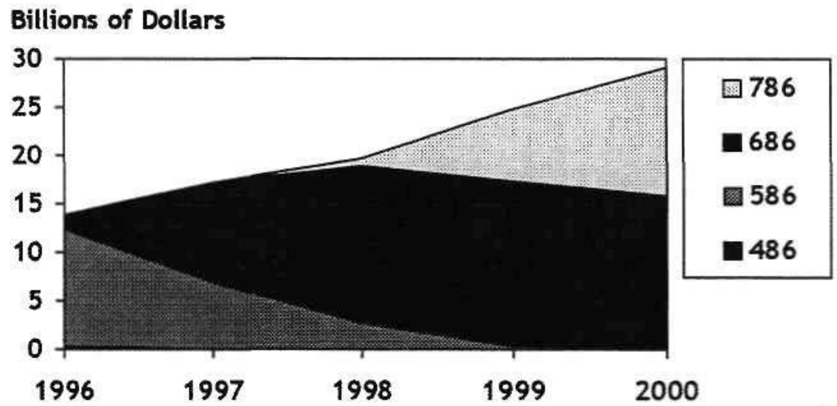
MPU Forecast



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Competitive Environment for Multimedia Chips

- High levels of competition
  - Established players in new segments
  - Many new players entering the market
- Too many suppliers for the market to support
- Consequences
  - Many will withdraw in the 1998 and 1999 time frame
  - Big players will look to consumer/convergence market for new opportunities

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Competitive Environment—Graphics Controllers

- Current market leaders are strong!
  - S3 has momentum and product line depth
  - Trident and ATI are growing
  - Cirrus—execution is key
- Many new competitors!
  - Intel is a wild card; success is not assured
  - Three start-ups to watch: 3Dlabs, Rendition, 3Dfx
- Too few design opportunities for this many suppliers

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Competitive Environment—PC Audio Chips

- The major battle is between Crystal, ESS, and Creative
- S3 is a wild card; VLSI even wilder
- New focus on audio quality
  - Wave table synthesis
  - Codec quality
- Success/failure of AC-97 will affect who wins and who loses
- Watch for integration with modem chips

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Competitive Environment—Analog Modem Chips

- Prestandard 56-Kbps products divided into two camps
  - Rockwell/Lucent (No. 1 and No. 2 in modem chipset business)
  - U.S. Robotics (No. 1 in finished modems)/TI/Cirrus
- U.S. Robotics is a technology supplier as well as a modem supplier
- TI gets a boost from U.S. Robotics' success
- 56-Kbps technology staves off digital modems—for now

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The Increasing Popularity of Programmable Chipsets

- Programmable chipsets will carve out market share
- Defined as "software configurable" to new standards or functions
- Examples
  - Prestandard 56-Kbps modem chipsets
  - Media processors
- Trade-off between flexibility and cost
- Insurance against obsolescence

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Integration Cuts Across Subsystems

- MMX and media processors embody this trend
- Requires programmability
  - Must keep pace with multiple standards
  - Tomorrow's modem with yesterday's audio won't sell
- Benefits
  - Potential for reducing total system cost
  - Better partitioning of digital and analog functions

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Impact of MMX

- Raises the bar for PC multimedia performance
- Greatest impact for low-end PCs
- Won't seriously compete with dedicated graphics chips
- Increases demand for peripheral interface chips
- Most likely to be used for:
  - Controllerless modems
  - Software decompression (MPEG and others)
  - Software wave table audio

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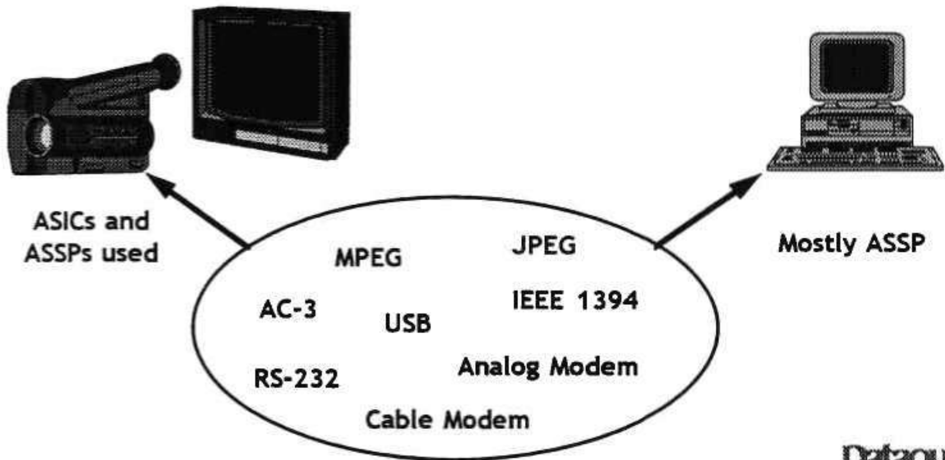
Convergence with Digital Consumer Electronics



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Dataquest Predicts

- Multimedia chips will drive PC semiconductor growth
- Survival of the fittest—many suppliers won't survive!
- Programmable chipsets will gain market share
- Peripheral chipset market will thrive in an MMX-based world

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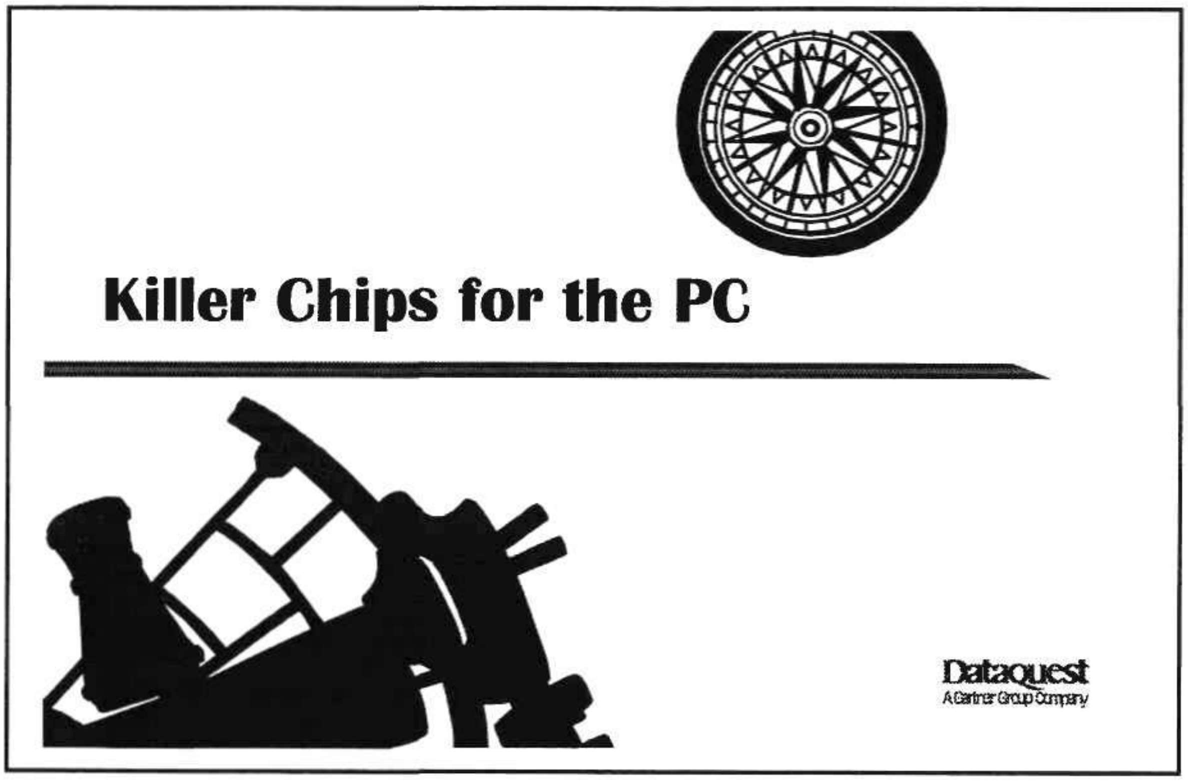
Killer Chips for the PC
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Notes

It's a Wireless World: Digital Cellular Meets Digital Cordless

David Moorhouse

Associate Director and Program Manager
Semiconductor Applications Market Europe
Dataquest

Mr. Moorhouse is an associate director and program manager of Dataquest's Semiconductor Application Markets Europe program, based in Egham, United Kingdom, and has worked in the European Electronics Industry for the past 15 years. Mr. Moorhouse's expertise is in communications, Mil/Aero, industrial, and emerging applications.

Before joining Dataquest, Mr. Moorhouse was a senior consultant with the design house ID Devices, with responsibilities for product developments in fiber-optic communications and speech synthesis systems. His previous marketing experience was gained at STC (Standard Telephones and Cables) Hybrids division as product marketing manager and applications manager. Before STC, Mr. Moorhouse worked for GEC Avionics as a designer in high-speed serial data bus systems used in military and civil aircraft.

Mr. Moorhouse is a graduate from Salford University with a degree in electronics.

Agenda

- ➤ Introduction
- ➤ Cellular telephone market
- ➤ Cordless telephone market
- ➤ Multimode and multiband cellular
- ➤ Third-generation cellular
- ➤ Summary/conclusion

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Agenda

- ➤ Introduction
- ➤ Cellular telephone market
  - Markets by standard
  - Digital cellular
  - Regional markets
  - Cellular semiconductor market
- ➤ Cordless telephone market
- ➤ Multimode and multiband cellular
- ➤ Third-generation cellular
- ➤ Summary/conclusion

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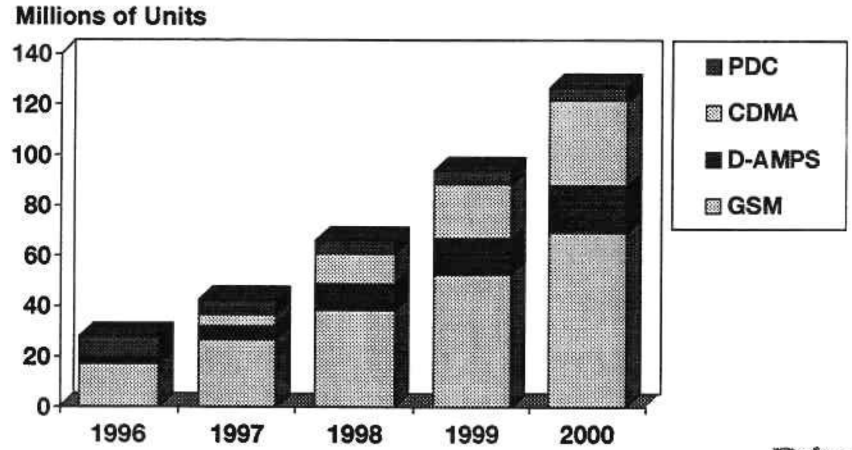
Worldwide Digital Cellular by Standard



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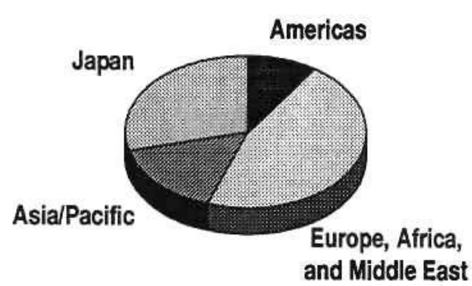
Regional Markets for Digital Cellular

- 1996—Europe major market
  - GSM900/DCS1800
- U.S. market small, growing fast
  - TDMA now
  - CDMA growing very fast
- Asia/Pacific biggest market by 2000



1996 Total = 28 Million Units

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Digital Cellular OEMs and Production

- ➤ Europe major production region, 1996 to 2000
- ➤ Trend regional production for regional markets
  - Nokia—Finland, Germany, United States, Korea
  - Motorola—United States, United Kingdom, Germany, Malaysia
  - Ericsson—Sweden, United Kingdom, United States, Hong Kong
- ➤ Dominated by a small number of players
  - Nokia, Motorola, Ericsson
  - Nokia now No.1 in digital cellular
  - Nokia expected soon to bypass Motorola in all cellular

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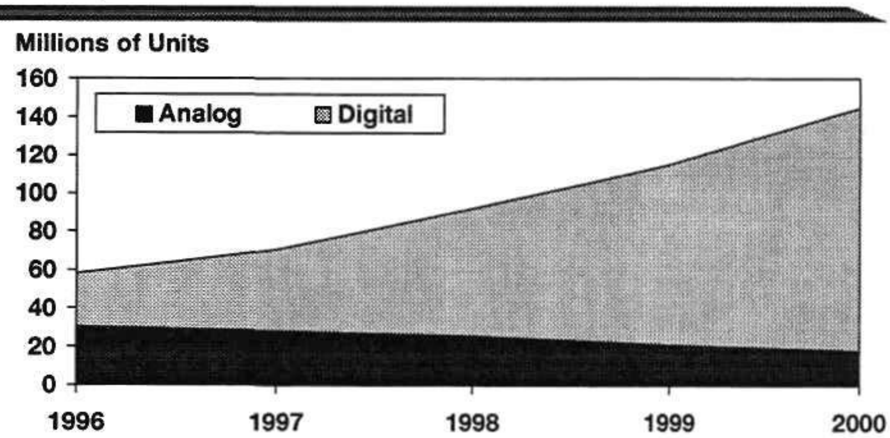
Analog versus Digital Cellular Market



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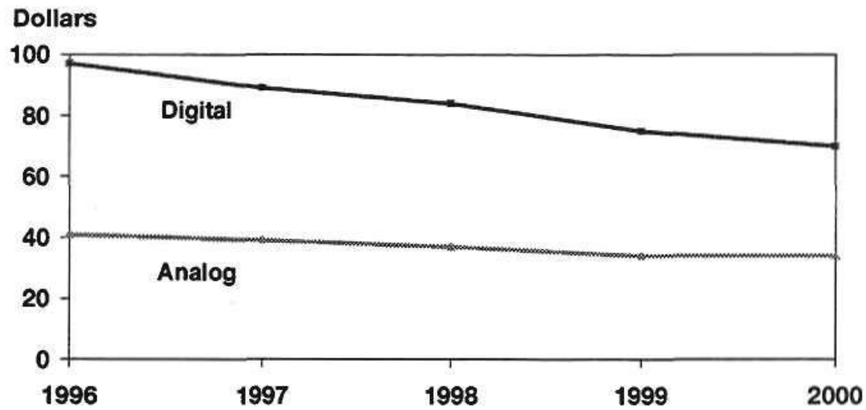
Analog and Digital Cellular Handset Semiconductor Content



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Trends in Digital Cellular

		1996	1998
Lower-Voltage Technology	5V	3V	1.8V
More Memory (Flash)	4M	8M	16M
Technology (Microns)	0.35	0.25	0.18

Market will segment
budget, consumer, executive, and super executive

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Major Cellular Semiconductor Vendors

- Baseband ASIC/ASSP
  - Texas Instruments
  - VLSI Technology
  - NEC
  - Motorola
  - SGS-Thomson
  - Qualcomm
- Baseband chipsets
  - VLSI Technology
  - Lucent Technologies
  - Analog Devices
  - Siemens
  - Philips
  - Asahi Kasei
  - CommQuest
  - GPS
  - Oki

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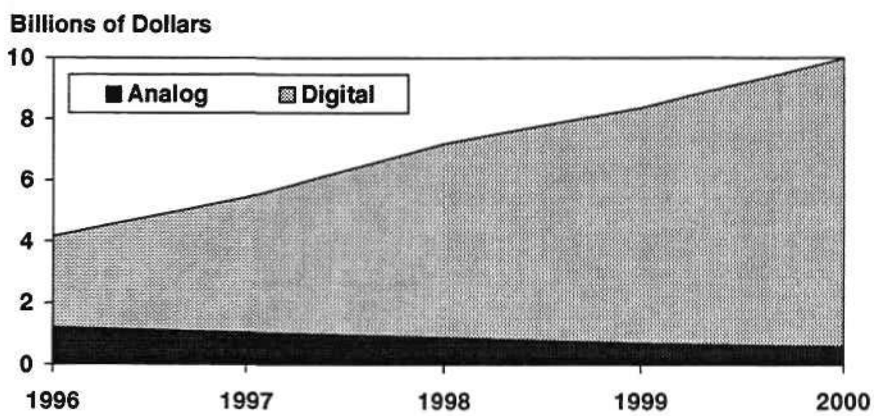
Analog and Digital Cellular Handset Semiconductor Market



Source: Dataquest
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Agenda

- ➤ Introduction
- ➤ Cellular telephone market
- ➤ Cordless telephone market
  - Digital cordless market
  - Cordless production by region
  - Cordless semiconductor market
- ➤ Multimode and multiband cellular
- ➤ Third-generation cellular
- ➤ Summary/conclusion

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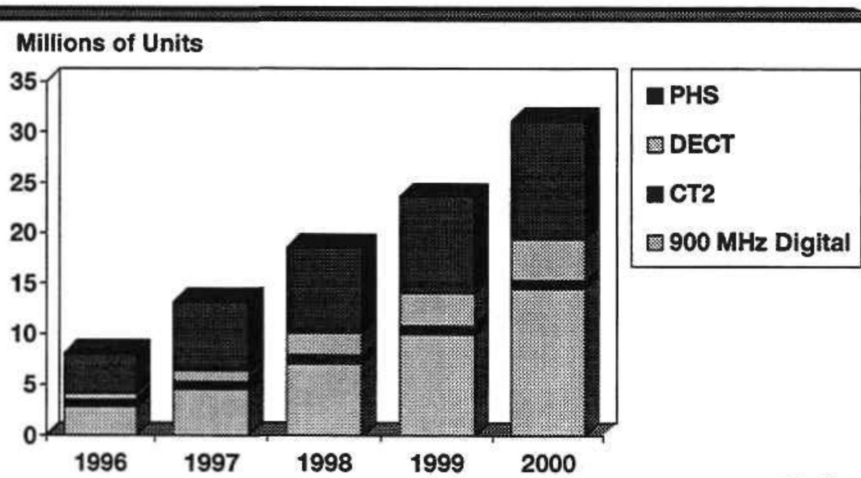
Worldwide Digital Cordless by Standard



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Digital Cordless Production Trends

- Phenomenal success of PHS
  - Japan largest producing region 1996 to 2000
  - Some production will move in to Asia/Pacific 1999/2000
- European DECT growing very fast now
  - Attacking markets outside Europe
  - Wireless PBX and residential are drivers
- Digital cordless technology finding new markets
  - Cordless fax, wireless LAN, wireless local loop

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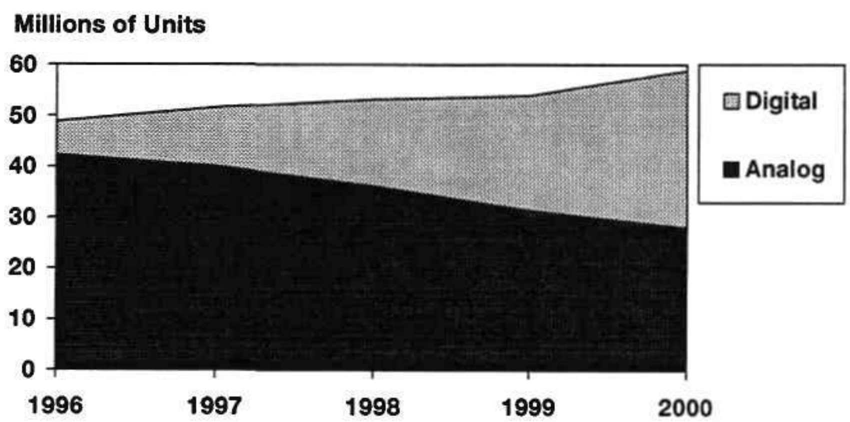
Analog versus Digital Cordless Market



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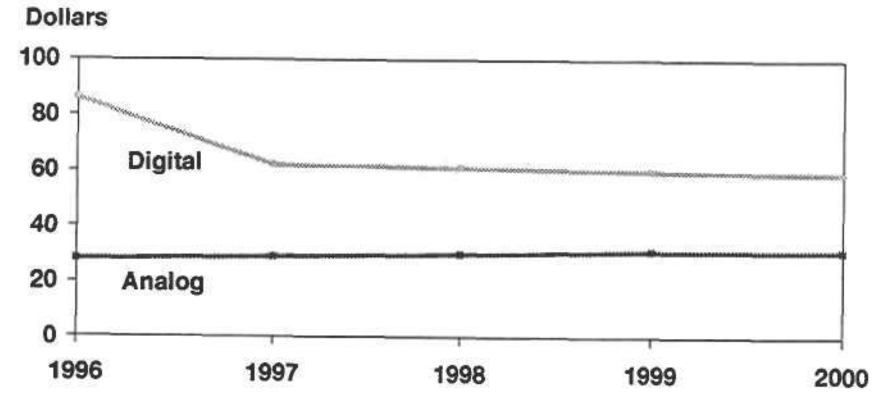
Analog and Digital Cordless Semiconductor Content



Source: Dataquest
971179

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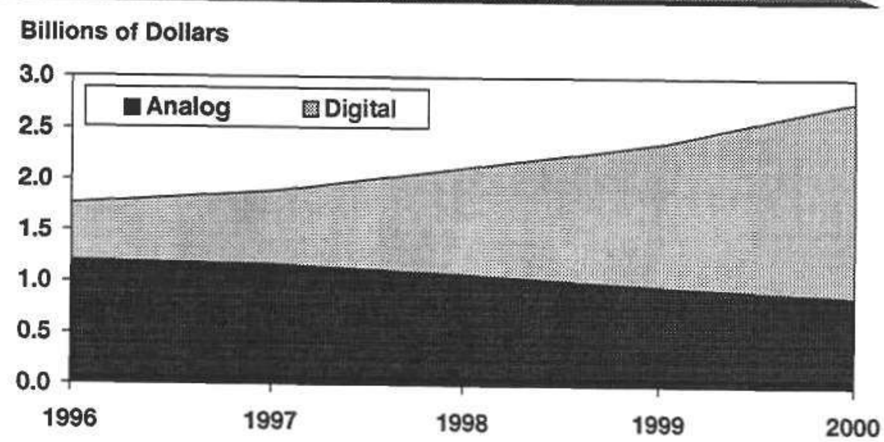
Analog and Digital Cordless Semiconductor Market



Source: Dataquest
971180

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Summary

- Analog cellular market declining slowly
- Digital cellular market growing fast
- GSM digital cellular major standard
- TDMA (IS54) and CDMA (IS95) growing rapidly
- Digital cordless taking off
- Digital cordless market exploding in Japan
- Digital cellular semiconductor market $10 billion by 2000

971181

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A Gartner Group Company

Agenda

- Introduction
- Cellular telephone market
- Cordless telephone market
- Multimode and multiband cellular
- Third-generation cellular
- Summary/conclusion

971182

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Current Technology Status

- Analog cellular—voice
- Digital cellular—voice and low data rates
- Digital cordless—improved range and speech quality
  - In building
  - Pedestrian roaming—telepoint
  - Wireless in the local loop (WLL)
- Wireless LANs (WLAN)—data rates around 1 Mbps
- Paging—low data rates, wide area
- Digital satellite handheld terminals—global coverage

971183

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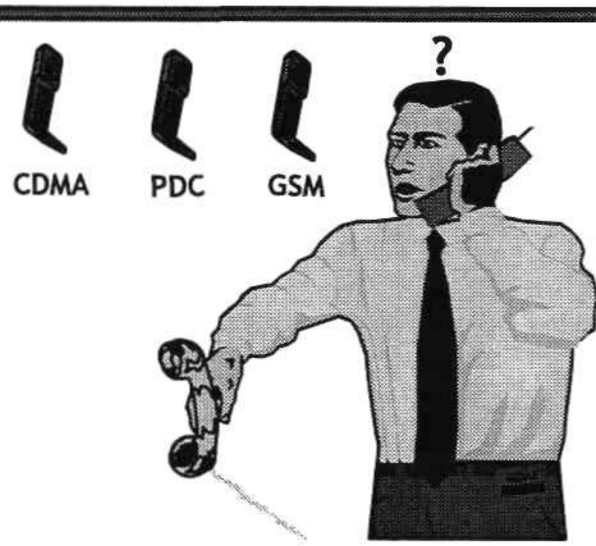
Communications Terminal Overload



971184

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Multiband and Multimode Cellular

- Multiband—Same transmission technique at multiple bands (frequencies)
  - Examples: combination of GSM 900, DCS 1800, PCS 1900
    - —GSM 900/DCS 1800
- Multimode—Differing protocol or transmission
  - Examples: combination of PDC, CDMA, PHS
    - —PDC/CDMA
    - —PDC/PHS

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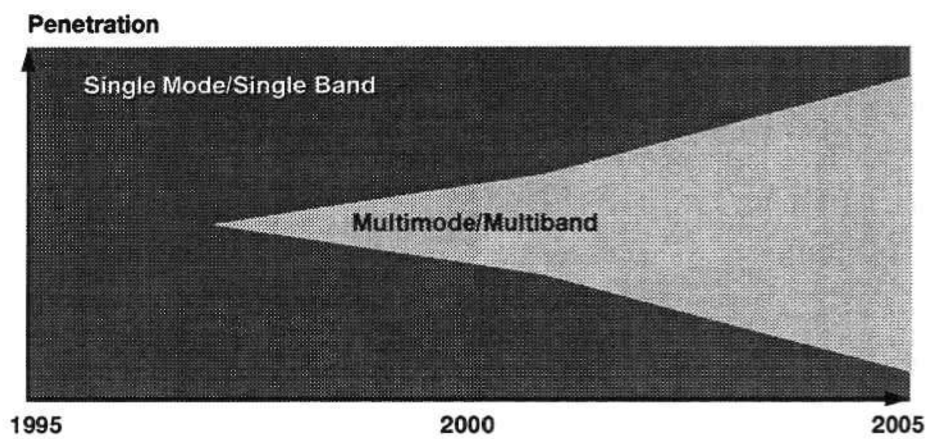
Multiband and Multimode Introduction



971186

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Agenda

- Introduction
- Cellular telephone market
- Cordless telephone market
- Multimode and multiband cellular
- Third-generation cellular
- Summary/conclusion

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Third-Generation Cellular

- First-generation cellular—analog (AMPS, TACS, NMT)
- Second-generation cellular—digital (GSM, CDMA, PDC)
- Third-generation cellular—digital (UMTS/FPLMTS)
  - UMTS—Universal Mobile Telecommunications System
  - FPLMTS—Future Public Land Mobile Telephone System

971168

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What Is UMTS/FPLMTS?

"UMTS is a set of services which we cannot imagine today with a technology that does not yet exist for users' needs which we do not know"

— Juha Rapeli (Nokia), Chairman, ETSI SMG5

971189

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UMTS/FPLMTS Telecomm Requirements

- Voice, data, and multimedia (video and graphics)
- Quality and services same as fixed lines
- Data rates up to 2 Mbps in micro and pico cellular areas
- Compatibility with ISDN, B-ISDN, and ATM
- Migration path from second-generation cellular

971190

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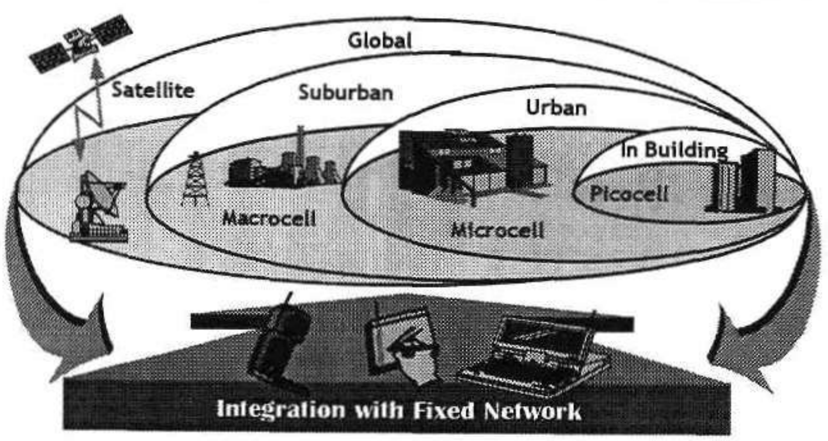
The UMTS/FPLMTS Environment



971191

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UMTS/FPLMTS Telecomms Environments

- Public mobile network
- Cordless set for domestic use
- Wireless PBX
- Wireless LAN
- Wireless local loop
- Cordless terminal mobility
- Private mobile radio
- Satellite system
- Mobile data network
- Paging network

971192

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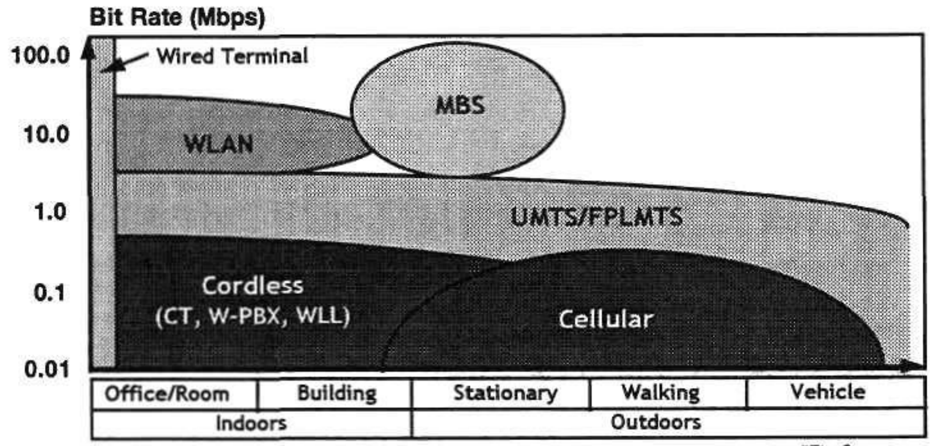
UMTS/FPLMTS Bit Rate versus Mobility



971193

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How Will UMTS/FPLMTS Requirements Be Achieved?

- Using intelligent networks (IN)
- Variable data rates on demand
- Provide asymmetric bit rates
- Adaptive baseband, coding, and radio interfaces
- Packet-switched and circuit-switched transmission
- Reassignable spectrum—per application/traffic
- Spectrum in the 2 GHz

971194

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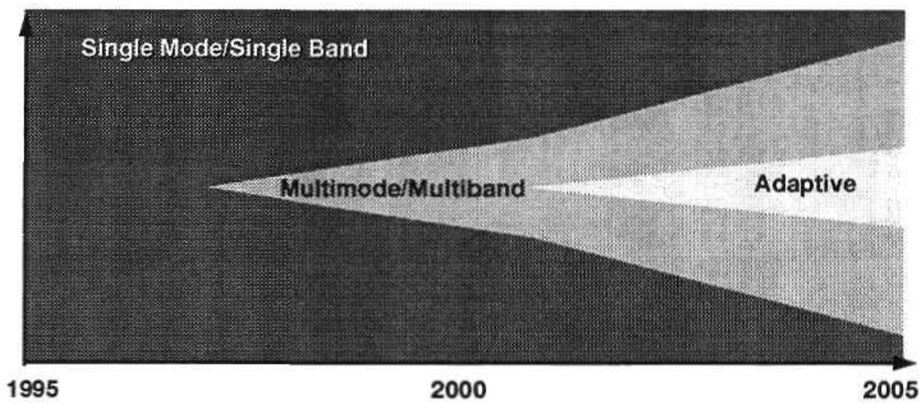
Multiband and Multimode Introduction



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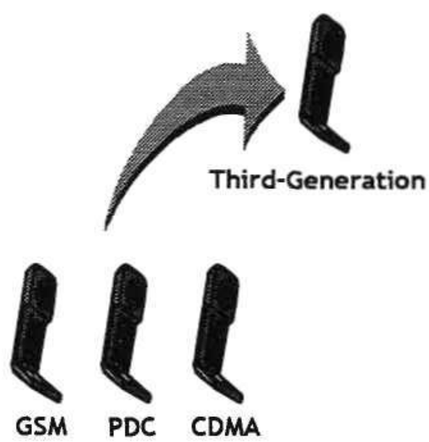
Third-Generation Cellular Summary



Adaptive
- Transmission—CDMA, A-TDMA
- Frequency 900 MHz to 2.5 GHz
- Bit rates
- Asymmetric data rates
- Downloadable algorithms

971196

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Agenda

- Introduction
- Cellular telephone market
- Cordless telephone market
- Multimode and multiband cellular
- Third-generation cellular—UMTS/FPLMTS
- Summary/conclusion

971197

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Dataquest Predicts

- Analog cellular in decline, still big market
- Digital cellular growing rapidly
- 1997 digital cellular market larger than analog
- 2000 cellular semiconductor market $10 billion
- Cordless telephone in changeover to digital technology
- The next phase, generation 2+, multiband, and multimode
- Third-generation cellular—ubiquitous wireless communications
- Very high cost of development—10x second generation

971198

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Conclusions

- Development of multimode/multiband, cellular/cordless
  - New developments/challenges to semiconductor industry
  - Reduce cellular semiconductor content decline
- Third-generation cellular, huge semiconductor market
  - New market 2002 to 2025
  - Much higher levels of cellular penetration

971199

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Notes

Semiconductor Capacity: From Shortage to Glut, What's Next?

Ron Dornseif

Principal Analyst
Semiconductor Equipment, Manufacturing, and Materials Worldwide
Semiconductors Group
Dataquest

Mr. Dornseif is a principal analyst for Dataquest's Semiconductor Equipment, Manufacturing, and Materials program in the Semiconductors group. Mr. Dornseif is responsible for research and analysis of semiconductor equipment and trends in IC manufacturing techniques.

Mr. Dornseif has more than 20 years of management and engineering accomplishment in the semiconductor industry with Intel Corporation, Genus Inc., and Watkins-Johnson Company's Semiconductor Equipment Group. His experience includes positions in product development, quality and reliability, operations, marketing, and strategic business development.

Mr. Dornseif holds a B.S. degree (with high honors) and an M.S. degree in electrical engineering from the University of Illinois, and an M.B.A. from Santa Clara University. Before redirecting his education toward a business focus, he had also completed Ph.D. directed study in electrical engineering at Stanford University under its industry Honors Cooperative Program.

Agenda

- ➤ Semiconductor drivers and forecast
- ➤ Capital spending
  - 1996 spending
  - 1997 to 1998: Issues to be reconciled
  - Forecast
- ➤ Wafer fab equipment
  - 1996 results
  - Forecast
- ➤ Dataquest predicts

970931

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Market Summary

- ➤ Steady growth in end-use demand for 1997-2000
- ➤ High-growth areas:
  - Sustainable PC unit growth
  - Mobile communications
  - High-speed connectivity
  - Digital entertainment
- ➤ 1996: Inventories, DRAM price cycle, slower demand
- ➤ Chip market recovery starting Q4/1996
- ➤ DRAM and foundry pricing pressures continue in 1997

970932

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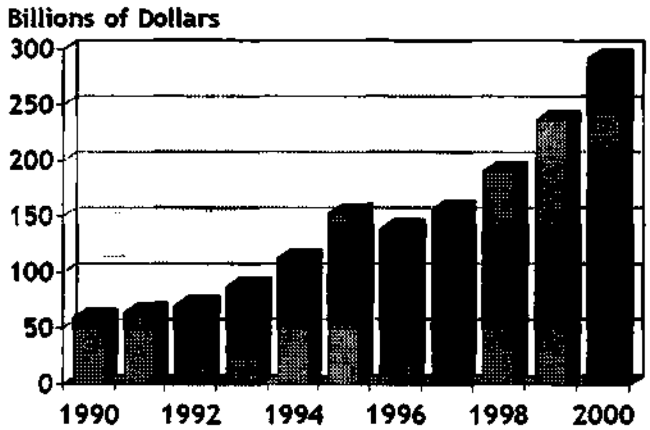
Worldwide Semiconductor Consumption Forecast



- Electronic equipment
  1995: $790 billion
  2000: $1,202 billion
- Semiconductor
  1995: $151 billion
  2000: $290 billion
- Wafer fab equipment
  1995: $19.0 billion
  2000: $33.5 billion

Source: Dataquest
970933

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Semiconductor Production Trends

- Americas: PC and ASIC driven
  - Foreign companies coming to the customer
- Japan: DRAM primary driver
  - Production shifting to other regions
- Europe: PC and telecommunications driven
  - Attracting fabs and foundries
- Asia/Pacific: DRAM and foundry production
  - Government-sponsored industrialization
  - Bringing manufacturing prowess to bear

970934

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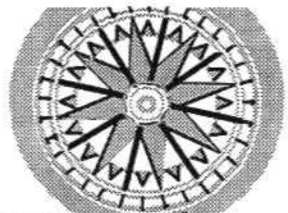

Capital Spending Forecast and Implications

Dataquest

1996 Capital Spending Overview

- ➤ Worldwide fab equipment
  - 12% to 13% growth, 1995 to 1996
  - Driven by 1995 momentum
- ➤ Few companies continued investment
  - Advanced foundry
  - IBM, Siemens, Texas Instruments
  - Korean growth in moderation
- ➤ DRAM companies cutting budgets
- ➤ Foundry companies pulling back

970936

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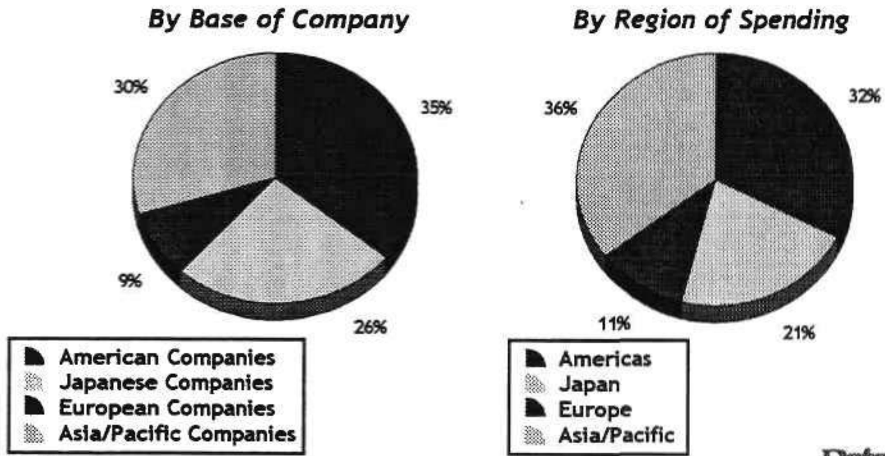
1996 Capital Spending Results: $43.7 Billion, Up 13.8%



Source: Dataquest
970937

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Top 10 Capital Spenders in 1996

1996 Rank	1995 Rank		Projected 1996 Spending ($M)	Percentage Change
1	1	Intel	3,400	-4
2	3	LG Semicon	2,748	22
3	12	Texas Instruments	2,300	113
4	5	Samsung	2,248	16
5	9	Hyundai	2,124	42
6	4	NEC	1,809	-10
7	10	IBM Microelectronics	1,550	35
8	16	Siemens AG	1,450	71
9	6	Toshiba	1,438	-12
10	14	Micron Technology	1,400	46

Source: Dataquest
970938

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Trends and Implications

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Impact of DRAMs

- DRAM increasing percentage of semiconductors
  - High single-digit percentage in early 1980s
  - Mid-20s percentage today
- Supplier dependence on DRAM revenue
- DRAM capacity: root cause of cycles
- Forecasts are more DRAM driven

970940

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Issues to Reconcile in 1997 to 1998

- Rate of capital expansion not fully corrected
  - Number of fabs coming on line too high
  - Capital spending ratio too high in 1997
  - Expect more cancellations and delays
- Silicon efficiency in DRAM
  - Bit demand up, wafer starts declining
  - Overcapacity through mid-1998
- Existing capacity redirected
  - Equivalent of 40 fabs prohibit recovery in 1997
- Capacity buys needed for sustainable recovery

970941

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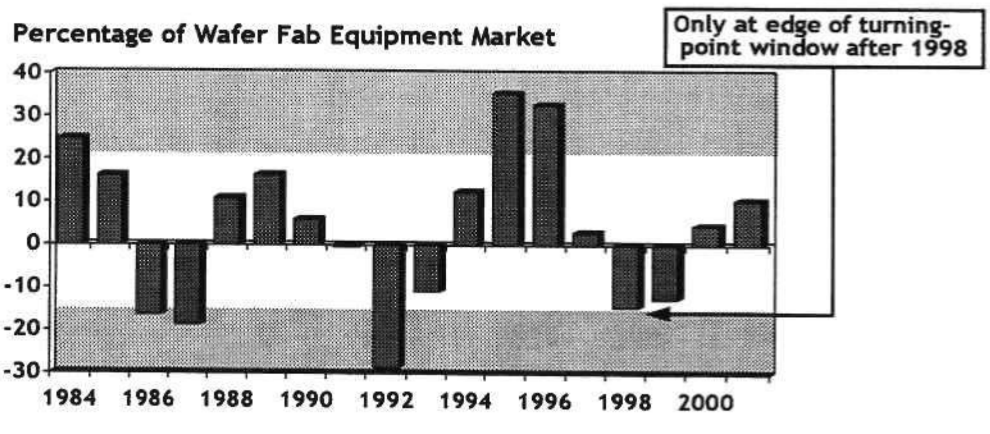
Net Cumulative Investment as a Percentage of Equipment Market



Source: Dataquest
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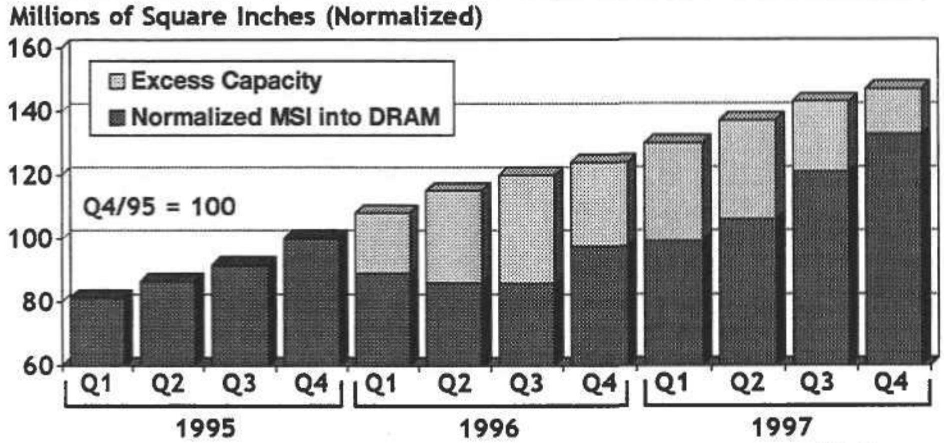
Silicon Consumption Efficiency in DRAM Driving a Real Decline!



Source: Dataquest
970943

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Chipmaker's Capital Spending Forecast

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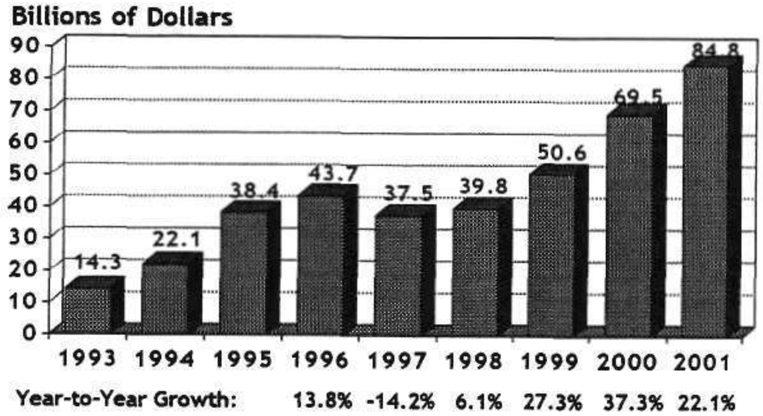
Capital Spending Forecast: Two-Year Pause for Equipment Suppliers



Source: Dataquest
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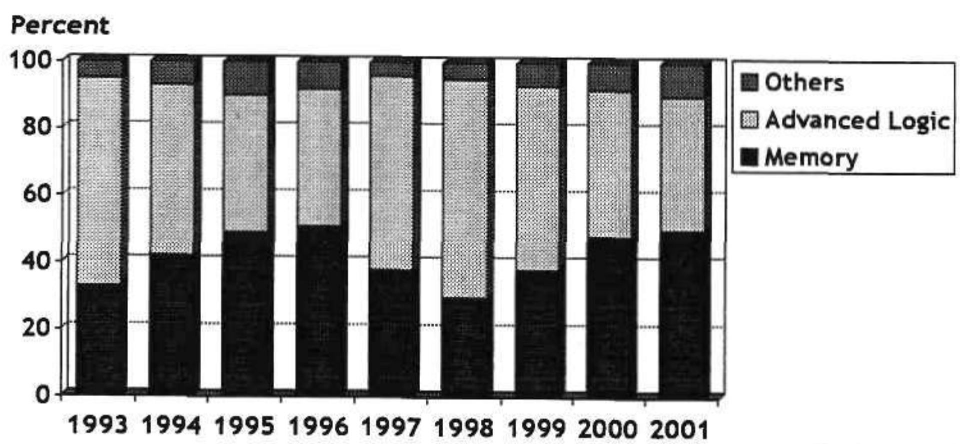
Capital Spending Mix: Near-Term Shift to Logic



Source: Dataquest
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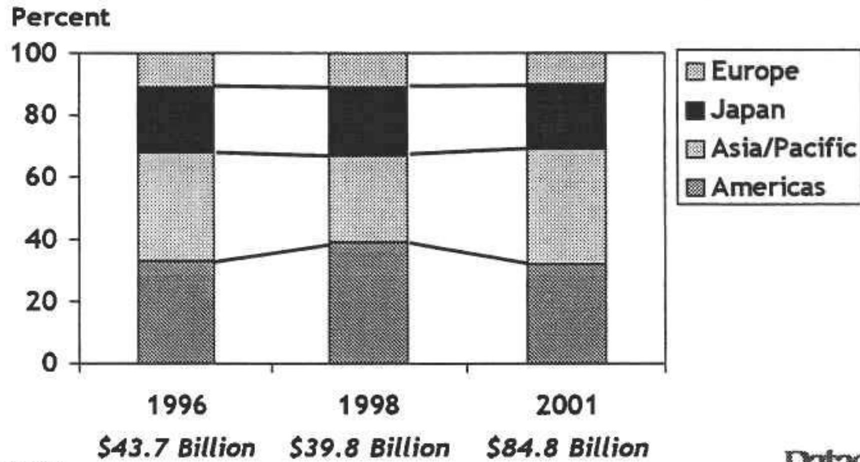
Capital Spending Near Term Favors United States



Source: Dataquest
970947

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DRAM Maker Strategies

- Old 4M DRAM capacity (0.6-0.8 micron)
  - Redirect to lagging technology
  - Move to MCU, mainstream analog, mixed signal
- Idle 16M DRAM capacity (0.4-0.5 micron)
  - Move to flash, commodity SRAM
  - Move to >0.5-micron foundry market
  - Upgrade for advanced logic, fast SRAM
  - Upgrade 16M DRAM to 200mm
- 1997-1998 an upgrade market versus new capacity

Source: Dataquest
970948

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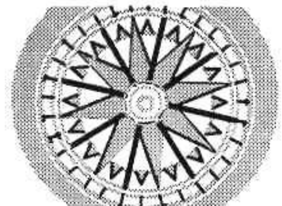

Wafer Fab Equipment Market 1996 Results

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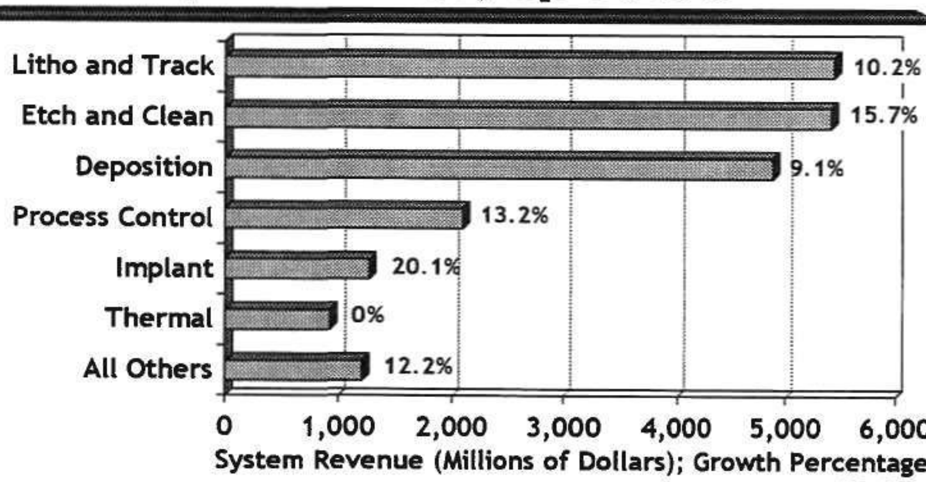
Wafer Fab Equipment Market 1996—$21.2 Billion, Up 11.8%



Source: Dataquest
970950

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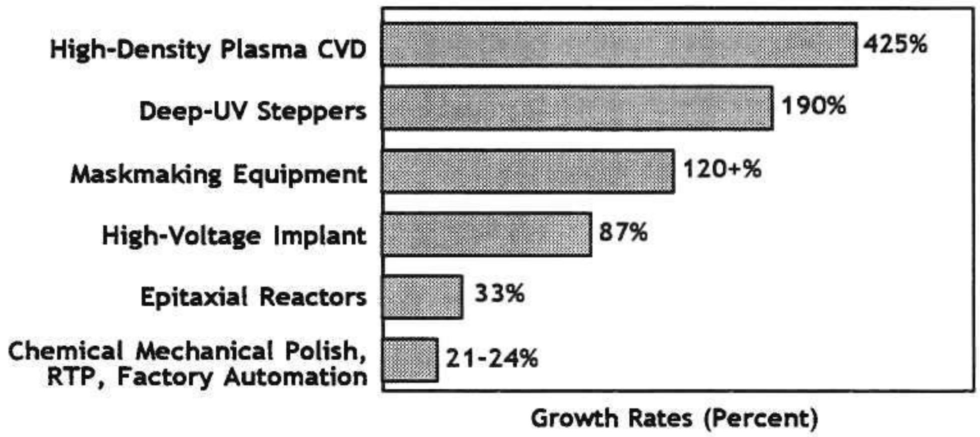
Fast-Growing Segments in 1996: Start of Technology Investment



Source: Dataquest
970951

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Top Beneficiaries of 1996 Capital Spending

1996 Rank	1995 Rank		Projected 1996 Revenue ($M)	Percentage Change
1	1	Applied Materials	3,425	18
2	2	Tokyo Electron Ltd.	2,160	3
3	3	Nikon	1,725	3
4	5	Lam Research	1,090	21
5	4	Canon	990	1
6	10	ASM Lithography	720	44
7	6	Hitachi	680	6
8	7	Dainippon Screen	610	12
9	12	KLA Instruments	595	29
10	8	Varian	565	6
(Tie)	11	Silicon Valley Group	565	15
(Tie)	13	Eaton + SEN	565	31

Source: Dataquest
970952

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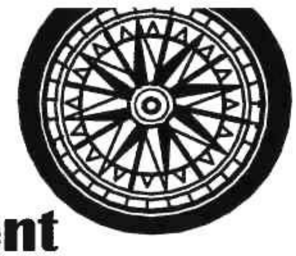
A Gartner Group Company



Wafer Fab Equipment Market Forecast

Dataquest
A Gartner Group Company

Dataquest Predicts

- DRAM equipment investment cut by 30%
- Asia/Pacific, Japan equipment spending hit hardest
- Mainstream logic slow due to foundry overbuilding
- Advanced logic spending recovers first
- "Strategic" investments continue, soften decline
- Technology buys continue
- Equipment backlogs to critical levels by midyear

970954

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A Gartner Group Company

Dataquest Predicts— Hot Equipment Segments

- Deep-UV lithography
  - Critical sub-0.3-micron levels
- Chemical mechanical polishing
  - Planarization, damascene process
- High-voltage implant
  - Lateral isolation, buried layers
- Rapid thermal processing
  - High interest with move to 300mm wafers
- Epitaxial reactors
  - High reliability in flash and logic; DRAM use?

970955

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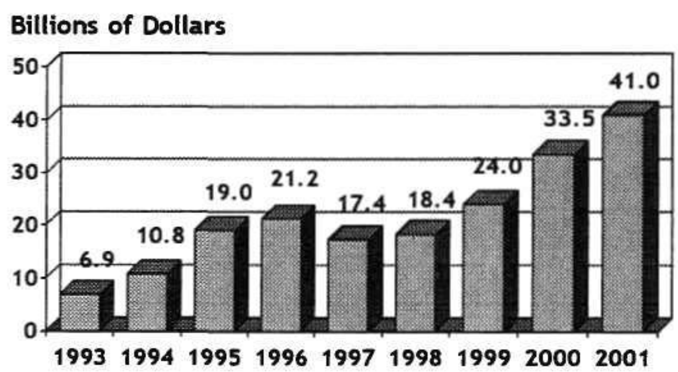
Wafer Fab Equipment Long-Term Forecast



Year-to-Year Growth: 11.8% -17.9% 5.4% 30.4% 39.6% 22.4%

Source: Dataquest
970956

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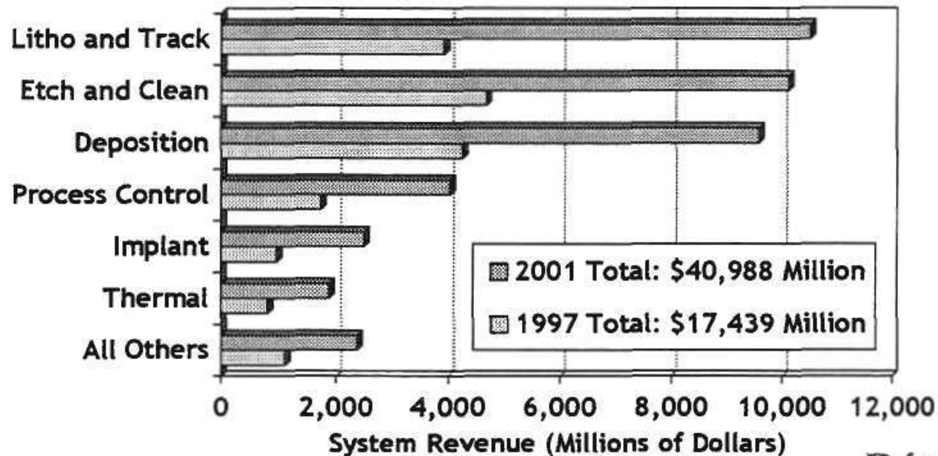
Equipment Segment Forecast
CAGR 1996 to 2001 +14%



Source: Dataquest
970957

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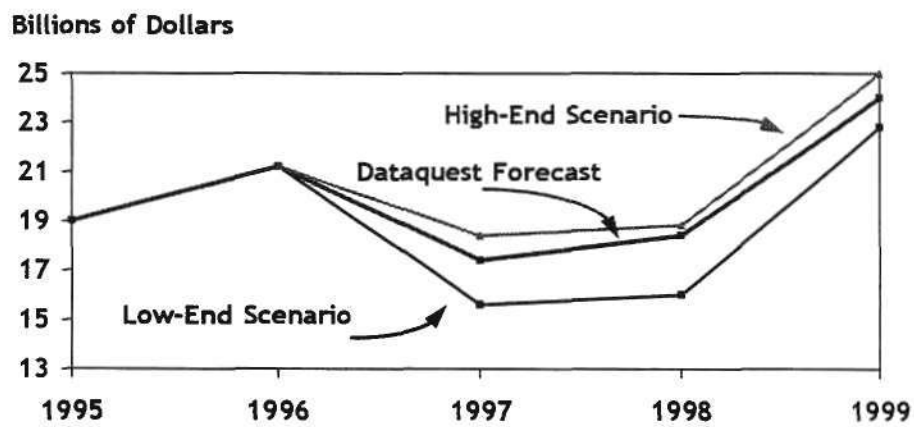
Wafer Fab Equipment Forecast: Downside Risk



Source: Dataquest
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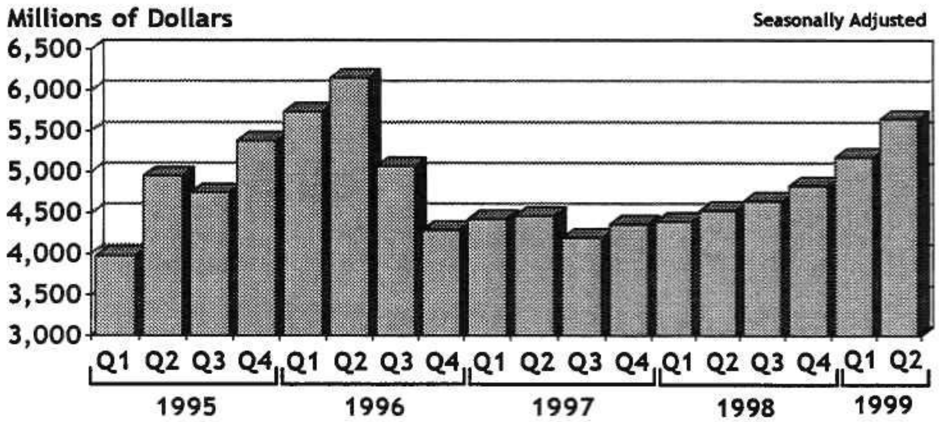
Wafer Fab Equipment
Quarterly Revenue Forecast



Source: Dataquest
970959

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Wafer Fab Equipment
Forecast Summary

- 1995: peak growth year—up 76%
- 1996: a transition growth year—up 12%
  - Substantial backlogs beginning year
  - Bookings drop H2/96
  - Backlogs shipped down to "normal"
- 1997-1998: two "pause" years
  - DRAM capacity migration
  - Toughest year—down 17.9%
  - Recovery: muted in 1998; upgrades, some capacity
- Accelerated growth resumes 1999 with DRAM buys

970960

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Dataquest Predicts Summary

- Electronic demand healthy
- Semiconductors return to growth in 1997—up 13%
- Fab capacity glut causes two-year equipment pause
- 1997 a tough year—fab equipment down 18%
- Sustainable equipment growth returns >Q2/98
- Equipment CEOs will:
  - Adjust for pause and protect backlog
  - Position technology and products for recovery

970961

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A Gartner Group Company

Notes

Semiconductor Outlook toward 2000

Gene Norrett

Corporate Vice President and Director
Semiconductors Group
Dataquest

Mr. Norrett is corporate vice president and director of Dataquest's Semiconductors group and is responsible for all worldwide semiconductor research, including Asia/Pacific-, Europe-, and Japan-based semiconductor research. Before this, he was director of marketing, responsible for the worldwide marketing strategies. Previously he was general manager for all North American technology services. Mr. Norrett was also the founder of Dataquest's Japanese Semiconductor Industry Service.

Before joining Dataquest, Mr. Norrett spent 14 years with Motorola's semiconductor product sector, serving in various marketing and management positions. Mr. Norrett was also a founder of the World Semiconductor Trade Statistics Program and was chairman of the Board of Directors of the Statistics Committee. He speaks frequently at Client Industry and Trade Association conferences. In 1987 he was voted by the *San Jose Mercury News* as one of Silicon Valley's top 100 influential people.

Mr. Norrett's education includes a B.S. degree in mathematics from Temple University and an M.S. degree in applied statistics from Villanova University.

Agenda

- Electronic equipment production forecast
- The big three chip drivers
- Semiconductor market status
- Semiconductor forecast
- Summary

970817

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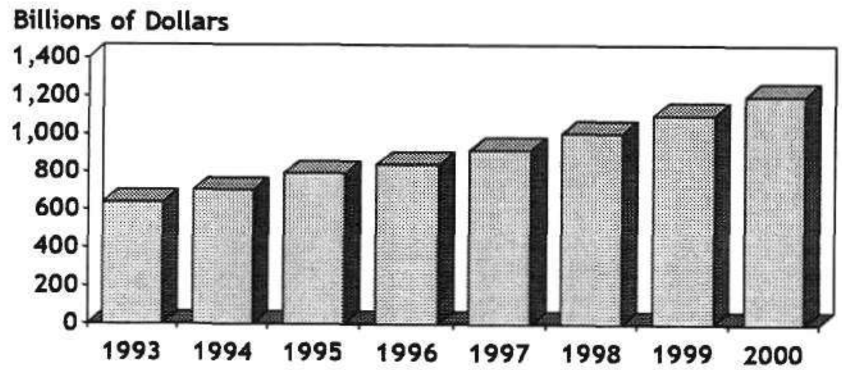
Worldwide Electronic Equipment Production

Dataquest

Worldwide Electronic Equipment Production



Source: Dataquest
970819

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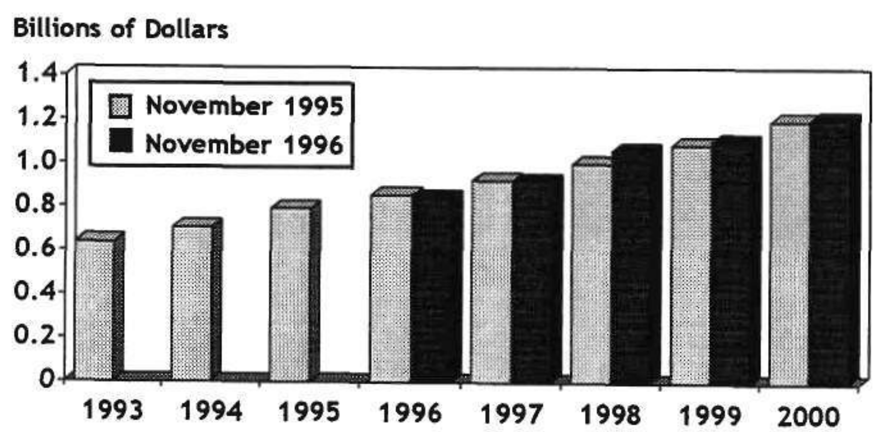
Worldwide Electronic Equipment Production—Forecasts Compared



Source: Dataquest
970820

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The Big Three Chip Drivers

- PCs
- Communications
  - Wireless (mobile)
  - Wired (LAN, WAN, public telecom)
- Digital consumer

970821

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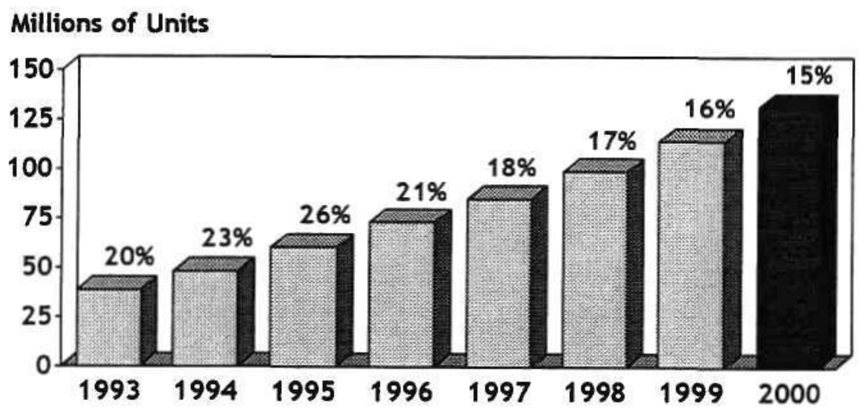
A Gartner Group Company

Worldwide PC Forecast



Source: Dataquest
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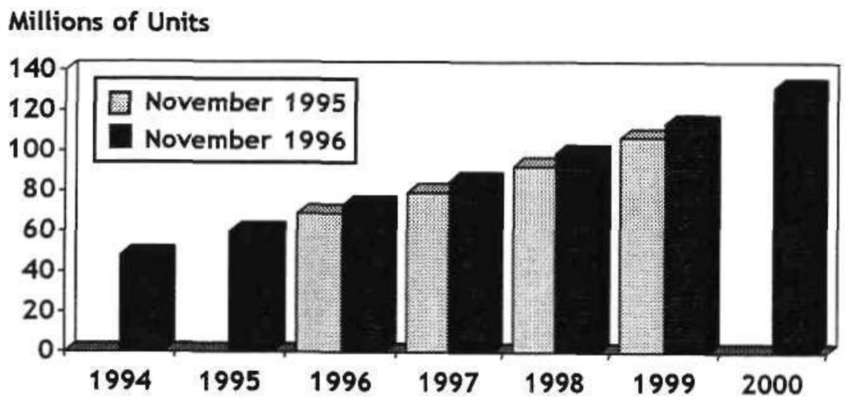
Worldwide PC Forecast—Forecast Comparison



Source: Dataquest
970823

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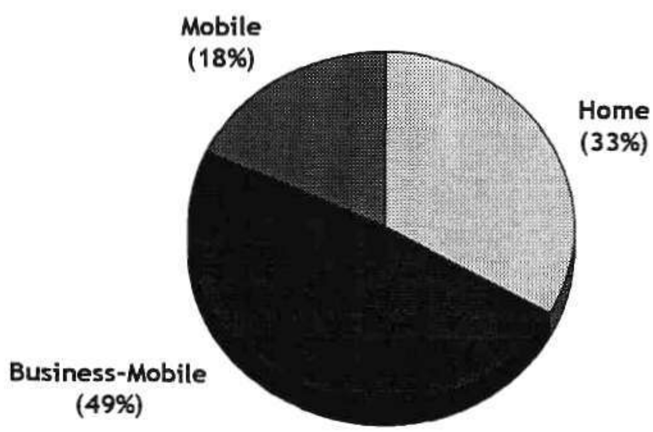
The U.S. Home-Business Split



Source: Dataquest
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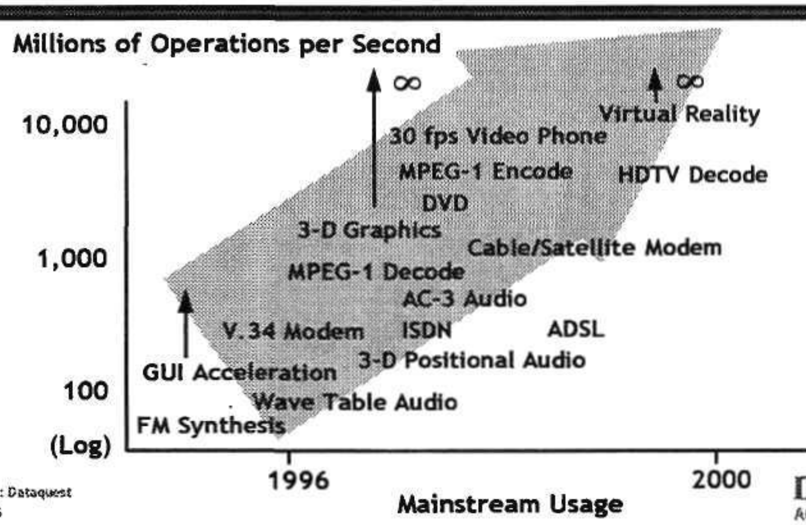
Multimedia Computing



Source: Dataquest
970825

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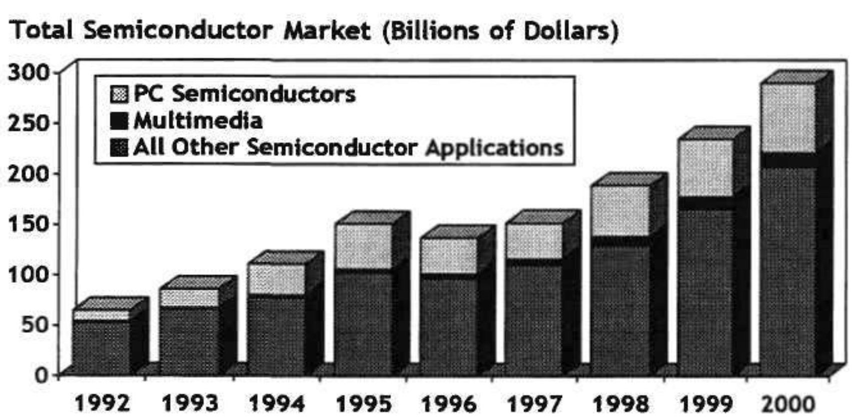
PCs Consume More Semiconductor Content than Any Other Application!



Source: Dataquest
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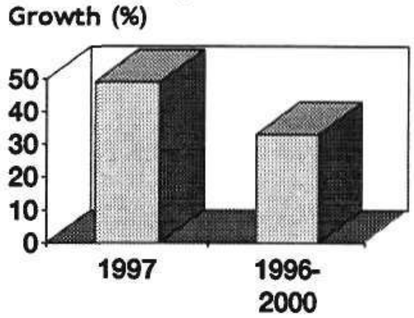
Growth in Mobile Communications Semiconductors

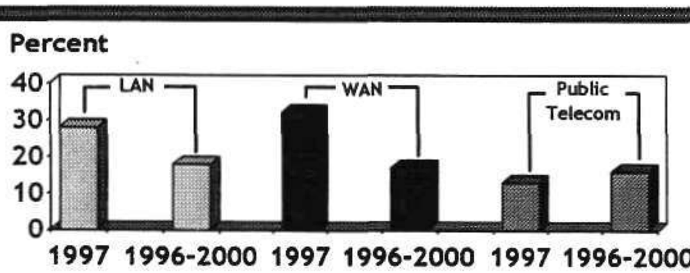


- Cellular subscribership to reach 360 million, pager—230 million
- GSM, IS-136, CDMA, PDC
- Cordless goes digital
  - DECT, PHS, 900 MHz
- Motorola, Nokia, Ericsson
- ASSP, ASIC, DSP, MCU, flash

Source: Dataquest
970827

Dataquest
A Gartner Group Company

Growth in Communications Semiconductors



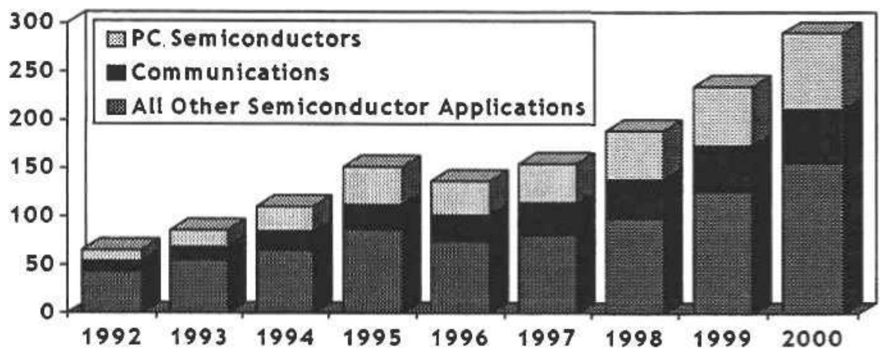
	ASSP	ASIC	MPU	DRAM	Flash	Analog	Opto
LAN	X	X	X	X	X		
WAN	X	X	X	X			
Public Telecom	X	X				X	X

Source: Dataquest
970828

Dataquest
A Gartner Group Company

PCs Consume More Semiconductor Content than Any Other Application!

Total Semiconductor Market (Billions of Dollars)



Source: Dataquest
970829

Dataquest
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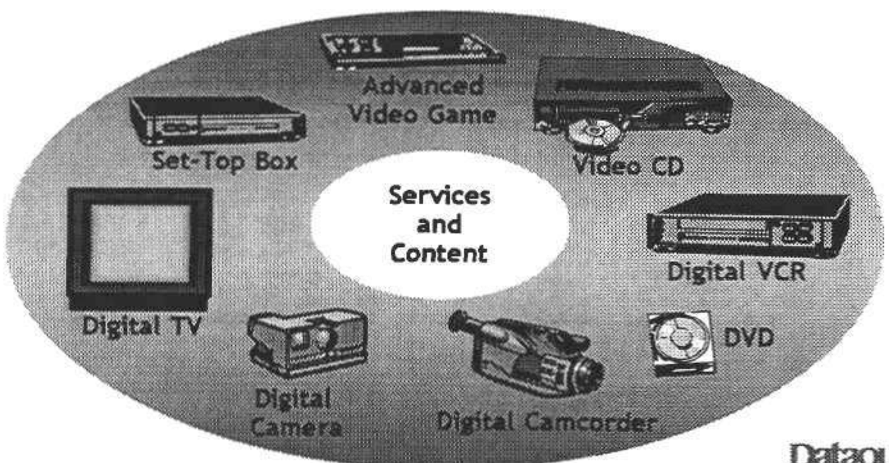
Digital Consumer Systems



970830

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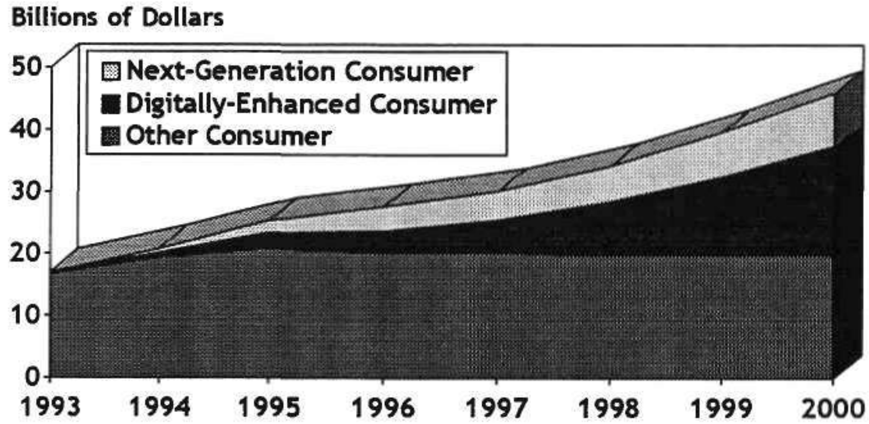
The Chip's Performance Will Be Rewarded with Strong Growth in Consumer Electronics Chip Market



Source: Dataquest
970831

Dataquest
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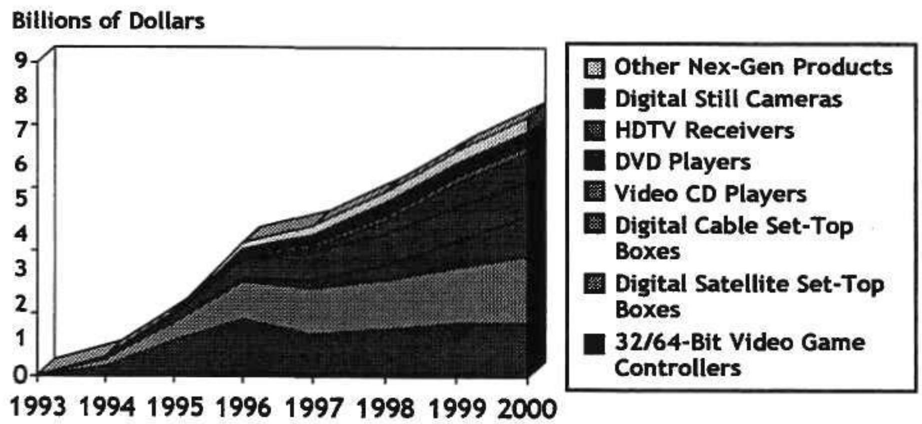
The Chip Market for Next-Generation Consumer Electronics Will Hit $8.3 Billion by 2000



Source: Dataquest
970832

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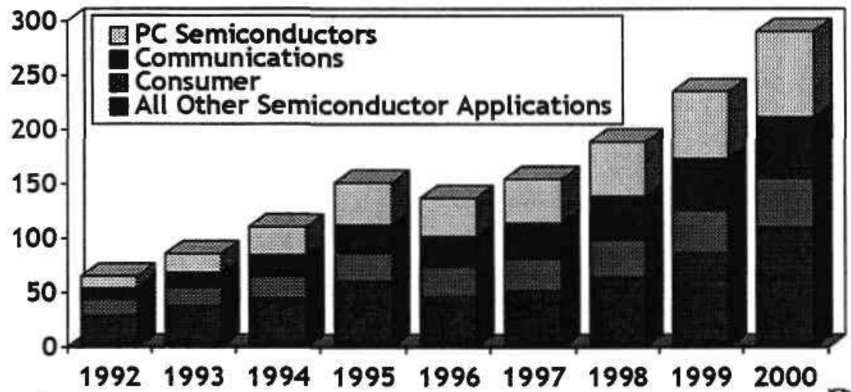
PCs Consume More Semiconductor Content than Any Other Application!

Total Semiconductor Market (Billions of Dollars)



Source: Dataquest
970833

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Current Semiconductor Market Status

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Summary of 1996 Semiconductor Market

- 1996: Excess inventories and a DRAM ASP cycle
- DRAM revenue declines 46%
- Non-DRAM semiconductors show 5% growth
- Recovery started in fourth quarter
- Asia/Pacific growth slowed
- Intel extends its leadership
- European semiconductor vendors have a new leader

970835

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What Hit Us?

- Optimistic Windows 95 expectations
- Optimistic fourth quarter PC forecasts
- Excess inventories going into 1996
- 4Mb-to-16Mb transition
- Overcapacity
- Market slowdowns

970837

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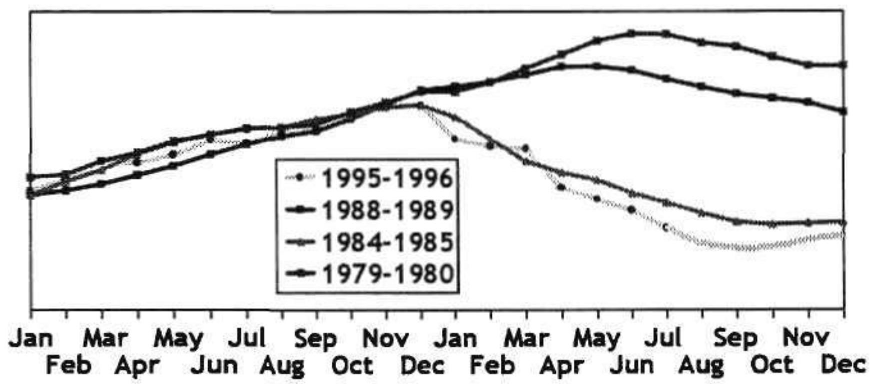
MOS Memory— Four "Downturns" Compared



Source: Dataquest
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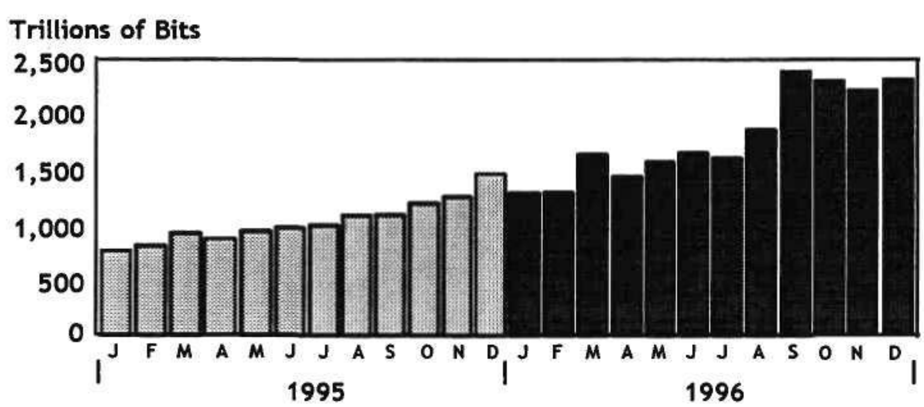
Bit Growth Continues Strong!



Source: Dataquest
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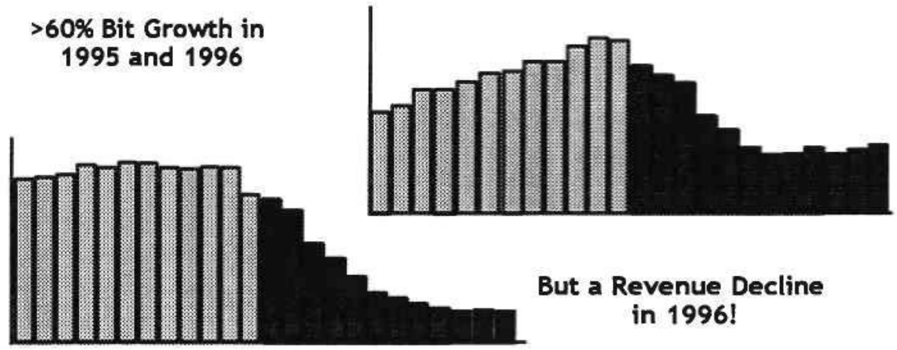
DRAM by Month



Source: Dataquest
970840

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Semiconductor Rankings

*Millions of U.S. Dollars**

1996 Rank	1995 Rank		1995 Revenue	1996 Revenue	Percentage Change	1996 Market Share (%)
1	1	Intel	13,172	16,938	28.6	12.0
2	2	NEC	11,314	11,077	- 2.1	7.8
3	5	Motorola	8,733	8,437	- 3.4	6.0
4	4	Hitachi	9,135	8,056	-11.8	5.7
5	3	Toshiba	10,076	7,981	-20.8	5.7
6	7	Texas Instruments	7,831	7,090	- 9.5	5.0
7	6	Samsung	8,332	6,196	-25.6	4.4
8	8	Fujitsu	5,535	4,507	-18.6	3.2
9	9	Mitsubishi	5,274	4,200	-20.4	3.0
10	14	SGS-Thomson	3,398	4,200	23.6	3.0

*Factory revenue includes Hybrid

Source: Dataquest
970841

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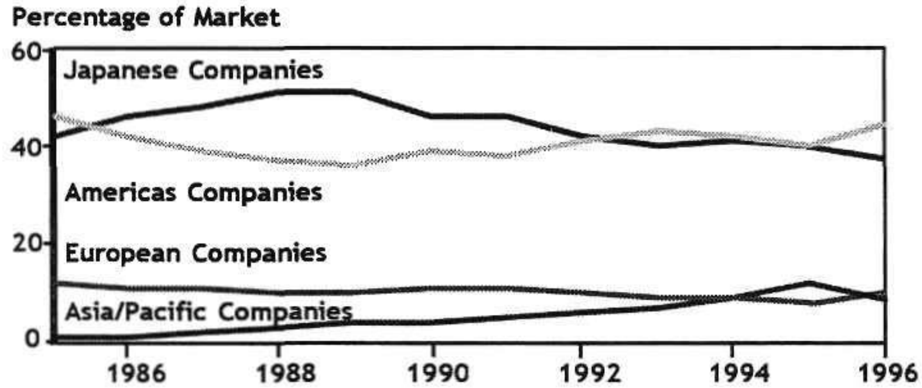
Regional Supplier Growth



Source: Dataquest
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Semiconductor Forecast

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1996-1997 Revenue Forecast by Product

	1996		1997	
	Billions of Dollars	Percent	Billions of Dollars	Percent
Memory ICs	36.5	-34.1	40.3	10.3
Microcomponent ICs	39.3	13.8	45.7	16.3
Logic/ASICs	23.1	0.8	25.8	11.6
Analog ICs	18.0	2.6	20.5	13.4
Discrete Devices	13.5	-4.0	15.1	12.4
Opto Semiconductors	4.6	-3.9	5.2	13.7
Total	137.0	-9.4	154.6	12.9

Source: Dataquest
970842

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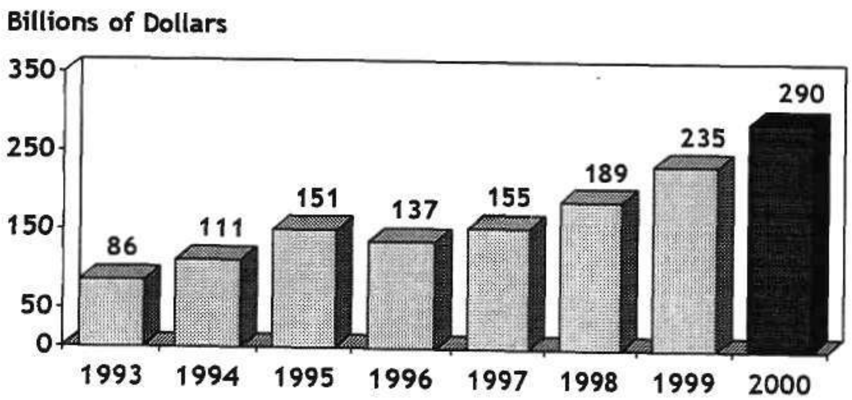
Semiconductor Forecast



Source: Dataquest
970843

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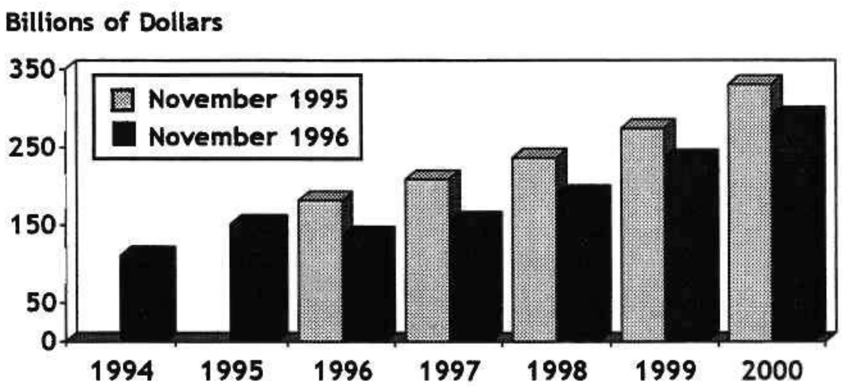
Semiconductor Forecast Comparison



Source: Dataquest
970844

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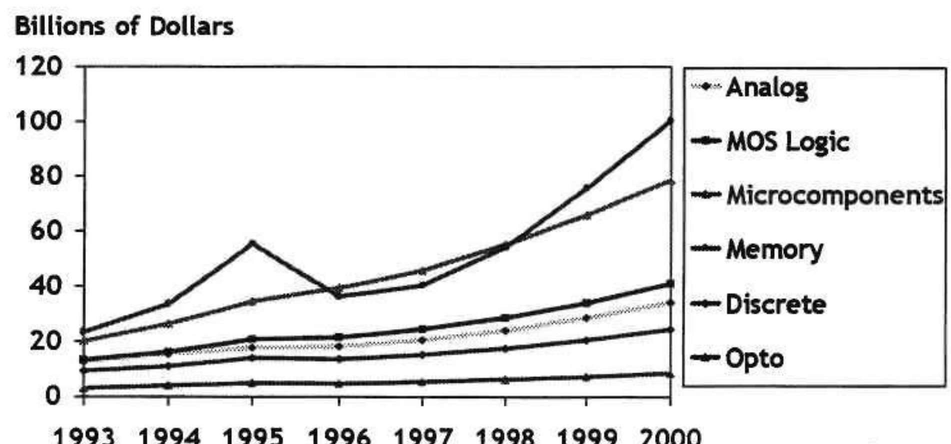
Worldwide Semiconductor Forecast by Product



Source: Dataquest
970844a

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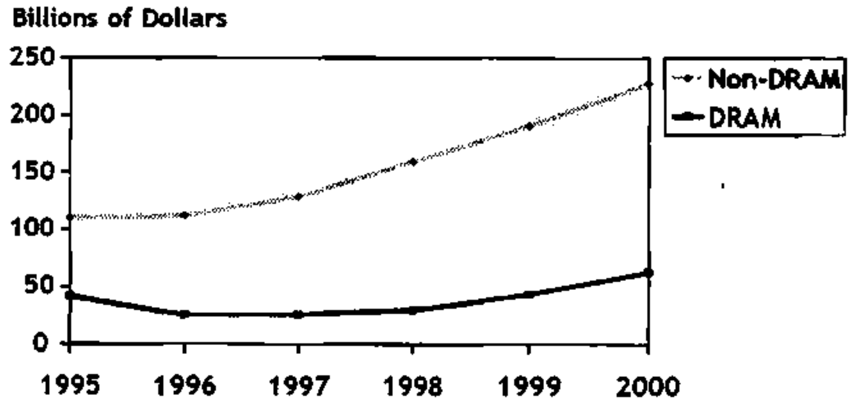
DRAM and Non-DRAM Revenue Forecast Compared



Source: Dataquest
970844e

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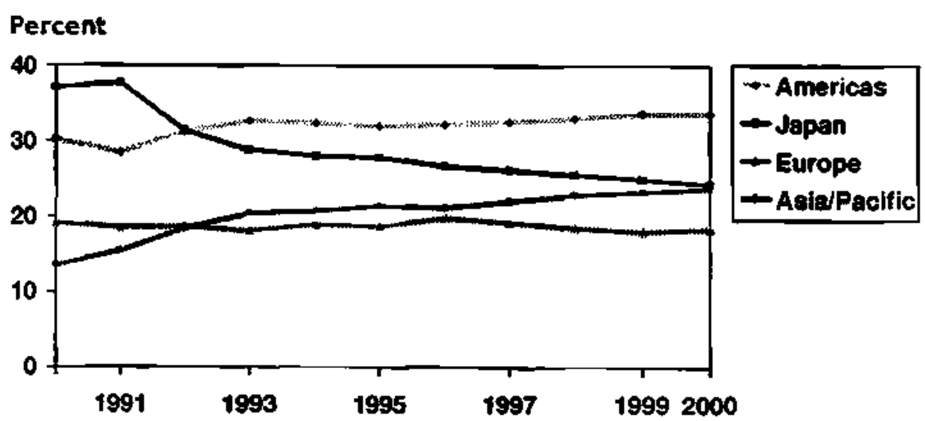
Regional Share of Worldwide Semiconductors



Source: Dataquest
970845

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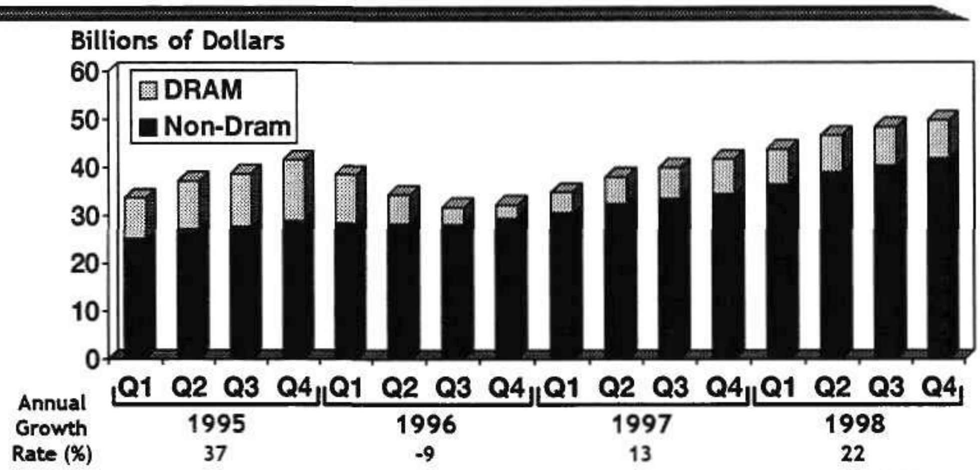
Revenue Forecast by Quarters



Source: Dataquest
970844f

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Dataquest Predicts

- ➤ Electronic equipment growth of 9% in 1997
- ➤ Semiconductor growth of 14% in 1997
- ➤ Capital expenditures decline 14% in 1997
- ➤ Excess capacity until late 1998

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Notes

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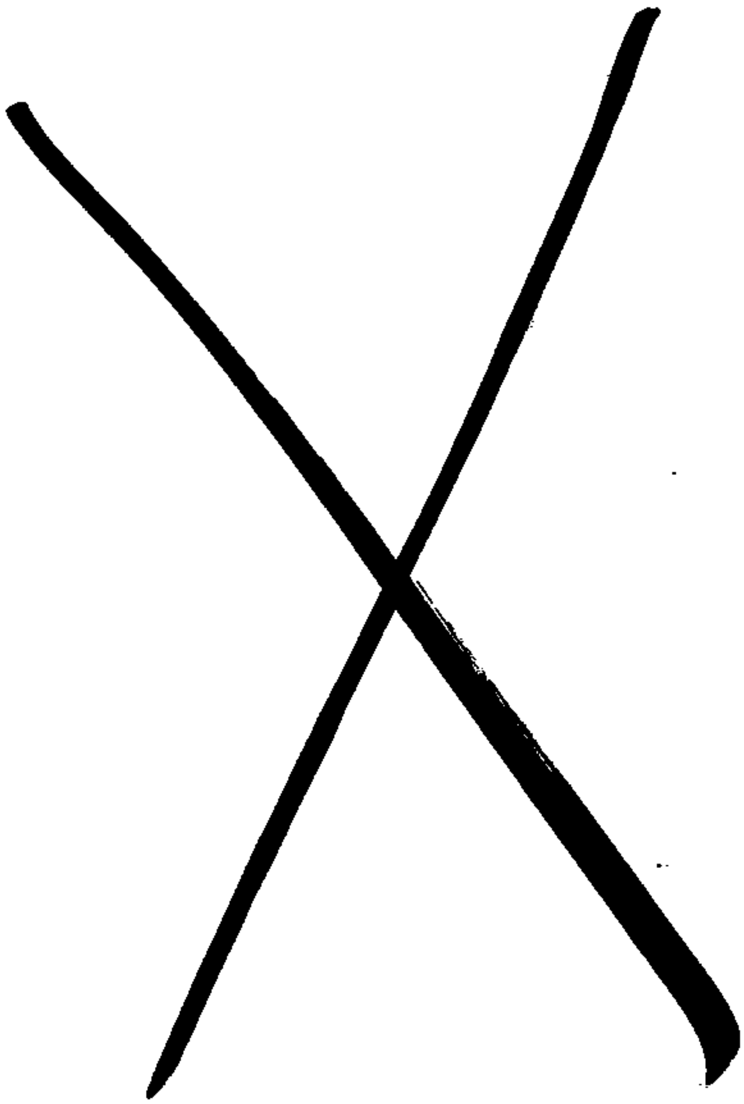

The Worldwide PC Marketplace

William C. Schaub

Director, Quarterly Tracking Programs
Computer Systems and Peripherals Group
Dataquest

Mr. Schaub is director for Dataquest's Quarterly Tracking programs. In addition to managing the day-to-day activities of this research group and its syndicated programs, Mr. Schaub is responsible for the quarterly computer statistical tracking programs offered by this group.

During his five years with Dataquest, Mr. Schaub managed the relationship between Dataquest and its largest clients, managed new business development for North America, and served as principal analyst for various syndicated research programs. He is thoroughly knowledgeable within the core high-tech industry segments covered by this worldwide marketing research company, which range from semiconductors through the product markets these technologies serve. For the past few years, key account clients have called upon Mr. Schaub and his associates to participate in product technology road mapping, PC market segmentation, and ongoing U.S. consumer demand monitoring.

Mr. Schaub has been associated with the high-tech business solutions industry for almost 20 years. He has held a variety of marketing and management positions with Xerox Corporation, Wang Laboratories, Compaq Computer Corporation, and Dataquest.

Mr. Schaub holds a B.S. degree from California State University, Sacramento, and an M.B.A. from St. Mary's College of California.

Agenda

- ➤ Where have we been?
- ➤ Where are we today?
- ➤ Where are we going during the next two years?
  - Triggers
  - Inhibitors

971588

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Bring It All into Perspective

- ➤ 1970s: PCs were primarily in homes and universities
- ➤ 1981: IBM entered the PC market and validated PCs for business use
- ➤ 1992: Compaq reset the playing field for major PC manufacturers
- ➤ 1994: Consumer PC market kicked in

971589

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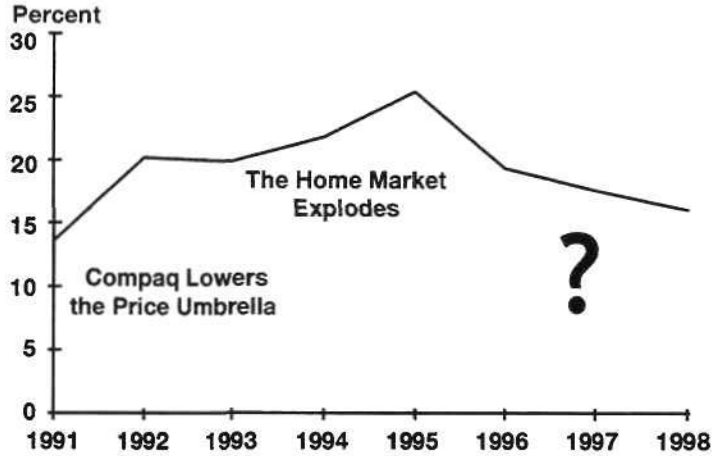
Worldwide PC Growth



Source: Dataquest
971590

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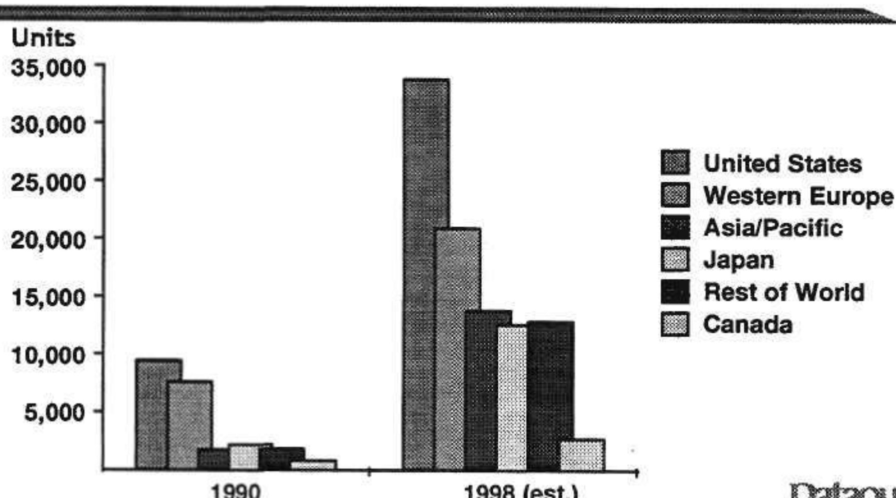
Units Shipped to the World



Source: Dataquest
971591

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Today's PC Market

- ➤ Defined by market segments and geographies
- ➤ Consumer versus commercial
    - Emotion versus process
    - Personal values versus organizational values
- ➤ First-time/eligible seats versus replacement
- ➤ By countries, which roll up to regions

971592

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1996 Total PC Market

- ➤ 70,861,000 units
- ➤ 17.8% growth over 1995

971593

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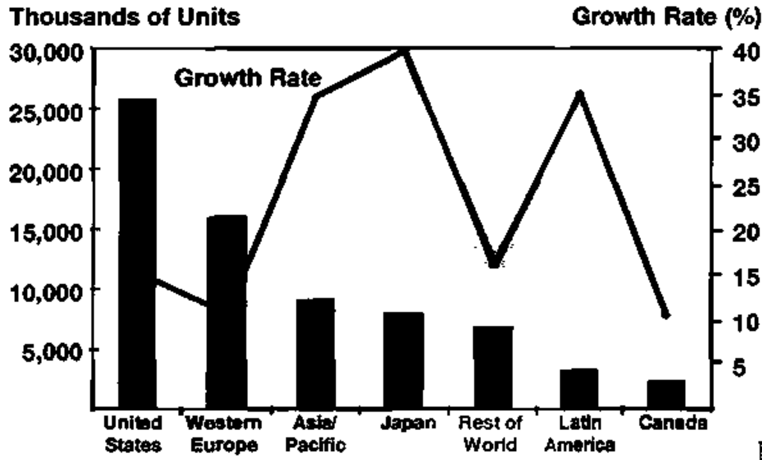
1996 Totals



Source: Dataquest
971594

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Western Europe

- ➤ Like Asia/Pacific, Europe consists of a very diverse group of countries with independent cycling economies and political changes
- ➤ Four countries make up over 66% of the volume in Europe:

	1996 (K Units)	PPG* (%)
Germany	3,854	11
U.K.	3,328	15
France	2,323	11
Italy	1,309	4

PPG = Period-to-period growth

Source: Dataquest
971595

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Western Europe Forecast

- Next two years' growth will be reasonable:

1997	1998
15.3%	13.8%

- Triggers
  - Pentium Pro and NT success stimulates commercial replacement market
  - Small businesses will lead business segment growth
- Mixed trigger: Consumer use of the Internet

971596

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Western Europe Forecast

- Inhibitors
  - Uncertainty in the ramp of EMU '99
  - Slow demand from first-time consumers
  - Italy and Spain are likely to continue to lag
- For the major branded international manufacturers:
  - Growing success of store brands and "white boxes"

971597

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Central and Eastern Europe

- Huge territory with 27 countries covering 13 time zones
- Four major countries make up 75% of demand but combined have the PC market size of France:

	1996 (K Units)	PPG (%)
Russia	1,300	29
Poland	425	29
Czech Republic	247	11
Hungary	127	13

PPG = Period-to-period growth

Source: Dataquest

971598

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Central and Eastern Europe Forecast

- Next two year's growth will be healthy:

1997 1998
28.4% 33.8%

- Triggers
  - Many eligible desktops in the commercial market
  - Commercial buyers value newest technology
  - For those with money, consumer markets are beginning to emerge
- Inhibitors
  - Loyalty to local manufacturers
  - Volatile economic and political environments

971599

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Latin America

- 1996 finished the year strong with over 3 million units shipped, growing 28% over last year
- Continued investment in PCs in the education market has fueled the consumer segment
- Relatively healthy economy in the region has resulted in significant strength in the commercial sector

971600

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Latin America Forecast

- Blooming growth

Year	Units (K)	Growth (%)
1997	4,068	24
1998	4,846	19

- Triggers
  - Businesses realize the competitive advantages offered by technology
  - Internet and Internet commerce offer greatly expanded markets for PCs
  - Continued major investments in communications infrastructure carry over to PCs
  - Access to PCs for emerging middle classes is like a degree

971601

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Latin America Forecast

- Inhibitors
  - Personal and corporate debt is always a burden in Latin America
    - Acer is offering personal financial assistance
  - Existing and proposed higher tariffs in some countries
  - Challenge to major manufacturers from "white boxes"

971602

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Japan

- Finished 1996 with continued sound PC growth of 33%, resulting from shipments of 7.5 million units
  - Vendors focused on profits rather than market share
    - ASPs grew from $2,330 to $2,700
  - Implementation of the "velocity manufacturing model" reduced channel inventories
  - Unlike last year, commercial segment outgrew consumer purchases

971603

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Japan Forecast

- Growth will fall to 27% in 1997 and 17% in 1998 with over 20 million units shipped over this period
- Triggers
  - Many eligible desktops in small to medium-size companies
  - Parents committed to children's success
  - Introduction of lower-priced PCs (<$1,500)

971604

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Japan Forecast

- Inhibitors
  - Manufacturers' myopic focus on just the high end of both private and professional markets
  - Potential sluggishness of the economy
  - Curtailing of larger account investments in PCs

971605

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Asia/Pacific Market Results

- Fastest-growing regional market for PCs with 37% growth to about 7.5 million units in 1996
- Korea was the largest PC market: 1.9 million total units shipped with half of those going into homes; healthy unit sales growth of 27%, but on a declining growth path
- China surpassed Australia as the second biggest market in the region; China remained the hottest market in Asia, growing at 53% in unit sales to 1.6 million units in 1996
- Australia was the slowest-growing market, reaching only 10% to 1.3 million units; fastest-maturing market in Asia

971606

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Asia/Pacific Market Results

- Exceptional unit sales growth in emerging markets:
  - Indonesia at 34%
  - Malaysia at 27%
  - Thailand at 26%
  - India at 23%
  - Rest of Asia at 15% (led by New Zealand, the Philippines, Vietnam)
  - A/P market including ROA hit over 9 million units in 1996
- Mixed results for maturing markets:
  - Taiwan and Hong Kong slowed down; Singapore gained

971607

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Asia/Pacific Forecast

➤Relentless growth in the coming years

Year	Units (M)	Growth (%)
1995	5.4	32
1996	7.4	37
1997	9.6	30
1998	12.6	31
1999	16.1	27
2000	20.0	24

971608

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Asia/Pacific Forecast

➤ Triggers
- Rapid economic development
  - —New infrastructures
  - —Government computerization projects
  - —Expansion of current private networks
- Low PC penetration rate in emerging markets
- Pent-up demand due to new technology
- Continued price drop
- Takeoff of the home market

971609

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Asia/Pacific Forecast

➤ Triggers
- Increased investment in computer education
- Boom in Internet access
- Mac clones will show up in at least four flavors: Umax (Taiwan); Tatung (Taiwan); Power Computing (U.S.); Motorola/Panda Electronics (U.S./China JV)
- Growth in the portable and server-class PCs

971610

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Asia/Pacific Forecast

➤ Inhibitors
- Maturity of the major markets: Australia, Korea, Hong Kong, and Taiwan (50% of total A/P unit sales)
- Lack of affordability in emerging markets like China, India, Indonesia, and Thailand where underdevelopment is pervasive

➤ Dilemma
- Failure of AcerBasic <$1,000 PC

  Note: Underestimated user requirements, overtaken by huge price drop (average price dropped from U.S.$1,900 in 1995 to U.S.$1,400 in 1996)

971611

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Notes

New Technologies Fueling PC Market Growth

Martin Reynolds

Vice President, PC Technology Program
Computer Systems and Peripherals Group
Dataquest

Mr. Reynolds is the vice president of Dataquest's PC Technology program, which analyzes desktop, notebook, and handheld personal computer products technologies and trends. The analyses focus on product costs and viability of technologies, which are factors that relate directly to the success or failure of products in the market.

Before joining Dataquest, Mr. Reynolds was employed by Computer Intelligence InfoCorp where he developed the Technology Roadmap Services. Before that, Mr. Reynolds spent nine years with Memorex Telex as Director of Engineering, where he was responsible for the design and development of IBM 3270 communications and personal computer products, system architectures, and technological planning. Before joining Memorex Telex, Mr. Reynolds lived and worked in the United Kingdom, where he designed and developed advanced electronic cash registers, wrote software as a consultant in the banking industry, and was involved in the early development of IBM-compatible personal computers. He has been involved with industry groups, including the Video Electronics Standards Association (VESA) and the Micro Channel Developers Association (MCDA), and has served on the Microprocessor Report editorial board.

Mr. Reynolds, originally from London, England, was educated at Oxford University and holds an M.A. degree and a B.A. degree in engineering science.

Agenda

- The business environment: Velocity
- Java and low-cost PCs
- A summary of the PC market
- Processors for PCs
- The Q4/97 PC
- Assorted technology notes
- Predictions: Last year's and new

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Velocity II—System Shock

- Manufacturers have moved to the velocity model
  - Earns times turns is the measure
- Clear evidence of reduced inventory cycles
  - Intel's quarterly financial reports
  - Manufacturer's financials
- But there are no buffers left
  - System shock when market downturns
  - Germany: Escom is an example

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The Java Language

- An object-oriented programming language
  - Cleaner than C++
- More reliable code
  - Rigid typecasting
  - No gotos at all
  - No pointers: References are implicit
  - Automatic memory allocation
  - Try, throw, and catch functions for error handling
- But not really suitable for device drivers without system-dependent extensions

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Java Bytecode

- Java bytecode is a pseudocode for the Java Virtual Machine
  - Very compact code
- Java source can be compiled to any architecture
- Other languages can be compiled to Java bytecode
- But so far, Java is exclusively paired with Java bytecode

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The Java Virtual Machine

- A Java bytecode interpreter designed by Sun
  - Compact code for network transfer
  - Platform-independent
- Single-byte opcodes
- Variable length instructions
- Stack-based; no registers
- Nonaligned instructions
- Intended to be interpreted

Not very RISC-like!

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Java in a Client/Server Environment

- Large systems cannot spare bandwidth to handle the user interface
  - Keystrokes
  - Advanced graphics
  - Printing
  - Pull-down menus
  - Field preprocessing
- Java can do this—and more—at the desktop
  - At a very low cost

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The Press Promises:

- Java is the language of the Internet (True)
- Java will establish a new standard and eliminate the old ones (Intel and Microsoft) (False)
- Java systems are more manageable (Maybe)

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The Realities of Java Bytecode

- Slow, slow, slow
  - Even JIT compilers suffer because of the stack (heavy load/store)
  - One of the costs of guaranteed compatibility (PCs may trade compatibility for performance)
- Will do well in its purest form where:
  - Performance is not an issue
  - Replacement cycles are long

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Java and Sun Will Succeed

- Sun will offer Java top-to-bottom
  - Servers and tools that support Java clients
  - Java workstation clients
  - JavaStation terminals
- JavaStations have a great future
  - picoJava cuts cost and boosts performance
  - Supports Sun's networking premise
  - Risky for other Java terminal vendors

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Java NC Volumes

- The terminal market is about 3.5 million units/year
  - About 35 million terminals are in use today
  - Many sell for less than $300
  - Advanced (X-windows) terminals run 100,000 units/year
- Terminal life cycles are long
  - 7 years typical; 10 to 12-year tail
  - Replacement market is limited
  - Many hand-me-down PCs compete

Suggests that 3 million units/year is aggressive for 2000

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The Future of Java and the Internet

- Microsoft will endorse and corrupt Java
  - Visual J++ has Windows 32 specific extensions
  - Will compile down to binaries for better performance
- Internet applications will use JavaBytes
  - Slower performance at first
  - Then possible architectural enhancements to processors
  - The Java system rides Moore's Law as advanced Internet applications appear

Java accelerators on the way?

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Summary: The Java Fork

- Route 1: The NC
  - Used in client/server applications
  - Think hourly paid employees
  - Stable standard of functionality and performance aids management
- Route 2: The Internet
  - Performance, features will be added to Java
  - Loss of cross-platform compatibility
  - But a true enabler for the Internet

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The $500 PC

- ➤ Promoted by mainframe-centric companies
- ➤ Simple PC with network instead of HDD
- ➤ Issues:
  - Moore's law will overrun the mainframe
  - Bandwidth will become supercritical
  - Applications will continue to demand more resources
- ➤ Assumes that non-PC users want the Internet
  - And that they do not want a "real" PC

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The Net PC/ZAI

- ➤ Just like the PC that we have today
  - But software resides on the network
  - Local copies aid performance
  - Transparent updates from the host
  - Gartner estimates 20-30% drop in TCO
- ➤ Security features
  - No floppy drive
  - Inaccessible or disabled ports
  - No code downloads

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The Upside-Down PC

- More multimedia silicon than processor silicon
  - Chromatic, Samsung, Philips
- Designed for entertainment, not productivity
  - HDTV; DVD; games; some Internet
  - Primarily passive viewing
- $500 or less cost
  - Connects to a TV set
  - Includes sound features

The third wave of home computing?

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The Unbranded Market

- Perhaps 20% to 30% of the market
- Strong in the United States (Sunday paper)
- Strong in Asia
- Strong in Europe
- Enabled by small cost differentials for volume and large savings for compromised quality
- Could become the dominant vendor class in the Far East!

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971358

Barrel-Bottom Cloner Economics

- Can cost 20% less than mainstream vendors!
  - 10 points in reduced overhead
  - $159 on system build
- And then 10 points of reduced margin
- On a $1,500 sales price system, a cloner can be $400 lower!

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System Savings

Cost Area	Potential Savings
Motherboard	$29
Opportunity Hard Drive	$30
Windows "Preloaded"	$45
Spot Processor and Memory	$20
Rough Quality Video Card	$10
Generic Power Supply and Case	$10
IBM Royalties	$15
Total	$159

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Cloner Summary

- Cannot be driven out by brand and marketing
  - Cost differential too great—especially in emerging economies
  - Quality compromises unacceptable for major manufacturers
- Potentially a defining factor for the emerging Asian megamarkets
- Risk of counterfeit computers!
- New strategies needed: subsystem sales; new brands; prosecution; and partnerships

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Market Summary: Ongoing Growth

- We forecast strong, ongoing growth worldwide
  - United States doing better than expected; France, Germany weaker; Asia ahead of expectations
  - Japanese market to be particularly strong
  - The technology cycle to fuel an ongoing replacement market in home and business
  - New generations of buyers are PC-smart

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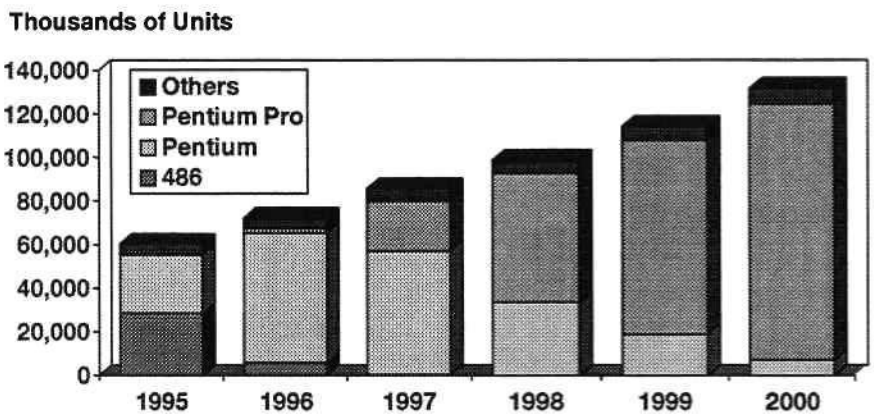
The Total PC Market



Source: Dataquest

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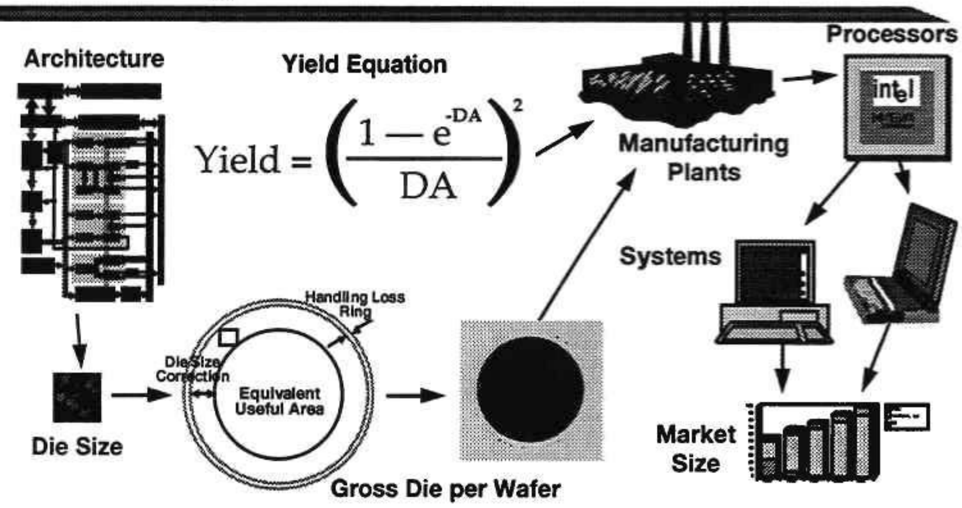
Silicon to Systems: Predicting the Market



971364

Manufacturing Economics

Geometry/Type L2 Cache	Net Die	Annual Plant Cap.	Cost ($)
0.35u/32Ki P55C	104	26.3M	46
0.35u/256K PPro	37	9.2M	121
0.35u/ 32Ki PPro	60	14M	75
0.25u/128Ki PPro	117	30.1M	85
0.35u/64KiK6 (AMD)	94	24M	68

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Klamath

- Klamath expected Q2/97
  - Double L1 cache over Pentium Pro
  - L2 cache on daughtercard, not dual-cavity package
    - —Dramatically lower cost
  - Enhanced for Windows 95 performance
  - Clock speeds to 300 MHz in 1997
  - Will be the dominant processor in 1998

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Merced

- A monster for the millennium
  - Server shipments in 1999
  - Volume desktop in 2001
- Full x86 compatibility
  - 64-bit x86 extensions
- Architectural performance enhancements
  - That only billions can buy
  - Fueled by tens of millions of transistors
- Rambus?

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Intel Competitors

- Cyrix
  - Excellent technology and manufacturing
  - But beaten by the Intel brand
  - May find a niche in the cutthroat consumer market
- AMD
  - Made a big commitment with NexGen and Q4/96
  - CS-34EX and die photograph is a good sign
  - 162mm die area, 8.8M transistors is advanced
  - Capacity, technology coming together
  - 15 million devices in 1998

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Can MMX Displace Media Processors?

- MMX performance will follow Moore's Law
- But media processors can stay ahead
  - Easier to scale
  - Lower prices
- MMX wins when there is enough performance
  - But 3-D, video, and others will stay ahead
- Speech recognition and others will keep the processor busy

So media processors have a way to go yet

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The Future of Media Processors

- Ultimately merge with the video controller
  - Integrated memory for high bandwidth
  - AGP for large data objects
  - Integrated DACs for video and audio
  - Possibly the place for 1394

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Media Processors Will Proliferate

- Example: digital camcorder
  - 2.5-inch 2GB drive
  - MPEG-1 and 2 compression silicon
  - Camera and lens assembly, viewfinder and battery
- In 1998
  - Should cost less than $400 to build
  - Weigh less than a pound
  - Record 1 hour at MPEG-2 or 3 hours at MPEG-1
  - Requires a PC to be useful

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E

The Q4/97 PC

- SEC processor (Klamath)
- NLX form factor
- AGP and 3-D graphics
- Flawless MPEG-2
- AC'97; USB; some 1394
- Superfloppy/Zip/CD-E/DVD

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SEC—Single-Edge Connector Module

- Module includes: PCB; processor; cache; heatsink
- Connects through a slot (Slot 1), not a socket
- Allows cache to be separated from processor
  - 1MB, 2MB, 4MB caches at low cost
  - Vital for 300-500 MHz
- A modified P6 bus
  - May move to 133 MHz
  - Question of openness
- Klamath the first implementation

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NLX

- Intel's slimline ATX
  - Better designed, supports SEC and AGP
  - AST, Digital, Fujitsu, Gateway, HP, IBM, ICL, Micron Electronics, NEC, Sony, Toshiba, Tulip
- Likely to proliferate in 1997
- Potentially a competitive challenge
  - Reduces differentiation
    - Case and riser card?
  - Brings new technologies to market faster

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AGP—The Accelerated Graphics Port

- New IAL incentive
  - New bus into the chipset
  - 600-MB/sec transfer rate
  - Designed for bursty data, 3-D texture maps
  - Video controller still has its own buffer
- Will dominate the landscape in 1998
  - System, graphics, core logic manufacturers ignore at their peril
- May find other applications, e.g., SCI interface
  - Server networking
- Reduces the need for PCI-66

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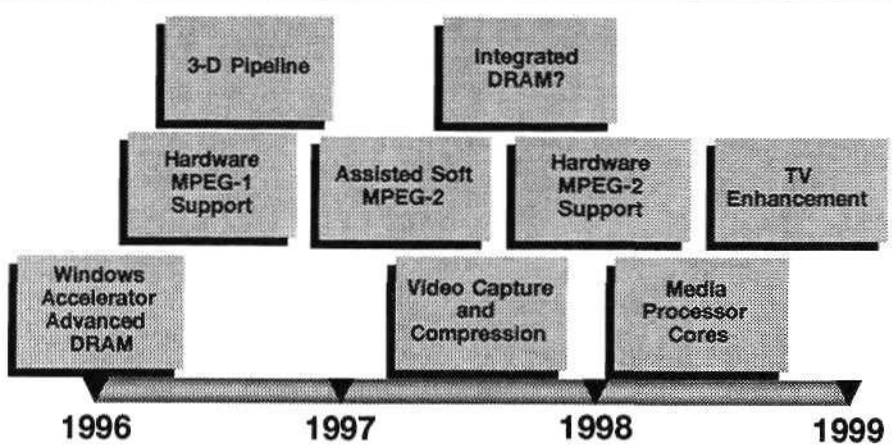
Desktop Video Road Map



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Superfloppies—100MB+ Rewritables

- Zip—Five-year-old HDD technology in a floppy package
  - Cheap, fast, but not compatible with installed base
  - Superb marketing to the individual
- LS120—Floppy technology with optical tracking
  - Also potentially cheap
  - Compatible with standard drives
  - Marketing is behind Zip and to the wrong segment
- Optical
  - CD-RW coming; may get squeezed by superfloppy and DVD

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1394

- Now has full backing from key players
  - IBM; Intel; Microsoft; Compaq; TI; Sony
- Specification and implementation challenges
  - But will be overcome
  - Introduction at some level in 1997 (core logic)
  - Dominant by the year 2000
- Will be the preferred interface for:
  - Disk drives; digital cameras; serial docking
  - Consumer digital video
  - Consumer digital multichannel sound
  - DVD

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Display Trends

- Windows 95/NT, P166, and Pentium Pro make high-resolution displays (1280 x 1024) useful and productive
  - Move toward 17-inch and 19-inch displays at high end
- LCD panels to start to displace 20-inch monitors in 1997
  - 14-inch, 1280 x 1024 panels at about $2,000
  - 20-inch, 3000 x 2500 panels late in decade
- Large LCD panels imply huge frame buffers, high transfer rates

The return of the transportable?

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Last Year's Predictions

- 3-D graphics in consumer machines for Christmas
- MMX accelerators to enter the market
- USB, ATX—and maybe 1394—to become standards
- Windows 95 to get a Pentium Pro enhancement
- UMA to succeed only in low-end markets
- The $500 Internet PC to succeed in words only
- Pentium Pro and NT to succeed in businesses
- Cyrix to succeed with 6x86
- Ultraportables to continue to struggle
- ISDN to the home to grow (please lobby your telco)

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Nine Predictions

- The beginnings of the desktop LCD screen revolution
- Intel to be less than 50% share of Pentium in 1998
- AMD to have a hot 1998
- Pentium to hit 266 MHz; P6 to exceed 300 MHz
- Java NCs not to exceed 500,000 units in 1997
- 1394 to debut late this year
- SDRAM to be significant by Christmas
- MMX accelerators to enter the market
- Apple to have a (relatively) strong year

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Notes

Panel: Digital Video Disk: The Next Big Thing?

Moderator: Phil Devin

Vice President and Chief Analyst, Computer Storage Technologies
Computer Systems and Peripherals Group
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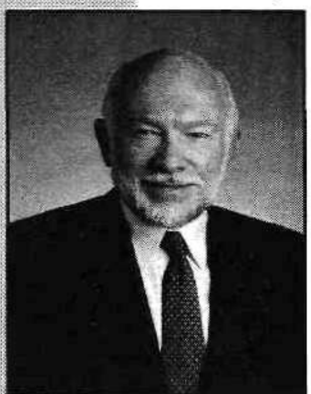

Mr. Devin is vice president and chief analyst of Dataquest's Computer Storage program and is recognized internationally as a leading authority in this industry. His primary responsibility at Dataquest is analysis of all segments of the computer storage industry. He also handles company analyses, consulting reports, and client projects.

Mr. Devin has 32 years of experience in the computer industry, in positions ranging from early process control system design to marketing management in the computer storage industry. He has been an active member of ANSI subcommittees.

Mr. Devin received a B.S. degree in engineering from Iowa State University.

Notes

Panel: Digital Video Disk: The Next Big Thing?

Panelist: Mary Bourdon

Senior Industry Analyst, Computer Storage
Computer Systems and Peripherals Group
Dataquest

Ms. Bourdon is a senior industry analyst for Dataquest's Computer Storage program in the Computer Systems and Peripherals group, specifically focusing on the optical disk storage industry. Tracking trends and technologies, she analyzes the market, products, and issues that affect the optical disk drive industry and is also responsible for cross-industry support and consulting services to Dataquest's subscription clients.

Before joining Dataquest, Ms. Bourdon was the market analyst for the CD Industry Research Service at Strategic Marketing Decisions, a market research firm based in Los Gatos. Before this, she dedicated her career in technical and marketing management roles in the systems and peripherals industry. As Market Program Manager at Maxoptix Corporation for four years, Ms. Bourdon was responsible for forecasting revenue projections for rewritable as well as WORM optical drives. Previously, she was the New Business Manager in the Systems Products Business Division of Ricoh Corporation and had market responsibility in addition to management of product planning involving peripheral products such as fax modems, printers, copiers, and scanners. Ms. Bourdon's 12 years with IBM included field positions as a systems engineer and systems engineering manager, and staff positions in business planning and forecasting.

Ms. Bourdon received a B.A. degree in mathematics from the University of South Florida.

Agenda

- ➤ What is DVD?
- ➤ Predictions

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What Is DVD?

- ➤ Universal Disc Format (UDF)
  - Accommodates audio, video, and data
  - Provides interchangeability among ROM, RAM, and consumer audio and video discs

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What Is DVD?

- Enhancement of current CD-based technology
  - 7 times the capacity of current CD technology
  - 133 minutes of feature-length movies with MPEG-2 video quality and AC3 surround sound audio with multiple soundtracks
  - Multiple languages and subtitles
  - Multiple ratings, providing parental guidance options
  - Interactive movies

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What Is DVD?

	DVD-ROM	DVD-R	DVD-RAM
Single-Sided/Single-Layer	4.7GB	3.8GB	2.6GB
Single-Sided/Dual-Layer	8.5GB		
Double-Sided/Single-Layer	9.4GB	7.6GB	5.2GB
Double-Sided/Double-Layer	17GB		

Source: Dataquest
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Predictions

- DVD-ROM drives will ship in high-end PC configurations by spring 1997
- DVD-ROM will replace CD-ROM in all new PCs in 1999
- DVD players will coexist with VCRs well beyond the year 2000
- DVD-RAM will resurrect the rewritable optical disk market starting in 1999

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Panel

Van Baker	Digital Consumer Market
Mary Bourdon	Optical Storage Market
Mike Casey	Distributed Storage Systems
Dale Ford	Semiconductor Application Markets
Scott Miller	Desktop PC Market

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Prediction #1

DVD-ROM drives will ship in high-end PC configurations by spring 1997

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Prediction #2

DVD-ROM will replace CD-ROM in all new PCs in 1999

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Prediction #3

DVD players will coexist with VCRs well beyond the year 2000

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Prediction #4

DVD-RAM will resurrect the rewritable optical disk market starting in 1999

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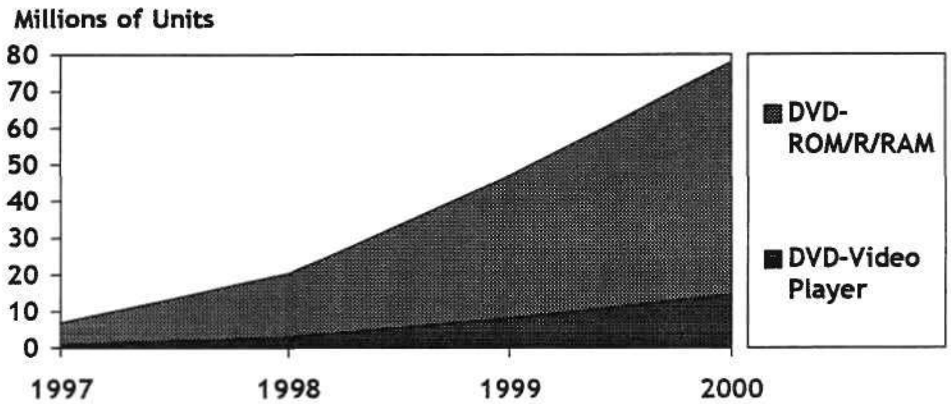
DVD Unit Shipment Forecast



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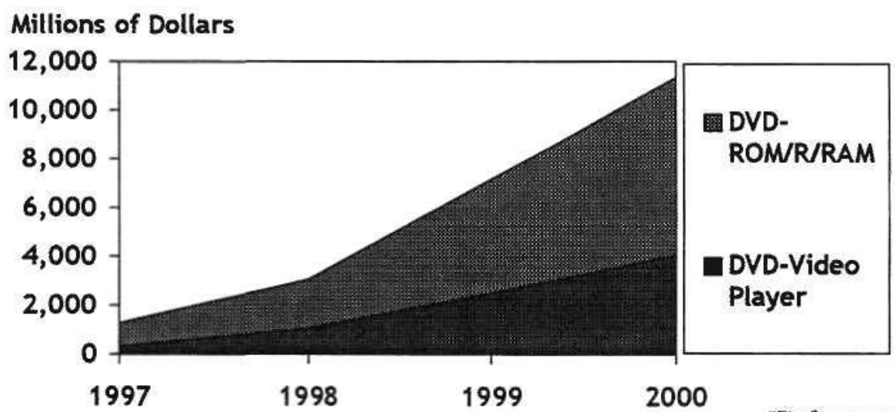
DVD Revenue Forecast



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Panel: Digital Video Disk: The Next Big Thing?

Panelist: Dale L. Ford

Senior Industry Analyst, Semiconductor Application Markets Group
Dataquest

Mr. Ford is responsible for conducting market research and analysis for the Semiconductor Application Markets group at Dataquest. He is a specialist on the end use or application of semiconductors with the scope of analysis including both economic and technical trends regarding the semiconductor content of electronic equipment. His work also includes contributions on client-specific consulting projects.

Mr. Ford is the program manager for the Consumer Multimedia Semiconductors and Applications program and also has primary responsibility for Dataquest research in wireless communications and mobile computing semiconductor applications. In addition, he contributes to the general semiconductor applications research.

Before his current role, Mr. Ford completed major consulting projects in the telecommunications, mobile computing, and multimedia industries for Dataquest. His work included the development of forecasting models to project the development of new technologies and the growth of emerging markets. He also led the launch of Dataquest's successful teardown program, where in-depth analysis is performed on electronic equipment, including PCs, workstations, cellular phones, set-top boxes, and video games.

Before joining Dataquest, Mr. Ford was employed by Sun Microsystems in its product marketing organization where he created and implemented marketing plans and joint development agreements with third-party vendors. Earlier, he was a design engineer working with real-time image processing technologies and computer-aided-engineering systems for Evans & Sutherland, a producer of graphics workstations and high-performance flight simulators.

Mr. Ford has an M.B.A. in strategic management from The Wharton School, University of Pennsylvania, and a B.S.E.E. degree in electrical engineering from Brigham Young University.

Panel: Digital Video Disk: The Next Big Thing?

Panelist: Van L. Baker

Director and Principal Analyst, Distribution Channels Worldwide
Computer Systems and Peripherals Group
Dataquest

Mr. Baker is director and principal analyst of Distribution Channels Worldwide program for the Computers and Peripherals group at Dataquest. He is responsible for all facets of distribution channel research for computers and peripherals. This includes quantitative analysis of distribution channel sell-through for systems products offering shipment data segmentable by elements such as form factor and processor. Mr. Baker is also responsible for qualitative analysis of channel and vendor business models for distribution of computers and peripherals.

Mr. Baker is recognized as an industry expert in the field of computer distribution channels. He is quoted in such publications as the *Wall Street Journal, Business Week, Computer Reseller News, VARBusiness,* and local newspapers. Having spent time in industry both on the sales and manufacturing sides of the business, Mr. Baker brings to Dataquest an understanding of the reseller business as well as the manufacturer business and the constraints inherent in both.

Mr. Baker has spent more than 13 years in the computer industry and seven years in retailing before that. His most recent position was with Computer Intelligence InfoCorp where he was responsible for distribution channel research as well as distribution channel consulting. Before this he held a number of positions with Hewlett-Packard Company. These positions included dealer channel manager where he was responsible for implementation of a new dealer channel contract for Hewlett-Packard's Personal Computer Group. He also sold Hewlett-Packard PC and peripheral products for a number of years to a dealer channel and retail channel accounts.

Mr. Baker earned a B.A. degree in psychology from the University of California, Berkeley.

Panel: Digital Video Disk: The Next Big Thing?

Panelist: R. Scott Miller

Senior Industry Analyst, Advanced Desktop and Workstation Computing,
Computer Systems and Peripherals Group
Dataquest

Mr. Miller is senior industry analyst for the Personal Computers Worldwide program of the Computer Systems and Peripherals group and is responsible for quantitative modeling and qualitative analysis for the global PC markets. Mr. Miller has done extensive research on the U.S. consumer technology market as well as the market for computers in small and medium-size businesses in addition to covering global vendor strategies, technology shifts, and vendor's competitive positioning.

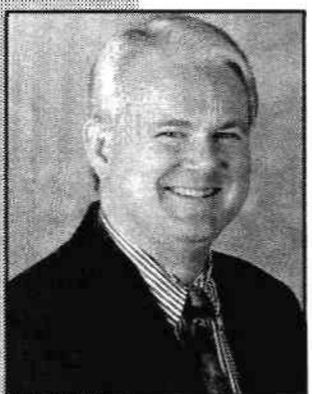
Before joining Dataquest, Mr. Miller was a market analyst at Computer Intelligence InfoCorp in the Microsystems Group. Mr. Miller's work at Computer Intelligence InfoCorp included research and analysis of the desktop, mobile, and handheld computer markets. In addition, he was responsible for detailed pricing analysis of these systems. Mr. Miller also worked as a sales and marketing analyst at The Indus Group, a manufacturer of client/server software for the power generation and chemical industries, and he has held marketing positions at SCI/ Fortune Systems.

Mr. Miller attended Cornell University where he earned a B.S. degree in operations research and industrial engineering and an M.E. degree in engineering management.

Panel: Digital Video Disk: The Next Big Thing?

Panelist: Mike Casey

Research Director, Distributed Storage Systems
Gartner Group



Mr. Casey is research director for distributed storage systems at Gartner Group.

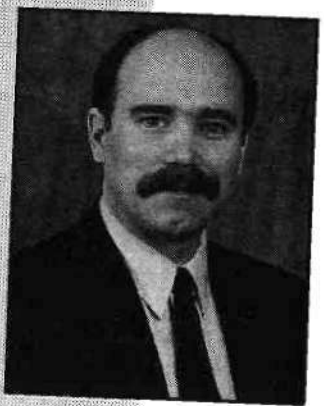
Before joining Gartner Group, Mr. Casey was manager of product planning and competitive analysis for IBM's disk storage business, and vice president of storage industry research at Computer Intelligence InfoCorp. At CII, Mr. Casey provided consulting expertise for end-user surveys focused on data storage topics such as RAID subsystems, tape, and optical storage solutions, and worked with storage vendors to define market opportunities and to evaluate competitive products and technologies. Mr. Casey has more than 12 years of industry experience in various engineering, manufacturing, and marketing roles with several storage vendors.

Mr. Casey received a bachelor's degree in physics and a master's degree in business administration from the University of Santa Clara.

Panel: Drilling into the PC Market

Moderator: Kimball Brown

Vice President, Desktop and Mobile PCs Worldwide
Computer Systems and Peripherals Group
Dataquest



Mr. Brown is vice president of Desktop and Mobile PCs for Dataquest. He is responsible for the PC Worldwide program, which tracks both quantitative (market shares, volumes shipped by region of the world, by type, by processor) and qualitative (drivers of demand, technology shifts, financial strengths, and weaknesses of industry participants) aspects of the PC Industry worldwide. He is also responsible for all facets of Mobile Computing, including the thorough quantitative analysis of the devices themselves, such as notebooks and handheld computers, and qualitative analysis of connectivity to networks for local or wide area networks, the emerging wireless networks from a computer user's viewpoint (for example, which ones would solve the data needs of mobile computer users in terms of cost, geographical availability, and time frame when they will be viable), and the applications and operating systems software used in mobile computing environments.

Mr. Brown is recognized as an industry expert in the field of PCs and mobile computers. He is frequently quoted in such publications as the *Wall Street Journal*, the *New York Times*, *Business Week*, *USA Today*, *PC Week*, *InfoWorld*, and local newspapers. Having spent time as a securities analyst on Wall Street, Mr. Brown brings a unique understanding of business models, margin analysis, capital accumulation, and the importance of the business side of succeeding in the market rather than simply having great products or services.

Recent accomplishments include developing a forecast for the handheld computer market by business model (proprietary versus standards-based) and geographical breakdowns for U.S. and worldwide markets, by type of connectivity (standalone, wired and wireless); type of input (keyboard versus pen or voice); and creating new definitions for handheld types in this highly volatile and still emerging products category.

Mr. Brown speaks regularly at industry forums on mobile computing. During 1994 and 1995 he spoke at the Hong Kong Productivity Counsel's PDA Symposium in Hong Kong; presented at an LCD Seminar in Tokyo sponsored by the Nikkei; and also spoke at Mobile 95, Phoenix Technologys Mobile Conference, COMDEX, and PC Expo. He participates semiannually in IBM's Industry Advisory Counsel for Mobile Products, and in AT&T Wireless Services Counsel. Mr. Brown did a presentation for the top 45 managers in IBM's R&D division. Discussions covered include the effects of the deregulation of the telecommunications industry on mobile computing, wireless networks as they relate to mobile users needs, and trends in the technologies and markets of notebooks, ultraportables, and handheld computers.

Mr. Brown has 20 years of experience in the computer industry as an engineer, manager, and analyst, including more than four years in the securities industry as a sell-side analyst and investor relations manager. His career includes past positions with IBM, Amdahl, and Everex. In addition, he has worked for Prudential-Bache Securities, where he covered the PC industry as a sell-side analyst, and at InfoCorp, a market research company, where he analyzed and managed research of the PC and handheld computing industries. He has built and maintained relationships with members of the press at major print media (mentioned above) and with executives at most major PC manufacturers and resellers.

Mr. Brown received an M.B.A. from University of California at Berkeley and a B.S. degree in electrical engineering from Duke University.

Four Key PC Markets

- Mobile
- Home PCs
- Advanced desktops
- Small business

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Four Key Analysts Make Predictions

- Mike McGuire
- Scott Miller
- Peter ffoulkes
- James Staten

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Notes

Notes

Panel: Drilling into the PC Market

Panelist: Peter ffoulkes

Director and Principal Analyst, Advanced Desktops and Workstations Worldwide
Computer Systems and Peripherals Group
Dataquest

Mr. ffoulkes is the director and principal analyst for the Advanced Desktops and Workstations Worldwide program within the Computer Systems and Peripherals group at Dataquest. He is responsible for analyzing the market trends in the advanced desktop arena, which combines the traditional UNIX/RISC workstation market, the emerging Windows NT/Intel-based workstation market, and related technologies including the high-performance graphics subsystems utilized by these systems. In addition to his responsibilities to syndicated clients, he performs analysis on a consulting basis for vendors and end users to assist with strategy development and tactical decision making.

Mr. ffoulkes has over 18 years of international experience in product marketing, marketing programs and communications, competitive analysis, sales, and training. His fields of responsibility have covered a wide range of technologies including client/server software, UNIX, and PC-based computer systems, computer graphics, and networking.

Before joining Dataquest, Mr. ffoulkes held a variety of marketing management roles with Digital Equipment Corporation in Massachusetts and sales roles with both Digital and Tektronix in the United Kingdom.

Mr. ffoulkes has a B.S. degree in statistics and a Post Graduate Qualification in education from the University of Bath in the United Kingdom.

The Advanced Desktop: Looking Ahead

- The profit opportunity is lower than anticipated
- Klamath and AGP will have negligible impact
- Long-term gain will be restricted to those who invest in technological innovation

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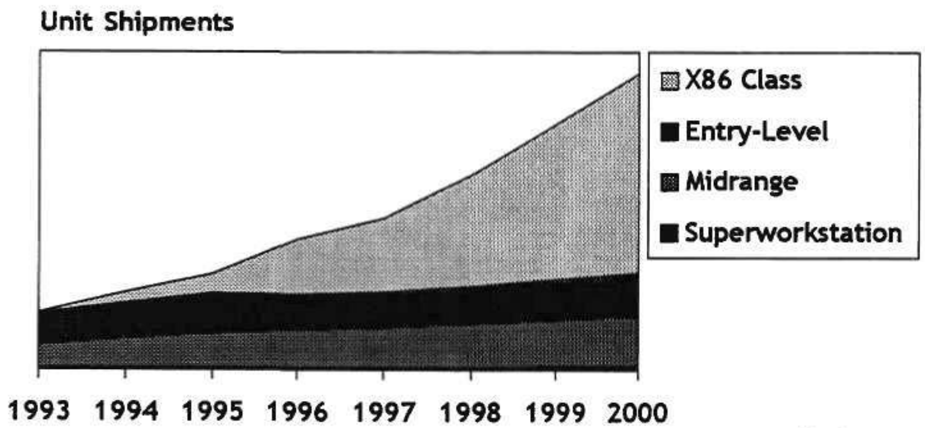
The Size of the Opportunity ...



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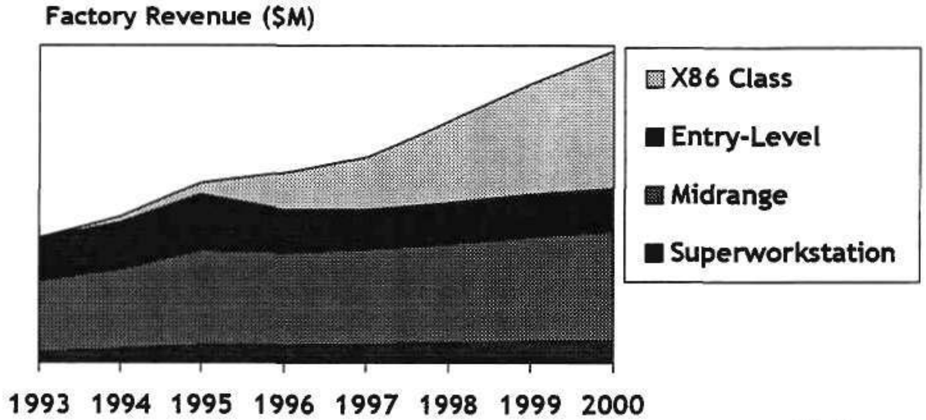
The Size of the Opportunity Is Misleading



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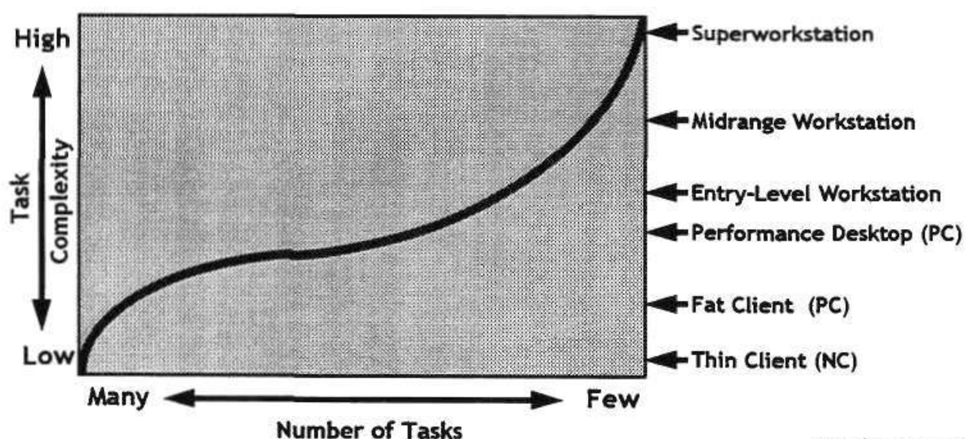
The Range of Opportunity Is Limited



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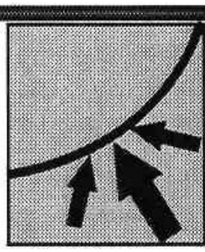
Advanced Desktop Early Opportunities



- *The entry-level market is the most suited to commodity product and marketing*
- *Most of the major application vendors will support Windows NT by the end of the year*
- *1997 will reveal which Wintel workstation vendors will be the early winners*
- *Success will depend upon sales and marketing prowess; relationships with VARs, distributors, and application vendors; and customer support*

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Advanced Desktop Long-Term Opportunities

- *Midrange and superworkstation categories differentiate themselves at a technology level*
- *Distribution-focused PC companies will find it difficult to break through to the next level*
- *Wintel workstation vendors that succeed in the entry-level market and can also be technology innovators will have an opportunity to break through to the next level*
- *UNIX/RISC vendors will not be threatened until this occurs*

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Notes

Notes

Panel: Drilling into the PC Market

Panelist: R. Scott Miller

Senior Industry Analyst, Personal Computers Worldwide,
Computer Systems and Peripherals Group
Dataquest

Mr. Miller is senior industry analyst for the Personal Computers Worldwide program of the Computer Systems and Peripherals group and is responsible for quantitative modeling and qualitative analysis for the global PC markets. Mr. Miller has done extensive research on the U.S. consumer technology market as well as the market for computers in small and medium-size businesses in addition to covering global vendor strategies, technology shifts, and vendor's competitive positioning.

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Mr. Miller attended Cornell University where he earned a B.S. degree in operations research and industrial engineering and an M.E. degree in engineering management.

Predictions ...

- A "bottom-up" design approach will deliver $800 PCs that are worth $800
- The existing infrastructure will be unable to deliver these products
- Those who are early to market or who own fundamental technologies will dominate this space

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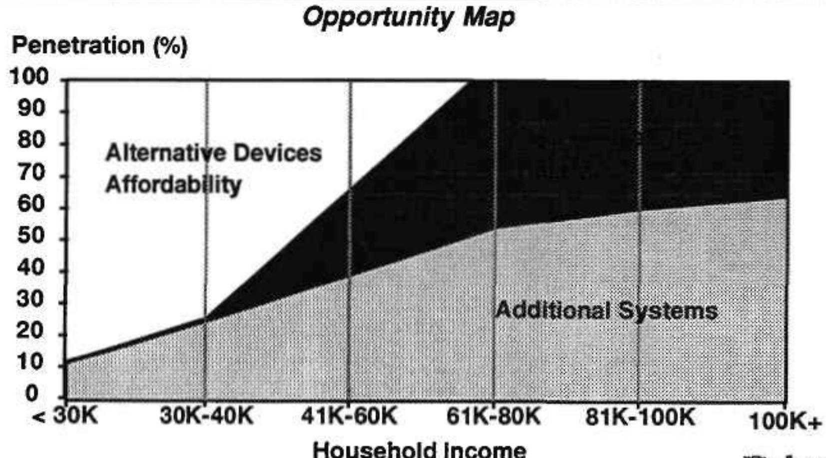
Barriers to Growth ...

Opportunity Map



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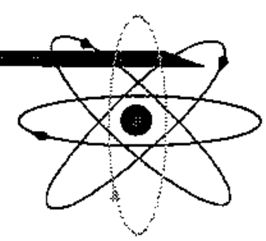

Critical Mass

The point at which a reaction is self-sustaining

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Addressing Relevance

➤ Computing as part of the social fabric
- Internet = Communication, information, inclusion
- Games = Addiction, thrill, competition
- Productivity = Work at home, "getting organized"
- Education = Dive for success, fear of failure
- Lifestyle = The digital consumer!

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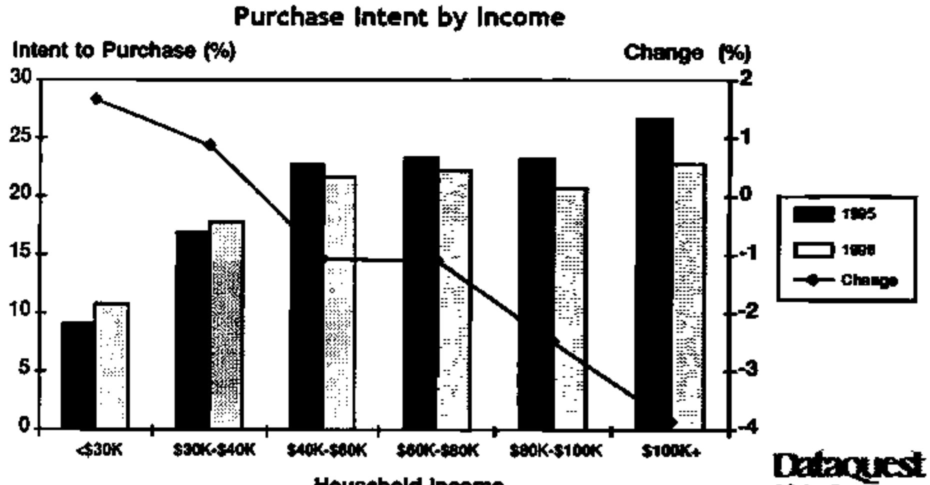
Affordability Is Problematic ...

Purchase Intent by Income



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The Calculus of the $800 PC ... A Top-Down Approach

- Based on older technology
- Hobble the existing platform
- Squeeze margins along the chain
- Issues:
  - Marketing is tricky
  - No configuration consistency
  - Poor user experience

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The Calculus of the $800 PC ... A Bottom-Up Approach

- The "Honda approach"
- Collapse the supply chain
- Build to competitive performance
- Benefits:
  - Clean marketing message
  - Minimize margin squeeze
  - "Thrifty" versus "cheap"

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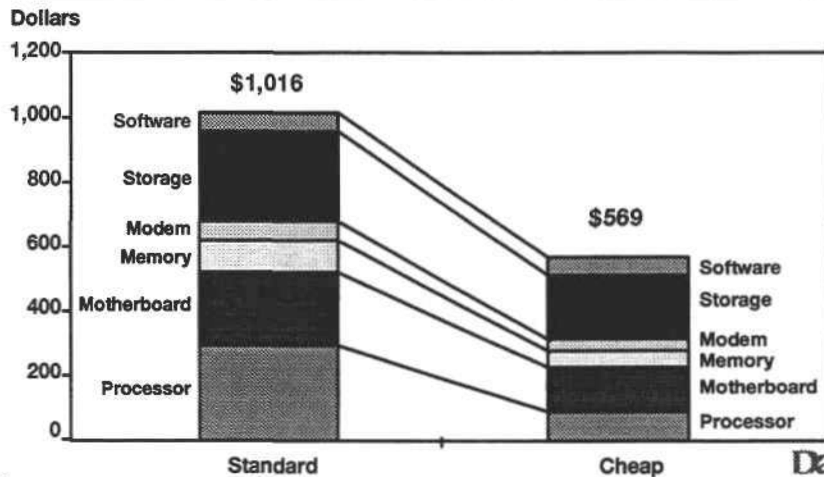
Defeaturing—An Example



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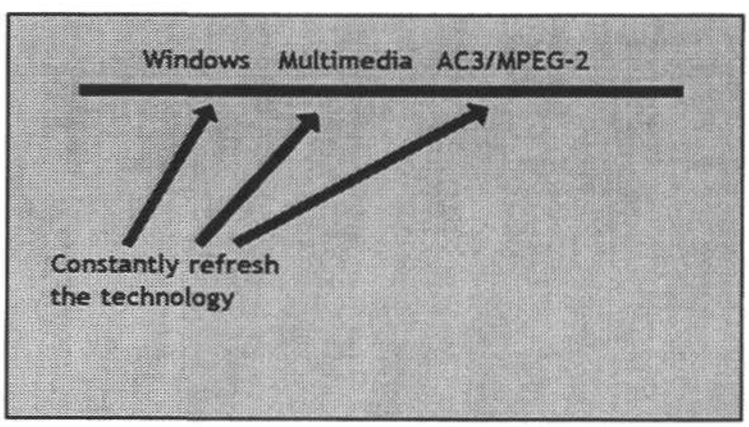
Exclusion Points ...



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Boom Box PCs?

- Media processors?
- Fewer subsystems = Fewer participants
- Sealed case
- The role of software

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Who Will Win?

- Companies that own technology
- Companies that are early to market
  - Create a new segment
  - Enable a new infrastructure
- Companies that consumers trust
  - Build your brand!

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Notes

Panel: Drilling into the PC Market

Panelist: Mike McGuire

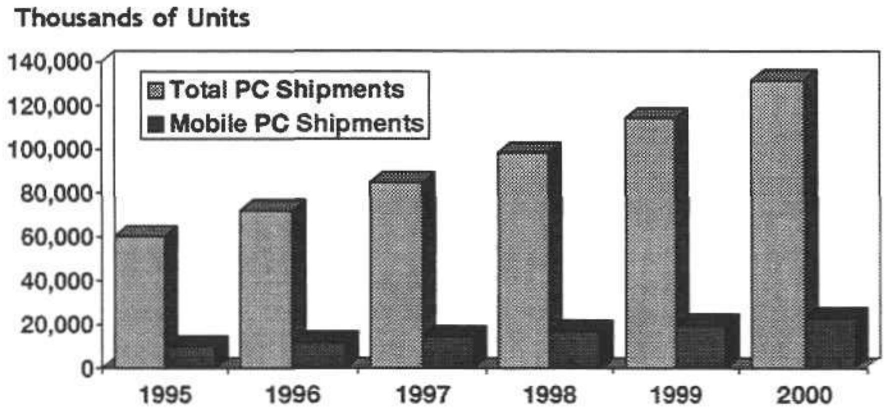
Senior Industry Analyst, Mobile Computing Worldwide
Computer Systems and Peripherals Group
Dataquest

Mr. McGuire is the senior industry analyst for the Mobile Computing program of the Computer Systems and Peripherals group. He is responsible for the quantitative analysis of the devices (for example, notebooks and handheld computers) and qualitative analysis of connectivity to networks such as local or wide area networks, the emerging wireless networks from a computer user's viewpoint (for example, which ones would solve the data needs of mobile computer users in terms of cost, geographical availability, and time frame when they will be viable), and the applications and operating systems software used in mobile computing environments.

Before joining Dataquest, Mr. McGuire worked as a senior writer with *PC Week*, the nation's top computer industry newspaper, where he was responsible for the publication's coverage of Apple Computer Inc., the personal digital assistant (PDA) market, and a number of PC companies including AST Research Inc. Mr. McGuire has held public relations positions at companies such as GeoWorks, GRiD Systems, Acer America, and Octel Communications Corporation. Before joining the computer industry, Mr. McGuire worked for seven years as a daily newspaper reporter at a number of Bay Area newspapers.

Mr. McGuire received a B.A. degree in journalism from San Jose State University.

Worldwide Mobile PC Unit Forecast in Perspective



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Mobile Market Predictions

- Windows CE's biggest impact not in current handheld form factor but in "ultra ultraportables"
- Value notebook market—Look for more and more vendors to find it too tough to play
- Beyond 2000: Majority of mobile Web/Internet connections are from handhelds

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Windows CE's Biggest Impact Not in Current Form Factor but in "Ultra Ultraportables"

- Desktop application metaphor on tiny screens and tiny keyboards = Long-term frustration
- Think ... $800 or less
  - A roaming "terminal" to your desktop
  - 2 pounds or less, color screen
  - "Work" sketches with "pocket" versions of Excel/Word and IE
  - "Days" of battery life
  - Easy synchronization with full-featured desktop applications

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Value Notebook Market—Look for More and More Vendors to Find It Too Tough to Play

- Technology-development linkage between high-end products and value products
- Screens—Those with direct access win
- TI/Acer—Example of things to come

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Beyond 2000: Majority of Mobile Web/ Internet Connections Are from Handhelds

- Web/Internet becomes transaction medium
- "Regional/local," not "national/regional," services drive market
  - One-way data communication as important as two-way to consumer market
  - One-way paging infrastructure pervasive now!
  - Two-way here but coverage is very spotty

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Notes

Notes

Panel: Drilling into the PC Market

Panelist: James Staten

Industry Analyst, Personal Computers Worldwide
Computer Systems and Peripherals Group
Dataquest

Mr. Staten is an industry analyst in the Computer Systems and Peripherals group and is responsible for the quantitative and qualitative analysis of trends and technologies in the computer industry.

Before joining Dataquest, Mr. Staten was the editor of the Internet and networking section of *MacWEEK*, the top Macintosh computer industry newspaper. Before that he served as *MacWEEK's* first online editor, and during his tenure *MacWEEK's* Web site grew to become the second most popular in the Ziff-Davis family. He has also covered the mobile market; several software categories including databases, graphics applications, PIMs, and productivity applications; and peripheral categories including monitors, speakers, storage, multimedia hardware, memory, and accelerators. Mr. Staten was the reviews editor for *MacHome Journal* and *PC Home Journal* previous to *MacWEEK*. He has also held communications positions at Rockwell International and Chiat/Day/Mojo, and worked as a CAD system value-added reseller.

Mr. Staten holds a master's degree in journalism from the University of Southern California and a bachelor's degree in psychology from the University of North Texas.

Dataquest Predicts

- The small business market will grow at least 10 percent faster than any other PC segment in 1997
- This growth will be driven by vendors implementing these solutions:
  - Small business servers
    - —Auto maintained
    - —Quick setup
  - Mininetworks
    - —Integrated turnkey networking solutions

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Defining the Market

- SOHO: SO and HO are two different markets
- 2-100 employees

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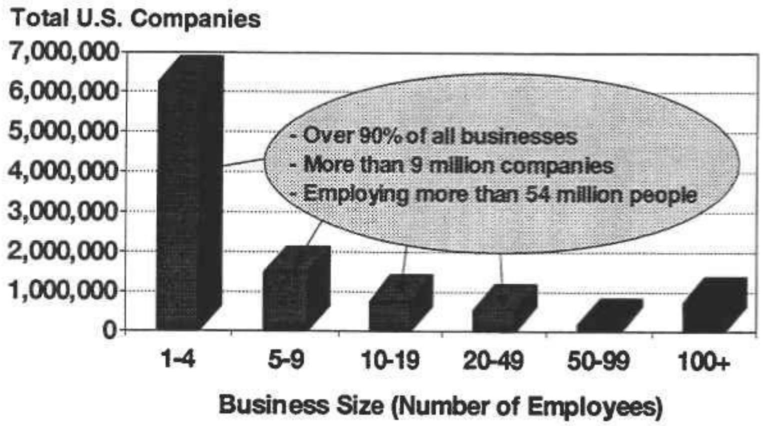
How Big Is the U.S. Small Business Market?



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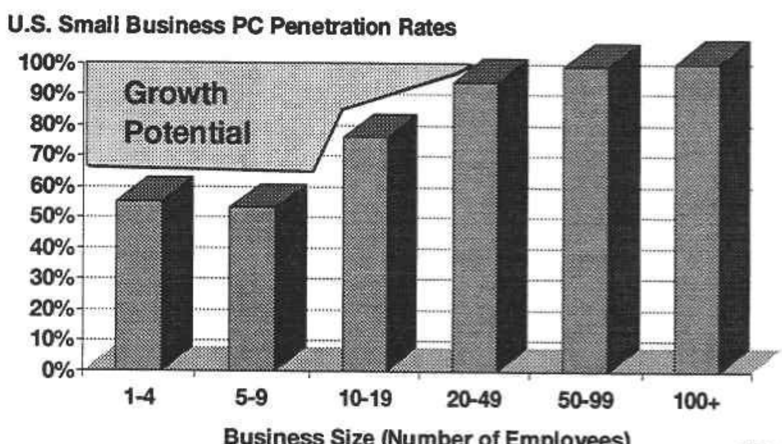
Where Are the PCs in This Market?



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So What Does It Mean?

- If you sell only one PC for every 5 employees in these key segments
- That's more than 10 million PCs
- Nearly half the total U.S. PC market in 1996

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Defining the Market

- No IS manager
- Limited PC knowledge
- Limited IS budget
- Limited time to deal with IS problems

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What Small Businesses Want

- Easy to use, affordable, reliable solutions
  - Price always a paramount concern
  - Support and service secondary concern
  - Ease of use a close third
- Client: Windows 95, Windows NT server

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The PC Vendor/Dealer Is the Small Business IS Department

- Very reliant on dealer/vendor for:
  - Solution integration
  - Technical support (software and hardware)
    - —Remote support
  - Fast reliable service (on-site)
  - Networking/communications expertise

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Predictions

- Small business servers
  - Low maintenance
  - Self-maintained
    - —Unattended backup
    - —UPS
    - —Self-diagnostics
    - —Plug-and-play components
    - —Integrated and optimized software solutions
      - —Internet/intranet
      - —Business segment solutions

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Predictions

- Mininetworks
  - Easy to set up and use networks
  - All pieces integrated
  - Optimized for use together
  - Work right out of the box
  - For peer-to-peer or client/server

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Addressing Their Needs

- Provide targeted and integrated solutions
- Provide special support services
- Quality and reliability

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Recommendations

- Be prepared to help small business customers grow
  - Most small business solutions today are first-buy PCs
  - Provide networking solutions
  - Provide Internet solutions
  - Small business servers

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Notes

Successful Intranet and Web Servers

Gregory C. Garry

Senior Industry Analyst, Client/Server Computing
Computer Systems and Peripherals Group
Dataquest

Mr. Garry is a senior industry analyst in the Client/Server Computing program with a specific focus on the server segment of this explosively growing computing environment. By looking at server buying trends, product implications, technology and business trends, and vendor strategies he is able to analyze and evaluate the ongoing impact of client/server computing. In addition to developing weekly coverage of client/server issues in the form of *Client/Server Virtual Views*, Mr. Garry also produces longer reports on a custom consulting basis.

Before joining Dataquest, Mr. Garry was West Coast editor of *Client/Server Computing*, a monthly magazine providing news and analysis for users who are migrating to or already working in a client/server computing environment. In his capacity as West Coast editor, Mr. Garry analyzed and wrote about systems, servers, and networking equipment. Before that, Mr. Garry held the position of senior editor at *Client/Server Today*, a monthly magazine that reported on and analyzed client/server computing. He focused on the servers, networking equipment, desktop client systems, and processor architectures helping to shape the developing client/server paradigm. Before his stint on *Client/Server Today*, Mr. Garry was senior editor with *Digital News and Review*, where he reported on and analyzed Digital Equipment Corporation's thrust into the distributed computing market. In addition to carefully tracking Digital, he closely followed the company's primary competitors, including IBM, Hewlett-Packard, Sun Microsystems, and Silicon Graphics. Mr. Garry has also held key editorial positions with *Electronic Buyer's News*, *Automotive Electronics Journal*, *Educational Computer Magazine*, the *Los Gatos Weekly*, and the *Santa Cruz Sentinel*. His work in technology-related coverage dates back to early 1983.

Mr. Garry received a B.A. degree in journalism from San Jose State University.

Successful Intranet and Web Servers

Kimball Brown

Vice President, Desktop and Mobile PCs Worldwide
Computer Systems and Peripherals Group
Dataquest

Mr. Brown is vice president of Desktop and Mobile PCs for Dataquest. He is responsible for the PC Worldwide program, which tracks both quantitative (market shares, volumes shipped by region of the world, by type, by processor) and qualitative (drivers of demand, technology shifts, financial strengths, and weaknesses of industry participants) aspects of the PC Industry worldwide. He is also responsible for all facets of Mobile Computing, including the thorough quantitative analysis of the devices themselves, such as notebooks and handheld computers, and qualitative analysis of connectivity to networks for local or wide area networks, the emerging wireless networks from a computer user's viewpoint (for example, which ones would solve the data needs of mobile computer users in terms of cost, geographical availability, and time frame when they will be viable), and the applications and operating systems software used in mobile computing environments.

Mr. Brown is recognized as an industry expert in the field of PCs and mobile computers. He is frequently quoted in such publications as the *Wall Street Journal*, the *New York Times, Business Week, USA Today, PC Week, InfoWorld*, and local newspapers. Having spent time as a securities analyst on Wall Street, Mr. Brown brings a unique understanding of business models, margin analysis, capital accumulation, and the importance of the business side of succeeding in the market rather than simply having great products or services.

Recent accomplishments include developing a forecast for the handheld computer market by business model (proprietary versus standards-based) and geographical breakdowns for U.S. and worldwide markets, by type of connectivity (standalone, wired and wireless); type of input (keyboard versus pen or voice); and creating new definitions for handheld types in this highly volatile and still emerging products category.

Mr. Brown speaks regularly at industry forums on mobile computing. During 1994 and 1995 he spoke at the Hong Kong Productivity Counsel's PDA Symposium in Hong Kong; presented at an LCD Seminar in Tokyo sponsored by the Nikkei; and also spoke at Mobile 95, Phoenix Technologys Mobile Conference, COMDEX, and PC Expo. He participates semiannually in IBM's Industry Advisory Counsel for Mobile Products, and in AT&T Wireless Services Counsel. Mr. Brown did a presentation for the top 45 managers in IBM's R&D division. Discussions covered include the effects of the deregulation of the telecommunications industry on mobile computing, wireless networks as they relate to mobile users needs, and trends in the technologies and markets of notebooks, ultraportables, and handheld computers.

Mr. Brown has 20 years of experience in the computer industry as an engineer, manager, and analyst, including more than four years in the securities industry as a sell-side analyst and investor relations manager. His career includes past positions with IBM, Amdahl, and Everex. In addition, he has worked for Prudential-Bache Securities, where he covered the PC industry as a sell-side analyst, and at InfoCorp, a market research company, where he analyzed and managed research of the PC and handheld computing industries. He has built and maintained relationships with members of the press at major print media (mentioned above) and with executives at most major PC manufacturers and resellers.

Mr. Brown received an M.B.A. from University of California at Berkeley and a B.S. degree in electrical engineering from Duke University.

Main Predictions

- PC servers will make major assault in 1997, increasing their share of the market dramatically
- Companies investing in technological innovation that users want will hold or gain share
  - Sun isn't going away as the PC companies ramp
  - IBM/Lotus will continue to "own" the Fortune 200
- In 1998, continued share gains by PC companies will be difficult
  - "Off the shelf" subsystems/components will not cut it

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What Has Changed to Enable the Web Server Market to Explode?

- Infrastructure shifts
  - Telcos able to improve offerings; internetworking technology explodes
- Internet shift from character-based UI to GUI
- Netscape
- Client/server model shifts to unified standards

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Infrastructure Shifts

- Emergence of low-cost laser diodes and fiber optics in the 1980s enabled dramatically lower-cost high-speed data lines
- Breakup of AT&T enabled free local access to the Web
  - 1983 decree forced RBOCs to provide free Internet access
- PC shipments grew to tens of millions per year
  - In the 1990s, networked PCs—connected PCs via modem—became prevalent, providing a much larger base of users
- Advanced communications technology became pervasive
  - Cisco, 3Com created hubs, routers, now IP switches
  - A lot more than modems! T1, T3, ISDN, ATM, 1Gb Ethernet

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The Economics of Bandwidth

- Historically, long distance capacity was more expensive than local capacity
  - Cables, satellites
- Fiber changes the equation
  - 30,000 calls per wire
- New entrants into long distance haulage
  - Railroads; utilities; oil and gas companies
- For $60 million, MCI acheived 600 MB/sec

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Emergence of the Browser and the WWW

- March 1989: Tim Berners-Lee proposes the Web
- November 1990: First World Wide Web prototype
- January 1993: First Web Browsers for X and Macintosh released as alpha; around 50 known HTTP servers
- February 1993: First alpha version of Marc Andreessen's "Mosaic for X"
- September 1993: WWW traffic measures 1% of NSF backbone traffic. Mosaic browser available for X, Windows, and Macintosh
- January 94: O'Reilly, Spry, etc., announce "Internet in a box"
- March 1994: Marc Andreessen and colleagues form "Mosaic Communications Corp." (now Netscape)

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Netscape

- Netscape's browser provided a common user interface across all significant platforms
  - 50 million users, 80 million hits/day at Netscape site
  - Forced servers to adopt these open standards in order to work with the installed base of Browser users
  - Shifted competitive focus from operating systems to browser and applets
  - Sun's Java VM incorporated into Netscape browser
  - Microsoft was <u>forced</u> to follow Netscape!
    - —Microsoft's dominant GUI threatened
    - —Microsoft forced to enable Java VM support
    - —"We love Java"?

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Client/Server Shifts

- Emergence of the "browser" and the WWW enabled a common UI across disparate hardware
- Internet standards have enabled users to develop client/server applications with common standards across many hardware and software vendors' offerings
  - HTML, TCP/IP
  - Java applications and Java VM
- Users now have the infrastructure, tools, and standards to develop intranets using Internet standards

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Bundles Now Available for PC Companies

- Microsoft: Normandy and Back Office
  - February 1995 Internet Information Server (IIS) announced
  - Normandy announced 6/96 to be available by mid-1997
    - —Integrates Back Office with IIS
    - —Enterprise, Mail, SNA, SQL, Merchant, Systems Management
- Netscape: SuiteSpot servers
  - SuiteSpot from Netscape becomes complete in Q2/97
  - Servers: Enterprise, mail, media, collaboration, calendar, commerce, auto-admin, application development, security
- 1997 is the first year that X86/NT vendors have the tools to win

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Intranet Systems Lay of the Land

- Three main camps
  - PC companies
  - Traditional systems vendors
  - Niche systems vendors

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Who's in the PC Server Crowd?

- Traditional PC vendors selling complex PCs
- $5K-$50K system price
- Compaq, Dell, Gateway, Acer, AST, others
- Lots of white box clones
- Characterized by as much as 128MB RAM, 10GB disk, off-the-shelf multiprocessing

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Who's in the Traditional Crowd?

- Traditional large system vendors, UNIX vendors
- Sun, HP, SGI, IBM, Digital
- Product types: workstations, servers, midrange systems
- Servers are not only about hardware
  - Enterprise computing, storage farms, client/server, mission-critical, Oracle $1M software systems not $199 Paradox

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Who's in the Niche Crowd?

- Specialized systems: Nonstop, scalable multiprocessing, redundant
- Tandem, Stratus, Tricord, NetFRAME, Sequent
- Why do they have a reason to live?
  - Specialized applications, mission-critical, price-insensitive market

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PC Guys

- Strengths:
  - Significant price advantages
  - Mass distribution channels
  - Good at reaching small sites with limited needs
- Weaknesses:
  - Reliability and serviceability; "low-touch" business model
  - Everyone is a specialist (hardware, software, service)
- Difficult sell into mission-critical environments
- Until recently, just boxes with weak software offerings

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Traditional Guys

- Strengths:
  - Long-term investments servicing mission-critical environments
  - Vast experiences in managing large data environments
  - Huge worldwide service infrastructure
  - Develop in-house technology to complement outside offerings
- Weaknesses:
  - Large and slower to move
  - In-house technology development, service and support, and direct salesforce a high-cost business model
  - Not economic for 1- to 10-system deals; small opportunities

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Niche Guys

- Strengths:
  - Innovation—address specific user needs: SMP beyond 8-way, nonstop, scalability
- Weaknesses:
  - Expensive
  - Not the most open technology
  - Too pricey for mainstream deployment
  - Some companies not large enough support infrastructure (Tricord, NetFRAME)
  - Some must play catch-up in open systems race (Tandem)
- Carving niches in mission-critical areas

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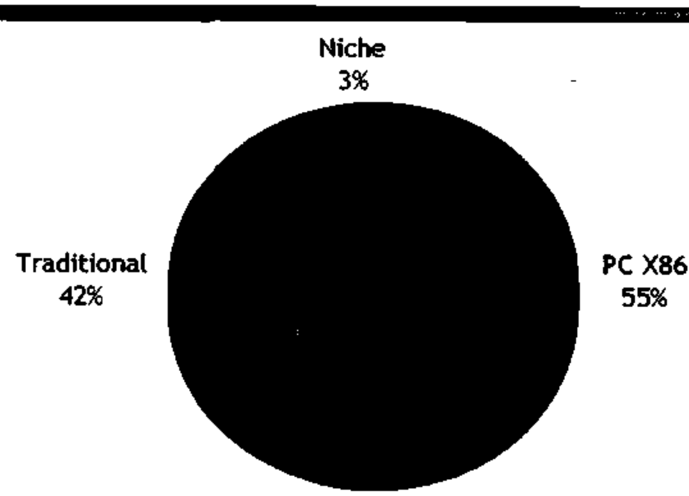
Unit Share by Type of Computer Company



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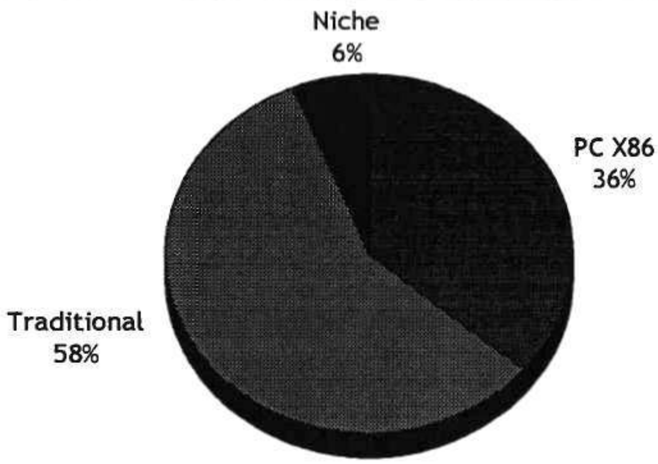
Revenue Share by Type of Computer Company



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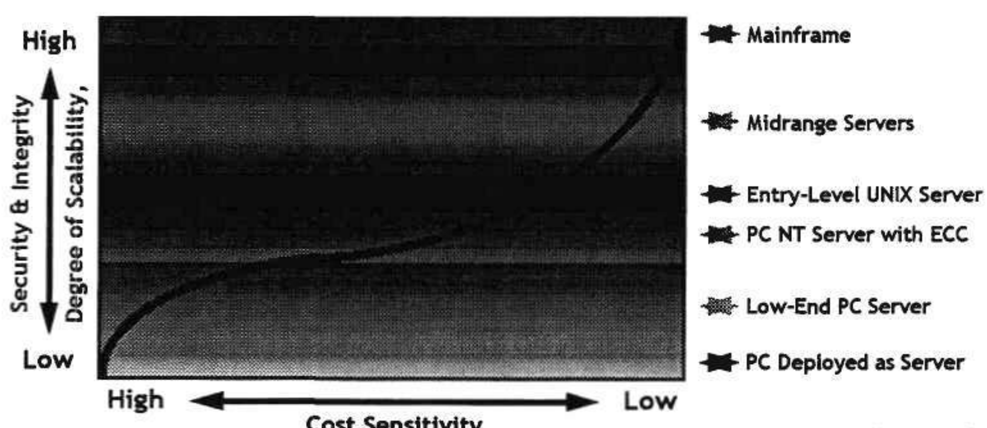
The Range of Opportunity for PC Servers



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Why Will PC Guys Be Able to Play Big Time? Enablers

- Hardware architectures: Intel 4 CPU off-the-shelf boards, MP bus, RAID controllers
- Operating systems: More robust OS: NT 4.0
  - 4 mpu support,
  - C4 security, Not there on fail over, mirroring, crash recovery
- Communications: Basic comm. technology to compete (http, TCP/IP) are available to everyone and standardized
- Applications: Pick which back office to play on MS or Netscape
  - A year ago Back Office-IIS/SuiteSpot not ready for prime time
  - Exchange maturing

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Innovating Companies Will Rule in 1998

- Vendors with size, R&D budget
- IBM, HP, Sun, Digital, Compaq, SGI
- Such vendors have more ability to pull off technology partnerships (HP and Cisco) (IBM-3Com-Cascade)
- They have ability to leverage and improve on performance enhancers (Sun-Gigaplane, Digital-Memory Channel)
- Compaq has more experience with large systems than other PCx86 types
- SGI will combine Web expertise and video server opportunities

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Who Is Innovating NOW?

- Compaq's R&D is 1-2% of revenue versus Sun's 9-10%
  - Mainly hardware with some software integration: rack & stack, hot swap, intelligent PCI, site manager
  - Compaq R&D spending little on basic technology; most on sustaining, manufacturing development
- Sun: Java/Java VM and Solaris/SPARC architectures
  - $100M Kleiner Perkins fund
  - 64-CPU $1M system to low-end workgroup servers
- Digital: Alpha 2-3x X86, lead in NT service support engineers
- HP: UNIX/PA X86/NT thrust; huge service infrastructure, systems integration
- IBM: S/390, AS/400, RS/6000 and X86/NT with Domino/Notes

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Software Bundles: A Key

- Users will write their own applications or will expect them to be bundled with the Web server
  - As a result, the successful systems vendors will provide the right preinstalled server software
    - For example, http, mail/messaging, commerce, firewall technology
    - Workgroup applications that allow collaboration
    - But also development tools for Web pages, applications that are easy to use

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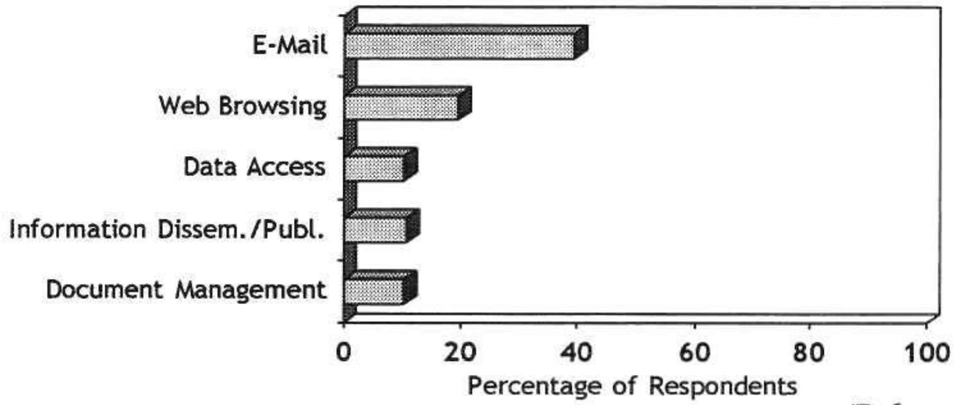
Access to/Exchange of Data Is Key

Leading Intranet Software Categories, Applications, or Functions



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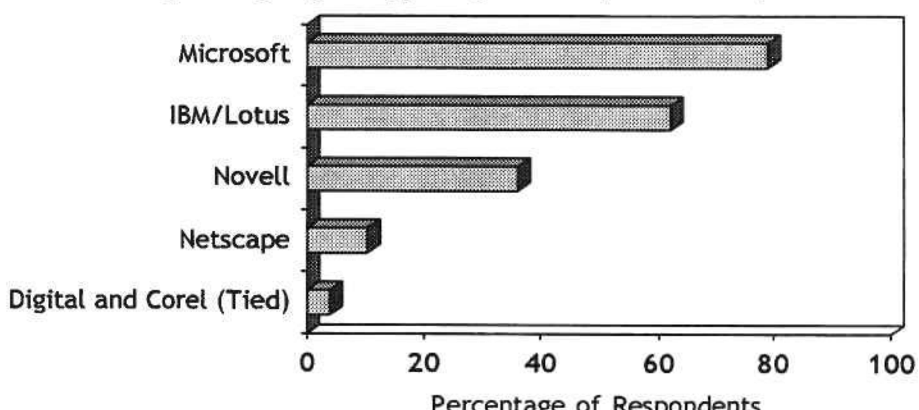
Microsoft/IBM Lead in Workgroup Software

Leading Workgroup or Office Systems Software Companies



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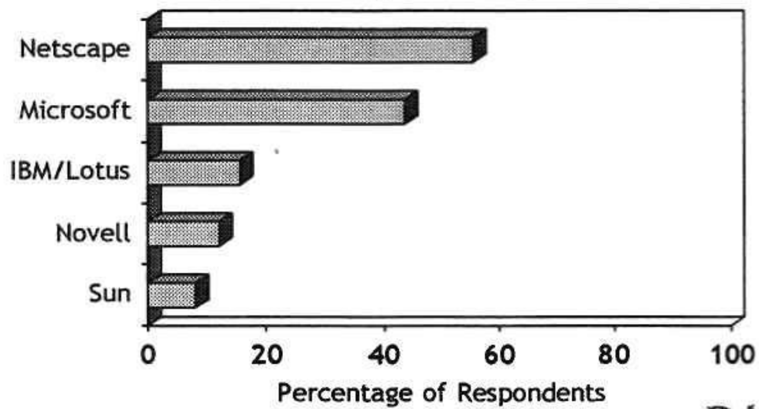
Netscape, Microsoft Are Associated with Intranet Software

Leading Intranet Software Companies



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Key Intranet Bundles

- Microsoft
  - Combination of Back Office and Normandy Web Suite
- Netscape
  - Netscape SuiteSpot out first with capability growing
- Novell
  - IntranetWare
- IBM/Lotus
  - Internotes Web Publisher 4.0 (to be replaced by Domino)

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Key Internet Bundles

- Microsoft
  - Internet Information Server
- Netscape
  - Netscape Commerce
- Novell
  - NetWare Web Server
- Others

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Key Deployments That Will Drive Growth

- E-mail clearly will be the earliest growth driver, especially in intranet space
- File serving
  - Opportunities for server vendors with strong Novell and NT packages for text-heavy file serving
  - Technical server specialists like Sun, SGI, and others will maximize for NFS file servers
  - NT workstation should change that mix
- Challenges for Web servers
  - Direct connection between Web servers and database still complicated

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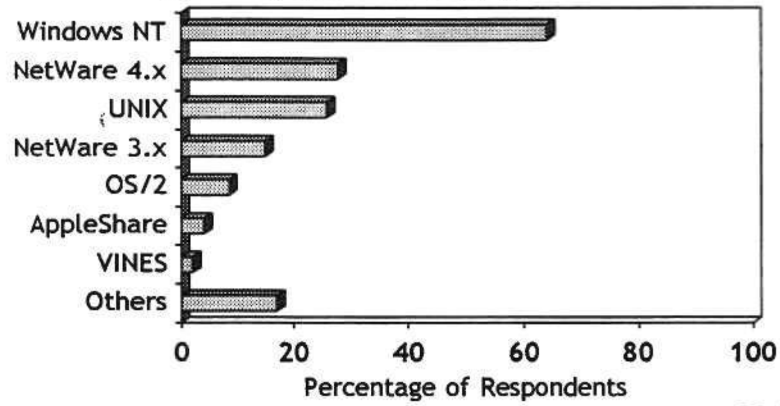
NT Coming On, but NetWare and UNIX Strong

Server Operating Systems in Deployment in 1997



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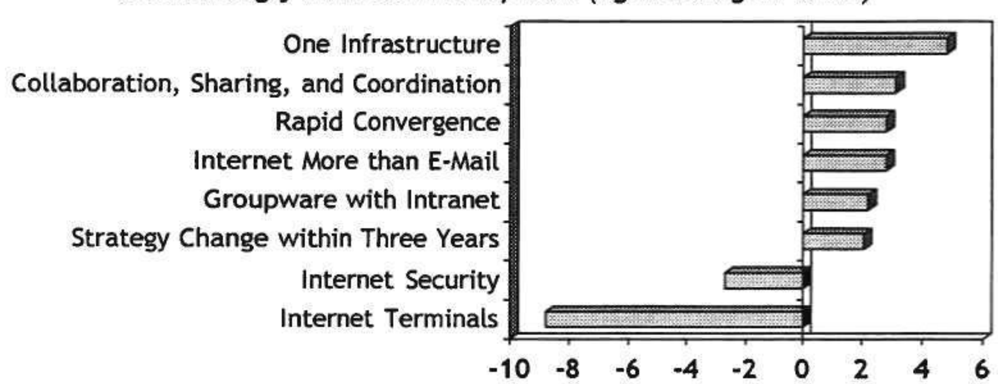
Users Prefer Single Architecture, Worry about Security

Most Strongly Held User Perceptions (Agree/Disagree Ratio)



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Multiple Architecture/OS Vendors Have Broader Opportunities, Integration Is Key

- IBM
  - S/390, AS/400, RS/6000, PC Servers will be Web-enabled
  - Several processor architectures and at least eight operating systems
- HP
  - Intel/NT Netserver, RISC/UNIX HP 9000, HP 3000 MPEiX
- Digital
  - Intel/NT Prioris Web servers, AlphaServer running NT, UNIX, and OpenVMS
- Sun
  - Java OS/picoJava and Solaris/SPARC

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Single Architecture/OS Vendors Will Offer Cleaner Integration; May Miss Some Sales

- SGI
  - MIPS and IRIX
- Compaq, Dell, Gateway, many others
  - Intel and Windows NT
- Apple
  - PowerPC and Mac OS

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Security Concerns

- Firewall software approaches include:
  - Application-level
  - Circuit-level
  - Packet-level
  - Protocol-level firewall software

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Firewall Must Match Site Type

- Variety of packages mix-and-match approaches
  - Secure Computing's Sidewinder
  - NEC's PrivateNet
  - Data General's Cybershield
  - 3Com's Netbuilder

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Strong Resellers a Key

- Access Graphics
- Ingram Micro
- Tech Data
- Merisel
- Hall-Mark
- Others

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A New Service Level Will Be Required

- Internal approaches must match user organization size and application profile
- Outsourcing must be done carefully—you don't want your Web systems competitor to handle your service calls
- Major systems vendors serious about this market will add to their service and support headcount and develop specialized programs for both corporate intranets and the Internet

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Systems and Network Vendor Alliances Will Unfold

- HP and Cisco
- IBM and 3Com and Cascade
- Sun and everyone
- Compaq and Cisco
- More such deals will be cut—involving Cabletron, Bay Networks, Fore Systems and others
- They will be nonexclusive but are necessary due to quickly evolving needs for 100-Mbps Ethernet, switched Ethernet, the role of FDDI, ATM, and Gigabit

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RAID Expertise and Alliances Important

- Companies that possess strong RAID capabilities will have an advantage with NFS file, database, and other applications attached to Web servers. Companies like IBM, HP, Data General, Digital, Sun, and Compaq will be well positioned.
- Other Web server systems aspirants will have to strengthen their existing relationships or pursue relationships with such independent RAID vendors as EMC, Hitachi Data Systems, and StorageTek

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Sun's Java/Java VM Concept Rescues IBM

- The new SAA for IBM
- Allows IBM's four disparate architectures to interoperate
  - S/390, AS/400, RS/6000, and NT
- Application written once runs on all their systems
- Held together by Domino/Notes
- Only viable for nonperformance dependent applications
- Will allow IBM to keep account control

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Sun Riding the Web Wave

- Solaris/SPARC aimed at workstations and servers
- Java/Java VM architecture aimed at leveling the playing field
- Sun cannot compete directly with X86/NT servers
  - But JavaStations allow them to go lower
  - Will sell when replacing terminals, fixed-function-use PCs
  - Will sell where IS wants centralized control
    - —"Functionality is cheaper than freedom"
- Sun Servers and JavaStations versus NT servers and PCs

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1997 Prediction Summary

- 1997 is the easy year for PC guys to get on the map—market share spurt
- 1998—everyone gets the same technology, stabilized, further share gains more difficult
- Only those companies that invest in innovation will gain share
- Expect IBM and Sun to defend share as Web-based servers become pervasive

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Conference Summary

Davis Blair

Vice President, Online, Multimedia, and Software Group
Dataquest

As vice president of the Online, Multimedia, and Software group, Mr. Blair is responsible for planning and execution of Dataquest products in the Online Strategies (Internet), Multimedia, and Software areas, including Desktop Software, Client/Server Software, Workgroup Computing, EDA, MCAD, AEC and GIS offerings worldwide. Having over 14 years of experience as both a user and an analyst of technology, and several years of international experience, Mr. Blair can offer some unique perspectives to Dataquest clients.

Before joining Dataquest, Mr. Blair served as the vice president and general manager of Asia/Pacific for International Data Corporation. During a seven-year tour in the region, he founded the regional headquarters and helped to make it IDC's largest international subsidiary within a five-year period. In addition to management of 10 offices, Mr. Blair was responsible for product and service development covering all important areas of the IT industry for the region. He was on the founding team of IDC Korea and is fluent in the Korean language.

Before market research and consulting, Mr. Blair was an MIS manager and systems analyst responsible for development and implementation of an online hospital management solution covering integrated billing, inventory management, patient and medical history management, and other areas.

Mr. Blair received a B.S. degree in information systems.

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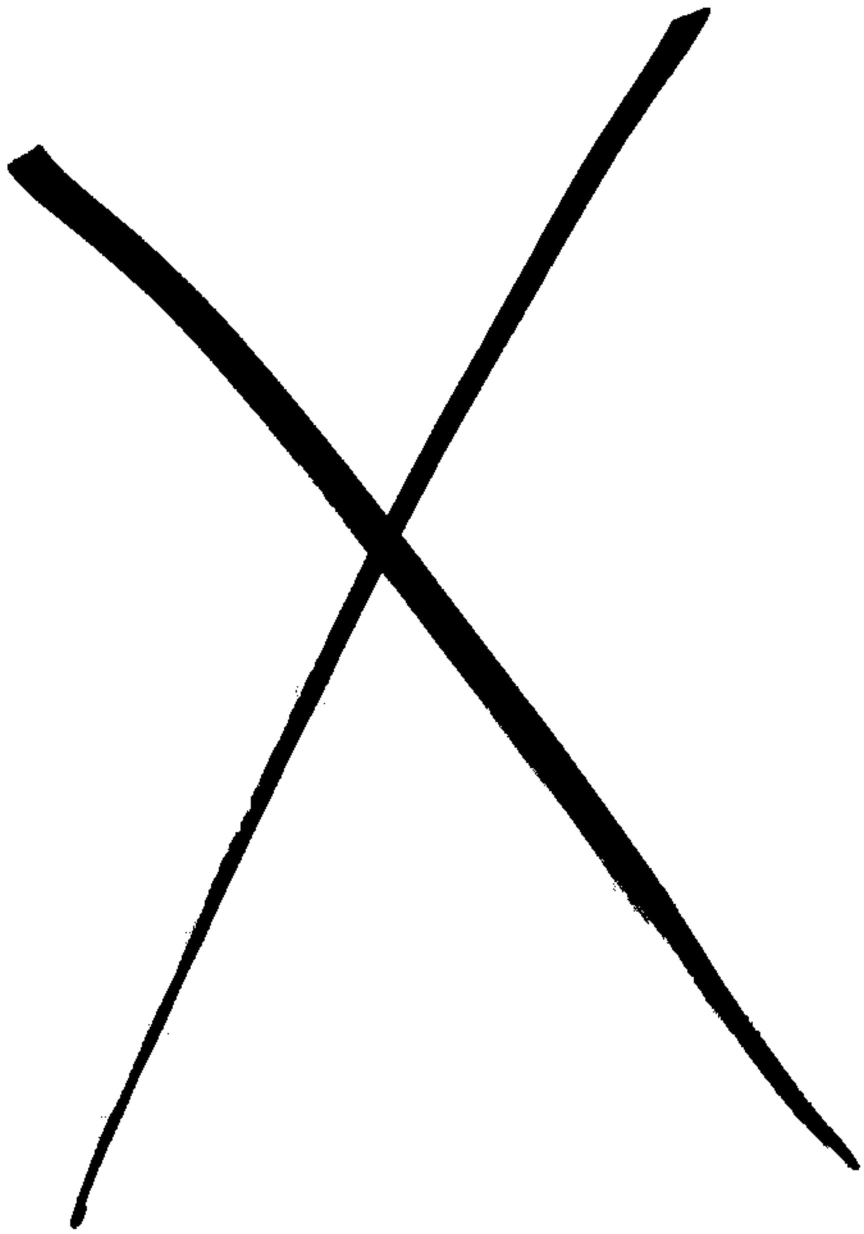

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