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Reply Card Semiconductor User and Applications Conference

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Buying and Selling Semiconductors: The Changing User-Supplier Relationships in the 1990s

February 12–13, 1990 Hyatt Union Square San Francisco, California

Strategic and Tactical Information for Management in High Technology







Dr. Michael Canning Vice President, Manufacturing Cirrus Logic, Inc.



Dr. Timothy W. Carr Senior Vice President, Technology Product and Market Development Alcoa Electronic Packing, Incorporated



Charles Clough President and CEO Wyle Laboratories



Victor de Dios Director North American Semiconductor Research and Semiconductor User and Applications Group, Dataquest Incorporated



Joseph Duncan Vice President, Corporate Economist and Chief Statistician Dun & Bradstreet Corporation



Kevin McGarity
Senior Vice President,
Semiconductor Group
Manager, Worldwide Marketing
Texas Instruments, Inc.



Jean Pierre Melia Semelco Member of the Board Magneti Marelli France Purchasing Director Magneti-Marelli-Semelco



Linn Nelson Vice President Barnel International, Incorporated

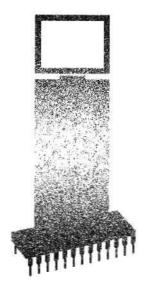


John Rizzo Vice President, Marketing Momenta Corporation



Charles (Chuck E.) Thompson Senior Vice President and Director of Worldwide Marketing Semiconductor Sector Motorola, Incorporated

Hear more than 20 thought-provoking presentations from distinguished industry leaders as well as from Dataquest's authoritative analysts on the implications of the changing nature of user-supplier relationships.



Buying and Selling Semiconductors: The Changing User-Supplier Relationships in the 1990s

Relationships between semiconductor users and suppliers are changing dramatically as they become stronger and closer but more complex. Identifying these complexities and analyzing their implications is a crucial first step in developing strategies to capitalize on the unique opportunities they afford. Join Dataquest and more than 250 forward-looking industry executives at this conference as we discover creative new ways of planning for success in the midst of this changing landscape.

Providing Actionable Information and Analysis

The emphasis at this conference is on providing practical, actionable information. You will hear more than 20 thought-provoking presentations from distinguished industry leaders as well as from Dataquest's authoritative analysts on the implications of the changing nature of user-supplier relationships. The topics cover both tactical and strategic issues ranging from market outlook and product trends to more focused sessions on market development and procurement strategies.

The ONLY Semiconductor Conference that Brings Buyers and Sellers Together

At this conference, executives responsible for the selection, evaluation, and purchase of billions of dollars worth of semiconductors will join their semiconductor manufacturing counterparts to formulate strategies, exchange insights, and build effective working relationships.

We urge you to register today! Call (408) 437-8245 or fax (408) 437-0292 for reservations and further information.

The Supplier of the Year Award

The second annual Supplier of the Year award will be conferred on a company chosen by the leading electronic equipment manufacturers. This award is based on excellence in technical support, customer service, and overall quality, as reflected in the results of Dataquest's annual user survey.

Agenda

Monday, February 12

7:30 a.m. to 9:00 a.m. Breakfast

Registration

9:00 a.m. Conference Begins

MARKET OUTLOOK

▲ Conference Welcome and Overview

Victor de Dios

Director

North American Semiconductor Research and Semiconductor User and Applications Group Dataquest Incorporated

▲ 1990 Worldwide Economic Outlook

Joseph Duncan

Vice President, Corporate Economist

and Chief Statistician

Dun & Bradstreet Corporation

Today's semiconductor industry is in the "silicon cycle" stage, a time when it is most affected by economic events. This speech will present the economic forecast and discuss the major economic issues and drivers for 1990.

▲ Electronic Equipment Outlook and the Next PC Boom

Kevin Landis

Terrance Birkholz

Industry Analyst

Research Analyst

Semiconductor Application

Semiconductor Application

Markets

Dataquest Incorporated

Dataquest Incorporated

Dataquest will present the worldwide electronic equipment production forecast based on our worldwide applications database. The speakers will also identify the applications expected to drive the next semiconductor industry upturn in 1992.

▲ 1990 Worldwide Semiconductor Industry Outlook

Hal Feeney

Group Vice President and Director

Components Group

Dataquest Incorporated

Dataquest's latest worldwide semiconductor forecast will be followed by a discussion of the major product, market, technology, and application trends expected in the next five years.

▲ Trends in Semiconductor Capacity and Capital Spending

Joseph Grenier

Director

Semiconductor Equipment and Materials Service

Dataquest Incorporated

Capital spending determines the future ability of the semiconductor industry to support the electronics market and has a key role in past product shortages or excess availability. This speed will project the level and nature of capital spending in the next five years.

▲ The Fifth Annual Survey Results

Mark Giudici

Carolyn Doles

Senior Industry Analyst Semiconductor User

Research Analyst Central Research Group

Information Service

Dataquest Incorporated

Dataquest Incorporated

Dataquest will present the results of its annual survey of 600 users on their expectations of the nature, issues, and trends of the semiconductor market in 1990. The speech will present the optimism level and major concerns of the semiconductor user community.

CHANGING MARKET RELATIONSHIPS

▲ Changing World Markets—Procurement Challenges in the '90s

Linn Nelson

Vice President

Barnel International, Incorporated

For success in the competitive markets of the '90s, global sourcing opportunities together with total supplier performance will be essential for procurement's contribution to manufacturing cost reduction. This speech will present the future challenges and potential global domestic solutions for successful supplier development.

▲ Global Procurement Demands Worldwide Service

Charles (Chuck E.) Thompson

Senior Vice President and Director of Worldwide

Marketing Semiconductor Sector

Motorola, Incorporated

Electronic system makers are resorting to global procurement for both their component and subsystem needs to remain competitive in the international marketplace. This trend challenges the service capabilities and creativity of semiconductor manufacturers and will be the topic of this speech.

▲ Keeping Pace with Dynamic Regional Issues Kevin McGarity

Senior Vice President, Semiconductor Group Manager, Worldwide Marketing

Texas Instruments, Inc.

Despite the globalization of the semiconductor industry, each region appears to be pursuing diverse trade policies. As discussed in this speech, a semiconductor manufacturer needs to respond to the growingly disparate needs and conditions in each region.

▲ Assimilation and Service:

Japanese Company Directions

Robert Brown

Vice President and General Manager

Semiconductor Operations

Toshiba America Electronic Components, Inc.

Japan-based companies are attempting to internationalize and assimilate with the regional market requirements for service and product quality. This speech will address major trends that these companies will employ in delivering that service to their customers.

▲ The Future Role of Distribution

Charles Clough

President and CEO

Wyle Laboratories

A quarter of semiconductor shipments in the United States are made through distributors. As technology changes toward application!specific products and other technologies, new challenges and questions are raised on the future role of distribution. This speech will address these challenges and

▲ Service Performance Electronics Industry versus Automative Industry

R. Gene Richter

Executive Director Corporate Procurement Hewlett-Packard Company

The electronics industry is one of the major manufacturing sectors in the world, but supplier service performance has not yet reached the standards of other mature industries. This speech offers insight into how the electronics industry might learn to raise performance through lessons from the automotive sector.

6:00 p.m. Cocktail Reception

7:00 p.m. Dinner

Dinner Speaker to be Announced Supplier of the Year Award Ceremony 7:30 a.m. to 9:00 a.m. Breakfast

MARKET TRENDS AND ISSUES

▲ Dealing with Fabless Semiconductor Manufacturers: Benefits and Concerns

Dr. Michael Canning

Vice President, Manufacturing

Cirrus Logic, Inc.

Fabless vendors have emerged as strong companies that deliver value by focusing on their design orientation rather than on the complexities of process and manufacturing technology. This speech will also discuss how these companies address users' continuing concerns in dealing with fabless vendors.

▲ Growing Trends and Impact of Sole-Sourced ICs Speaker to Be Announced

Sole-sourced ICs such as proprietary processors and ASICs are a growing trend. Will this trend continue and change user-suppler relationships? This question and others will be addressed in this speech.

▲ Growing Dependence on Semiconductor Vendors: A User's Perspective

Speaker to Be Announced

Users are relying more on their semiconductor suppliers for solesourced ICs as well as for system designs implemented in silicon. How will system companies respond to this growing dependence? One user's viewpoint is expressed in this presentation.

▲ The DRAM Futures Market

Hoon Won

Chief Executive Officer

Memory Clearing Corporation

The DRAM futures market is little understood but promises to be a powerful financial and risk management tool. This speech will explain the benefits and realities of such a market and its influence on the semiconductor industry.

▲ Practical Procurement and Distribution Strategies in a Unified Europe

Jean Pierre Melia

Semelco Member of the Board

Magneti Marelli France Purchasing Director

Magneti-Marelli-Semelco

This speech will carry the discussion of Europe 1992 beyond political and trade concerns and into more practical dimensions. The speaker will identify strategies that both semiconductor manufacturers and users can employ to reap the benefits of a unified Europe.

▲ Interconnect Technology: Impact on Future IC Buying and Selling

Dr. Timothy W. Carr

Senior Vice President, Technology Product and

Market Development

Alcoa Electronic Packing, Incorporated

Analysts agree that multichip modules are inevitable and will be indispensable within the next five years as microprocessor speeds break the 50-MHz barrier. The impact on IC buying and selling can be tremendous depending on how this technology is absorbed by the industry. This impact will be further explored in this speech.

Lunch

Register today! Call (408) 437-8245 or fax (408) 437-0298.

PRODUCT AND PRICING TRENDS AND ISSUES

▲ 1990 Price Outlook: Commerican and Military Prices

Greg Sheppard Senior Industry Analyst

Senior Industry Analyst MilAero Technology Service Dataquest Incorporated Ron Bohn Industry Analyst Semiconductor User Information Service Dataquest Incorporated

Dataquest presents the current outlook for commercial and military prices in 1990 based on recent surveys and market analyses.

▲ "Semicomputer" Companies and the Trend toward Application-Specific Standard Products (ASSPs)

John Rizzo

Vice President, Marketing

Momenta Corporation

More and more elements of system design are done by semiconductor companies and implemented in silicon. In this speech, you will hear how these designs result in ASSPs that optimize function and performance for an application.

▲ Memory ICs: Have the Rules Changed?

Fred Jones

Associate Director

Semiconductor Industry Service

Dataquest Incorporated

Complex processors and expensive fabs are cited as major reasons why the rules of the memory market might change. This speech provides a glimpse into the memory market in 1990.

▲ Market Impact of Growing ASIC Complexity

Jerry Banks

Manager, ASIC Service Segment

Semiconductor Industry Service

Dataquest Incorporated

Increasing ASIC complexity raises manufacturers' concerns about reduced design starts and user concerns about vendor selection and testability. This speech examines the future market impact of this trend.

▲ The Trend toward Mixed Analog/Digital ASICs

Gary Grandbois

Senior Industry Analyst

Semiconductor Industry Service

Dataquest Incorporated

Mixed analog/digital ICs are taking the forefront as analog ICs become integrated into ASICs. This speech will discuss the complexities in this emerging market that will affect system design, cost, and the working relationships between users and suppliers.

5:00 p.m. Conference Adjourns



Conference Information

Dates

February 12 and 13, 1990

Location

Hyatt Union Square, 345 Stockton Street, San Francisco, California 94108

Telephone: (415) 398-1234 Fax: (415) 391-1780

Registration

Registration deadline is Friday, February 2, 1990. You can register for the conference by mailing the attached reply card. For faster service, you can telephone or fax the reply card to the Dataquest Conference Desk nearest you. Conference Desk information is provided below.

Registrations received after February 2, 1990, will be confirmed on a space-available basis. Confirmation of your registration will be mailed to you. Be sure to include a mail stop if your company uses them. Attendees located outside the United States should include fax or telex numbers for confirmation.

Conference fees must be paid in full prior to the start of the conference. A check, purchase order, or credit card will be acceptable. Do not send monies for food or lodging to Dataquest.

Cancellation Policy

Cancellation deadline is Tuesday, February 6, 1990. Registrants who cancel after February 6, 1990, or who do not attend will be assessed a cancellation charge unless they send replacements. Notice of cancellation must be made to the Central Dataquest Conference Desk in San Jose, California, telephone (408) 437-8245 or fax number (408) 437-0292. You will be given a cancellation number when you call.

Lodging

All hotel reservations must be made through Dataquest.

The room rate at the Hyatt Union Square for the night of February 12 is \$220 for single occupancy or \$320 for double occupancy plus approximately 15 percent for taxes and gratuities. This rate includes the cost of all group meals beginning with breakfast on Monday and ending with lunch on Tuesday. The rate for all nights other than February 12 is \$140 single or double occupancy plus 11 percent tax.

Save on your Airfare to San Francisco
Dataquest has arranged with United Airlines to offer
you savings on your airfare to the conference. Fly
between your point of origin and San Francisco between February 8 and February 16 to qualify for
these discounts. To find out the discount for which
you qualify, you or your travel agent should call the
United Airlines Convention Desk toll-free at (800)
521-4041, between 8:30 a.m. and 8:00 p.m. Eastern
time, and give the Dataquest account number,
0201N. Call as soon as possible to qualify for the

best fare. (This program is available only within the

continental United States.)

International Conference Registration Desks

| | North America | Japan/ | Asia | | Europe | |
|----------------------------|--|--|-------------------|-------------------|---|-------|
| Phone | (408) 437-8245 | 81-3-546-3191 | | 33- | 1-48-97-3100 | |
| Fax | (408) 437-0292 | 81-3-546-3198 | | 33- | 1-48-97-3422 | |
| Address | Dataquest Incorporated Conference Desk 1290 Ridder Park Dr. San Jose, CA 95131 U.S.A. | Dataquest Japan Conference De Taiyo Ginza Bl 7-14-16 Ginza, Tokyo 104 Japan | sk dg. 2nd Fl. | Cor Tou 36, | aquest Europe nference Desk r Gallieni Avenue Gallie 75 Bagnolet C nce | eni |
| Semiconduct Semiconduct | ernate attendee from tor User Information Service, tor Application Markets service, or ican Semiconductor Markets service | US\$ | ¥ | £ | FF | DM |
| ▲ Additional a | ttendee from a client company | 595 | 80,000 | 404 | 3,960 | 1,140 |
| ▲ Each attende | ee from a nonclient company | 895 | 121,000 | 608 | 5,960 | 1,720 |
| ▲ Cancellation | charge | 250 | 34,000 | 170 | 1,630 | 480 |

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1990 Semiconductor User and **Applications Conference**

February 12-13, 1990 Grand Hyatt Hotel San Francisco. California

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a company of The Dun & Bradstreet Corporation

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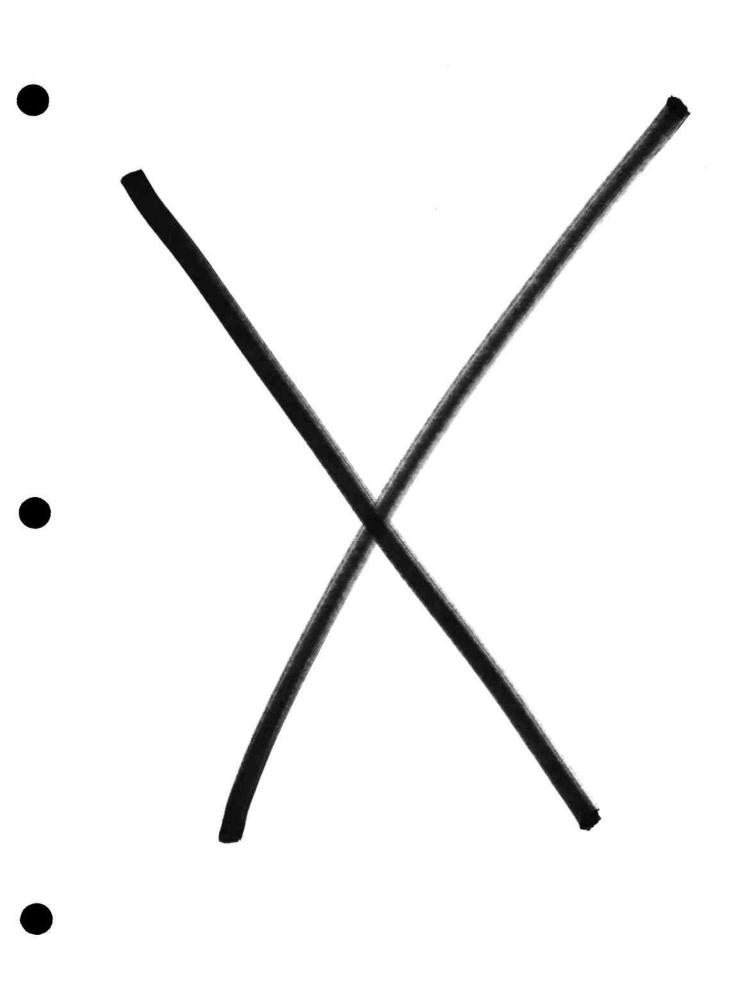
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SEMICONDUCTOR USER AND APPLICATIONS CONFERENCE

Buying and Selling Semiconductors: The Changing User-Supplier Relationships in the 1990s

February 12-13, 1990 Grand Hyatt Hotel San Francisco, California

| MONDAY, Febr | uary 12, 1990 | |
|-----------------|--|---|
| 7:30 a.m. | Registration | |
| 8:00 a.m. | Breakfast | Farailon Room |
| Market Outlook | | |
| 9:00 a.m. | Conference Welcome and Overview | Plaza Ballroom West |
| 9:20 a.m. | 1990 Worldwide Economic Outlook | |
| 9:50 a.m. · | Electronic Equipment Outlook and the Next PC Boom Kevin Landis Industry Analyst Semiconductor Application Markets Dataquest Incorporated | Terrance Birkholz Research Analyst Semiconductor Application Markets Dataquest Incorporated |
| 10:20 a.m. | Coffee Break | |
| 10:50 a.m. | 1990 Worldwide Semiconductor Industry Outlook Hal Feeney Group Vice President and Director Components Group Dataquest Incorporated | Plaza Ballroom West |
| 11:20 a.m. | Trends in Semiconductor Capacity and Capital Spendi George Burns Senior Industry Analyst Semiconductor Equipment and Materials Service Dataquest Incorporated | ingPlaza Ballroom West |
| 11:50 a.m. | The Fifth Annual User Survey Results | Carolyn Doles Research Analyst Central Research Group Dataquest Incorporated |
| 12:20 p.m. | Lunch | Farallon Room |
| Changing Market | t Relationships | |
| 1:30 p.m. | Changing World Markets—Procurement Challenges in Linn Nelson Vice President Barnel International, Incorporated | the '90sPlaza Ballroom West |
| 2:00 p.m. | Global Procurement Demands Worldwide Service Charles (Chuck) E. Thompson Senior Vice President Director of Worldwide Marketing, Semiconductor Section Motorola, Incorporated | |
| | | |

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| 2:30 p.m | Keeping Pace with Dynamic Regional Issues |
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| | Senior Vice President, Semiconductor Group Manager Worldwide Marketing |
| 2.22 | Texas Instruments, Inc. |
| 3:00 p.m. | Coffee Break Ballroom Foyer |
| 3:30 p.m. | Assimilation and Service: Japanese Company Directions |
| | Semiconductor Operations Toshiba America Electronic Components, Inc. |
| 4:00 p.m. | The Future Role of Distribution |
| ····· F······ | Charles Clough |
| | President and CEO |
| 4-20 | Wyle Laboratories Service Performance: Electronics Industry vs. Automotive Industry |
| 4:30 p.m. | R. Gene Richter Executive Director, Corporate Procurement |
| 6.00 | Hewlett-Packard Company Cocktail Reception |
| 6:00 p.m. | Dinner |
| 7:00 p.m. | Supplier of the Year Award Ceremony |
| | ·• |
| TUESDAY, Feb | |
| 8:00 a.m. | Breakfast |
| Market Trends a | and Issues |
| 9:00 a.m. | Dealing with Fabless Semiconductor Manufacturers: Benefits and Concerns |
| | Vice President, Manufacturing |
| | Cirrus Logic, Inc. |
| 9:30 a.m. | Implications of the Growing Trends toward Sole-Sourced ICs |
| | Director, Sales and Marketing |
| | Intel Corporation |
| 10:00 a.m. | Europe: Planning and Positioning for Unification |
| | Senior Industry Analyst European Components Group |
| | Dataquest Europe Ltd. |
| 10:30 a.m. | Coffee Break |
| 11:00 a.m. | The DRAM Futures Market |
| | Chief Executive Officer |
| 11-20 | Memory Clearing Corporation |
| 11:30 a.m. | Practical Procurement and Distribution Strategies in a Unified Europe |
| 12:00 Noon | Interconnect Technology: Impact on Future IC Buying and Selling |
| 12.00 110011 | Dr. William Steingrandt Director, Product Development and Marketing |
| | Alcoa Electronic Packaging, Inc. |
| 12:30 p.m. | Lunch Farallon Room |

| Product and Pri | cing Trends and Issues | |
|-----------------|---|---|
| 1:45 p.m. | 1990 Price Outlook: Commercial and Military Prices. Greg Sheppard Senior Industry Analyst MilAero Technology Service Dataquest Incorporated | Ron Bohn Industry Analyst Semiconductor User Information Service Dataquest Incorporated |
| 2:15 p.m. | "Semicomputer" Companies and the Trend toward Application-Specific Standard Products (ASSPs) John Rizzo Vice President, Marketing Momenta Corporation | Plaza Ballroom West |
| 2:45 p.m. | Memory ICs: Have the Rules Changed? | Plaza Baliroom West |
| 3:15 p.m. | Coffee Break | Farallon Room |
| 3:45 p.m. | The Market Impact of Growing ASIC Complexity Jerry Banks Manager, ASIC Service Segment Semiconductor Industry Service Dataquest Incorporated | Plaza Ballroom West . |
| 4:15 p.m. | The Trend toward Mixed Analog/Digital ASICs Gary Grandbois Senior Industry Analyst Semiconductor Industry Service Dataquest Incorporated | Plaza Ballroom West |
| 4:45 p.m. | Conference Adjourns | |



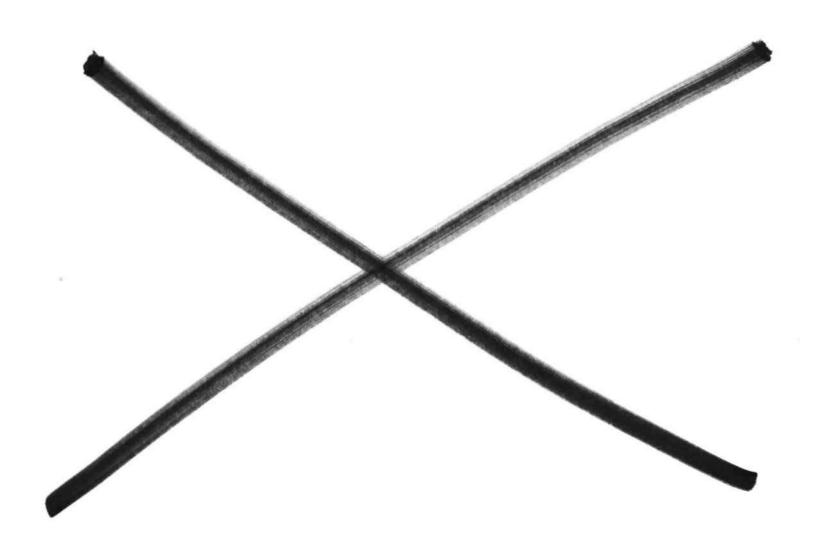
1990 Semiconductor User and Applications Conference Market Research Survey

In order to continually improve the types of products and services that Dataquest provides for semiconductor users and manufacturers, we need to better understand your information needs. Please help us by completing the following questionnaire.

| | CEO, President, Vice President | | Produ | ct Man | oneme | ent |
|---|---|---|---|--------------------------------------|--------------------------------------|---|
| | Strategic Planning/Business Development | | | tions N | | |
| | Sales and Marketing Management | | | | | Selection |
| • | Product Development/R&D/ | | | | | |
| | Engineering Management | _ | | | | |
| . H | low did you learn about this conference? | | | • | | |
| | The brochure was mailed directly to me. | | | | | |
| | Someone in my company gave me the brochure. | | | | | |
| | I saw the announcement in a newspaper or magazine. | | | | | |
| | I heard an announcement at a previous Dataquest meeting. | | | | | |
| | Someone from Dataquest called me. | | | | | |
| | Other | | _ | • | | |
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| | Circle only those applicable to you. To hear Dataquest's forecasts To hear industry leaders To meet my customers To talk with Dataquest analysts To meet my counterparts To hear about and discuss critical industry issues | Mos i 1 1 1 1 1 | 2 2 2 2 2 2 | 3 3 3 3 | 4 4 4 4 | Least 5 5 5 5 5 5 5 5 5 5 5 |
| | circle only those applicable to you. To hear Dataquest's forecasts To hear industry leaders To meet my customers To talk with Dataquest analysts To meet my counterparts To hear about and discuss critical industry issues To help evaluate our investment portfolio To meet my suppliers To learn about my competition | Mos 1 1 1 1 1 1 1 1 1 1 | 2 2 2 2 2 2 | 3 3 3 3 | 4 4 4 4 | Least 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 |
| | circle only those applicable to you. To hear Dataquest's forecasts To hear industry leaders To meet my customers To talk with Dataquest analysts To meet my counterparts To hear about and discuss critical industry issues To help evaluate our investment portfolio To meet my suppliers | Mos 1 1 1 1 1 1 1 1 | 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | 3 3 3 3 3 3 3 3 | 4 4 4 4 4 4 4 4 | Least 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 |
| | circle only those applicable to you. To hear Dataquest's forecasts To hear industry leaders To meet my customers To talk with Dataquest analysts To meet my counterparts To hear about and discuss critical industry issues To help evaluate our investment portfolio To meet my suppliers To learn about my competition | Mos 1 1 1 1 1 1 1 1 1 1 | 2 2 2 2 2 2 | 3 3 3 3 3 | 4 4 4 4 | Least 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 |
| | b hear Dataquest's forecasts b hear industry leaders b meet my customers b talk with Dataquest analysts b meet my counterparts b hear about and discuss critical industry issues b help evaluate our investment portfolio b meet my suppliers b learn about my competition b examine new Dataquest products I've heard about b learn about new markets and sales leads for my company's | Mos 1 1 1 1 1 1 1 1 1 1 1 1 1 | 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | 3 3 3 3 3 3 3 3 | 4 4 4 4 4 4 4 4 | Least 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 |

(Over)

| | 1990 outlook Products and technology | | | ising is | | es |
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| | | Highe | <u>st</u> | | <u>]</u> | Lowest |
| 6. | How would you rate the conference facilities? | | | | | |
| | Guest rooms | 1 | 2 | 3 | 4 | 5 |
| | Meeting rooms Meals | 1 | 2 | 3 3 3 | 4 | 5 5 |
| 7. | Check each previous year that you have attended a Dataque Conference. | est Semiconduct | or Use | r and a | Applica | ations |
| | 1989 1988 1987 | | | | | |
| 8. | Where and when would you like future Dataquest Semicon held? | ductor User and | Appli | cations | Confi | erences to |
| | Location: East Coast West Coast | | | | | |
| | Timing: (preferred month) | | | | | |
| | If you prefer the West Coast, should the program be held: | | | | | |
| | In the Santa Clara Valley | | | | | |
| | Within driving distance of the Santa Clara Valley | | | | | |
| | Anywhere in California | | | | | |
| | Other | | | | | |
| 9. | In the future, should the length of this conference be: | _ Shorter | Longe | т | The s | ame |
| | <u>-</u> | | | | | |
| U. | Topics/speakers you would like to hear in the future: | | | | | |
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| | Are you a Dataquest client? Yes No | | | | | |
| 1. | Are you a Dataquest client? Yes No Additional comments: | | | | | |
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SEMICONDUCTOR USER AND APPLICATIONS CONFERENCE February 12 through 13, 1990 San Francisco, California

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Commodity

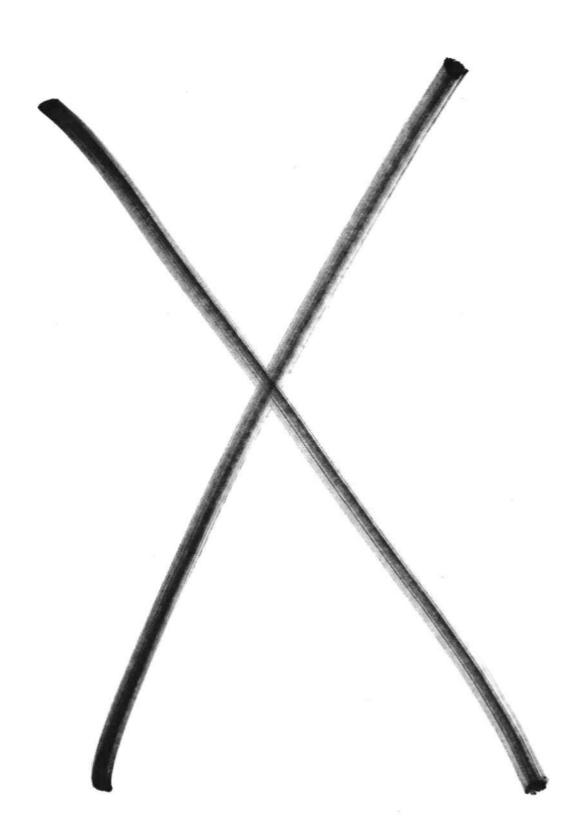
Zilog, Inc.

Wayne Ricciardi, Vice President,

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Zitel Corporation

Errol Ives, Director of Materials





VELCOME AND OVERVIEW

Victor G. de Dios
Director
Semiconductor User and Applications Groups
and
North American Components Research
Dataguest Incorporated

Victor de Dios directs four Dataquest services: North American Semiconductor Markets (NASM), Semiconductor Application Markets (SAM), Semiconductor User Information Service (SUIS), and the MilAero Technology Service. He focuses on indepth analysis of strategic and tactical data affecting the semiconductor primarily responsible for user and application-based market and is information. Mr. de Dios previously managed the analysis of the memory IC market for Dataquest and was responsible for forecasting major changes in DRAM Before joining Dataquest, Mr. de Dios held several marketing management positions at Hitachi America and Intel, managing the introduction of several new memory products and the development of major account penetration strategies. Prior to this, he was involved in sales management, strategic planning, and organization development with several Asian companies. Mr. de Dios received a B.S.E.E. degree from the University of the Philippines and an M.B.A. from the Wharton School, University of Pennsylvania.

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1990 WORLDWIDE ECONOMIC OUTLOOK

Joseph W. Duncan
Vice President
Corporate Economist and Chief Statistician
The Dun & Bradstreet Corporation

founding Business Business Economists. Dr. Duncan received a B.S.M.E. from Case Institute of Technology, an M.B.A. from Harvard Graduate School of Business Administration, and a Ph.D. in Economics from Ohio State University. He also attended the London Association. Conference of which he Office of Information and Regulatory Affairs in Budget, where he was responsible for national s practices. develop new economics-related products and services to analyze economic trends and to evaluate the economic impact of government policies and business the cor the Dun & Bradstreet Corporation (D&B). He is responsible for the quality of the databases maintained by all D&B divisions and in this capacity chairs their Information Resources Coordinating Council. Dr. Duncan also works with the extensive information taught International International column Business Economics. the U.S. representative to the was chairman in 198 National & Bradstreet Looks At Business and is author of the "Statistical Corner" Business Economics. Dr. Duncan was previously chief statistician for the of Information and Regulatory Affairs in the Office of Management and extensive information resources of the Dun & Bradstreet and on economic trends for D&B Report magazine, is Duncan is Vice President, city planning School of Economics. He has chairman of the Statistics Committee of currently luate the economic impact of government policies and business He heads the corporate Economic Analysis Department. He writes a chairman in 1981. Dr. Duncan is an elected member of the Business Economists and serves as vice president of the Association for Official Statistics, a section of the Statistical Institute. He is a past president and chairman of Economists Club and a fellow of the American Statistical Dr. Duncan is a past president of the Forecasters' Club of New prently served. a serves Ohio State University on its executive le for national statistical policy. He served the United Nations Statistical Commission, of 81. Dr. Duncan is an elected member of the Corporate Economist and Chief lectured at a number committee. He and the University the National Association of the executive editor of He also attended of universities universities and Corporation is also Statistician of.

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1990 WORLDWIDE ECONOMIC OUTLOOK

JOSEPH W. DUNCAN

Vice President Corporate Economist and Chief Statistician The Dun & Bradstreet Corporation IF YOU HAVE NOT RECEIVED A COPY OF MR. DUNCAN'S HANDOUT JUST PRIOR TO HIS SPEAKING, IT WILL BE AVAILABLE AT THE CONFERENCE REGISTRATION DESK AFTER HIS PRESENTATION

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ELECTRONIC EQUIPMENT OUTLOOK AND THE NEXT PC BOOM

Kevin M. Landis
Industry Analyst
Semiconductor User and Applications Group
Dataquest Incorporated

Kevin Landis is an Industry Analyst for Dataquest's Semiconductor User and Applications Group. He is responsible for worldwide research of semiconductor markets in the electronic dataprocessing industries, including the computer, storage, printer, and other peripheral industries. He supports clients of both the Semiconductor User Information and Semiconductor Application Markets services. Prior to joining Dataquest, Mr. Landis served as Director of Marketing for the venture leasing firm of Costella Kirsch. Mr. Landis received a B.S. degree in Electrical Engineering and Computer Sciences from the University of California and an M.B.A. degree from Santa Clara University.

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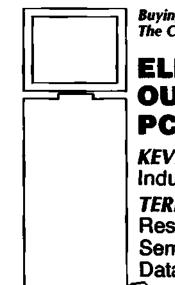


ELECTRONIC EQUIPMENT OUTLOOK AND THE NEXT PC BOOM

Terrance A. Birkholz
Research Analyst
Semiconductor User and Applications Group
Dataquest Incorporated

Terrance Birkholz is a Research Analyst for Dataquest's Semiconductor User and Applications Group. He works with semiconductor users and manufacturers to assess semiconductor demand by analyzing and forecasting electronics industry business trends and their impact on semiconductor consumption. In addition, he analyzes electronics business activity as it relates to overall economic activity. Previously, Mr. Birkholz was a Research Analyst in Dataquest's Asian Semiconductor and Electronics Technology Service. There, he assisted in research and analysis of Asian semiconductor and electronic systems markets and trends and Asian economic activity. Mr. Birkholz received a B.A. degree in Economics from Humboldt State University and an M.A. degree in Economics from the University of California at Santa Barbara.

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ANNANANANA

Buying and Selling Semiconductors: The Changing User-Supplier Relationship in the 1990s

ELECTRONIC EQUIPMENT OUTLOOK AND THE NEXT PC BOOM

KEVIN M. LANDIS
Industry Analyst
TERRANCE A. BIRKHOLZ
Research Analyst
Semiconductor User and Applications Group
Dataquest Incorporated

AGENDA

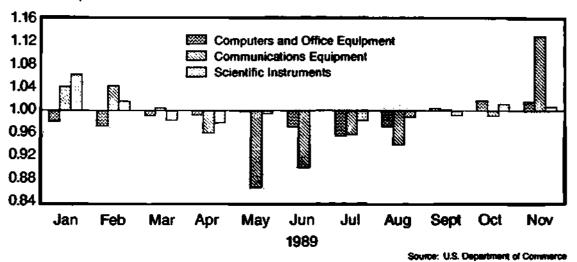
- Near-term outlook
- 1990 market drivers
- Long-term outlook
- Long-term application drivers
- Summary

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NEAR-TERM OUTLOOK

U.S. ELECTRONIC EQUIPMENT ORDERS-TO-SHIPMENTS RATIO

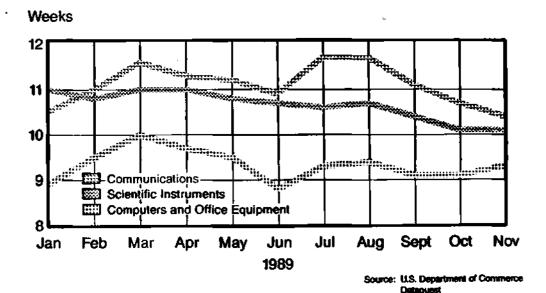
Orders:Shipments



88474804 BIG \$1,0276 LAN

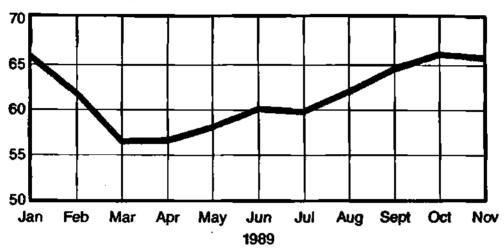
Dataquest

U.S. ELECTRONIC EQUIPMENT INVENTORY-TO-SALES RATIO



U.S. COMPUTER ORDERS TO SEMICONDUCTOR SHIPMENTS





Source: U.S. Department of Commerce Distancest

BETTAND MED BY ESPECIAL

NEAR-TERM OUTLOOK

United States

- Equipment orders-to-shipments ratio at parity or greater
- Equipment inventory is being well managed
- Computer orders to semiconductor shipments leading indicator is rising
- Data processing equipment production growth will slow in 1990
- Total equipment growth in 1989, 6.0%; in 1990, 5.8%

ELECTRONIC EQUIPMENTPRODUCTION FORECAST

(Billions of Dollars)

| | 1989 | 1990 | <u>%∆</u> |
|-----------------|-------|---------------|-----------|
| Total Worldwide | 659.0 | 694 .8 | 5.4 |
| North America | 269.2 | 285.0 | 5.8 |
| Japan | 187.0 | 188.7 | 0.9 |
| Europe | 149.0 | 159.6 | 7.1 |
| Asia/Pacific | 53.8 | 61.5 | 14.3 |

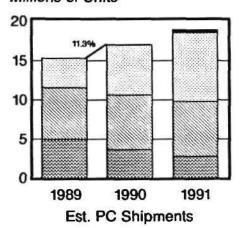
Source: Dataquest

SHI 4000 BED SINGSOLAN

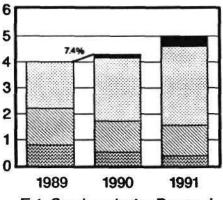
1990 MARKET DRIVERS

386-BASED PCs DRIVE GROWTH

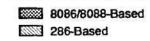
Millions of Units



Billions of Dollars



Est. Semiconductor Demand



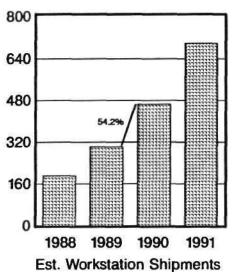
386-Based

Source: Dataquest

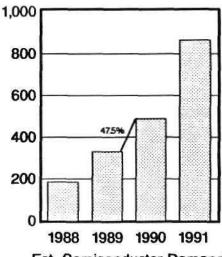
88414010.8AG 01/31/00:LAN

WORKSTATIONS OUTPACE OTHER COMPUTERS

Thousands of Units

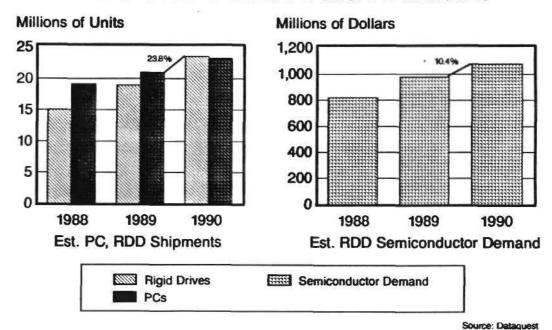


Millions of Dollars



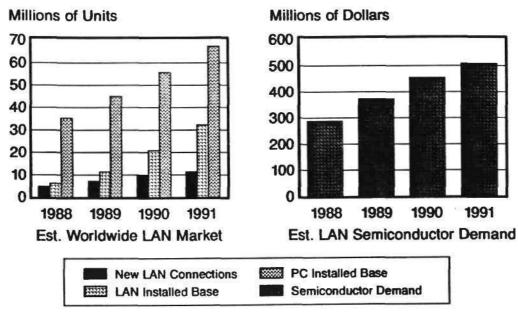
Est. Semiconductor Demand

RIGID DRIVES SATURATE THE PC MARKET



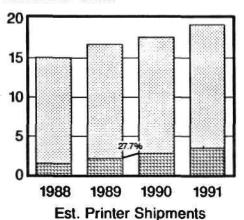
98414012.8MG 01/22/30:LAN

ASPS TEMPER THE LAN MARKET

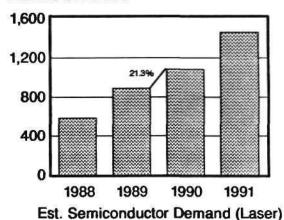


LASER PRINTERS DRIVE THE PRINTER INDUSTRY





Millions of Dollars



Laser Printers
All Other Printers

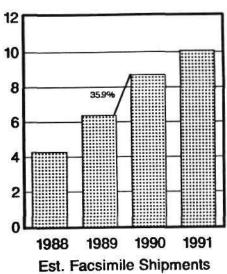
Semiconductor Demand

Source: Dataquest

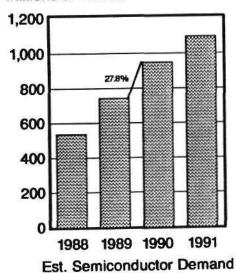
88414014 MG 01/22/90 LAN

FACSIMILE MARKET CONTINUES TO GROW

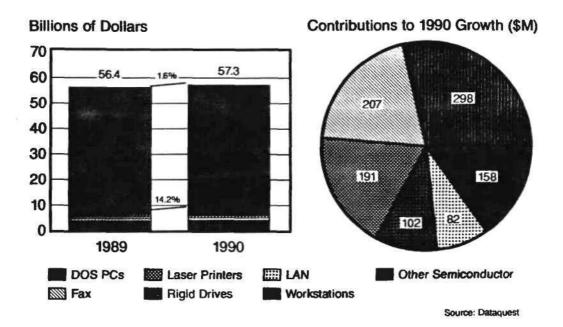
Millions of Units



Millions of Dollars



ESTIMATED SEMICONDUCTOR MARKET GROWTH

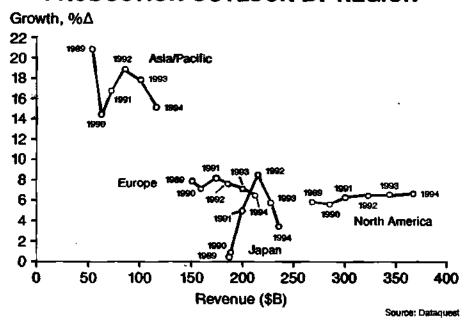


8414016.MAG 01/25/90:tan

LONG-TERM OUTLOOK

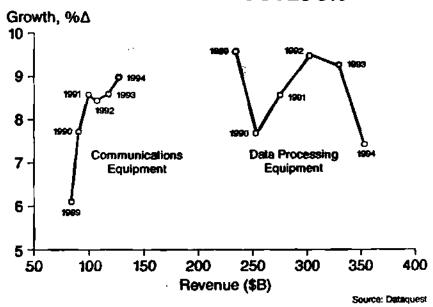
88414017.88G 01/22/50 WA

ESTIMATED WORLDWIDE ELECTRONIC EQUIPMENT PRODUCTION OUTLOOK BY REGION

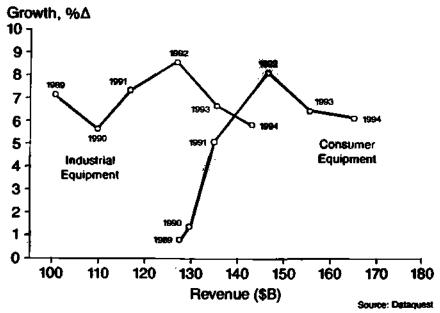


(MAC) 4010 BIO 9172279 MIN

ESTIMATED WORLDWIDE ELECTRONIC PRODUCTION OUTLOOK

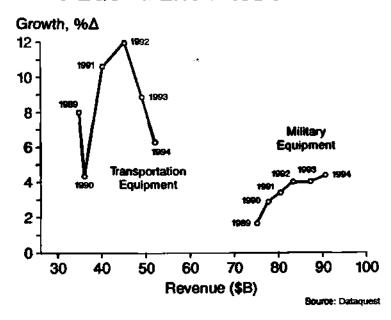


ESTIMATED WORLDWIDE ELECTRONIC EQUIPMENT PRODUCTION OUTLOOK



14425 MID 91/22/20 WA

ESTIMATED WORLDWIDE ELECTRONIC EQUIPMENT PRODUCTION OUTLOOK



WORLDWIDE LONG-TERM OUTLOOK

- Electronic equipment production growth to accelerate to 7.3% in 1991, from 5.4% in 1990
- Growth to peak at 8.6% in 1992
- Asia/Pacific and Japan are fastest-growing regions in 1992
- Rising trade protectionist sentiment necessitates more evenly distributed, regionalized production
- Eastern Europe and China emerging markets (?)

8414022 RAG 61725/96 (an

LONG-TERM APPLICATIONS DRIVERS

MULTIMEDIA PCs AND THEIR IMPACT ON SEMICONDUCTOR DEMAND

AT ARM SHE PURPOSED

SUBSYSTEM IMPLICATIONS

| P۵ | rin | he | rai | e- |
|-----|-----|----|------|----|
| , , | u | | ı Qı | • |

Will Need To:

Mass storage
Displays
Scanners/fax
Printers

Network interface

Voice recognition front end

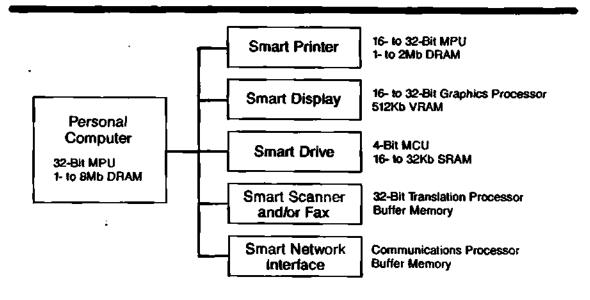
Search large image databases Generate real-time images Convert bit-mapped images

Match laser printer features

High-speed data compression/ network management

Implement Al software

DESKTOP COMPUTING SYSTEM TREND: DECENTRALIZED INTELLIGENCE



\$414007.840_ \$1750500.cm

SELECTED SMART PERIPHERAL PRODUCTION FORECASTS

(Millions of Systems, Worldwide)

| | 1989 | <u>1994</u> | CAGR |
|---|------|-------------|------|
| PCs/Workstations - Processor-Based Graphics | 21.4 | 34.8 | 10% |
| Subsystems | .7 | 10.5 | 72% |
| Small Rigid Disk Drives | 19.6 | 33.6 | 11% |
| - Intelligent Drives | 8.2 | 26.9 | 27% |
| Printers | 16.8 | 21.9 | 5% |
| - Laser Printers | 2.2 | 5.6 | 21% |

SELECTED SMART PERIPHERAL SEMICONDUCTOR CONSUMPTION FORECAST

(Millions of Dollars, Worldwide)

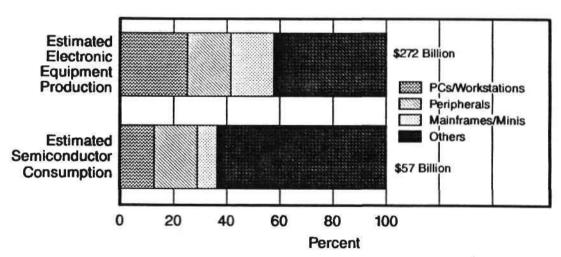
| | 1989 | 1994 | CAGR |
|--------------------------|-------|-------|------|
| Personal Computers | 4,000 | 7,100 | 12% |
| Laser Printers | 900 | 2,700 | 25% |
| Intelligent Drives | 420 | 1,080 | 21% |
| Processor-Based Graphics | 220 | 1,230 | 41% |

Source: Dataquest

98414029 BMS 01/31/90 lan

APPLICATION CONTRIBUTORS TO WORLDWIDE SEMICONDUCTOR GROWTH

1989 to 1994



SUMMARY

In the near term:

- 5.4% worldwide electronic equipment production growth forecast in 1990
- 1.6% worldwide semiconductor consumption growth, fueled by a few healthy markets

In the long term:

- 8.6% worldwide electronic equipment production peak growth forecast in 1992
- Multimedia PC boom extending to smart peripherals

Dataquest

The Dun & Bradstreet Corporation



1990 WORLDWIDE SEMICONDUCTOR INDUSTRY OUTLOOK

Harold V. Feeney
Group Vice President and Director
Components Group
Dataquest Incorporated

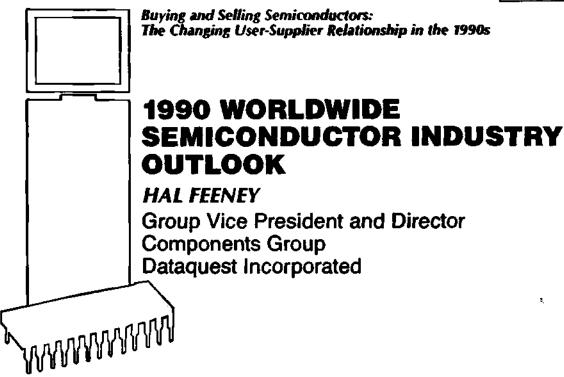
Hal Feeney is Group Vice Prsident and Director of Dataquest's Components In this capacity, he has direct responsibility for all U.S. semiconductor and component research and coordinates European and Japan-based Previously, he was Vice President and Director of Dataquest's Technical Computer Systems Industry Service. Before joining Dataquest, Mr. Feeney was Manager of International Customer Marketing at Intel Corporation, he was responsible for international marketing/sales support of microcomputer components and development systems. During his 14 years with Intel, Mr. Feeney held various positions in marketing management, product marketing management, and LSI design engineering. He designed the Intel 8008, the first 8-bit microprocessor. Prior to joining Intel, Mr. Feeney was a Component Design Engineer with General Instrument Corporation. Mr. Feeney received a B.S.E.E. degree from the University of Notre Dame and an M.S.E.E. degree from Stanford University. He completed additional graduate studies in Electrical Engineering at the University of Notre Dame.

Dataquest Incorporated

Semiconductor User and Applications Conference

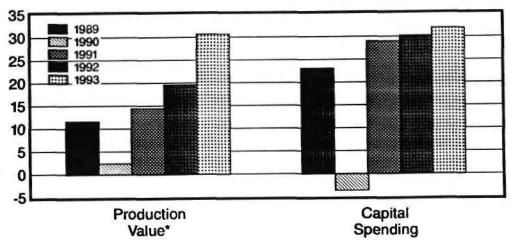
San Francisco, California

February 12-13, 1990



ESTIMATED SEMICONDUCTOR INDUSTRY PRODUCTION AND CAPITAL SPENDING

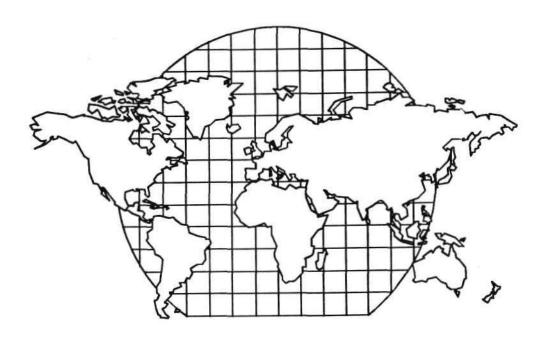
Percent Change Year to Year



*Includes captive production

Source: Dataquest

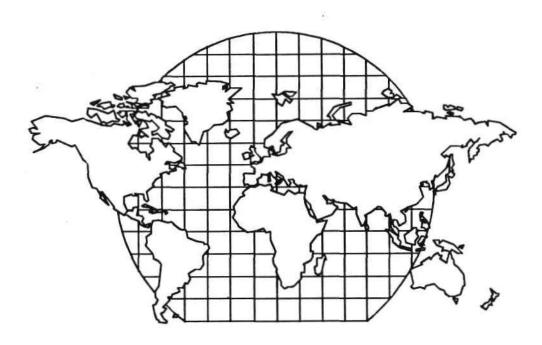
B8206030 IMG 01/05/90:FEE



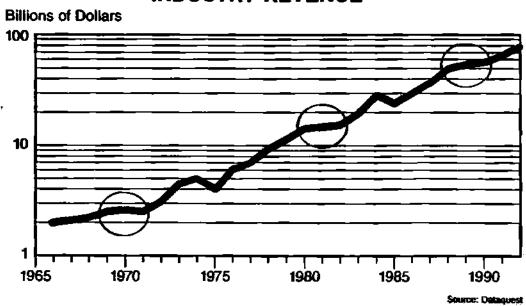
SUMMARY

- Today, life is flat
- Expect short-term DRAM price erosion (inventory related)
- Production capacity is under better control than in 1984-1985
- As DRAMs go, so goes the industry
- Industry consolidation began in the 1980s draw your own conclusions for the 1990s

B8296032 IMG 01/05/90.FEE

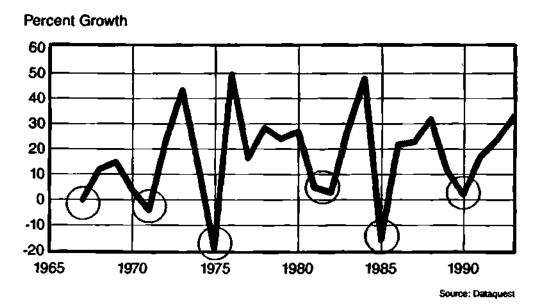


ESTIMATED WORLDWIDE SEMICONDUCTOR INDUSTRY REVENUE



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ESTIMATED WORLDWIDE SEMICONDUCTOR INDUSTRY REVENUE

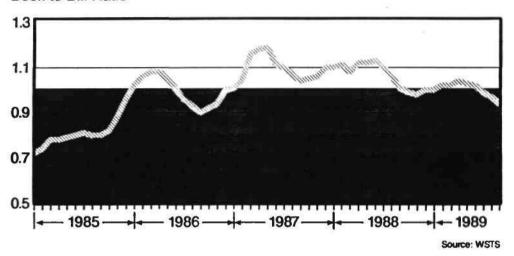


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WORLDWIDE SEMICONDUCTOR BOOK-TO-BILL RATIO

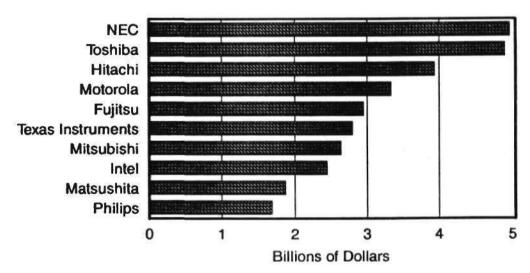
Three-Month Moving Average

Book-to-Bill Ratio



B8296000 BMG 01/05/30 FEE

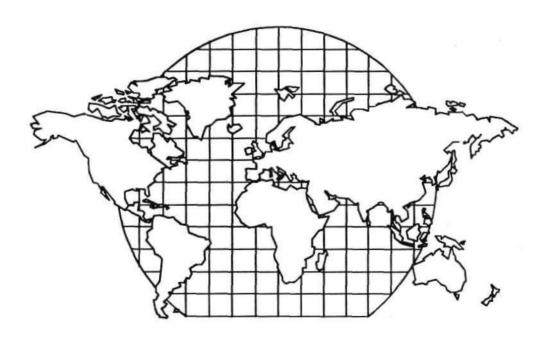
TOP 10 MERCHANT SEMICONDUCTOR COMPANIES' WORLDWIDE REVENUE IN 1989

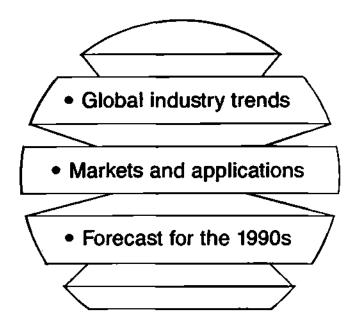




- Expect a slower industry in 1989
 - Strong first half
 - Then three negative growth quarters
- Capital spending slowing

Source: Dataquest SAM/SUIS Conference February 1989





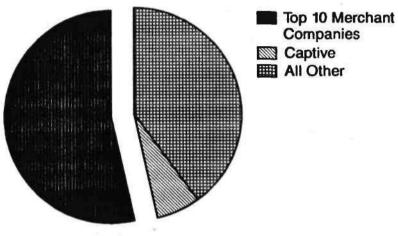
MINESONS INC. DIVERSE SEE

GLOBAL TRENDS FOR THE 1990s

- Regional manufacturing
- System standards become pervasive
- NICs become a greater force
- Wafer fabrication equipment -worldwide sourcing

88296012 IMG 01/08/90:FEE

WORLDWIDE SEMICONDUCTOR PRODUCTION IN 1989

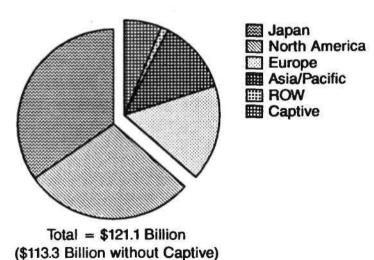


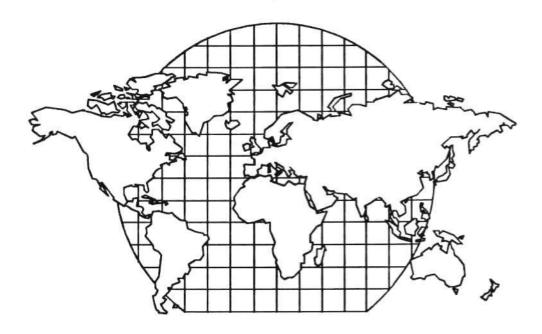
Total = \$59.1 Billion (\$55.8 Billion without Captive)

Source: Dataquest

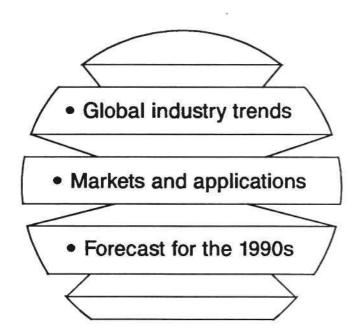
B8295013 IMG 01/05/30 FEE

ESTIMATED 1994 WORLDWIDE SEMICONDUCTOR INDUSTRY CONSUMPTION BY GEOGRAPHY





8820G015 MG 01/08/90:FEE

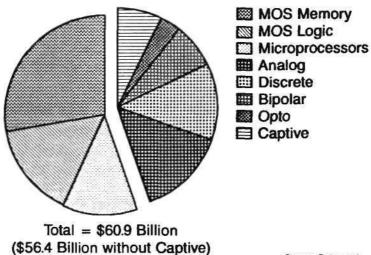


TRENDS IN SEMICONDUCTOR MARKETS

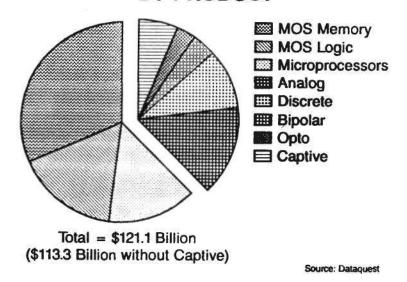
- Softening order rates
- Falling prices DRAMs, SRAMs, ASICs
- Few product constraints
- Selective personnel adjustments
- Concentration of vendor strength

98296017.84G 01/05/90:FEE

ESTIMATED 1989 WORLDWIDE SEMICONDUCTOR INDUSTRY CONSUMPTION BY PRODUCT



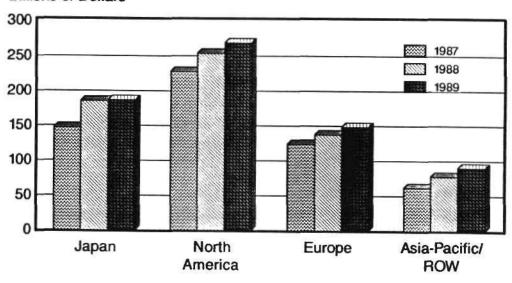
ESTIMATED 1994 WORLDWIDE SEMICONDUCTOR INDUSTRY CONSUMPTION BY PRODUCT



B629G019 MG 01/08/90 FEE

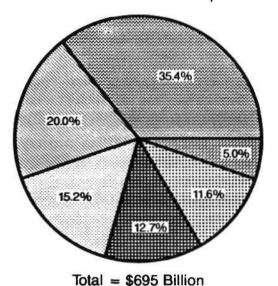
WORLDWIDE ELECTRONICS PRODUCTION

Billions of Dollars



WORLDWIDE ELECTRONICS MARKETS

1989 Shipments



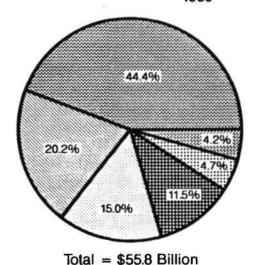
- Data Processing
- □ Consumer
- Industrial
- **Ⅲ** Communications
- Transportation
- Military

Source: Dataquest

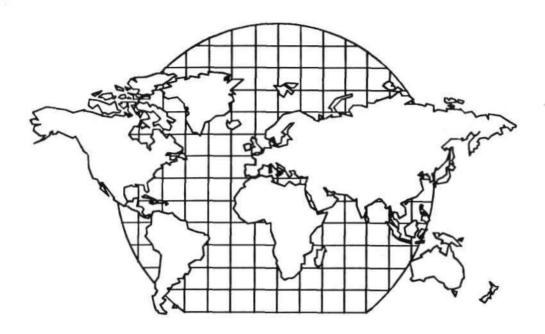
86296021 MG 01/11/90:FEE

WORLDWIDE SEMICONDUCTOR SHIPMENTS BY APPLICATION MARKET

1989



- Data Processing
- □ Consumer
- ☐ Communications
- **III** Industrial
- **Military**



88295024 MG 01/08/90 FEE



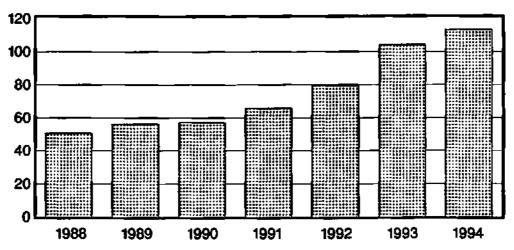
FORECAST TRENDS IN THE 1990s

- A slow start as inventories grow and DRAM prices fall
- Promise of Europe 1992 becomes reality
- Peak year of growth in 1993 paced by 4Mb DRAM shipments
- Globalization continues as Japanese electronic equipment manufacturers move production to North America and Europe
- Asia/Pacific provides the fastest growth opportunity

86296426 BIG 01/05/30 FEE

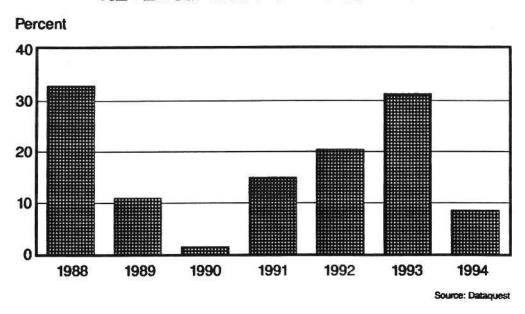
WORLDWIDE SEMICONDUCTOR INDUSTRY REVENUE FORECAST*

Billions of Dollars



*Excludes captive

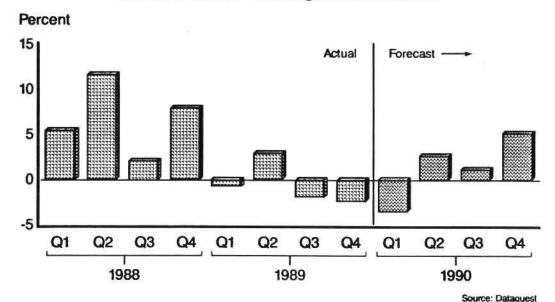
WORLDWIDE SEMICONDUCTOR INDUSTRY REVENUE GROWTH FORECAST



98296028.IMG 01/08/50:FEE

WORLD SEMICONDUCTOR INDUSTRY FORECAST

Quarter-to-Quarter Percentage Revenue Growth



Dataquest

a company of The Dun & Bradstreet Corporation



TRENDS IN SEMICONDUCTOR CAPACITY AND CAPITAL SPENDING

George Burns
Industry Analyst
Semiconductor Equipment and Materials Service
Dataquest Incorporated

George Burns is an Industry Analyst for Dataquest's Semiconductor Equipment and Materials Service (SEMS). He is responsible for the SEM's Semiconductor Manufacturing notebook and is also responsible for forecasting capital spending for the semiconductor industry. Mr. Burns has been in SEMs since 1985. Before joining Dataquest, he worked at Plantronics, Santa Cruz, where he was a Product Marketing Analyst and a Product Manager. Mr. Burns received a B.A. degree in Economics from the University of California at Santa Cruz and an M.B.A. in Marketing from San Jose State University.

Dataquest Incorporated
Semiconductor User and Applications Conference
San Francisco, California
February 12-13, 1990

Buying and Selling Semiconductors:
The Changing User-Supplier Relationship in the 1990s

TRENDS IN
SEMICONDUCTOR CAPACITY
AND CAPITAL SPENDING
GEORGE BURNS
Senior Industry Analyst
Semiconductor Equipment and
Materials Service
Dataquest Incorporated

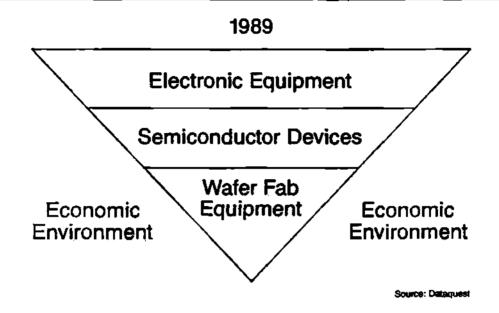
AGENDA

- Economic environment
- Semiconductor production
- Capital spending
- Capacity
- Conclusions

BOTTOMO SHARE SHARE

THE ECONOMIC ENVIRONMENT

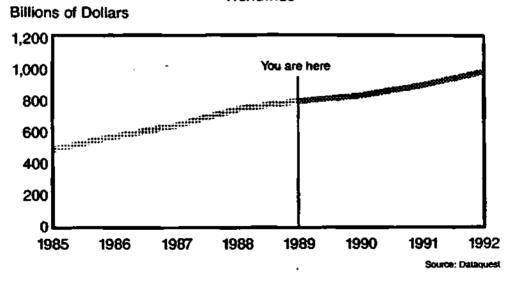
ELECTRONIC INDUSTRY FOOD CHAIN



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ESTIMATED ELECTRONIC EQUIPMENT MARKET

Worldwide



SEMICONDUCTOR PRODUCTION

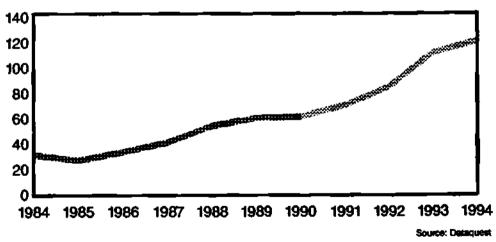
- Production follows consumption
- New regional sources
- Globalization

\$6375611,849, 01/18/90;8K/M

ESTIMATED WORLDWIDE SEMICONDUCTOR PRODUCTION

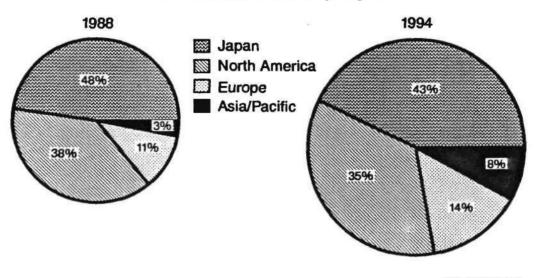
Merchant and Captive Producers

Billions of Dollars



ESTIMATED SEMICONDUCTOR PRODUCTION

Merchant and Captive, By Region

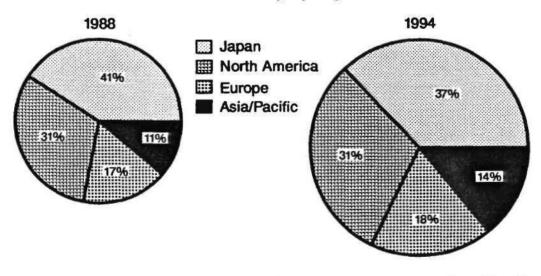


Source: Dataquest

84379013.MG 01/1M/90:BUR

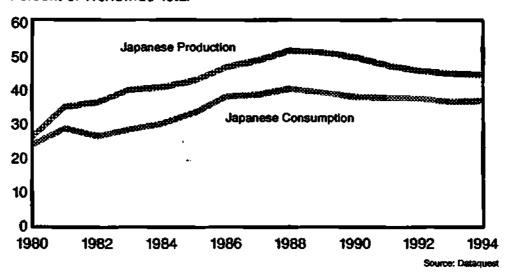
ESTIMATED SEMICONDUCTOR CONSUMPTION

Merchant Only, By Region



JAPAN: SEMICONDUCTOR CONSUMPTION FEEDS SEMICONDUCTOR PRODUCTION

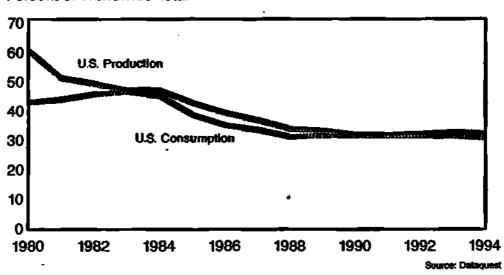
Percent of Worldwide Total



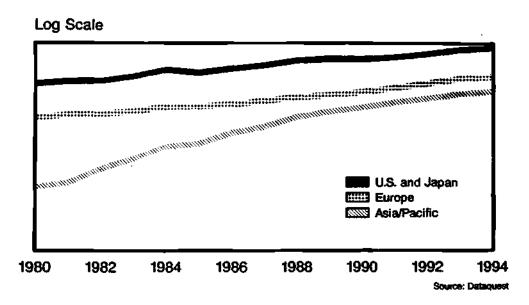
BESTEELS BAS OF PRESSURE

U.S.: SEMICONDUCTOR CONSUMPTION STARVES SEMICONDUCTOR PRODUCTION

Percent of Worldwide Total



REGIONAL SEMICONDUCTOR PRODUCTION GROWTH RATES



AND PARTY HAS DUTHER TO BE THE

NEW SOURCES

In every region of the world, offshore semiconductor manufacturers are becoming local producers.

OFF TO THE FUTURE (Part 1)

Offshore Fabs in Europe

- Analog Devices (Ireland)
- Digital Equipment (Scotland)
- Fujitsu (England)
- Hitachi (W. Germany)
- IBM (W. Germany)
- Intel (Ireland)

ESTRUCTURE ON SEPTEMBE

OFF TO THE FUTURE (Part 2)

Offshore Fabs in Europe

- ITT (W. Germany)
- Matsushita (?)
- Mitsubishi (W. Germany)
- Motorola (Scotland)
- Samsung (W. Germany)
- Texas Instruments (Italy)
- Toshiba (W. Germany)

CAPITAL SPENDING

- Forecast
- New regions
- New leaders and players

379021JA46 01/23/70 BUA

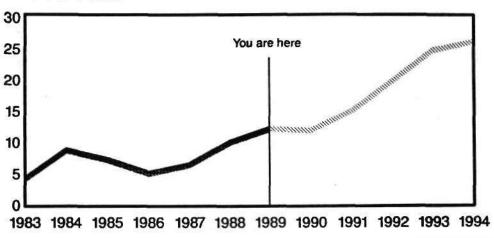
CAPITAL SPENDING

"The patient is now in excellent health - and is now a different person."

ESTIMATED WORLDWIDE CAPITAL SPENDING

All Semiconductor Manufacturers

Billions of Dollars

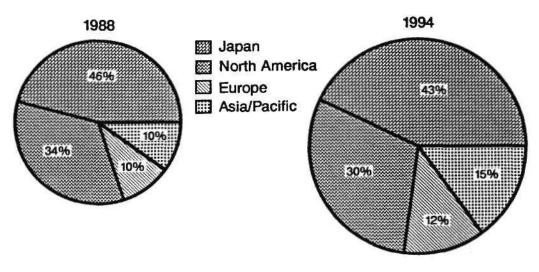


Source: Dataquest

98379023.84G 01/18/30:BUR

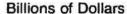
ESTIMATED CAPITAL SPENDING

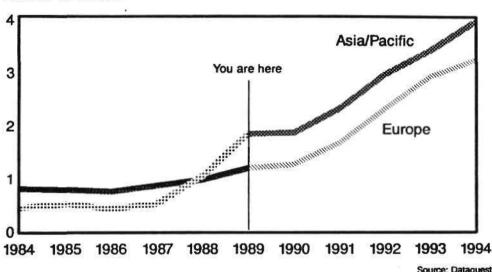
Merchant and Captive, By Region



ESTIMATED CAPITAL SPENDING

Europe and Asia/Pacific



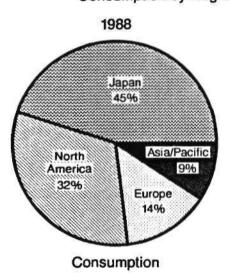


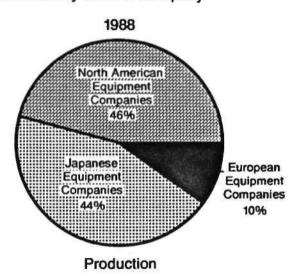
Source: Dataquest

86379025 MIG 01/18/90:BUR

WAFER FAB EQUIPMENT

Consumption by Region, Production by Base of Company





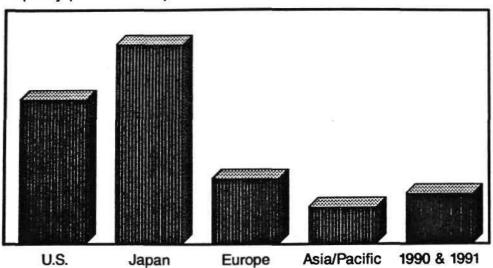
NEW SOURCES

- Regional capacity
- New capacity
- Capacity utilization

86379027.8MG 01/19/90:BUR

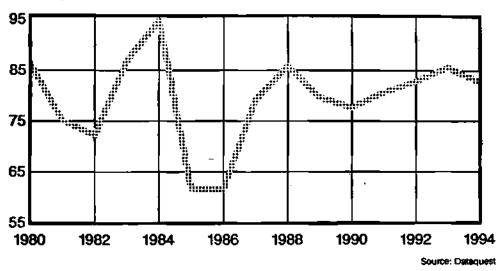
CAPACITY: TODAY AND TOMORROW

Capacity (Wafers/Month)



WORLDWIDE SEMICONDUCTOR CAPACITY UTILIZATION





#370029 IM/3 01/19/00 BUR

CONCLUSIONS

The next five years will continue the trends of new sources and regions. There will be adequate capacity. However, because of the effects of trade policies and subsidies, the possibility of overcapacity in 1995 does exist.

Dataquest

a company of The Dun & Bradstreet Corporation



THE FIFTH ANNUAL USER SURVEY RESULTS

Mark A. Giudici
Product Manager
Senior Industry Analyst
Semiconductor User and Applications Group
Dataquest Incorporated

Mark Giudici is a Product Manager and Senior Industry Analyst for Dataquest's Semiconductor User and Applications Group. He is responsible for worldwide research of semiconductor costs, strategic semiconductor procurement practices, and issues. He supports clients of both the Semiconductor User Information and Semiconductor Application Markets services. Prior to joining Dataquest, Mr. Giudici spent eight years in the computer and semiconductor industries, where he held a variety of financial and marketing positions. Most recently, Mr. Giudici was a Product Marketing Engineer with Gould-American Microsystems Inc., where he was responsible for cost modeling and marketing semicustom and custom semiconductor components. Mr. Giudici received a B.S. degree in Business Administration from California State University at Chico and an M.B.A. degree in Business Management from the University of Oregon.

Dataquest Incorporated
Semiconductor User and Applications Conference
San Francisco, California
February 12-13, 1990



THE FIFTH ANNUAL USER SURVEY RESULTS

Carolyn Doles
Industry Analyst
Central Research Group
Dataquest Incorporated

Carolyn Doles is an Industry Analyst for Dataquest's Central Research Group supporting the Components Group. She is responsible for database development, consistency, integration, and reconciliation of semiconductor data, focusing on application research. Ms. Doles is actively involved with the Semiconductor Application Market (SAM) group's development of a worldwide application overview linking components to systems across regions of the world (WSAM). Prior to joining Dataquest, Ms. Doles worked for Apollo Computer, Inc. Ms. Doles received a B.S. degree from San Jose State University.

Dataquest Incorporated
Semiconductor User and Applications Conference
San Francisco, California
February 12-13, 1990

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THE FIFTH ANNUAL SURVEY RESULTS

MARK A. GIUDICI

PANTANAMAN

Product Manager and Senior Industry Analyst Semiconductor User and Applications Group Dataquest Incorporated



7171**7**171717

Buying and Selling Semiconductors: The Changing User-Supplier Relationship in the 1990s

THE FIFTH ANNUAL SURVEY RESULTS

CAROLYN DOLES

Industry Analyst Central Research Group Dataquest Incorporated

KEY FINDINGS

- Overall, respondents plan on 9.6% semiconductor purchasing growth in 1990
- Medium-size semiconductor users are most optimistic about 1990 growth

 Delivery, price, and cost control are three top issues in 1990



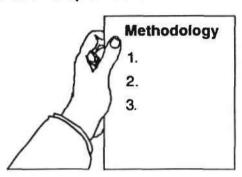
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AGENDA

- Methodology
- User forecasts
- User operating plans
- User issues
- Dataquest conclusions

METHODOLOGY

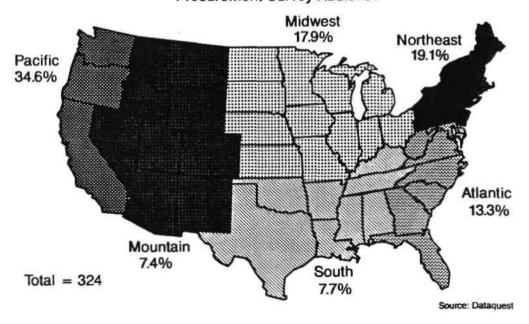
- Fifth annual survey
- Electronic Business magazine's Top 200
- 188 semiconductor user companies surveyed
- 882 semiconductor procurement sites polled
- 37% (324) procurement sites responded



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WHERE ARE THE RESPONDENTS?

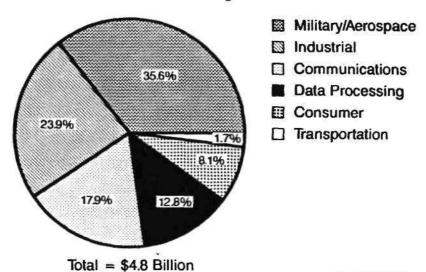
Procurement Survey Audience



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METHODOLOGY RESPONDENT BREAKDOWN

1989 Purchasing Dollars

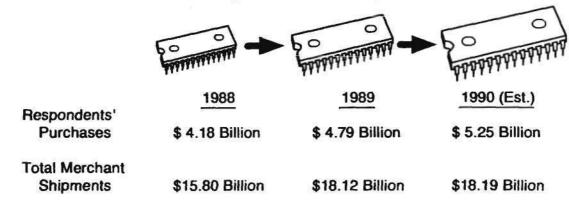


Source: Dataquest

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METHODOLOGY

What is the Respondents' Purchasing Power?



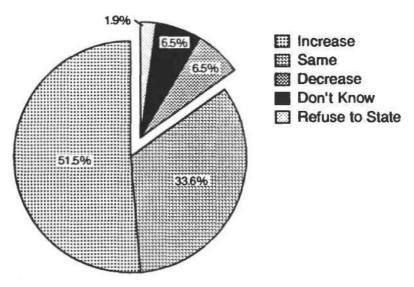
AGENDA

- Methodology
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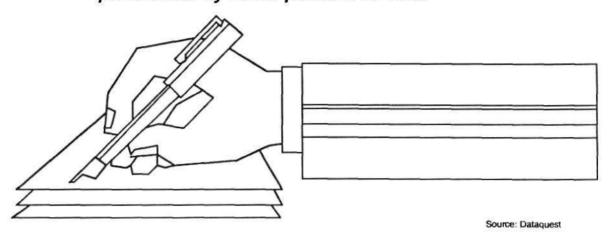
USER FORECASTS

1990 Equipment Sales Expectations



USER FORECAST

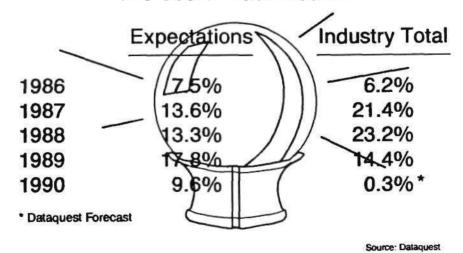
Users expect to increase semiconductor purchases by 9.6% percent in 1990



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USER FORECAST

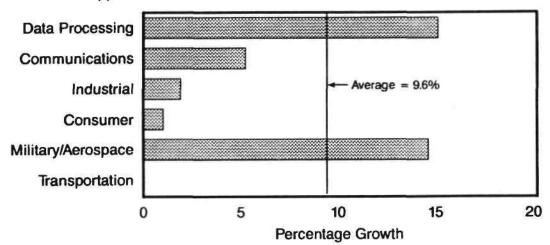
The Users' Track Record



USER FORECASTS

1990 Semiconductor Purchase Growth Rate by Application

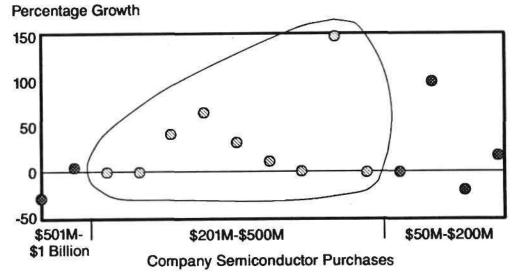
Electronic Application



Source: Dataquest

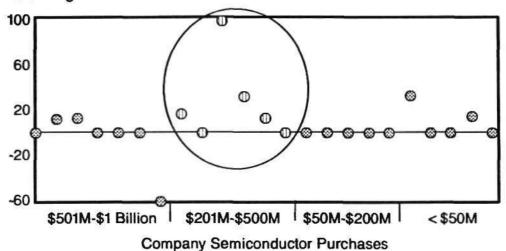
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1990 DATA PROCESSING SEMICONDUCTOR PROCUREMENT FORECAST



1990 COMMUNICATIONS SEMICONDUCTOR PROCUREMENT FORECAST

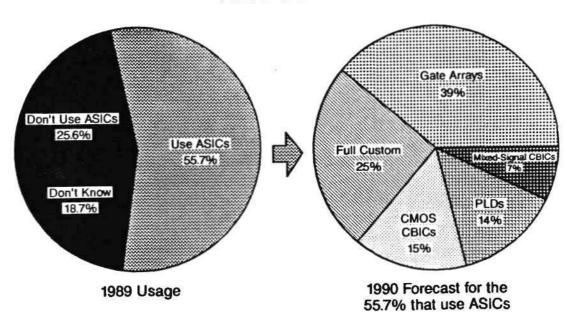
Percentage Growth



Source: Dataquest

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ASIC USAGE



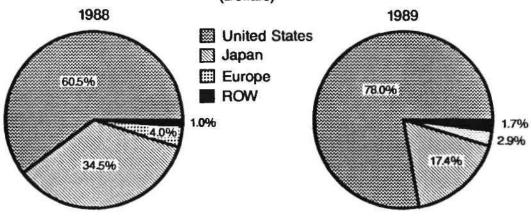
AGENDA

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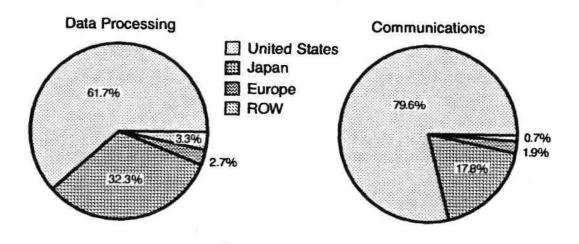
USER OPERATING PLANS

Regional Supplier Base --Total Respondents (Dollars)



1989 REGIONAL SUPPLIER BASE

Key Application Markets

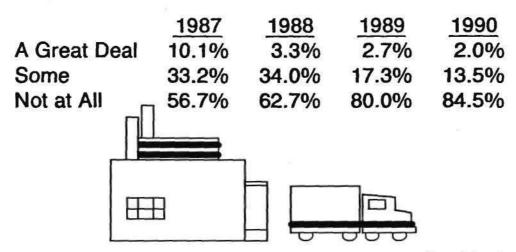


Source: Dataquest

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USER OPERATING PLANS

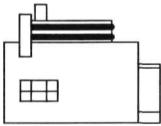
Anticipated Shift to Offshore Production

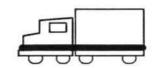


USER OPERATING PLANS

Anticipated Shift of Offshore to Onshore Production

| | 1989 | 1990 |
|--------------|-------|-------|
| A Great Deal | 1.9% | 2.3% |
| Some | 10.4% | 6.5% |
| Not at All | 87.7% | 96.2% |
| гД | | |



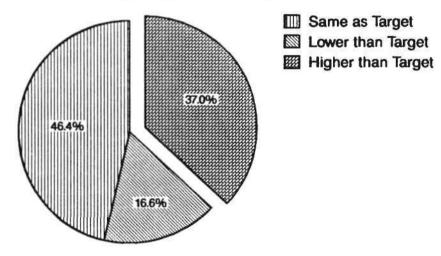


Source: Dataquest

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USER OPERATING PLANS

Beginning 1990 Inventory Levels

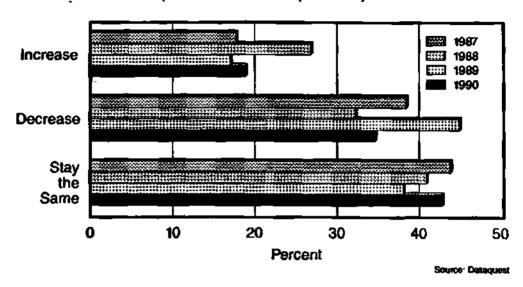


Average Target Inventory Level = 47 Days

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USER OPERATING PLANS

Expected Change in Target Inventory Levels (Percent of Total Respondents)



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AGENDA

- Methodology
- User forecasts
- User operating plans
- User issues
- Dataquest conclusions

USER ISSUES

| Rank | | Rank | |
|------------------|---|------------------|------------------|
| 1990 | | 1989 | 1988 |
| 1 2 3 4 | On-time delivery Pricing Cost control Availability | 3 2 7 1 | 3 2 4 1 |
| 5 6 7 | JIT/inventory control Quality/reliability New products/obsolescence | 6 4 8 | 9 6 8 |
| 8 9 10 | Reducing vendor base Forecasting Government regulation | - | 7 - |

Source: Dataquest

4378024 A&C 01/14/98 gas

AGENDA

- Methodology
- User forecasts
- User operating plans
- User issues
- Dataquest conclusions

DQ CONCLUSIONS

- Survey respondents expect 1990 growth to be at most half that of 1989
- More than half of respondents expect system sales to grow in 1990
- Mid size data processing and military are optimistic
- Costs, not availability, are overall key issues this year

Dataquest

a company of The Dun & Bradstreet Corporation



CHANGING WORLD MARKETS - PROCUREMENT CHALLENGES IN THE '90s

Linn E. Nelson Executive Vice President Barnel International, Inc.

Nelson is Executive Vice President and co-founder of Linn International. Barnel International, with particular emphasis being placed on Hong Kong, Japan, Korea, Taiwan, Singapore, and Europe, assists companies in the development and management of offshore manufacturing resources. Prior to co-founding Barnel International, Mr. Nelson served as Director of Quality Assurance and Materials for Synektron Corporation. His responsibilities encompassed the international procurement and quality assurance functions of the organization, as well as program management of products manufactured for Before joining Synektron, Mr. Nelson was affiliated with Tektronix, Incorporated, first as Director of Procurement for their Instruments Group, and then Director of Operations, Corporate Procurement. Mr. Nelson was Procurement and Materials Director of Electro-Scientific He began his career with RCA and ITT in Southern California. working on government aerospace projects as a design draftsman, later advancing to engineering procurement. Mr. Nelson founded and organized the Oregon Electronics Group of the National Association for Purchasing Management (NAPM), whose charter is to promote continuing education of procurement professionals. He has participated on the national advisory board of Cahners Publications' magazine, Electronics Purchasing. Mr. Nelson attended University in Canoga Park, California, and Portland State University in Portland, Oregon, where he studied economics and business law.

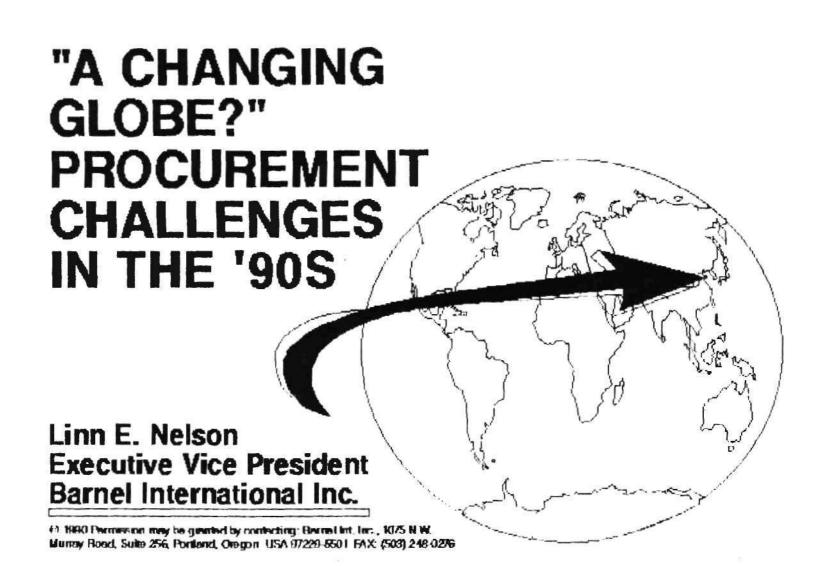
Dataquest Incorporated
Semiconductor User and Applications Conference
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CHANGING WORLD MARKETS --PROCUREMENT CHALLENGES IN THE '90s

LINN E. NELSON

Executive Vice President
Barnel International Incorporated





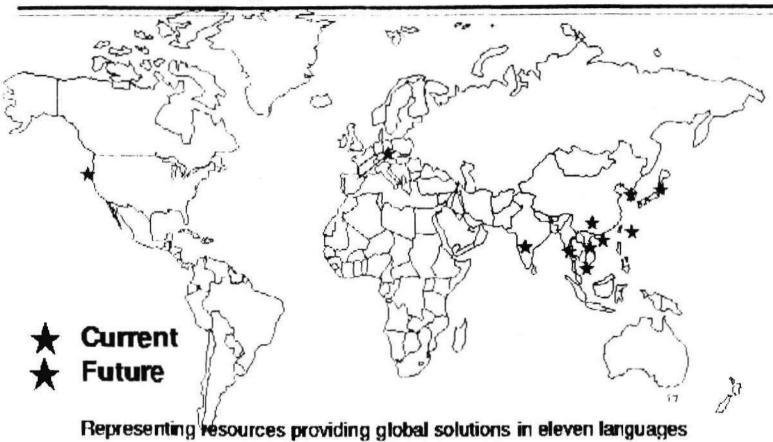
Barnel's History

Founded in 1985 by Ferdinand Baricevic & Linn Nelson

Responding to a need..

- International Purchasing Offices (IPO's) on contract
- Design for manufacturability
- Quality surveys worldwide
- Global sourcing and manufacturing

Barnel International Inc. Worldwide Sites



The Quest

Positioning through technology

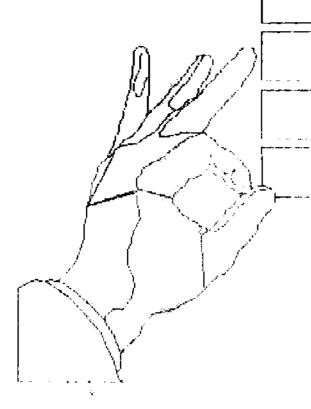
Customer value added

Improve time to market

Increased profitability

100% quality/delivery

Customer satisfaction



What is expected from Procurement Professionals in the 90's?

Knowledge. . . .

THE INDUSTRY:

Technological shifts

Time to market

Complexity of supplier relationships

(domestic and

global)

THE ENVIRONMENT:

- Economic conditions
- Political changes
- Industry structure
- Trade policies
- Financial markets

What is expected from Procurement Professionals in the 90's? (cont'd)

Knowledge. . . .

THE SUPPLIERS:

Global sourcing

Product availability

-quality

 Promotion of teamwork

 Early design involvement

THE PURCHASING PROFESSIONAL:

- Innovative
- Flexible
- Leader in practice
- Partnership
- Visionary

- Deming - acocca - Orlicky Just knowledge and experience with your suppliers. improvement in your company and share your Achieve synergy through strategic partnering. rewarding relationships with fewer suppliers. Establish and maintain long term, mutually You make your suppliers what they are. oster an environment for continuous Four Key Thoughts

In Summary. .



"Make your expectations clear, with manageable size supplier base, and work on continuous improvement programs."

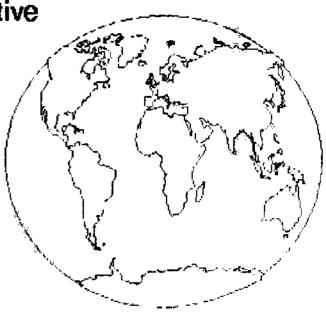
The 90's will be no time for a breather

Electronics industry will finally affirm its' global character

It will require the U.S. to respond vigorously to an inevitable series of global, economic and technological challenges

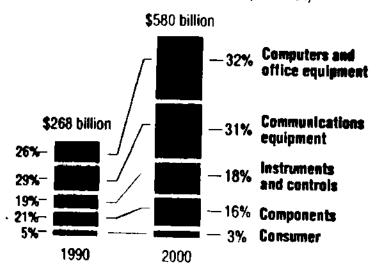
Why Go Global???

- Competitive benchmarking
- Marketing opportunities
- Provides a worldwide perspective
- Eliminates surprises
- 20% cost reduction needed



The U.S. electronics industry will more than double in size by the year 2000...

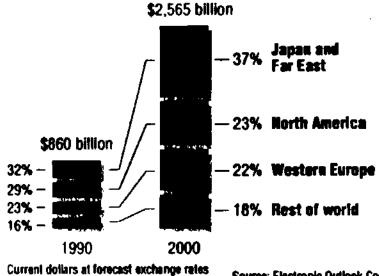
(Percentage of total U.S. electronics production)



Sources: U.S. Commerce Department, ELECTRONIC BUSINESS

...but the Far East's share of worldwide production will increase to 37%

(Percentage of total worldwide electronics production)



Source: Electronic Outlook Corp.

GLOBAL PURCHASING

IS GLOBAL PURCHASING BECOMING MORE OR LESS IMPORTANT TO YOUR COMPANY?

86.4% SAID MORE 13.6% SAID LESS

DANIEL COLLINS

• IN 1989, DOES YOUR COMPANY EXPECT TO INCREASE OR DECREASE ITS OFFSHORE PURCHASING?

89.5% SAID INCREASE

10.5% SAID DECREASE

• IN THE NEXT FIVE YEARS, DOES YOUR COMPANY EXPECT TO INCREASE OR DECREASE ITS OFFSHORE PURCHASING?

87.7% SAID INCREASE

12.3% SAID DECREASE

Buy American??? (This is nothing new)

Lies squarely on our suppliers with leadership from us buyers. . .

What's needed? Quality first, and service at a reasonable price

The far east mindset does not refuse business based solely on profit margins They have vision beyond imagination!

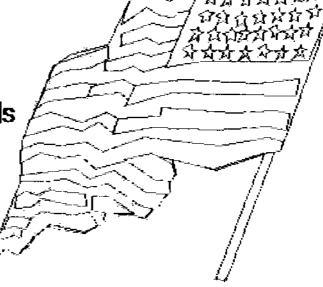
American buyers obligation:

Promotion of partnership programs

• Commitment to continuous improvement

Flexibility

It takes more than just words
...mutual trust, follow-thru
on commitments, and
information sharing





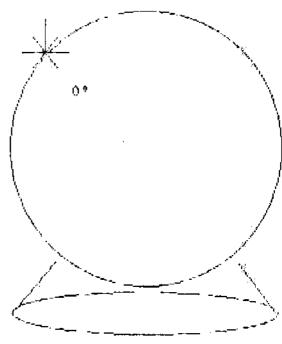
What will the 90's have in store for us?

Faster product development cycles will be to the 90's

what quality was to the 80's

 Imperative to this is early supplier involvement

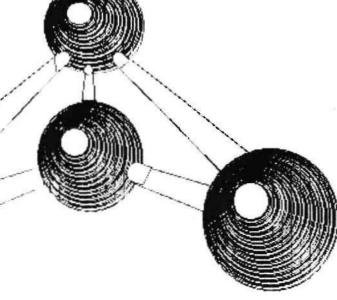
 Best of both worlds: Key supplier with a back-up if the prime supplier fails to measure up

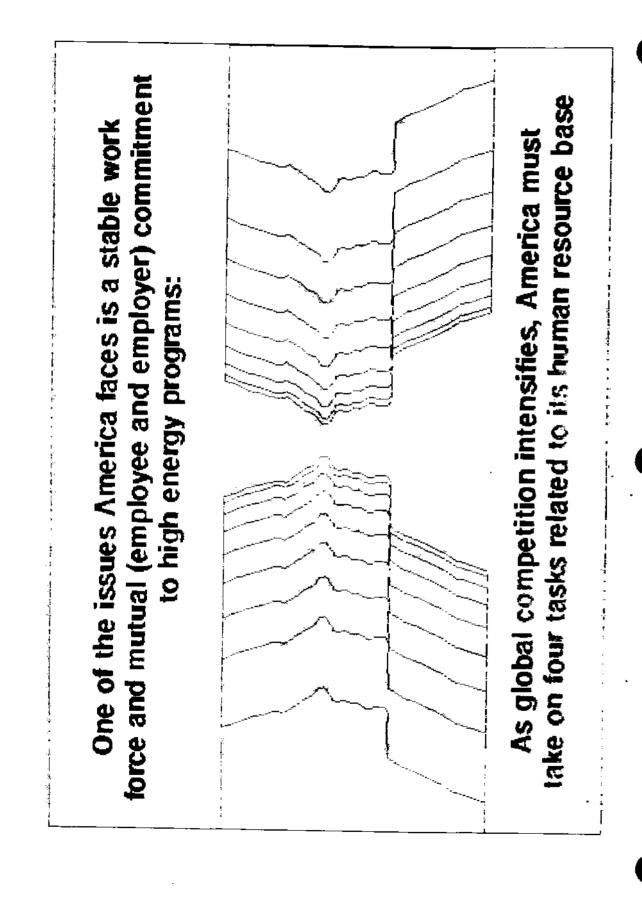


Longterm supplier partnerships and mergers

Pose a real challenge to the purchasing professional

Match of business philosophical beliefs to support the existing programs will require the purchasing professional to be well connected with senior management to foster the transition







People

Our most valuable resource

- Reach a common understanding of the challenges we face in world markets ahead
- Encourage the rapid deployment of our work force in response to changing technologies and markets
- Strengthen the quality of our human resources through education and training
- Our workforce needs employment security and in turn we need top notch employee performance

Shift in manufacturing strategy from our Asian counterparts?

- Japanese joint ventures are rampant
- Labor shortages
- Strengthening of currency
- GSP changes (duty)
- Avoid western protectionism



Thailand, Malaysia and Indochina

Are following in the footsteps of the four tigers and Japan

- Malaysia, 1200 production workers assembling
 Sony and Asahi CD players in one factory alone
- Thailand is rapidly becoming what Taiwan was in 1980
- Not far behind are Vietnam, India and Latin American countries

Key examples that will impact strategy in the 90's

- The new competitive powers of the Pacific Rim
- The market unification of Western Europe in 1992
- 1997 and Höng Kong

 The opening of Eastern Europe and the Iron Curtain

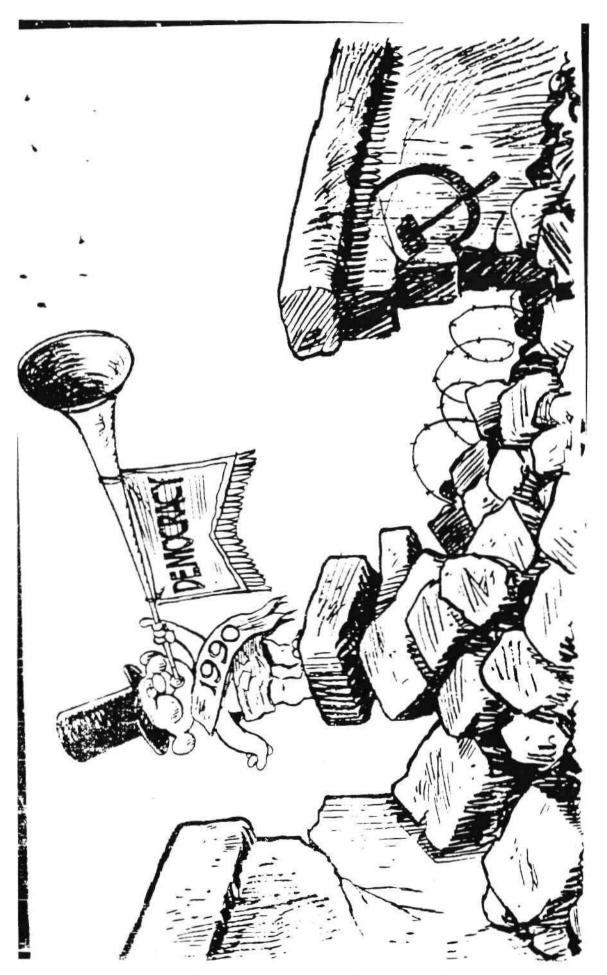
Eastern Europe

Breathtaking reforms are likely to see those nations striving to become competitive in world markets

The risks of sourcing behind the Iron Curtain are colossal

- Quality of goods are low
- Technology is far from current
- Legal, financial and cultural frameworks for conducting business are immature at best



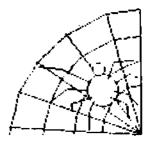


Dataquest Incorporated, a company of The Dun & Bradstreet Corporation 1290 Ridder Park Drive, San Jose, CA 95131-2398 / (408) 437-8000 / Telex 171973 / Fax (408) 437-0292

For the early 1990's

(Eastern Block) and the experienced purchaser:

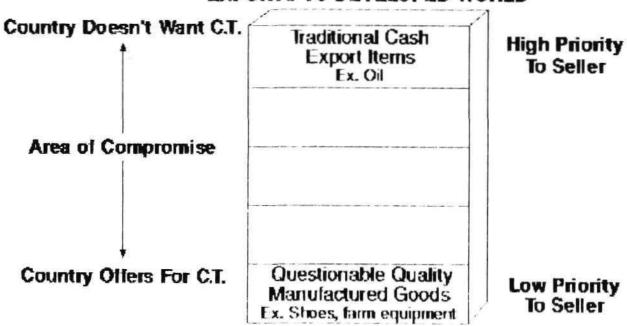
- Look to offset deals as a first option
- Team with your firm's marketing specialists to assess opportunities
- Examine Joint Ventures with the Soviet Union



Negotiation over C.T.

Between the developed world and third world country

Socialist or Third World Country
EXPORTS TO DEVELOPED WORLD



Source: Creative Countertrade, 1997, Elderkin and Norquist

Negotiation over C.T.

Between the developed world and third world country

Socialist or Third World Country IMPORTS INTO THIRD WORLD

Country Desires C.T. **Absolute High Priority** Necessities **Ex. Power Stations** Area of Compression Nonessential Country Insists on C.T. Consumer Items Ex. Cameras

Low Priority Items

Items

Source: Creative Counterwade, 1987, EtJarkin and Normist

Is countertrade a good idea?

- Generally it buys you marketshare
- Trading of goods is complicated and normally is sold in the west at a loss or breakeven
- Countertrade tends to impact overall profit

margin

1997 and Hong Kong

 The new 70-story Bank of China looks down over Hong Kong (symbol of government change)

 Several indicators suggest China will continue to manage Hong Kong as in the past

 Hotel development is on a fast pace

- New harbor is being built

New convention and exhibition center

- Plans for new International Airport



Hong Kong braindrain? And what about China?

 55K people will apply for passports in other countries in 1990 alone

 Many Hong Kong people are focused on short term goals and strategies

 Hong Kong ventures in China are popular (some link to family)

- Through September of 1989:
 4,281 joint ventures in China were granted alone
- Many companies reported excellent results

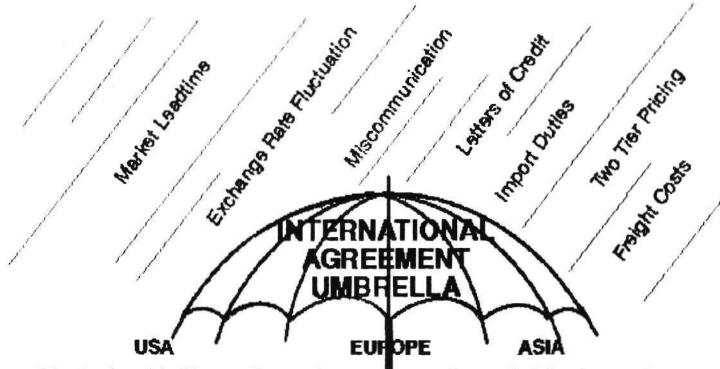


Strategy summary for the 90's

- USA sourcing is always best given it is economically feasible. However, having a global perspective is critical
- Remain flexible and mobile for sourcing labor intensive and low technology products
- Do not sole source in Eastern Europe, China, Korea, Hong Kong where political uncertainty remains
- Continue to keep a close watch on currency fluctuations

Strategy summary for the 90's (cont'd)

- Link your suppliers in early at the design level
- Look to accelerate your "Time to Market" with new product introductions
- If you choose to source internationally:
 - Visit the factory
 - Know your suppliers
 - Understand who is doing the manufacturing
 - Ensure your specifications are clear and explicit

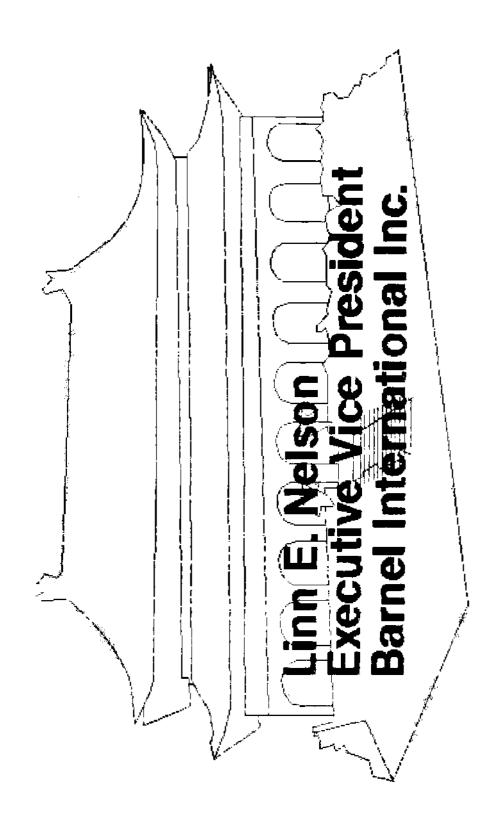


- Identical worldwide supplier goals
- Technological exchange Reduced lead times through JIT
- 100% quality/deliver
- Pricing based on worldwide requirements
- Pricing reflecting worldwide competitive conditions

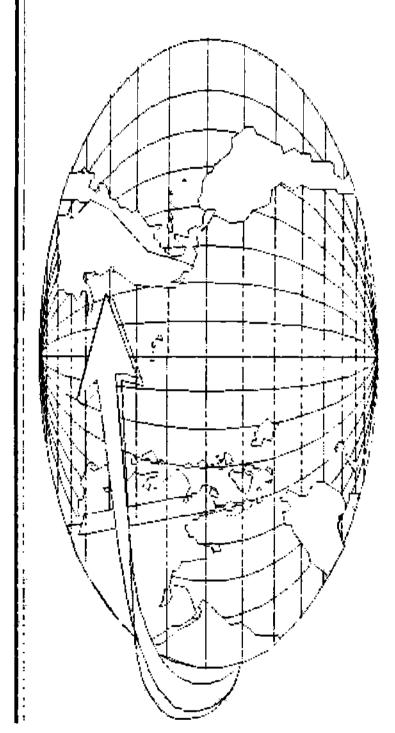
- Lower freight, duty and administration costs
- Value improvement programs (analysis)
- Continuous improvement programs
- Information and communication lines shortened and enhanced
- Electronic data interchange (EDI)

Consider what is at stake!

- Development of strategy and follow-through is key
- Global understanding is necessary for our success
- We are in a competitive environment where every victory is temporary and every defeat has left a permanent impact
- We must continue to improve our performance to survive



Barnel International Inc.



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Dataquest

The Duna Bradstreet Corporation



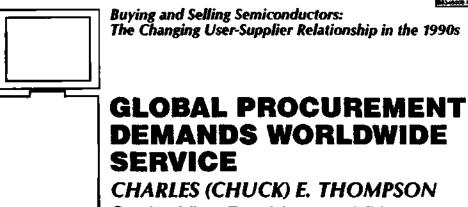
GLOBAL PROCUREMENT DEMANDS VORLDVIDE SERVICE

Charles (Chuck) E. Thompson
Senior Vice President and Director
World Marketing
Semiconductor Products Sector
Motorola Incorporated

Charles Thompson is Senior Vice President and Director of World Marketing for Motorola's Semiconductor Products Sector. Previously, Mr. Thompson was Materials Manager and responsible for Information Management. He joined Motorola as Manager of their Information Systems Department. Under his direction, Motorola Semiconductor Sector has become the outstanding customer support organization in the semiconductor industry. They were the recipient of Dataquest's first-ever Semiconductor Vendor of the Year Award in January 1989. Before joining Motorola, Mr. Thompson was Marketing Manager at General Electric Company for large computer systems. Mr. Thompson graduated Phi Beta Kappa from the University of Washington, where he received a B.S. degree in Mathematics.

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\$6348000 MG 61/12/90 SUA



Senior Vice President and Director
Worldwide Marketing Semiconductor
Products Sector
Motorola Incorporated

FINANCIAL OVERVIEW

- Motorola Inc. founded in 1928.
- Electronic equipment, systems and components.
- Corporate 1988 Sales \$ 8.25B Earnings \$ 445M
- Semiconductor Sector 1988 Sales \$ 2.74B Earnings \$ 268M *
- Corporate 3 Qtrs 1989 Sales \$ 6.97B Earnings \$ 366M
- * Sector Earnings figures are for Net Income before Corporate Expenses, Interest Expenses and Income Taxes.



CORPORATE STRUCTURE

- Communication Sector Schaumburg, Ill.
- Semiconductor Products Sector Phoenix, Az.
- General Systems Sector Arlington Heights, Ill.
- Automotive and Industrial Electronics Group Northbrook, Ill.
- Government Electronics Group Scottsdale, Az.
- Information Systems Group Canton, Mass.



MALCOLM BALDRIGE AWARD

- Awarded in 1988 by the United States Government.
- Quality drive began in 1981.
- Motorola imperative is known as "SIX SIGMA QUALITY".
- Goal is to reach a level of perfect quality.
- Quality measured in every aspect of the Customer relationship.
- Motorola Suppliers required to compete for award.





TEXAS INSTRUMENTS

CONTROL DATA

Honeywell



MANE

MAGNAVOX

Amdahi Communications

- Supplier Quality Award - Confided J.I.T. Supplier 1900

Apolio

- Confidence

Apple

Cornification

TATA

- Dear in Class

- Total Customer Satisfaction

4Q 64 ranked 61 of Six Suppliers

- First Semiconductor Supplier to identify & provide on industry acceptable assistance cover says for each and real products

- Semicenductor Vendor of the Year

C.D.C.

- Carofication

- IQ 69 Service flating #1 of 11

- Quality Excellence Award - 1982

- Failure Amplysis Vender of the Monds (7)

- Outlier Steam Arrand

. First Time Andit Score of Excellent

- Q1 Preferred Supplier Award

- Vender Confidence Duck to Stock for Sax

Devices

Hewlett Packard

- Highen Score Audit for Semiconductors

. Supplier Certification

Digital (DEC)

IC Supplier of the Year - 1988

· Q4 88 100% Quality Rating On-Time Delivery

- Ship to Line Place

Ownt Vendor Certification for ICs

Ship to Stack Program for Discreses

NORTH AMERICAN CUSTOMER AWARDS

1988 Vender Award for 99.5% Quality

Vendor Cartificación Award

Good Performance Assert

- Recognition of Service Award

· Clean Room Near Class 1000 Rating

Delce GM

Reliability Lab Cartification

GM Award of Excellence

GM Mark of Excellence Qualification

Kastman Kadak

- Class A Cartificati

General Instrument

Vendor Certification Award

Goold

- Certification

N.C.R.

- Cerufication

Northern Telecom

. Vendor Constitution Award

Drop Ship Certification

Honerwell

Outstanding Quality Record for 1987

Ship to Line Certification

- Quality Award

Husbes

Performance Excellence Award

IBM

- T? Pinter Ounlay

- Supplier Gold Award for Quality

- Supplier Silver Award for Service

- Zero Defect on all 188 Shipments

Lorain products

- Vendor Certificación Award

Magnever

- Supplier of Distinction '86, '87 '88.

Tektroniz

· Parents in Excellence Award

Superior Performance Index

Tesas Instruments

- Supplier Excellence Award

- Level | Excellent Supplier

- Ownershot Support Award

- Vendor Certification Award

- Shee to Line Award for 1995 Quality

Performance

Westinghouse

Excellent Total Quality Supplier for 1968



Winning Worldwide by Serving Customers Best!



UNISYS











INTERNATIONAL CUSTOMER AWARDS



PHILIPS BOSCH

BULL

Canon

AD Electronics Systems Ltd.

· Ranked 25 pts. over 25 for 1988 Deliveries · Firm Time Zaro Defect · Danamber 38

Acer

Outstanding Service and Support

Alcatel Duniness Systems Vendor of the Year - 1987

Asia Electronica

Excellent Delivery Performance

Beach

· TCS Supplier Award

Bull Angers Ship to Line Award - Quality Cartificants · #1 Quality in 1988

Ship to Line Certification

In Touch with Tonisme

Cases

- Quality Excellence Award

Ericason

· #1 in Service Od BB

GPT

- 100% On-Time Delivery

- Technical Service, Delivery, Quality & Price for 1987

Matenahita

- Six Months of Consecutive Total Quality

Morelli Autropia

- Certification

Mitsubishi

- Excellent Delivery Performance

- Recognision for Delivery

- Ship to Line Certification

Olivetti

- Self Certification

Philips

Shap to Line Certification

Siemene Brachasi

- Ship to Line Certification

Sept

 Contribution to Development of Microcomputer and Delivery During

Early Phase of Production

S Mogga Telecommunications Life.

Contribution and Support Award

Sel Aicatel Stullgart

· Quality Award for 1987

Telle Alcatel 3

Ounliev Contract

Telettra

· Carafication

Techiba

- Excellent Performance for

On-Time Delivery

U.K. National Supervisory

- Generic Facury Approval





OHITACHI



DATAOUEST AWARD

- 1989 Dataquest First Annual Supplier of the Year Award.
- First in overall Quality performance.
- First in overall Delivery performance.
- First in overall Price performance.
- First in overall Technical Support performance.
- First in overall Customer Service performance.
- Motorola proud to have placed first in all categories.



Winning Worldwide by Serving Customers Best!

CHANGES IN CUSTOMER RELATIONSHIPS

- 60's Solutions presented before problems are known.
 - Quality sacrificed for technology and productions sake.
- 70's North American and European Suppliers status quo.
 - Japanese Suppliers make Quality a national initiative.
- 80's A transitional period.
 - Problems identified before solutions presented.
 - Customer design teams work with suppliers to develop solutions (ASICS / CSICS / Custom).
 - Quality a real issue.



CHANGES IN CUSTOMER RELATIONSHIPS

- 90's Problems are shared to develop joint solutions.
 - Partnerships in Research & Development
 - Applications
 - Design
 - Process
 - Applications Success
 - Only Perfect Quality in everything we do is acceptable.



CHANGES IN CUSTOMER RELATIONSE

The profile of Customers will continue to change via

- Amalgamations

- Acquisitions

- Mergers

Strategic Alliances - Customers

- Suppliers

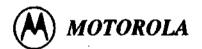
- Competitors

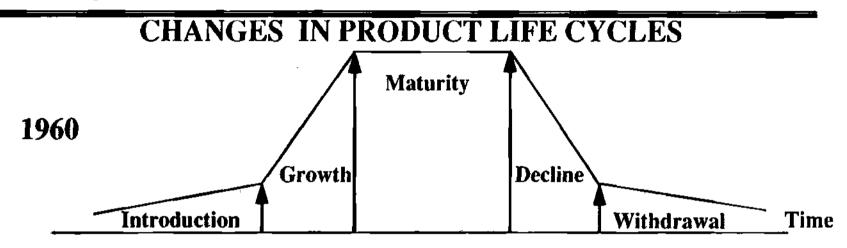


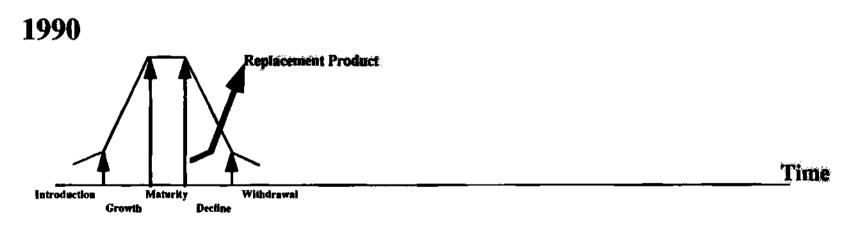
Winning Worldwide by Serving Customers Best!

CHANGES IN CUSTOMER RELATIONSHIPS

- Global Strategies will prevail over Multi-National Strategies.
- Uniform Marketing approaches worldwide.
- Competitive moves integrated across countries.
- Customer's increase their preference and competitive leverage.







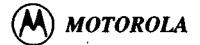


TECHNOLOGY - PROCESS - CUSTOMER

- Technologies and processes used by Motorola become Customer driven.
- Motorola Saber Radio, Bravo Pager, Micro-Tac Cellular Phone.
- Timex Motorola Wristwatch Pager.



PICTURE OF MOTOROLA SABER RADIO AND CONTENTS



TECHNOLOGY - PROCESS - CUSTOMER

- SABER PORTABLE RADIO FAMILY
- · Most advanced and sophisticated portable available
- Unmatched functionality for size and weight
 - Uses MC68HC11 Microcomputer
 - Special Custom ICs



PICTURE OF MOTOROLA BRAVO PAGER AND CONTENTS



TECHNOLOGY - PROCESS - CUSTOMER

- BRAVO PAGER
- Complete paging capability in small compact unit
 - Weighs less than 3 ounces
 - Operates on single standard "AA" Battery
- Advanced features
 - Full Alphanumeric LCD displays
 - Accepts messages from either telephone or data entry devices



PICTURE OF MOTOROLA MICRO-TAC CELLULAR PHONE

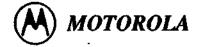


TECHNOLOGY - PROCESS - CUSTOMER

- MICRO-TAC CELLULAR PHONE
- Same power, features, and performance as competitive units that are twice as large
- Based on Motorola proprietary ICs
 - MC68HC11 Microcomputer
 - MC6805 Microcomputer
 - Custom audio processing unit
 - Custom signal interfacing unit
 - Single chip receiver
 - High efficiency power amplifier module

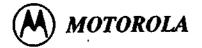


PHOTO OF MOTOROLA MICRO-TAC CELLULAR PHONE CONTENTS



TECHNOLOGY - PROCESS - CUSTOMER

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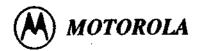


PICTURE OF TIMEX-MOTOROLA WRISTWATCH PAGER



TECHNOLOGY - PROCESS - CUSTOMER

- TIMEX MOTOROLA JOINT VENTURE
- Wristwatch pager integrated with timekeeping functions
 - One quarter the size and one half the weight of BRAVO



FUNDAMENTAL OBJECTIVE FOR MOTOROLA

- Total Customer Satisfaction.
- Key Beliefs: how Motorolans will always act.
- Key Goals: what Motorolans must accomplish.
- Key Initiatives: how Motorolans will do it.

Ask a Motorolan to share this with you.

OUR FUNDAMENTAL OBJECTIVE (Everyone's Overriding Responsibility)

Total Customer Satisfaction



MOTOROLA INC.



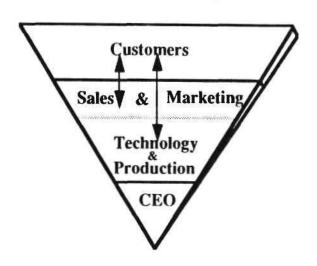
ADAPTIVE MANAGEMENT STRUCTURES

• Positioning of the customer.

TRADITIONAL



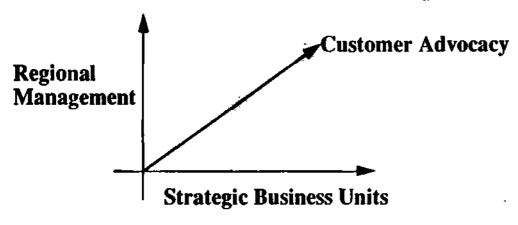
MOTOROLA





ADAPTIVE MANAGEMENT STRUCTURES

• Creation of the "Customer" reporting axis.



- Global Account Managers.
- Segment Marketing organization.
- "Sector Championing" for key accounts.

| INTEGRA | KAT | ED SF | RVIC | ESTR | ATE | JES A | ND PF | ATED SERVICE STRATEGIES AND PROGRA |
|---------------|----------|--------------------|---|---|-------------------|-----------------------|--------------|------------------------------------|
| | 4 | | | | | | | |
| Asia | Asia/Pac | C#3 C#5 C#10 | 2 C C C C E E E E E E E E E E E E E E E | C#1 C#1 C#2 C#2 C#3 | C#1 C#2 C#2 | C#2 C#6 C#7 | D#1 | |
| Region j | Japan | C#10 | C C C E E E E E E E E E E E E E E E E E | C # 4 C # 5 C # 6 C # 6 | C#1 C#6 C#9 | C#2 C#6 C#7 | D#1 | |
| Eu | Europe | C#3 C#5 C#10 | 2 2 2 2 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | C C C C E E E E E E E E E E E E E E E E | C#9 C#9 C#9 | C #2 C #6 C #7 | D#1 D#2 | |
| North America | erica | C#3 C#5 C#10 | C C C C C C C C C C C C C C C C C C C | C#1 C#4 C#6 C#9 | C# C# C | C#2 C#6 C#7 | D#1 | |
| | | Automotive | Computer | C Industrial | Communication | Consumer and PC | Distribution | • |

Segment



Winning Worldwide by Serving Customers Best!

INTEGRATED SERVICE STRATEGIES AND PROGRAMS

- Market Segment Service Managers.
- Regional Service Centers.
- Key Account Service Center.
- Customer Specific Service Centers.
- Worldwide Order Entry.
- EDI Gateway.
- Electronic Sales Force.
- Quality Mangers & Engineers in the field.
- Electronic Publishing On-line Technical Information.
- ASIC designers in 32 global marketplaces.

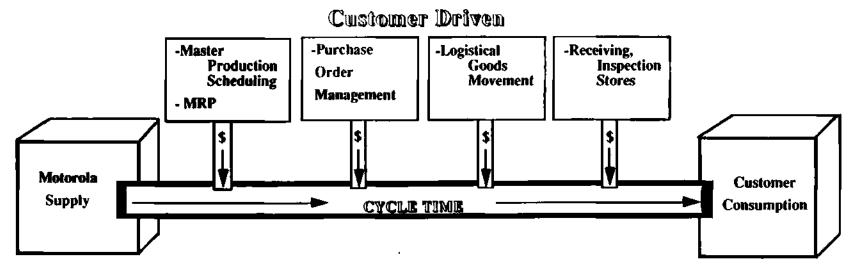


INTEGRATED SERVICE STRATEGIES AND PROGRAMS

• Integral Service Strategy focus is the reduction of cycle time and the removal of attracted costs in the Customer's process of acquiring Motorola products.



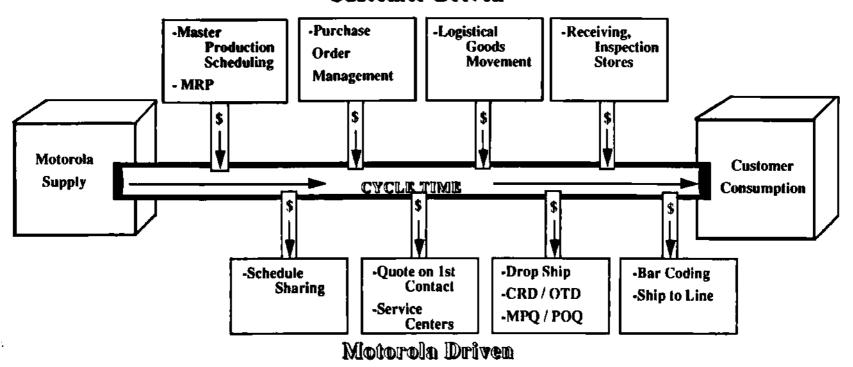
INTEGRATED SERVICE STRATEGIES AND PROGRAMS





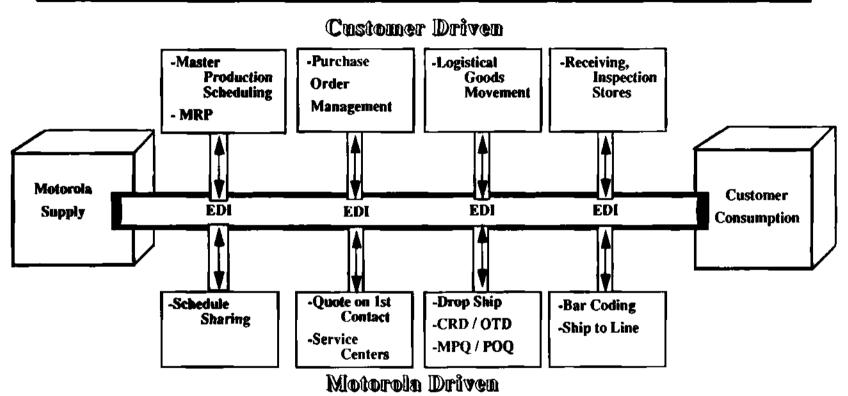
INTEGRATED SERVICE STRATEGIES AND PROGRAMS

Castomer Driven



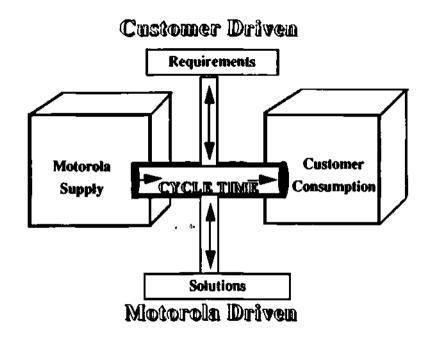


INTEGRATED SERVICE STRATEGIES AND PROGRAMS





TOTAL CUSTOMER SATISFACTION





TOTAL CUSTOMER SATISFACTION

Do What The Customer Wants When He Wants It Done



A GLIMPSE INTO THE FUTURE

- Totally Paperless Environment From RFQ To Payment,
- Demand Pull For Inventory With Leadtime Approaching Zero.
- Bar Coded / Microdot Quality Audit Data On The Part.
- Take An Order Anywhere & Ship It Anywhere With Leadtime Approaching Zero.
- Value Added Sub-Assembly.
- On-Time Delivery To The Customers Point Of Use.
- Lifetime Contracts.
- Margin / Profit Sharing Pricing.



Dataquest

a company of the Dun & Bradstreet Corporation



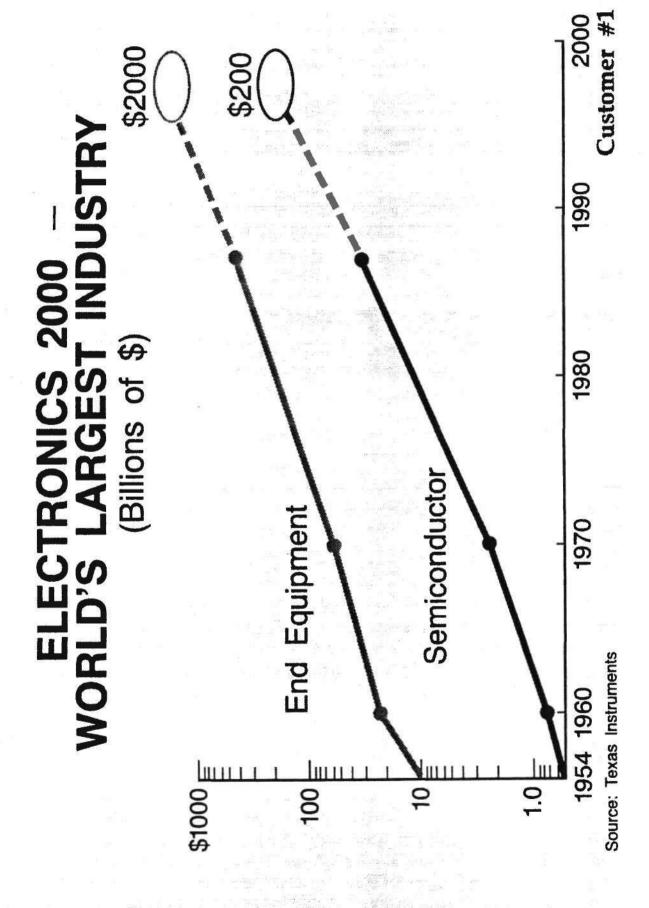
KEEPING PACE WITH DYNAMIC REGIONAL ISSUES

Kevin McGarity
Senior Vice President
Manager, Worldwide Marketing
Semiconductor Group
Texas Instruments Incorporated

Kevin McGarity is Senior Vice President and Manager of Worldwide Marketing for Texas Instruments' Semiconductor Group. He is responsible for sales, strategic marketing, market research, market development, merchandising, and field technical marketing. Mr. McGarity has been associated with Texas Instruments for 17 years and his previous assignments include Manager of North American Marketing for semiconductor products as well as various operational and marketing positions in the U.S. and Europe. Mr. McGarity received his B.S.E.E. degree from Marquette University.

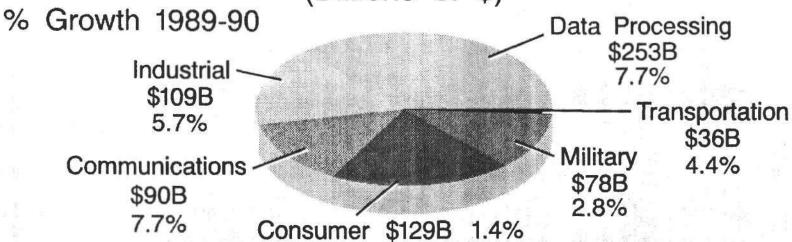
Dataquest Incorporated
Semiconductor User and Applications Conference
San Francisco, California
February 12-13, 1990





1990 WORLD ELECTRONICS END-EQUIPMENT MARKET

(Billions of \$)



| Region | 1990 (\$B) | Growth Rate | (%) 1989-90 |
|--------|------------|-------------|-------------|
| U.S. | 285 | 5 | .8 |
| Europe | 160 | | 1 |
| Japan | 189 | | .9 |
| ROW | 61 | 14 | |
| Total | \$695 | 5 | .4% |

Source: Dataquest

Customer #1

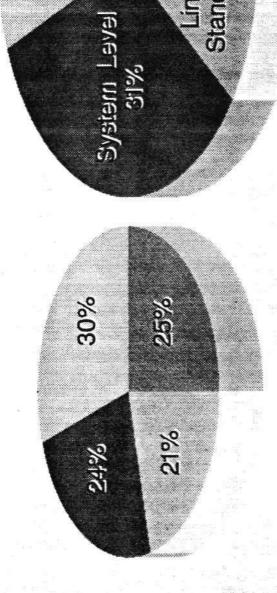
WORLD SEMICONDUCTOR MARKET

(Product Segmentation)

1989

1994

Memory 34%



\$113B

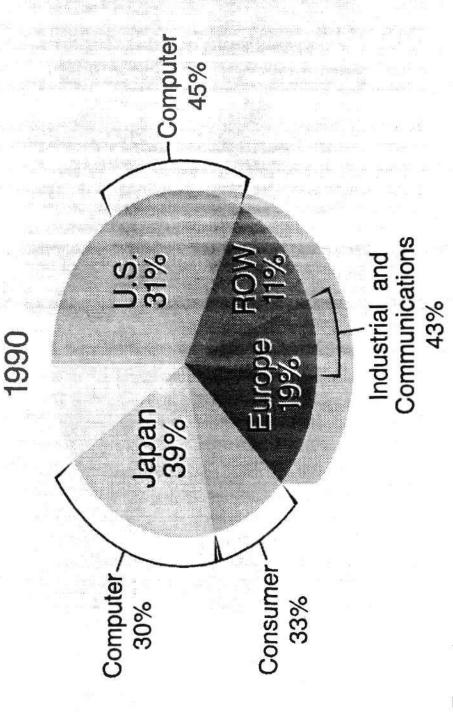
Linear and Standard Logic 18%

\$56B

Source: Dataquest

WORLD SEMICONDUCTOR MARKE

(Market by Region)



Source: Texas Instruments

GLOBAL MARKET ENVIRONMENT

- * Globalization . . . regional emphasis
- Worldwide end-equipment competitiveness
- Emphasis on inventory control
- Strategic partnerships and alliances
- Supplier and vendor reduction programs
- Trade issues . . . protectionism . . . intellectual property

Customer #1

CUSTOMER CAREABOUTS

Worldwide Requirements

| | 1986 | • | 1987 | 1 | 1988 |
|----|----------|----|---------|-------|----------------|
| 1. | Price | 1. | Price | 1 | . Availability |
| 2. | Quality | 2. | Leadti | mes 2 | . Price |
| 3. | Delivery | 3. | Quality | y 3 | Delivery |

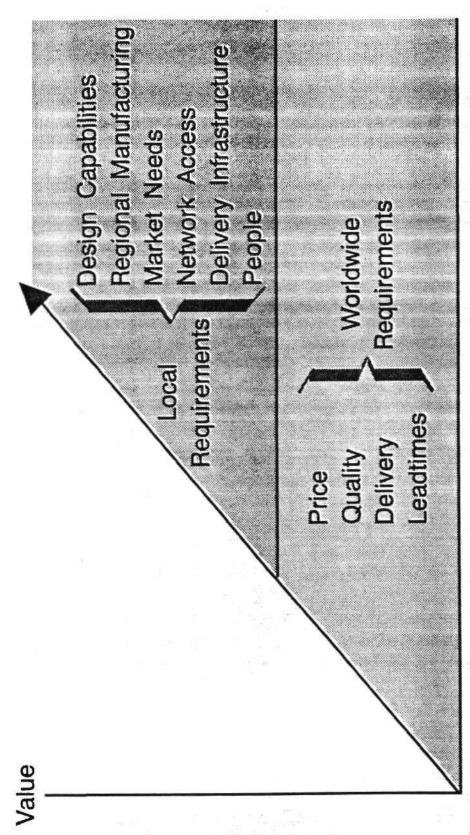
6. Quality

Source: Dataquest, 1988

Customer #1

CUSTOMER CAREABOUTS

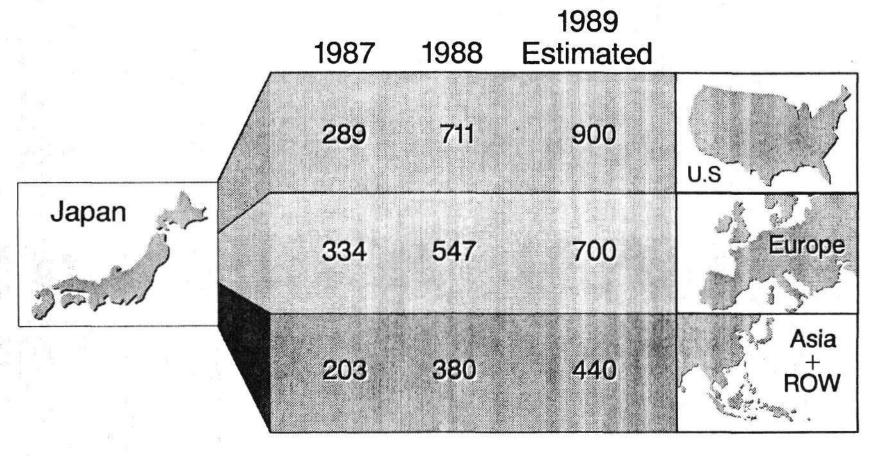
Value Chain



Technology Leadership

IC TAM MOVEMENT

(Millions of \$)

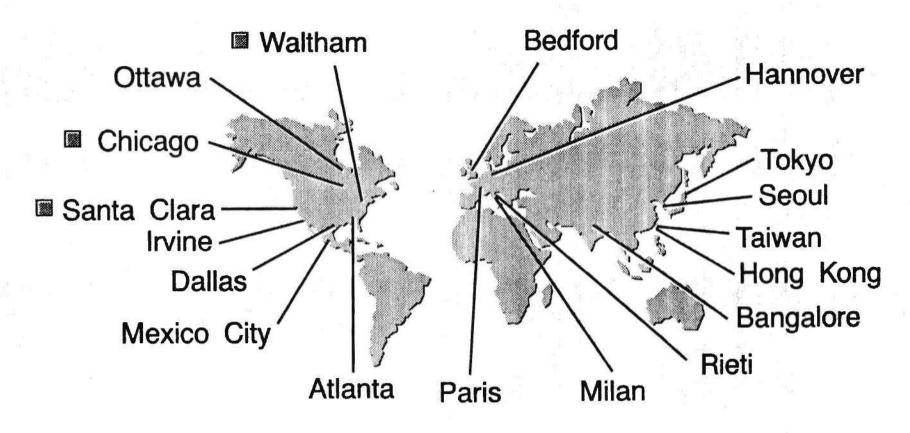


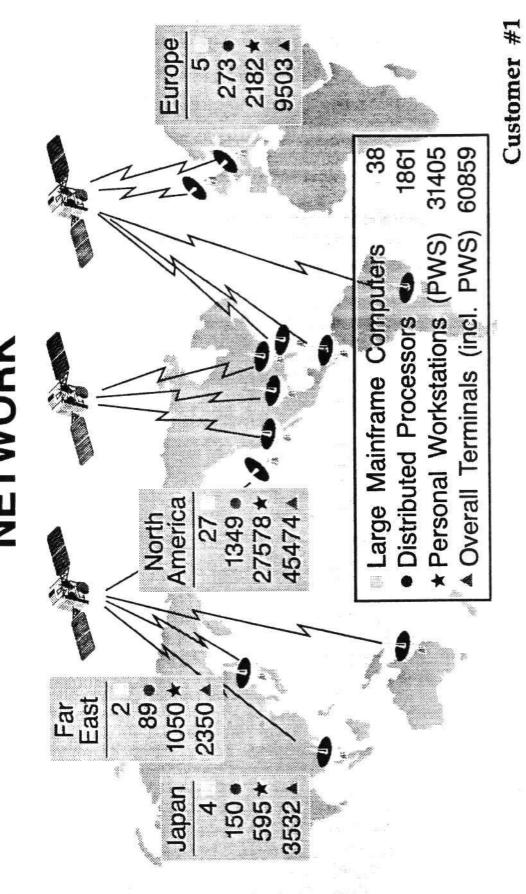
Source: Texas Instruments

Customer #1

REGIONAL DESIGN CAPABILITY

■ 24 Hour Design Centers

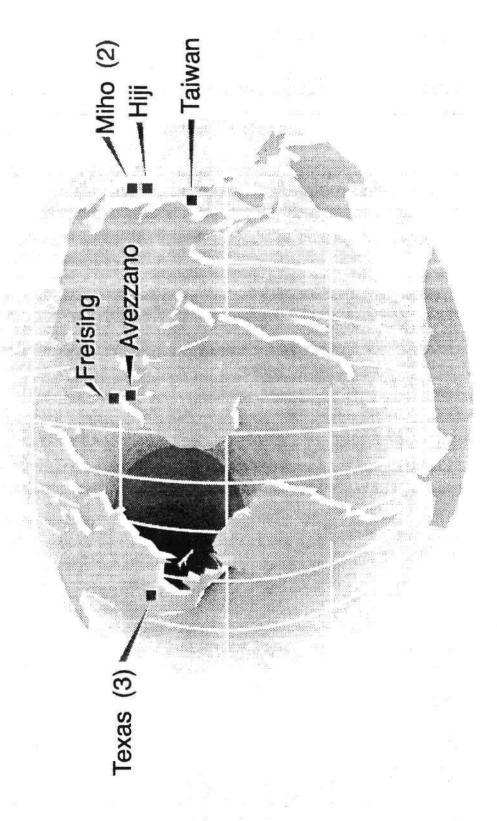




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- Technology Leadership
- Manufacturing Excellence

L SUB-MICRON TURING FACILITIE LOCAL



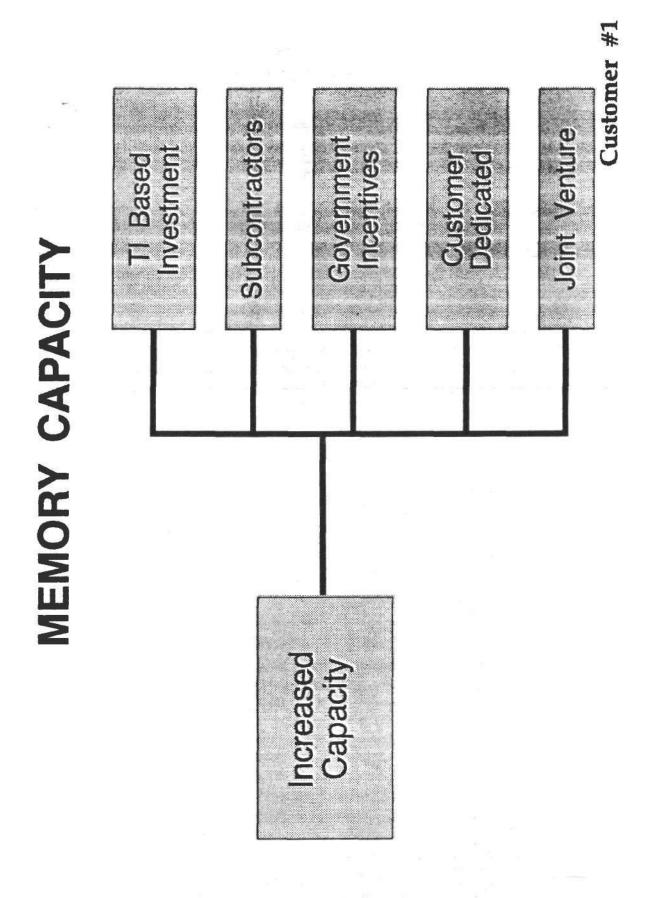
Manufacturing

Excellence

MEETING VLSI REQUIREMENTS

| | \$450M | | Allow the land of the land |
|--------------------------|--------------|-------------------|----------------------------|
| Component Density | \$200M 1M | M4 C.1 1 | and the second |
| Defect Density Reduction | 256K | 256K | Section 1 |
| Parametric Control (SPC) | Facilities & | Process | 1044222 |
| Productivity | Equipment | and Device Design | |
| Equipment Improvement | Costs* | Complexity | |
| Wafer Diameter | | | |
| | | | |

*Nomura Research Institute



MEMORY DEMAND

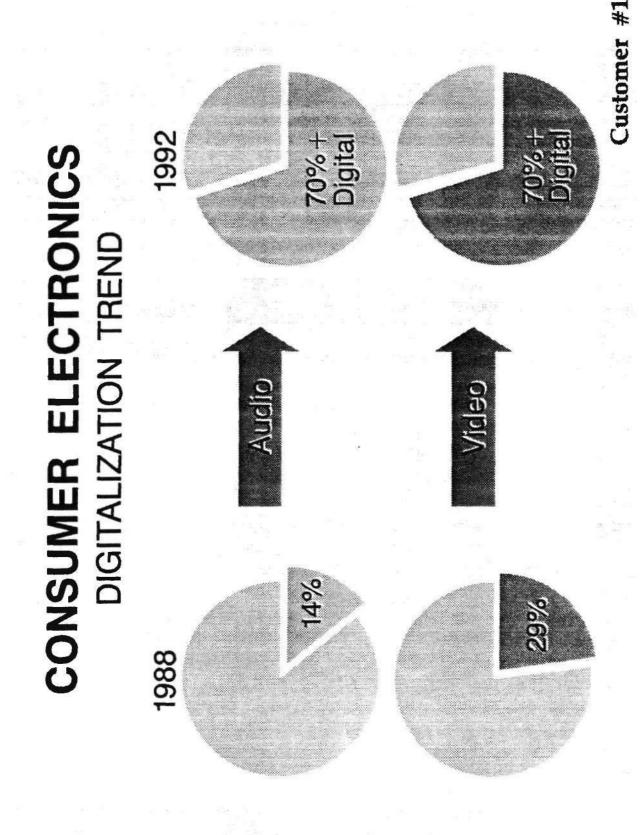
(1 Megabit Equivalent)

| Market Enc | | | | |
|----------------|------------------------------|-------|---------------------------------|---------------|
| Computers 77 | End Equipment Kilobit Age | DRAMs | End Equipment Megabit Age | DRAMs |
| | 16-Bit Terminal | 10-20 | 32-Bit Workstation | 80-100 |
| Communications | Fax | 0 | Laser Fax | 12-15 |
| Reproduction | Dot Printer Copier | 0 | Laser Printer Digital Copier | 9-18 35-40 |
| Entertainment | Television | 0 | HDTV | 32 |

Technology Leadership

Manufacturing Excellence

Market-driven – Products/Systen



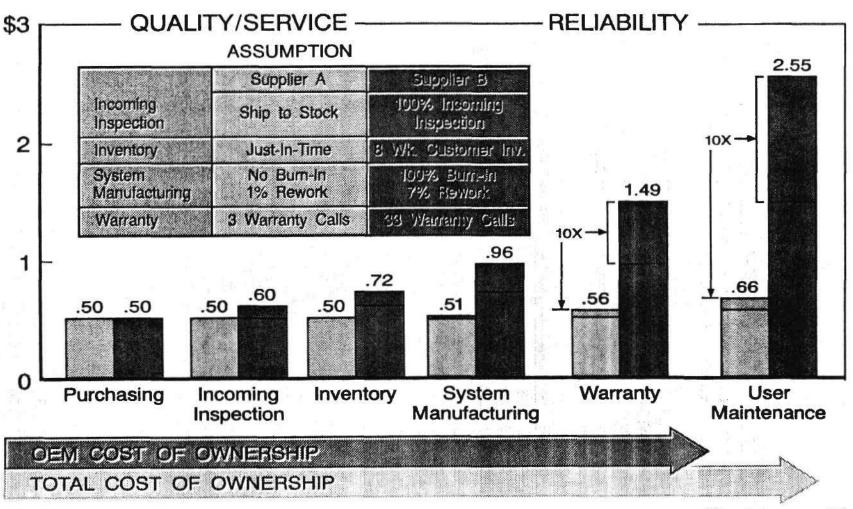
ROACHES REGIONAL

| Emission | Production Standard | Production Present TV Standard Compatibility | Implementation Target Date |
|--|------------------------|---|-------------------------------|
| Japan Direct Broadcast Satellite Government | 1125/60X | No | 1989+ |
| Europe Direct Broadcast Satellite – Government Owned | 1250/50 ed | No | 1991-2 |
| U.S. Terrestrial, Cable – Privately Owned | 1050/59.94? | Yes | 1993-4 |

REQ OCAL

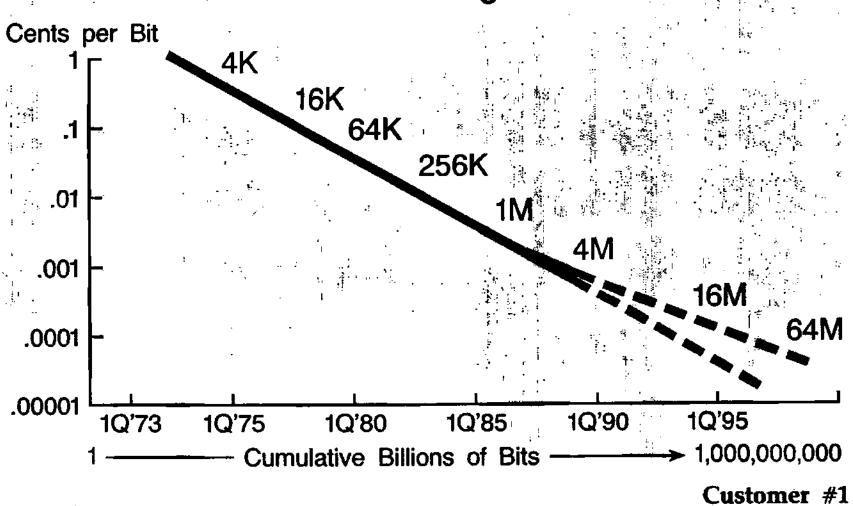
- Technology Leadership
- Manufacturing Excellence
- Market-driven
- Products/Systems
- Value-added Servi

COST OF OWNERSHIP



Customer #1

MANUFACTURING CHALLENGE DRAM Learning Curve



LOCAL REQUIREMENTS FOR GLOBAL CUSTOMER SATISFACTION

- Technology Leadership
- Manufacturing Excellence
 - Market-driven
 - Products/Systems
 - Value-added Services
 - Regional Diversity

SUMMARY OF EUROPE 1992 INITIATIVES

Dismantling of border barriers

specification Harmonization of standards and

* Harmonization of indirect taxation

Liberalization of public procurement

EUROPE 1992 MARKET OPPORTUNITY

| 0001 | Enrope | Japan | U.S. |
|-----------------------|--------|-------|------|
| Population (Millions) | 355 | 122 | 243 |
| GNP (\$B)* | 3550 | 1370 | 3250 |
| GNP/Capita (\$K)* | 10.2 | 11.2 | 13,4 |
| Televisions** | 37 | 45 | 80 |
| Telephones** | 56 | 61 | 80 |
| PCs** | 4 | 9 | 15 |
| Cars** | 32 | 25 | 58 |

* At 1980 prices and rate of exchange ** Per 100 people

SINGLE EUROPEAN MARKET LIKELY MAJOR CONSEQUENCES

- Acceleration of European and foreign investment
- Repatriation of equipment manufacturing
- Funding of high technology by EC
- Formation of formidable worldwide competitors through alliances, acquisitions and mergers
- Shift of manufacturing to Mediterranean countries
- Opening of Eastern Europe

LATIN AMERICA

Aguascalientes

Mexico City

Trade Issues

All * Balance of Trade

- Foreign Debt
- Inflation

Brazil * SC Market Reserve

- Software Protection
- Manaus Free Zone
- Informatics Law

Mexico * New Investment Opportunities

\$200M + SC TAM in Maquiladoras

| 1990 TAM (\$M) | |
|------------------------|--------|
| Local Manufacturing | \$360 |
| Direct Shipment | 240 |
| Maquiladoras/Free Zone | 430 |
| Total | \$1030 |

Manaus

Campinas

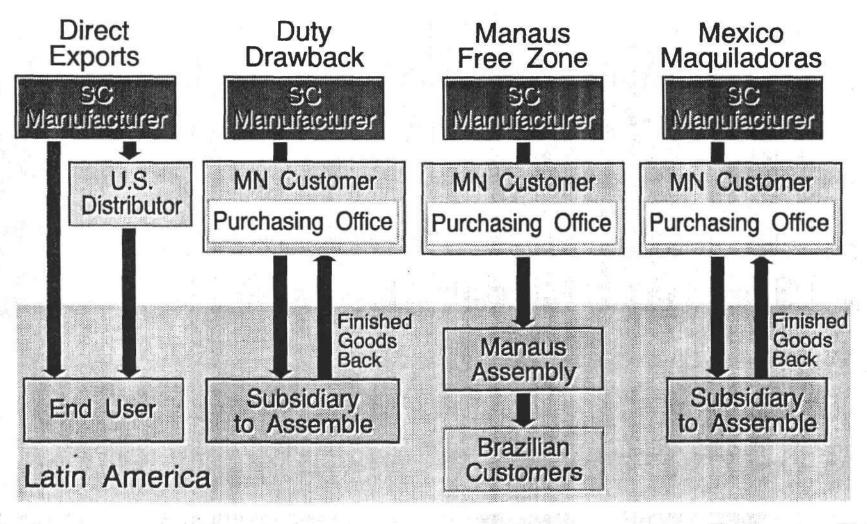
■ Sao Paulo

■ Buenos Aires

SalesManufacturing

Customer #1

IMPORT CHANNELS LOGISTICS



LOCAL REQUIREMENTS FOR GLOBAL CUSTOMER SATISFACTION

- Technology Leadership
- Manufacturing Excellence
- Market-driven
 - Products/Systems
 - Value-added Services
- Regional Diversity
- Close Ties to Customer

Customer #1

STRATEGIC RELATIONSHIPS

Yorklwide Presence Broad Technology Base Volume Manufacturing Design Automation

Advantages

Time-to-Market
Equipment Differentiation
Lower System Cost
Resource Efficiency
Increased Market Share

Cooperating
Company
System/Design Expertise
New Product Definition
Market Innovation

LOCAL REQUIREMENTS FOR GLOBAL CUSTOMER SATISFACTION

- Technology Leadership
- Manufacturing Excellence
- Market-driven
 - Products/Systems
 - Value-added Services
- Regional Diversity
- Close Ties to Customer
 - Worldwide Deployment

Customer #1

GLOBAL SEMICONDUCTOR MARKET

Europe

U.S.

Asia

Matsushita NEC Sony

Alcatel Ericsson Siemens

Compaq IBM Sun

Worldwide Customers

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Dataquest

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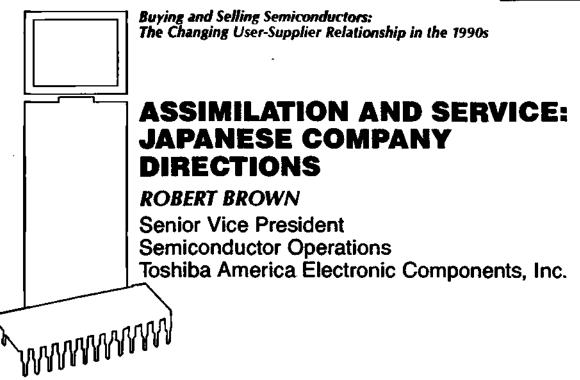


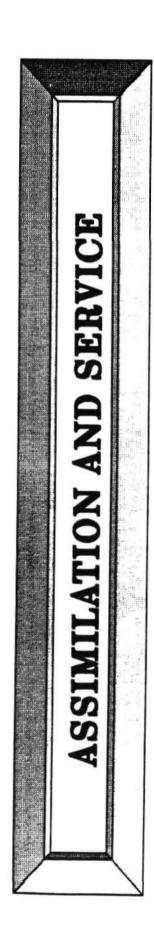
ASSIMILATION AND SERVICE: JAPANESE COMPANY DIRECTIONS

Robert Brown
Senior Vice President
Semiconductor Operations
Toshiba America Electronic Components, Inc.

Robert Brown is Senior Vice President of Semiconductor Operations for Toshiba America Electronic Components, Inc. Mr. Brown has held several managerial positions with Toshiba. He was Vice President and General Manager, MOS IC; Director of Sales, MOS IC; and National Sales Manager, MOS IC. Prior to joining Toshiba, Mr. Brown served in various regional sales managerial positions with Signetics Corporation and also as their Telecommunications Marketing Manager. Before his association with Signetics, Mr. Brown was District Sales Manager with Transitron Electronic Corporation, Discrete Semiconductors & Bipolar ICs. He also worked for Westinghouse Electric Corporation as Distributor Manager, IC Division; District Manager, Electronic Components; Sales Engineer and Product Specialist, Electron Tubes. Mr. Brown received a B.S.E.E. degree from Fairleigh Dickinson University.

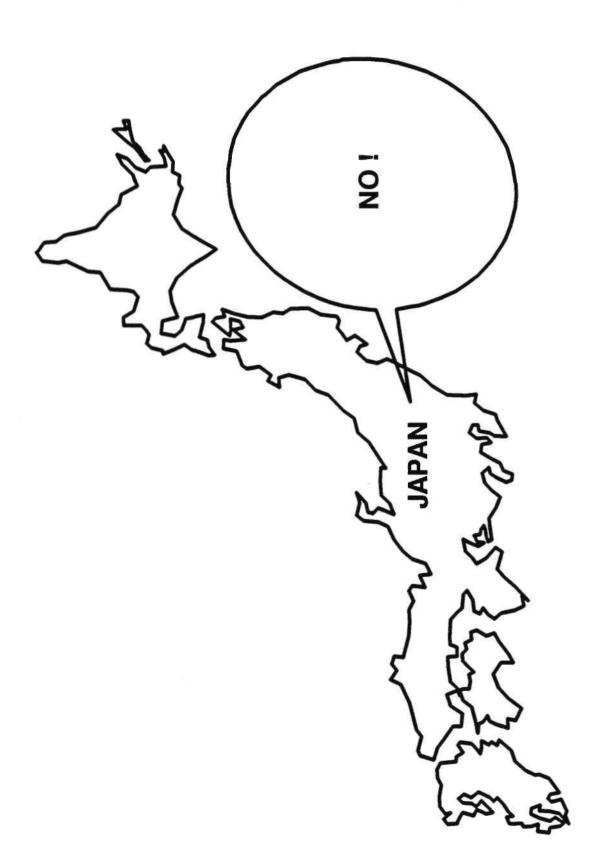
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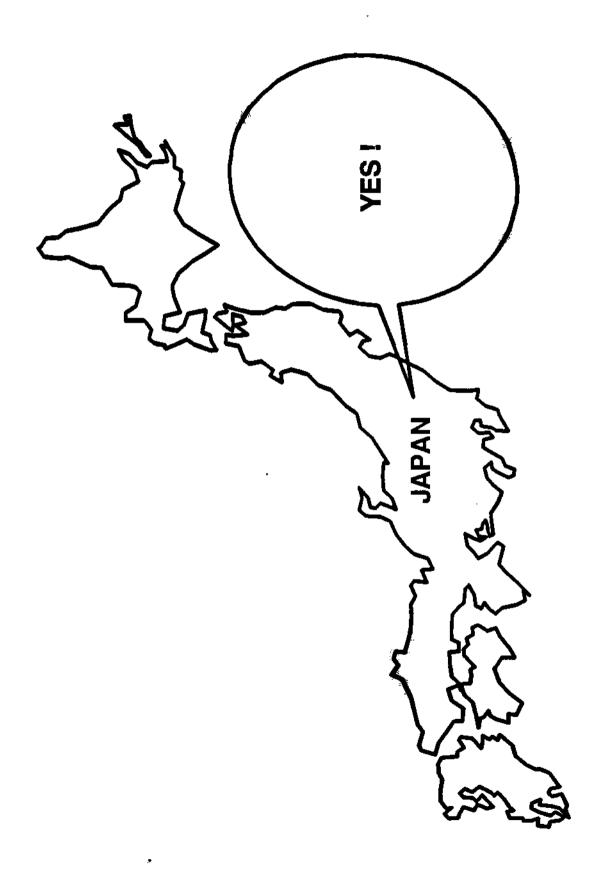




JAPANESE COMPANY DIRECTIONS

R. BROWN TAEC 2/12/90





ASSIMILATION:

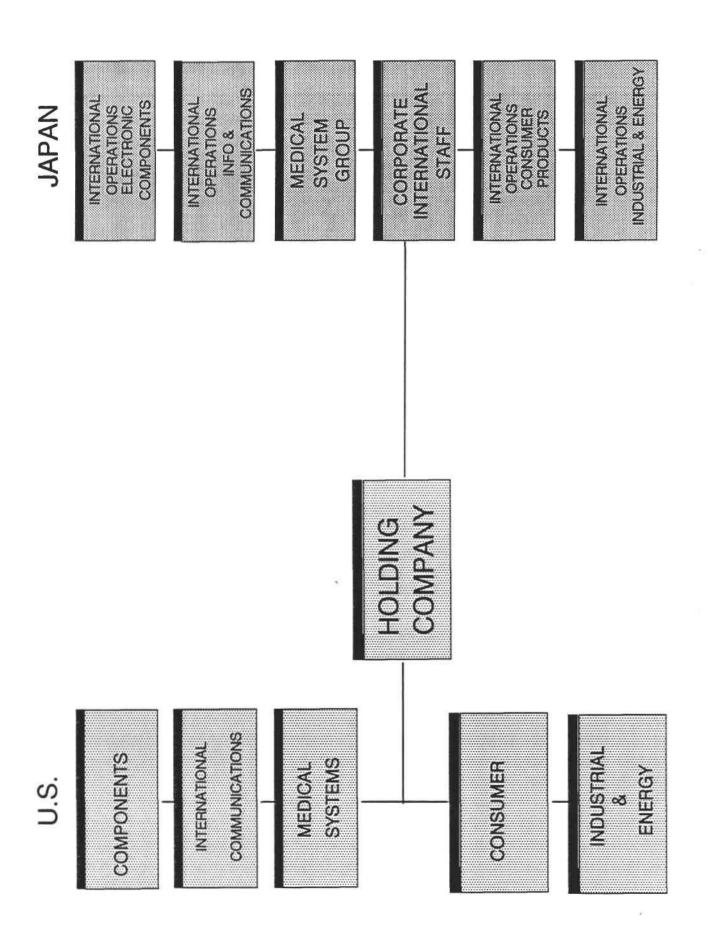
"THE PROCESS WHEREBY A GROUP, AS OF MINORITY OR
OR IMMIGRANT PEOPLES, GRADUALLY ADOPTS TO THE
CHARACTERISTICS OF ANOTHER CULTURE."

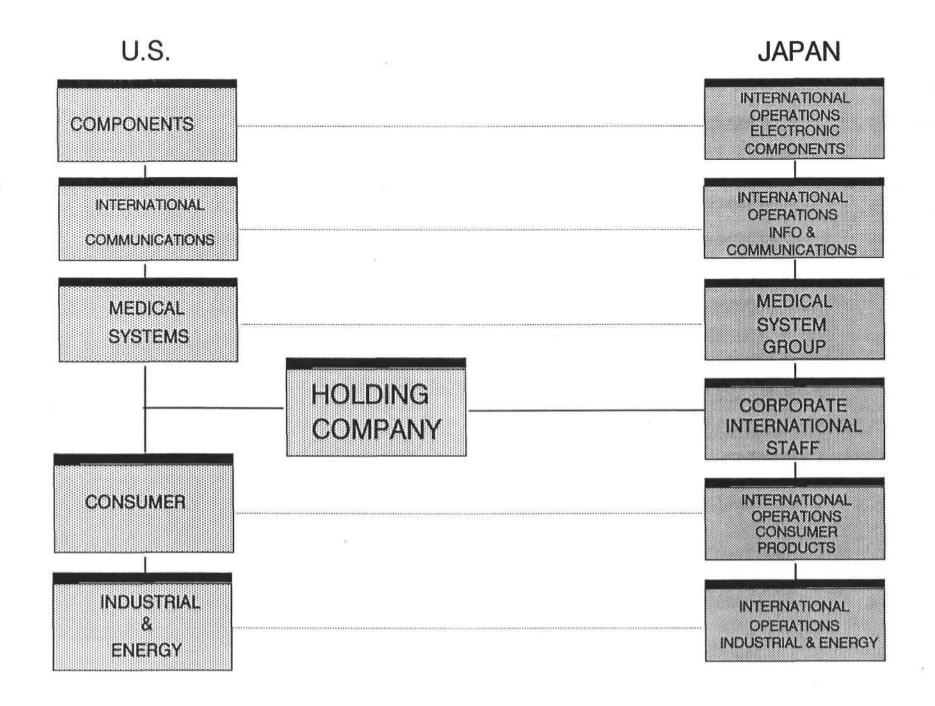
WEBSTERS DICTIONARY

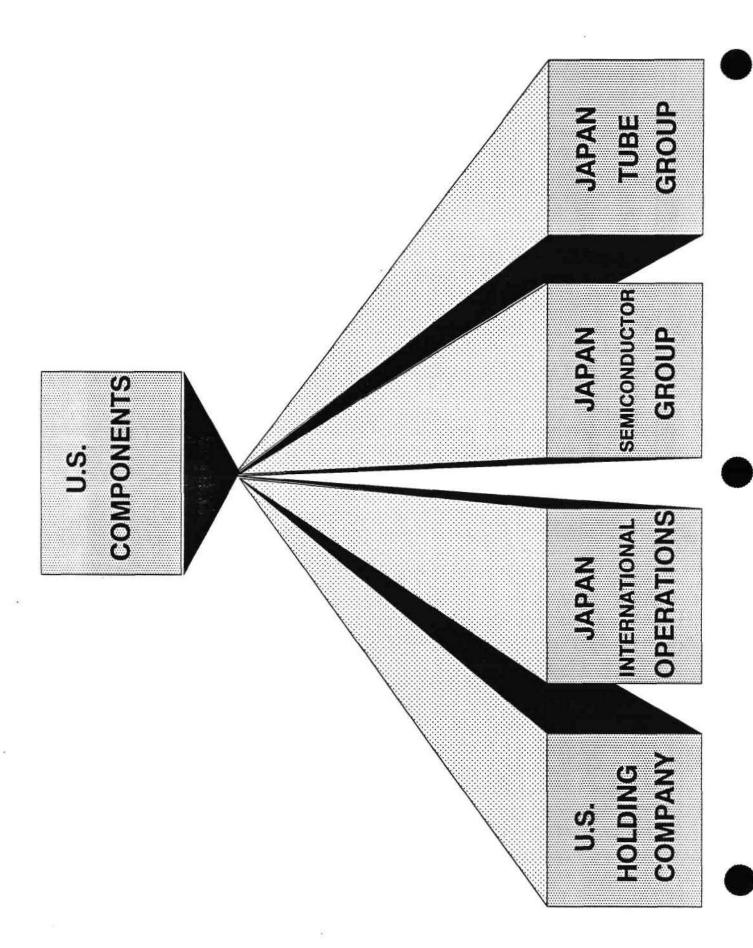
ASSIMILATION ISSUES:

- ORGANIZATIONAL
- CULTURAL
- FINANCIAL
- TRAINING

COMMUNICATION







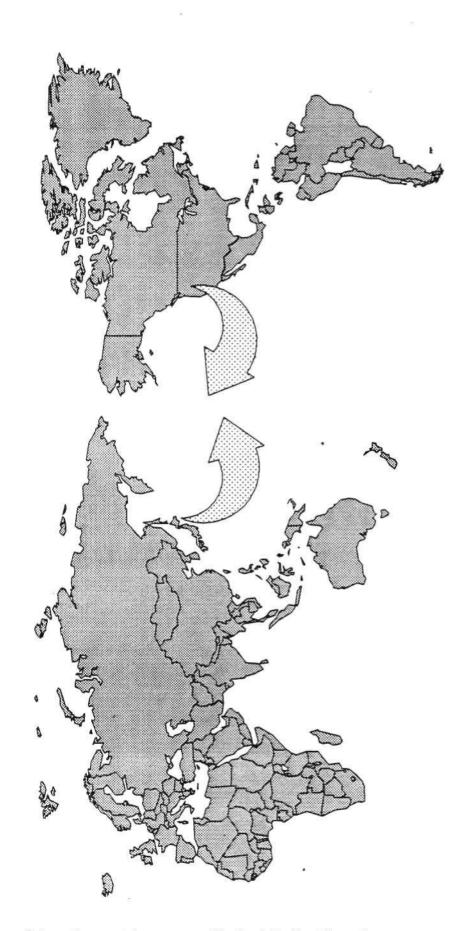


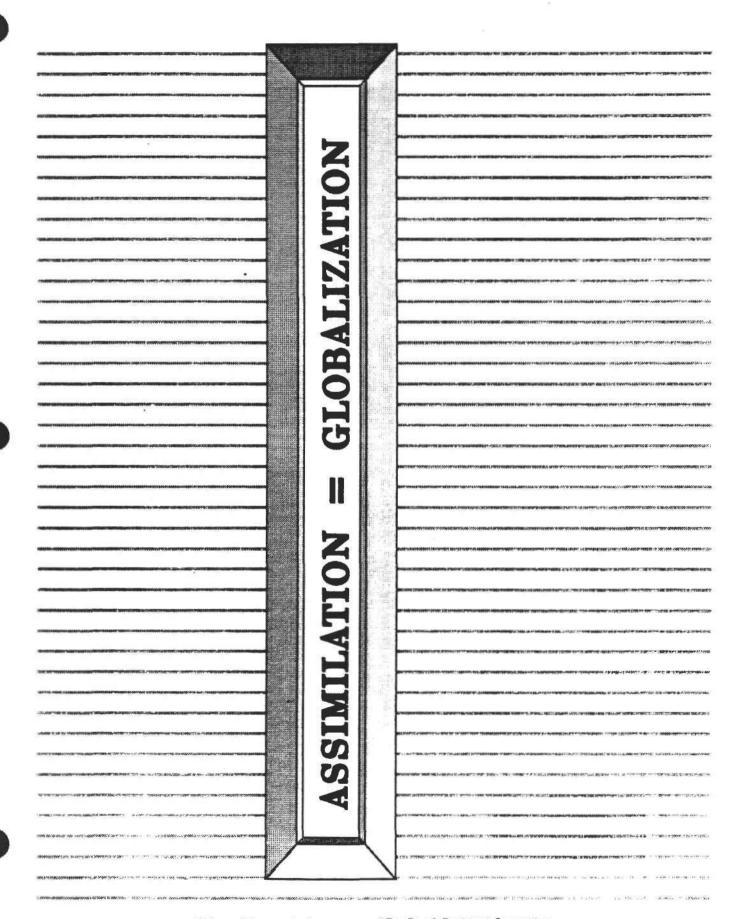
ORGANIZATIONAL

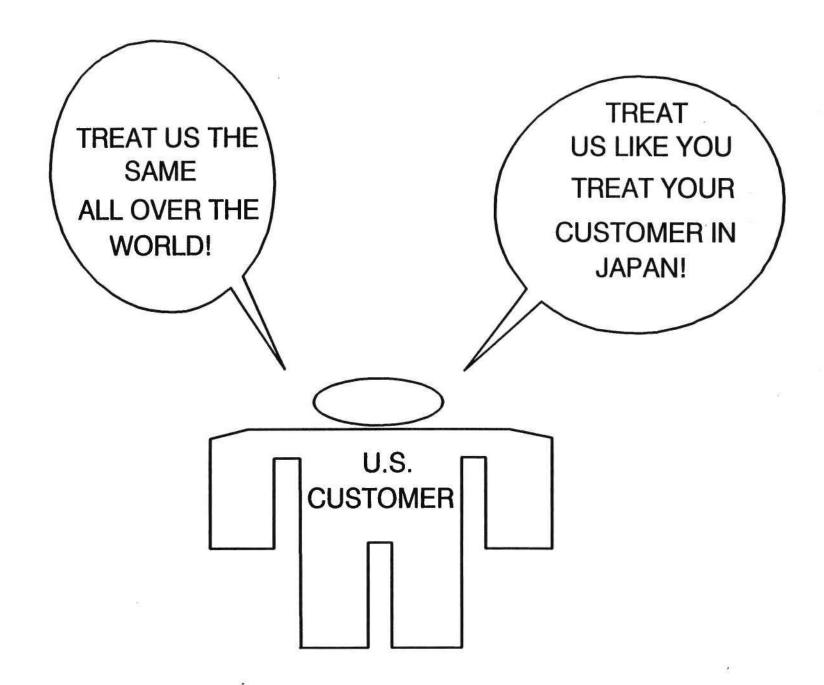
CULTURAL FINANCIAL

TRAINING

COMMUNICATION





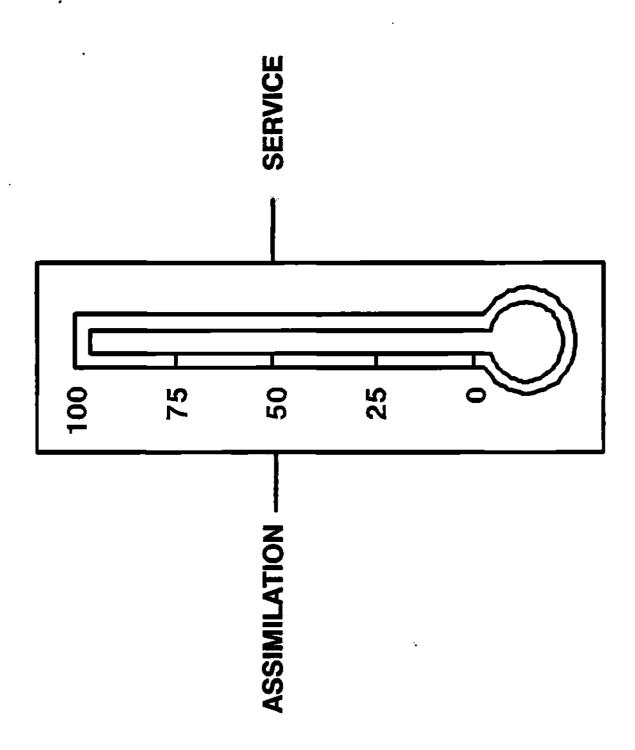


SERVICE ISSUES

- EARLY ACCESS
- TECHNICAL ASSISTANCE & RESPONSE
- LOGISTIC SUPPORT
- LOCAL MANUFACTURING
- **COST OF OWNERSHIP**
- FLEXIBILITY
- QUALITY PRODUCTS & SERVICES

HOW TO ACHIEVE

ATTITUDE ORGANIZATION SYSTEMS 'ASSIMILATION"



Dataquest

a company of
The Dun & Bradstreet Corporation



THE FUTURE ROLE OF DISTRIBUTION

Charles M. Clough
President and Chief Executive Officer
Wyle Laboratories

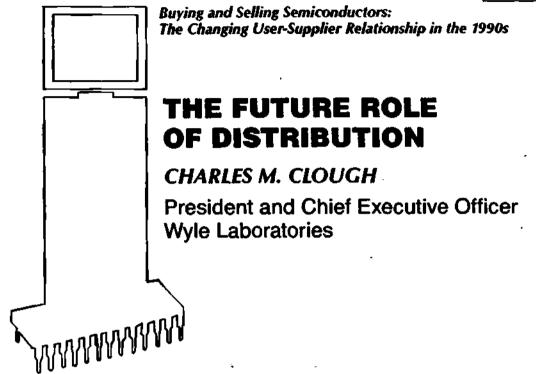
Charles Clough is President and Chief Executive Officer of Wyle Laboratories. He joined Wyle as Executive Vice President of the corporation and President of the Electronics Marketing Group. He subsequently became President and Chief Operating Officer. Before his association with Wyle, Mr. Clough served 27 years with Texas Instruments in a number of management and executive positions, the most recent being Vice President of the corporation and Manager of Corporate Marketing. In this capacity, he was responsible for all activities in Europe and Asia-Pacific and for direction of their marketing activities. Before this he was responsible for all Texas Instruments' European semiconductor operations, including product development, engineering, manufacturing, and marketing from six European facilities. Prior to his European assignments, he managed their U.S. Bipolar Semiconductor operations. Mr. Clough received a B.S. degree in Business from the University of Illinois and has served as an officer in the U.S. Air Force.

Dataquest Incorporated

Semiconductor User and Applications Conference

San Francisco, California

February 12-13, 1990



DATAQUEST CONFERENCE

THE FUTURE ROLE OF DISTRIBITION CHARLES M. CLOUGH



U.S. DISTRIBUTION INDUSTRY'S ROLE

- INCREASE COMPETITIVENESS OF AMERICAN EQUIPMENT MANUFACTURERS IN WORLD MARKETPLACE
- MAXIMIZE MARKETING EFFICIENCY OF AMERICAN SEMICONDUCTOR INDUSTRY

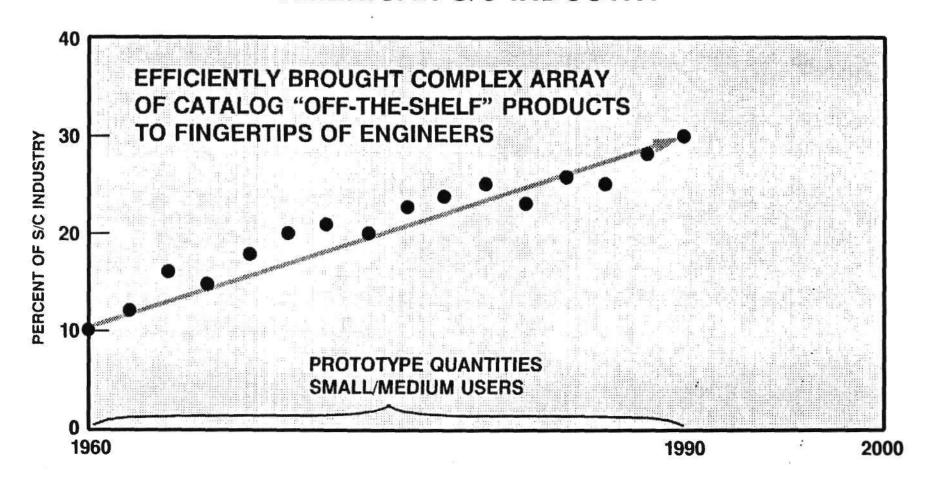
COST - QUALITY - TIMELINESS

WHO WILL DO THIS?

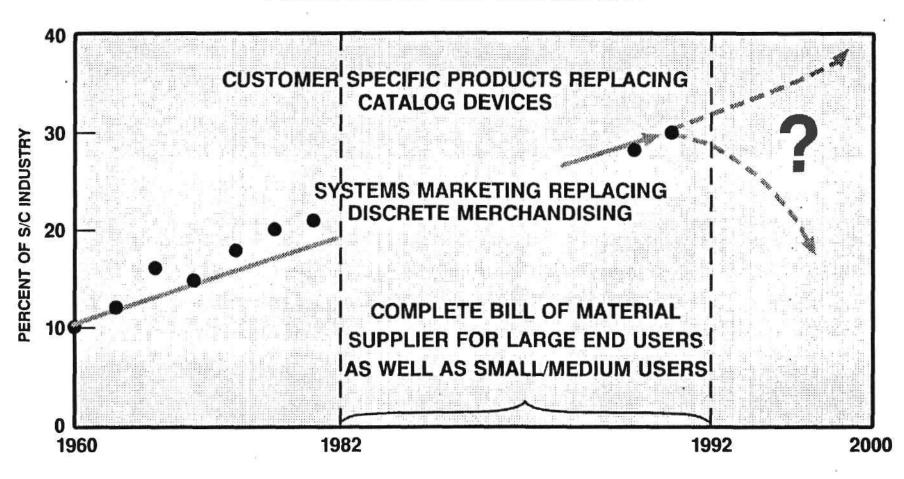
 ONLY THOSE THAT HAVE TECHNICAL/MARKETING AND FINANCIAL CAPABILITY TO INNOVATE AND IMPLEMENT

t Corporation 171973 / Fax (408) 437-0292

U.S. DISTRIBUTION AS PERCENT OF AMERICAN S/C INDUSTRY

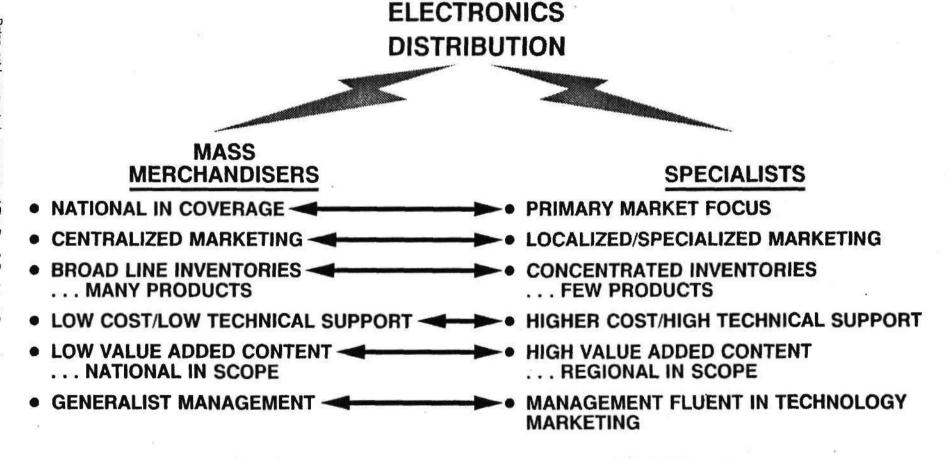


U.S. DISTRIBUTION AS PERCENT OF AMERICAN S/C INDUSTRY



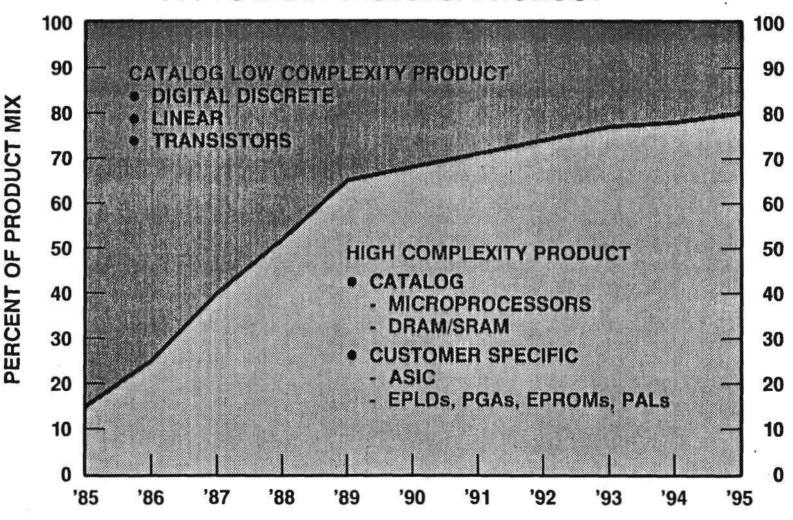
DATAQUEST . . . THE FUTURE ROLE OF DISTRIBUTION

MARKET: TWO DISTINCT CHANNELS OF ELECTRONIC DISTRIBUTION NOW IN FORMATION . . . AND ACCELERATING

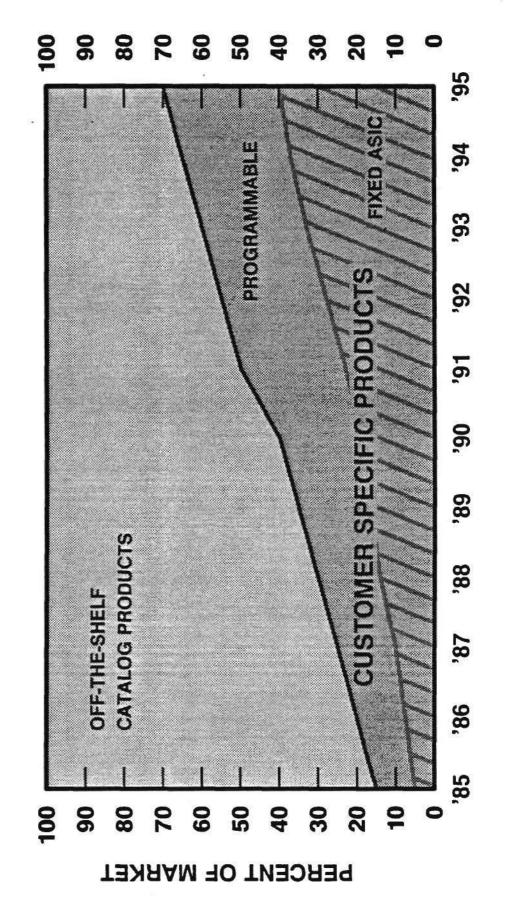


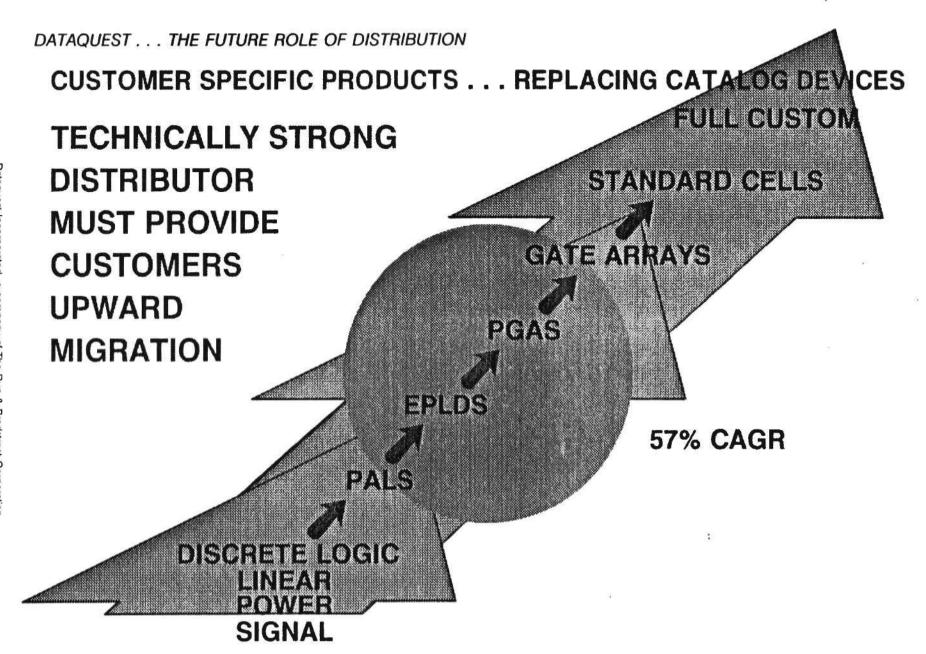
BOTH REQUIRE STRONG BALANCE SHEETS

MARKET: TREMENDOUS CHANGE IN PRODUCT MIX ... TOWARD VLSI/ULSI PRODUCT



MARKET: TREMENDOUS CHANGE FROM OFF-THE-SHELF .. TO CUSTOMER SPECIFIC PRODUCT

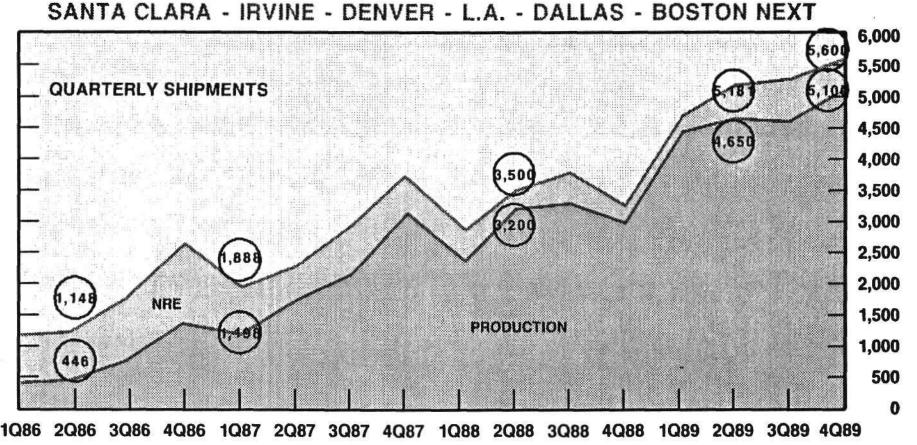




DATAQUEST . . . THE FUTURE ROLE OF DISTRIBUTION

CUSTOMER SPECIFIC PRODUCTS . . . REPLACING CATALOG DEVICES

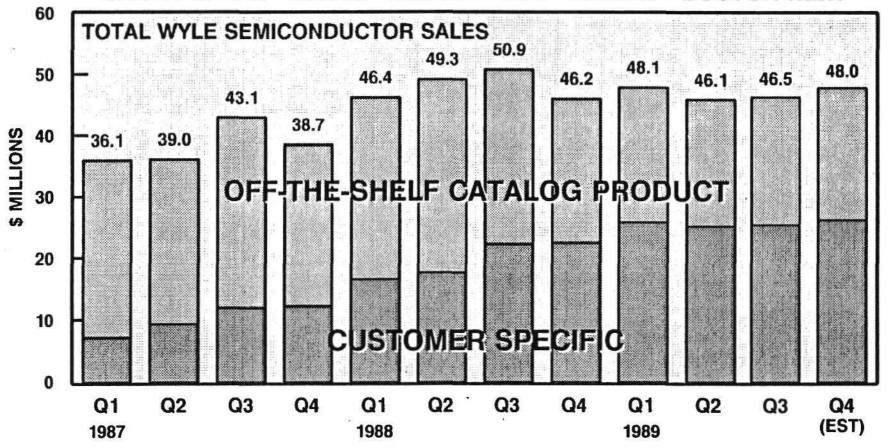
1984 - WYLE ESTABLISHED ASIC DESIGN CENTERS AND APPLICATION MARKETING CAPABILITY



(EST.)

CUSTOMER SPECIFIC PRODUCTS . . . REPLACING CATALOG DEVICES 1986 - WYLE ESTABLISHED DESIGN/COMPUTERIZED PROGRAMMING/100% TEST CENTERS

SANTA CLARA - IRVINE - DENVER - L.A. - DALLAS - BOSTON NEXT



DATAQUEST . . . THE FUTURE ROLE OF DISTRIBUTION

COMPLETE BILL OF MATERIAL SUPPLIER . . . TO SMALL/MEDIUM . . . AND LARGE USERS

ELECTRONIC DISTRIBUTOR

PRODUCTION PLANNING • INVENTORY CONTROL • PROCUREMENT

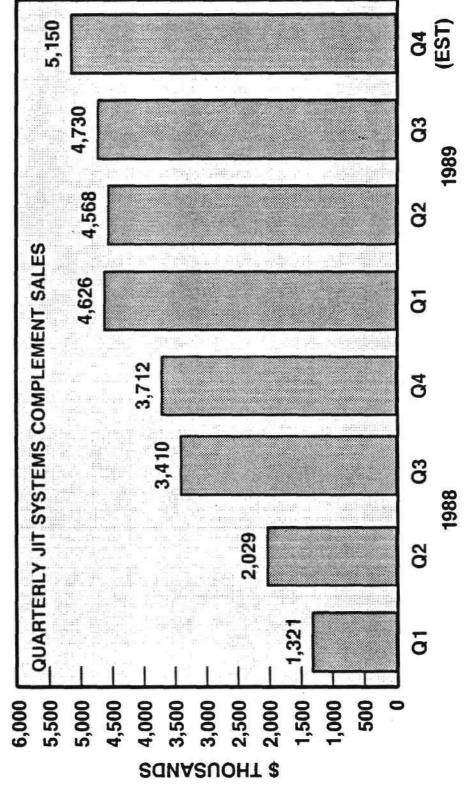
QUALITY CONTROL • ESD PACKAGING

JIT COMPLETE SYSTEMS COMPLEMENT OF COMPONENTS
SHIPPED DIRECT TO MANUFACTURING FLOOR

CUSTOMER INVENTORY PROCUREMENT PRODUCTION INCOMING COSTS PLANNING INSPECTION COSTS COSTS COSTS

KITTING





COMPLETE SYSTEM KIT REPLACED 187 P.O.S PLACED ON 42 DIFFERENT VENDORS BY THE CUSTOMER THIS ONE PURCHASE ORDER TO WYLE FOR A

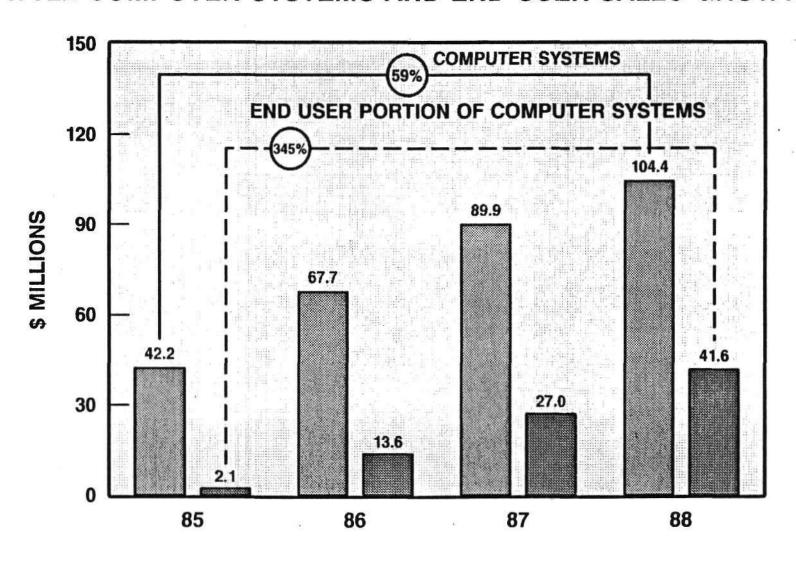
ELECTRONIC DISTRIBUTORS . . . WITH TECHNICAL MARKETING SKILLS . . . SHOULD BROADEN THEIR MARKETS . . . BEYOND COMPONENTS

COMPUTER SYSTEMS

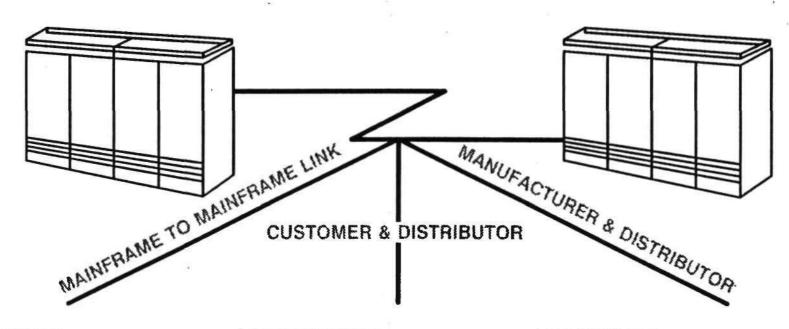
| 1982-1986 | WYLE ESTABLISHED POWERFUL SYSTEMS HARDWARE CAPABILITY |
|-----------|--|
| 1987 | NEXT CREATED SYSTEM ENHANCEMENT CENTERS TO INTEGRATE HARDWARE INTO CUSTOM SYSTEMS |
| 1988 | NEXT CREATED NEW END USER COMPUTER SYSTEMS MARKETING CHANNEL |

DATAQUEST . . . THE FUTURE ROLE OF DISTRIBUTION

WYLE COMPUTER SYSTEMS AND END USER SALES GROWTH



EDI - ELECTRONIC DATA INTERCHANGE



ACCESS

- SUPPLIER LIBRARIES
- NEWEST TECHNOLOGIES
- ON-LINE FACTORY ENGINEERING SUPPORT

TRANSMIT

- ORDER INFORMATION
- PURCHASE ORDERS
- INVOICES
- REQUEST FOR QUOTES

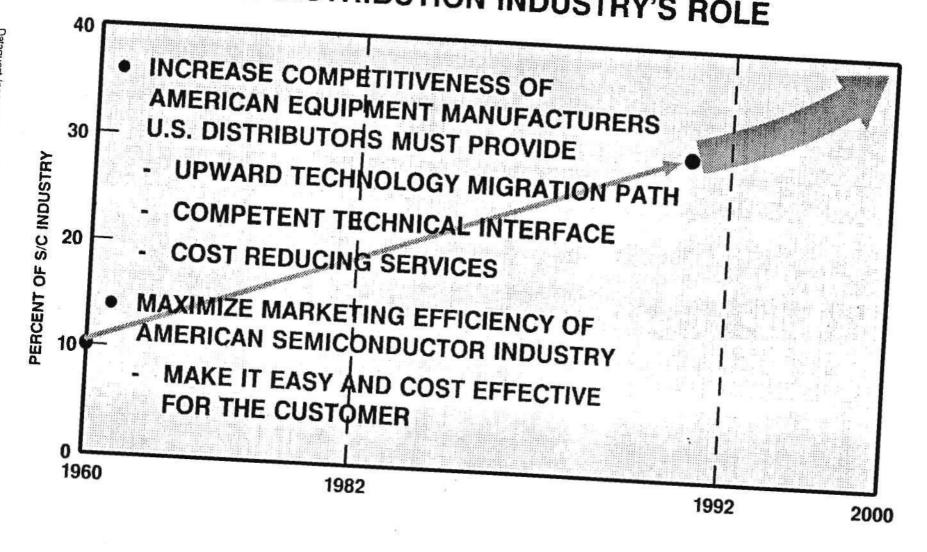
PROVIDE

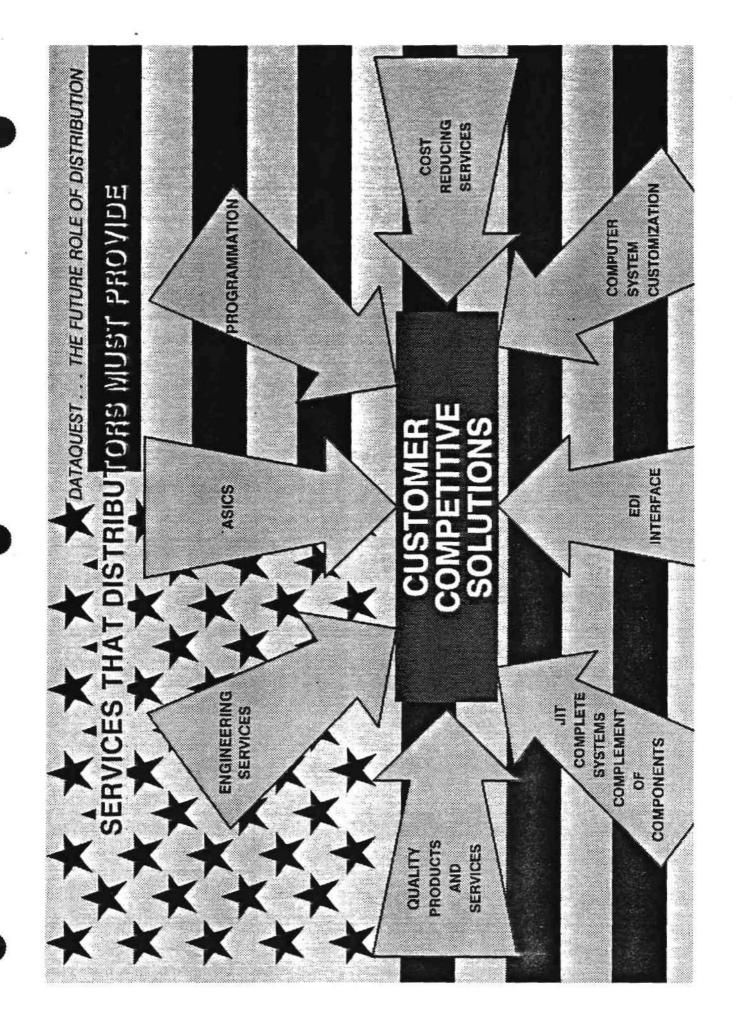
- INVENTORY INFORMATION
- ACCOUNTING INFORMATION
- ACKNOWLEDGEMENT DATA
- CONSOLIDATED CUSTOMER REQUIREMENTS

TO PROVIDE USERS WITH AN UPWARD MIGRATION PATH A SUCCESSFUL SPECIALIST DISTRIBUTOR MUST:

- 1 BE MANAGED BY TECHNICALLY COMPETENT MARKETING PEOPLE
- 2 ESTABLISH COMPETENT LOCAL CUSTOMER ENGINEERING/PROGRAMMATION DESIGN CENTERS
- 3 INCREASE TECHNICAL MARKETING SKILLS OF ENTIRE ORGANIZATION
- 4 HAVE THE BALANCE SHEET STRENGTH TO MAKE 3 5 YEAR INVESTMENTS . . . BEFORE PAYOFF

U.S. DISTRIBUTION INDUSTRY'S ROLE





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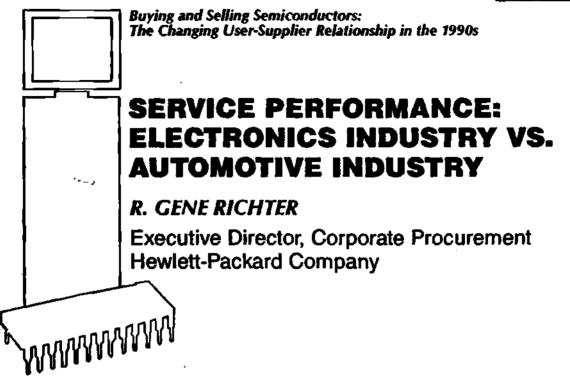


SERVICE PERFORMANCE: ELECTRONICS INDUSTRY vs AUTOMOTIVE INDUSTRY

R. Gene Richter
Executive Director, Corporate Procurement
Hewlett-Packard Company

Gene Richter is Executive Director, Corporate Procurement, for Hewlett-Packard Company. Prior to joining Hewlett-Packard, Mr. Richter was Vice President, Corporate Purchasing, for Black and Decker, Inc. In this capacity, he was responsible for the centralized procurement of \$400 Million that was procured in 14 decentralized locations. Approximately sixty percent of their manufacturing plants were located outside of North America, necessitating a worldwide procurement scope. In 1988 the company won the coveted Purchasing Office of the Year Award from Purchasing Magazine, joining Alcoa, Chrysler, and Xerox as the only winners of this award. Prior to joining Black and Decker, Mr. Richter was associated with Ford Motor Company in purchasing and procurement capacities. Mr. Richter received a B.S. Degree is Marketing and Economics from the University of Maryland and an M.B.A. degree from the University of Michigan.

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Automotive Suppliers are More

Responsive Than Electronics

Suppliers in Every Factor Except

Technology and Time-to-Market?



, | | | |

Corporate Procurement b:datqest2 gr36 jk/gal February 12, 1990

Possible Reasons Why:

- 1. Priority on Leading Edge Technology.
- 2. Silicon Roller Coaster.
- 3. More Assembly Flexibility.
- 4. Less Purchasing Dept. Clout.



Possible Reasons Why:

5. Less Knowledge of Supplier's Processes.

6. Lower Expectations.

7. Less Consistent Business Practices.





Possible Reasons Why:

Semiconductor Yield Variation.

 Greater Time-to-Market Pressures.

10. Rapid Growth vs. Attention Fundamentals.



Improved Supplier

Responsiveness

U,

Win – Win

Corporate Procurement b:datqest6 gr40 |k/gal February 12, 1990

What Shouldn't (or Can't) We Do:

- Reduce Emphasis on Leading Edge Technology.
- 2. Stop the Silicon Roller Coaster.
- Make Assembly Lines Less Flexible.
- 4. Slow Industry Growth.



What Should We do:

- 1. Raise Expectations.
- 2. Get to Know Suppliers Better.
- 3. More Attention to Fundamentals:
 - Planning
 - Communicating
 - Measuring
 - Follow-up



What Should We do (cont.):

- 4. Upgrade Sales Organizations:
 - More Resources
 - More Training
 - More Clout
 - More Global



What Should We do (cont.):

- Upgrade Purchasing Organizations
 - More Resources
 - More Training
 - More Clout
 - More Global



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DEALING WITH FABLESS SEMICONDUCTOR MANUFACTURERS: BENEFITS AND CONCERNS

Dr. Michael L. Canning, Ph.D. Vice President, Manufacturing Cirrus Logic, Inc.

Michael Canning is Vice President of Manufacturing for Cirrus Logic, Inc. Previously, he was associated with Teledyne Semiconductor as its President and General Manager. Before joining Teledyne, Dr. Canning was the Business Unit Manager for Data Acquisition, and Products and Operations Manager for Microprocessors at Signetics. He was also Director of Engineering at Commodore Semiconductor, and Engineering Manager at Intersil. Dr. Canning received a BSc in Electrical Engineering from the University of Durham, England, an M.B.A. from Santa Clara University, Santa Clara, California, and a Ph.D. in Electrical Engineering from the University of Newcastle-Upon-Tyne, England.

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DEALING WITH FABLESS SEMICONDUCTOR MANUFACTURERS: BENEFITS AND CONCERNS

DR. MICHAEL L. CANNING
Vice President, Manufacturing
Cirrus Logic Incorporated

Semiconductor Companies Dealing with Fabless

Benefits and Concerns

Michael Canning Cirrus Logic, Inc. *■CIRRUS LOGIC =*

Dataquest Incorporate 1290 Ridder Park Drive, San Jose, C

Lattice maxim ICI Array
Technologies IXYS

ACUMOS

IC SENSORS HYPRES, INC.

CATALYST SEMICONDUCTOR Pacific ADAPTEC

... Monolithics

mosel xilinx VIA TECHNOLOGIES

Crystal ACTEL CHIPS & TECHN

ADVANCED LINEAR DEVICES

XTAR

BROOKTREE

Seattle **ELECTRONICS**

Simtek Silicon Triad Semiconductors

■CIRRUS LOGIC

Emerging Semiconductor Companies - 1965 -

- Fairchild
- Motorola
- Signetics
- Texas Instruments

Broad Based, Self Supporting

CIRRUS LOGIC ≡

Emerging Semiconductor Companies - 1975 -

- AMD
- Intel
- Intersil
- Monolithic Memories
- Mostek
- National Semi

Technology Based

■ CIRRUS LOGIC

Emerging Semiconductor Companies - 1985 -

- Cypress Semi
- **IMP**

- LSI Logic
- Maxim
- Micron Technology
- Linear Technology VLSI Technology

Technology and Market Based

ECIRRUS LOGIC **≡**

Emerging Semiconductor Companies - 1990-

- Adaptec
- Altera
- Chips & Technologies
- Cirrus Logic
- Dallas Semiconductor
- Weitek

Market and Design Based

CIRRUS LOGIC

Reasons for Changes

- Technological Change
- Pervasive Use of Electronics
- Product Complexity
- New Market and Product Needs
- Specialized Markets & Products

CIRRUS LOGIC

Reasons for Changes

- Increasing Capital Costs
- Emergence of Specialized Subcontractors
- Growing Power and Affordability of Design Tools

CIRRUS LOGIC =

1990 Semiconductor Companies

Technology Based

DRAM SRAM Gate Array Specialized Products & Technology

Analog Mixed Signal EPROM PLA Design Based

Microprocessor Microcontroller DSP

== CIRRUS LOGIC ====

CIRRUS LOGIC

If a Semiconductor Company Should We Be Concerned Is Fabless?

Changes in Manufacturing

| | Integrated -> Subcontracted | | | |
|----------------|-----------------------------|--------------|------------|------|
| , | 1965 | 1975 | | 1990 |
| Test Equipment | $\sqrt{}$ | X | X | X |
| Mask Making | $\sqrt{}$ | √X | X | Χ |
| Assembly | $\sqrt{}$ | $\sqrt{}$ | \sqrt{X} | Χ |
| Wafer Fab | $\sqrt{}$ | $\sqrt{}$ | $\sqrt{}$ | X |
| Test | \checkmark | \checkmark | $\sqrt{}$ | √X |
| Design | $\sqrt{}$ | √ | √ | 1 |

CIRRUS LOGIC

Typical Concerns

Technology: Will It Limit End Product

Competitiveness?

Quality: Adequate and Maintainable?

Responsiveness: Can They Meet Volume

Production Schedules?

Do These Concerns Apply Only to Fabless Semiconductor Companies?

≡CIRRUS LOGIC **≡**

To Resolve "Fabless" Concerns Look At:

- Company Track Record
- Experience of Key Managers
- Technical and Management Depth

CIRRUS LOGIC ==

Some Specific Solutions: Technology

- Product Performance Requirements Should Define Technology Used -- Not Vice Versa
- Technology "Road Map" Should Support Future Product Direction
- Least Complex, Most Pervasive Technology
- Tweak the Design, Not the Technology

CIRRUS LOGIC =

Some Specific Solutions: Quality

- Internal Quality and Reliability Programs
- Zero Defect Mentality
- Internal Product Testing
- Controlling the Technical Environment

CIRRUS LOGIC =

Some Specific Solutions: Responsiveness

- Long-Term Relationships with Subcontractors
- Monitoring of Subcontractor Performance
- Multiple Sourcing
- Technical Discipline and Experience

CIRRUS LOGIC ≡

Benefits of Fabless Manufacturing: Flexibility

- Always Allows the Best Available Combination of Technology, Quality and Cost
- Multiple Sourcing Available

•

CIRRUS LOGIC **≡**

Benefits of Fabless Manufacturing: Focus

- Avoids Management Defocus of Building and Running a Fab
- Facilitates Market-Driven Product Definition

 \equiv CIRRUS LOGIC \equiv

Benefits of Fabless Manufacturing: Financial

- Avoids Continuing Capital Cost of Fab and Continuing Expense of Process Development
- Provides Opportunity for Investment of Time and Money on VLSI Products to Service Customer Needs

ECIRRUS LOGIC ≡

3Q89 Revenue Growth

| Cirrus Logic | 111% | 18.0M |
|---------------|------|---------------|
| Adaptec | 70% | 26.5 M |
| Chips & Tech | 61% | 70.9 M |
| Zymos | 57% | 10.1 M |
| Altera | 55% | 15.7M |
| Dallas Semi | 50% | 23.2M |
| Cal Micro | 49% | 8.4M |
| Logic Devices | 43% | 3.9M |
| LSI Logic | 42% | 133.7M |
| Cypress | 40% | 51.8M |

CIRRUS LOGIC

3Q89 EPS Growth

| Adaptec | 1100% | \$ 3.0M |
|---------------|-------|--------------|
| Cirrus Logic | 267% | 3.4M |
| AMD | 100% | 9.5 M |
| Altera | 50% | 2.9M |
| Chips & Tech | 49% | 9.1 M |
| Maxim | 44% | 1.7 M |
| Weitek | 40% | 1.8M |
| Cypress | 40% | 7.9 M |
| VLSI Tech | 40% | 3.3M |
| Logic Devices | 20% | 0.8M |

CIRRUS LOGIC

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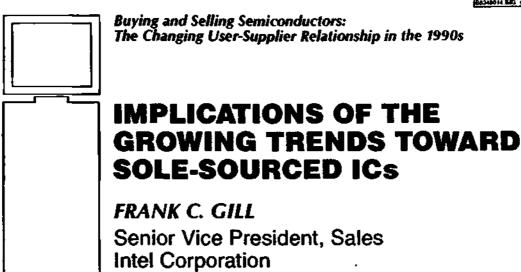
IMPLICATIONS OF THE GROWING TREND TOWARD SOLE-SOURCED ICS

Frank C. Gill Senior Vice President, Sales Intel Corporation

Frank Gill is Senior Vice President of Sales for Intel Corporation. Previously, Mr. Gill had marketing responsibility for Europe, Japan, and Asia Pacific. Prior to that, he was head of their North American sales force, including applications, sales training, sales administration, and the corporate strategic account group. Before joining Intel, Mr. Gill spent six years at Signetics in marketing, sales, and field management positions. Mr. Gill received a B.S.E.E. degree from the University of California at Davis.

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IMPLICATIONS OF THE GROWING TREND TOWARD SOLE-SOURCED ICs

Frank Gill
Senior Vice President, Sales & Marketing
Intel Corporation

Dataquest Semiconductor User & Applications Conference February 13, 1990

WHAT THE CUSTOMER WANTS

Availability of a Quality Product

Competitive Pricing

Product Continuity/Compatibility with Competitive Performance



CUSTOMER EXPECTATIONS

Past

16 Week Safety Stock

8-16 Week Leadtimes

DPM - 1% AQL

Price, Price, Price

Adversarial Relationship

Bottom Line: Many Sources

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CUSTOMER EXPECTATIONS

Present

Minimal Inventory

Guaranteed Lead Times,

< 4 Weeks

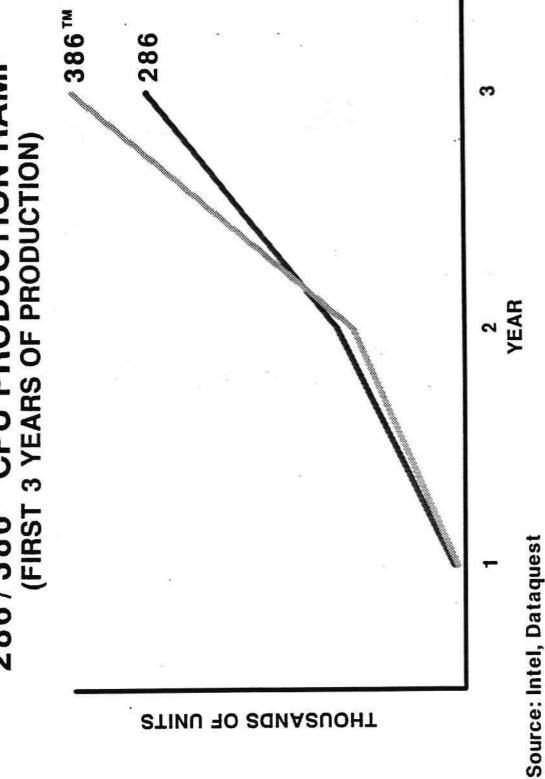
< 100 DPM

Total Cost, Value Analysis

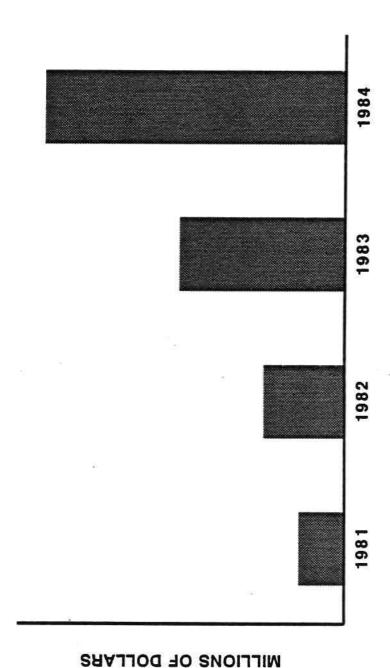
Mutual Dependency, Partnership

Bottom Line: Reducing the Vendor Base



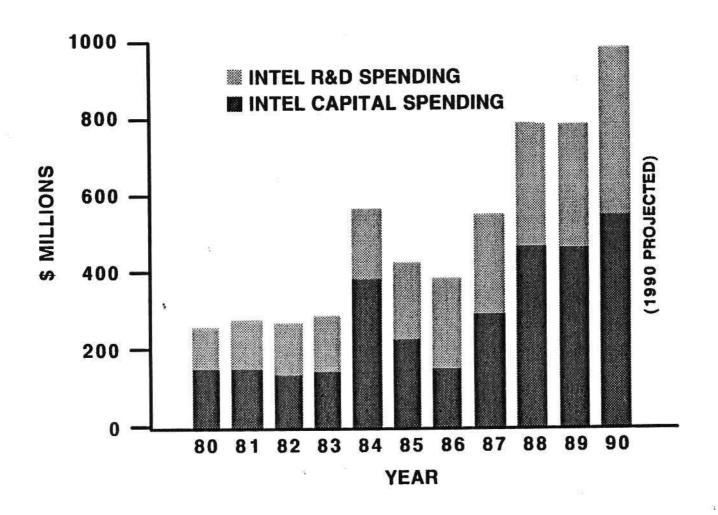


ASIC PRODUCTION RAMP (World-Wide Gate Array Shipments)

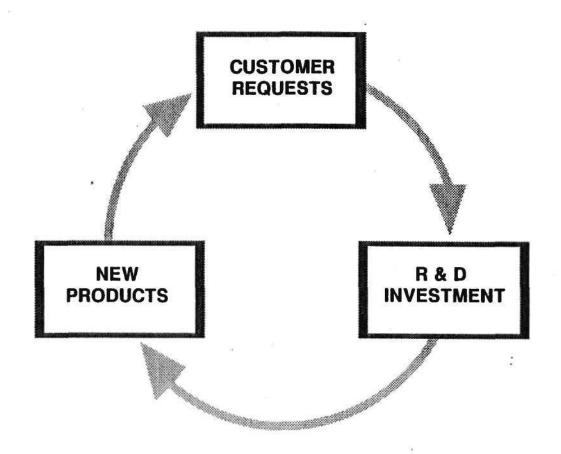


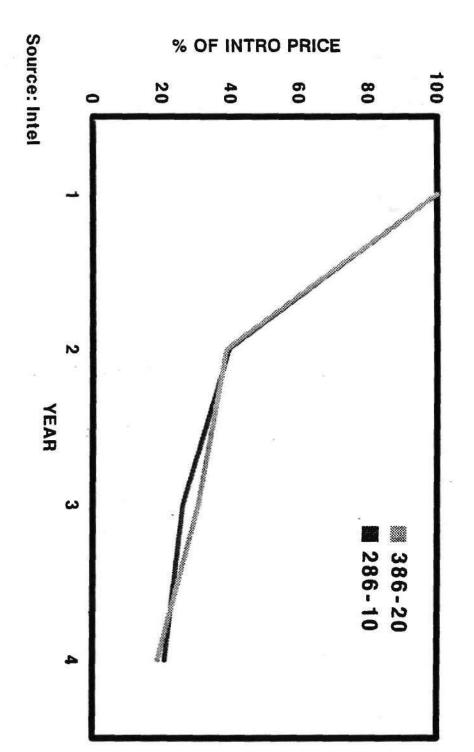


TECHNOLOGY INVESTMENTS



CONTINUITY/COMPATIBILITY (The Cycle)





286 / 386™ CPU PRICE TRENDS (FIRST 3 YEARS OF PRODUCTION)

DRAM Production

DRAM drought: No relief in near term

BY DAVID LAMMERS

Tokyo - For those wandering souls in search of DRAMs, the short-term picture shows no end to the pilgrunage. So said partici--Hetaquest Inc.'s Japa-

sharply over the last two months to all a million a month. Howeve

cre

nev

Yaı

about 1.5 million a month, about Samsung Hikes DRAM Tags the same une Cort

Several Samsung franchisees the increases apply only to

DRAM shortage casts a shadow over electronics industry forecast

DRAM Shortage Slams Bookings

he spectacular growth of the semicond this year slammed to forced OEM 4

Cit

Peibus Business Writer

h's electronics industry will continue to overall economy into the next decade, critical shortage of computer memors

Here are Dataquest's five-year forecasts for some electronics industry segments:

✓ Semiconductors: The U.S. market is expected to grow 24 percent this year, to 213 4 billion, and will

growth to \$20.9 rket will grow at Dataquest said. est market.

mpoter market. ons, will be the brough 1992, Da-

Rising DRAM Tags Press Gear Makers to Impose Surcharges

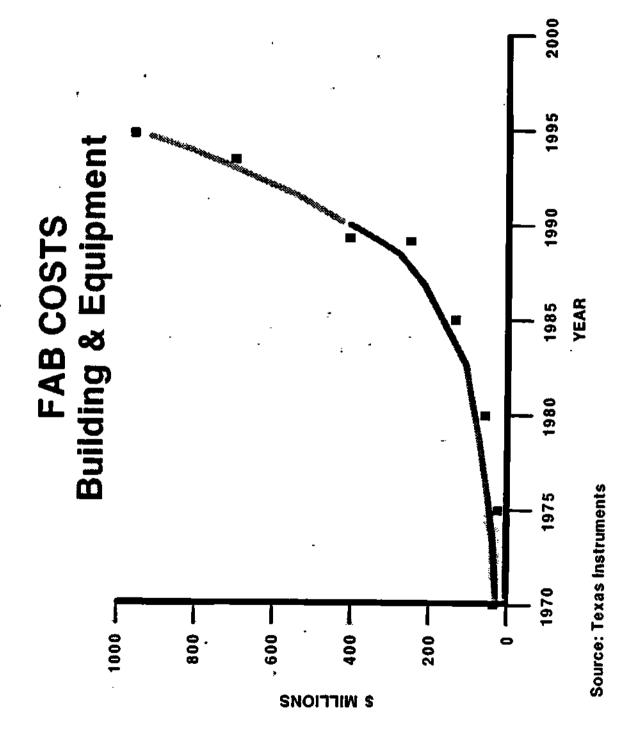
Confronted with soaring DRAM prices, manufacturers of memory-intensive equipment are looking to pass the cost onto customana in the form of surcharges

cent to more than triple in some cases.

On minimum-memory board configurations, which comprise about 80 or cent of AST's enhancement prod-initial price hikes range

"The issue has been as much availability as cost," he added. "The availability is still going to be tight and the way we're managing that is to not allow maximum memory to go out."

At Texas Instruments' Data Systems



SUMMARY

- Sole-Source Suppliers Have a Unique Responsibility to the Customer Base
- **Customers get the Advantages of Dedicated** Suppliers without Giving up the Benefits of a Competitive Supplier Base
- Trend Toward Sole-Sourcing will Continue



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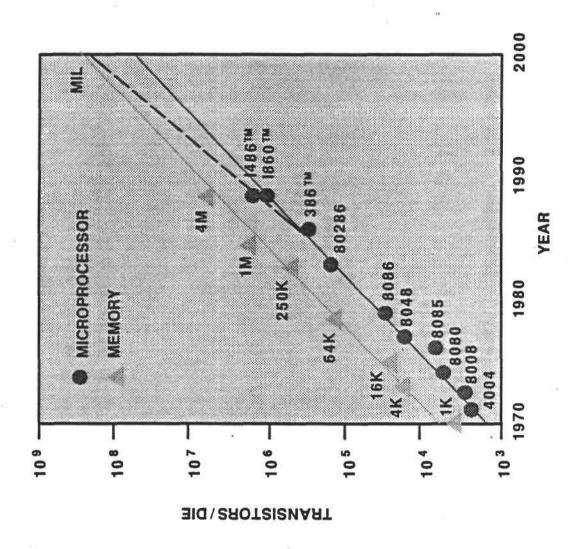
WHAT THE CUSTOMER WANTS

- Availability of a Quality Product
- Competitive Pricing
- Product Continuity/Compatibility with Competitive Performance

WHAT THE VENDOR REQUIRES

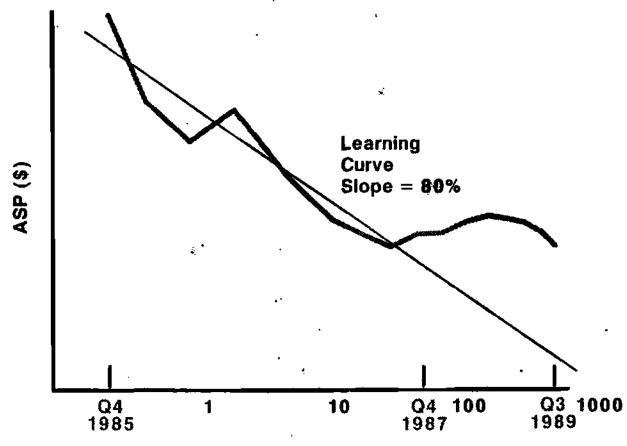
- Fair Return on Investment
- Ongoing Business Relationship

TECHNOLOGY TREADMILL





DRAM PRICE TRENDS



Source: Dataquest

CUMULATIVE UNITS (MU)

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ş C

GILL'S LAW

socket may be sole-sourced

PRODUCT CONTINUITY/COMPATIBILITY WITH COMPETITIVE PERFORMANCE

Microprocessors

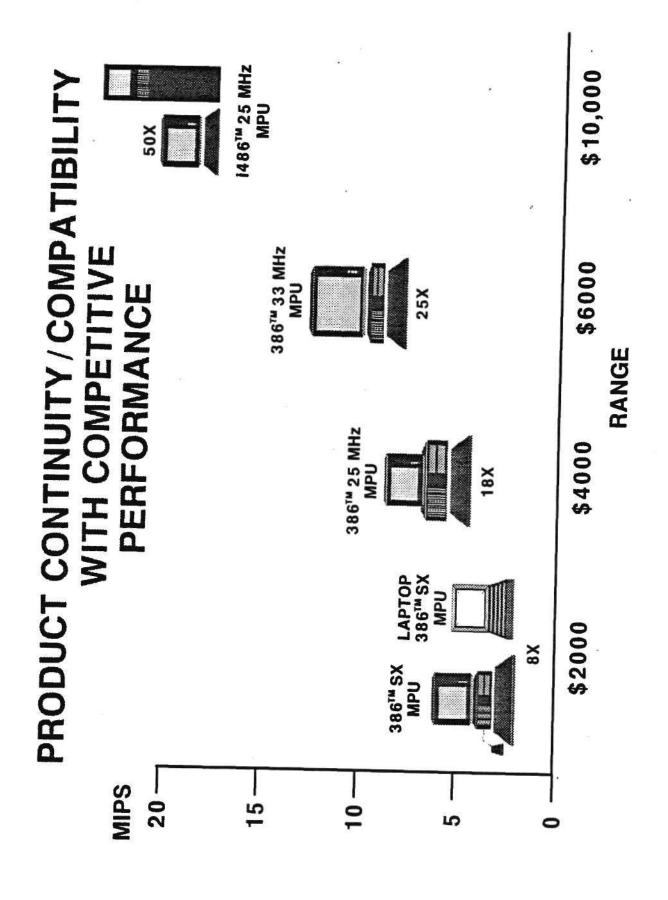
Microcontrollers

PC Chip Sets

ASIC Design Tools

Protects Customer's ROI





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BUROPE: PLANNING AND POSITIONING FOR UNIFICATION

Jim Eastlake Senior Industry Analyst European Components Group Dataquest Europe, Ltd.

Industry Analyst for Dataquest's Eastlake is a Senior European Jim Semiconductor Industry Service, based in London. He has more than eight years of experience in the electronics industry. Prior to joining Dataquest, he was with Texas Instruments' Northern European Semiconductor Division. In his most recent years at TI, he ran the European distribution program for the Linear Functions Business Group. Earlier, he managed TI's advanced bipolar logic families and was responsible for launching TI's programmable logic families and bit slice functions in Northern Europe. He also held a product marketing position for 8- and 16-bit microprocessors and peripherals. Mr. Eastlake graduated with an Honors degree in Physics from the University of Newcastle-on-Tyne, England.

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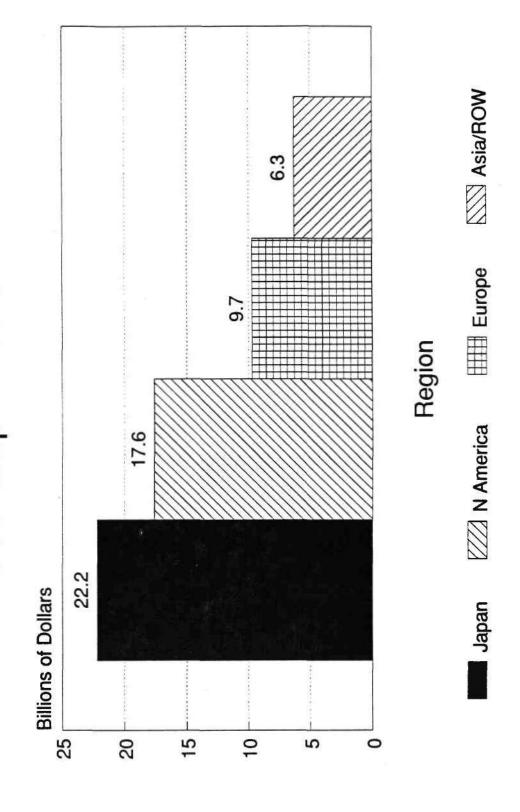
PLANNING AND POSITIONING

Jim Eastlake Senior Industry Analyst European Components Group

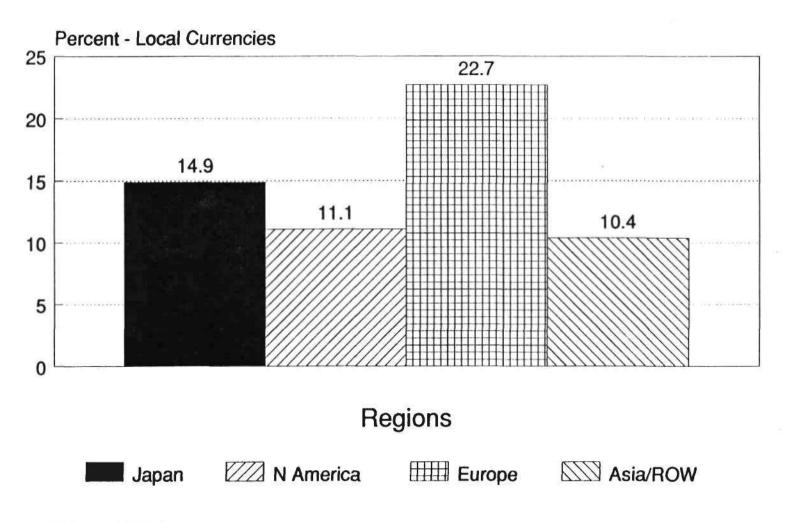
1992 - SEMICONDUCTORS AGENDA

- European Market Overview
- 1992 Factors
- Industrial and Trade Issues
- Opportunities for foreign Companies

Preliminary 1989 World Semiconductor Consumption Revenues



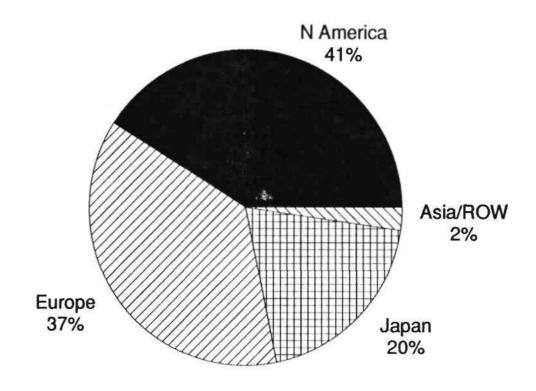
Preliminary 1989 World Semiconductor Market Growths



PRELIMINARY 1989 EUROPEAN SEMICONDUCTOR RANKINGS

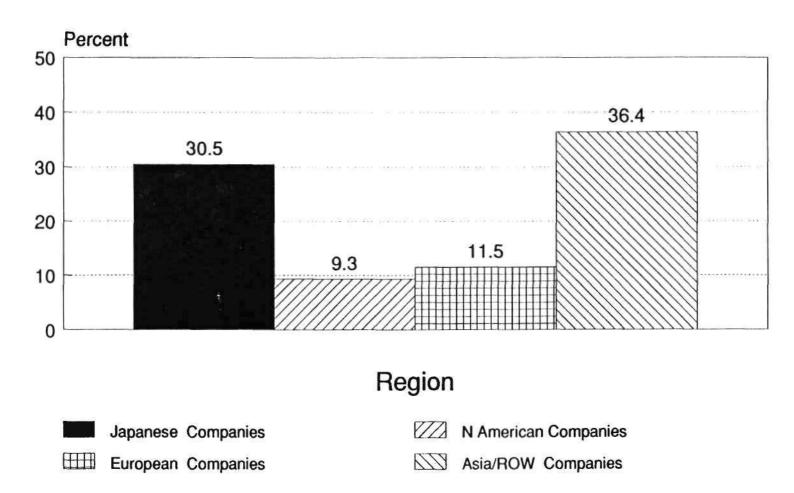
| Rank | Vendor | Revenue |
|------|-------------------|----------------|
| 1. | Philips | \$967M |
| 2. | Siemens | \$938M |
| 3. | SGS-Thomson | \$751M |
| 4. | Motorola | \$658M |
| 5. | Texas Instruments | \$650 M |
| 6. | Intel | \$540M |
| 7. | NEC | \$420 M |
| 8. | Toshiba | \$414 M |
| 9. | National Semi. | \$381 M |
| 10. | Hitachi | \$289M |

Preliminary 1990 European Market Share



1990 - \$9706m

Preliminary 1990 European Vendor Growths



Preliminary 1990 European Rankings - By Growth

| Rank | Vendor | Percent Growth |
|------|-------------|----------------|
| . 1. | Harris | 418% |
| 2. | Mitsubishi | 136% |
| 3. | Matsushita | 104% |
| 4. | Siemens | 65% |
| 5. | Fujitsu | 62% |
| 6. | Samsung | 35% |
| 7. | Hitachi | 18% |
| 8. | SGS-Thomson | 15% |
| 9. | Intel | 11% |
| 10. | NEC | 9% |

EUROPE

Strong market

Weak Industry

YEN APPRECIATION

- Spectacular increase in local Far Eastern production:
 - Printers
 - Photocopiers
 - Facsimile
 - Cellular telephones
 - Video recorders
 - Compact disk
 - Colour televisions

EC ANTI-DUMPING

Hardened EC attitude

 "Screwdriver" plants beginning to purchase locally

Purchasing commodity parts

EC ANTI-DUMPING

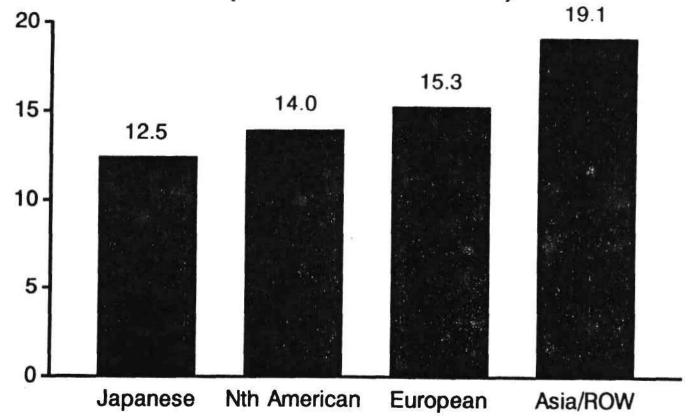
Still scope to import critical parts

What effect "negative regulation"?

1992 FACTORS

 Does not cover trade with rest of world Little direct 1992 impact - so far

1988 - 1994 FORECAST WORLD SEMICONDUCTOR MARKET GROWTHS (Percent CAGR)



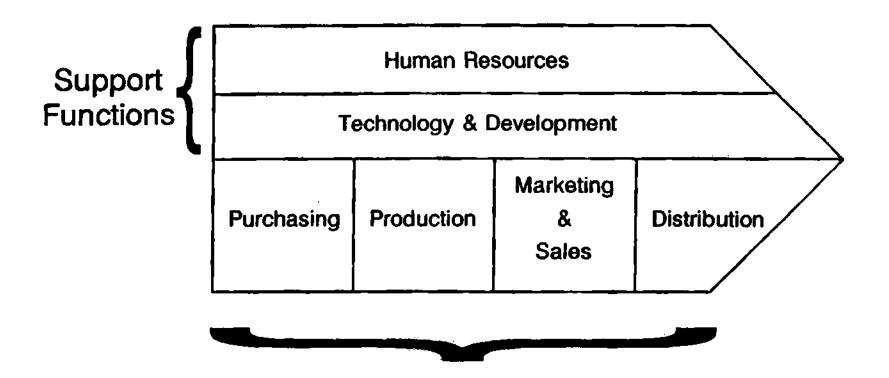


1992 FACTORS

279 directives

- Analysis by:
 - Directive type
 - Industry function

INDUSTRY FUNCTIONS



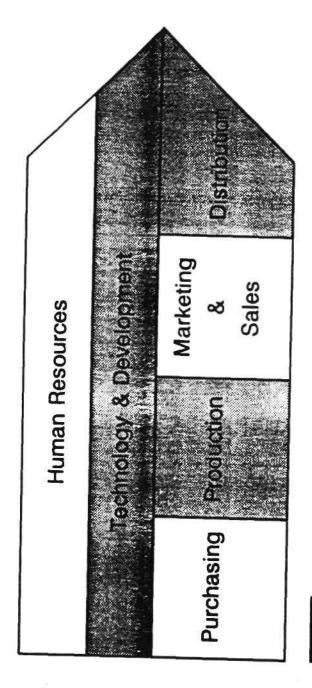
Primary Functions

REMOVAL OF TECHNICAL BARRIERS

- Safety and Interference
- Telecommunications
- Pan-European standards
 - CENELEC
 - ETSI
- Good for trade with Europe

REMOVAL OF TECHNICAL BARRIERS

- Longer production runs
- Lower development costs
- Lower inventory



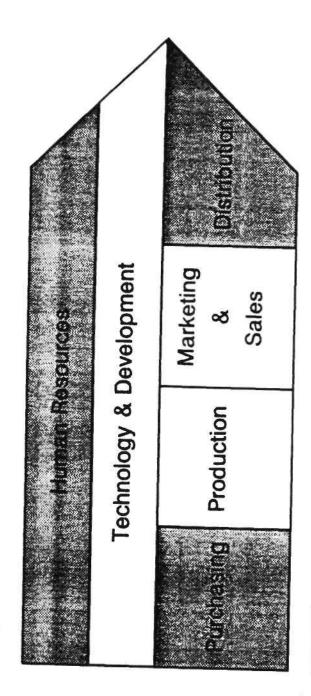
Functions most affected

REMOVAL OF PHYSICAL BARRIERS

- Frontier controls removed
- Cheaper transport
- Less delay
- Free movement of:
 - goods
 - people
 - money

REMOVAL OF PHYSICAL BARRIERS

- Consolidation of distribution
- Shift from national to pan-European franchises
 - Centralized warehousing



Functions most affected

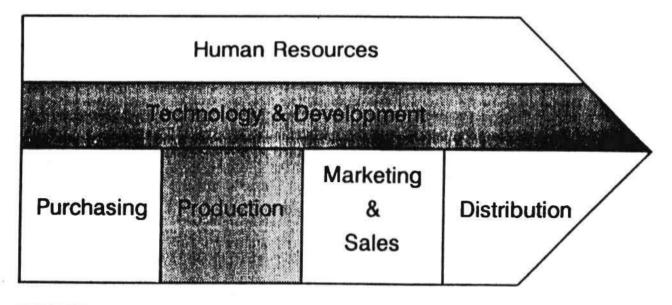
ECONOMIES OF SCALE

Open procurement

Mutual recognition

ECONOMIES OF SCALE

- Fixed costs amortized over 12 markets not 1
- Rationalization of core activities



Functions most affected

CROSS BORDER RESEARCH

 EC aims to give central funding and leadership

• 1.3 billion ECU's spent in 1989

Spending to double by 1991

ESPRIT

- 10 year program in 2 phases
- Key activities:
 - Microelectronics
 - Software technology
 - Computer integrated manufacture
- Funding: 50% community 50% industry
- Foreign participation if research conducted within EEC
- 1600 million ECU's spent since 1984

EUREKA

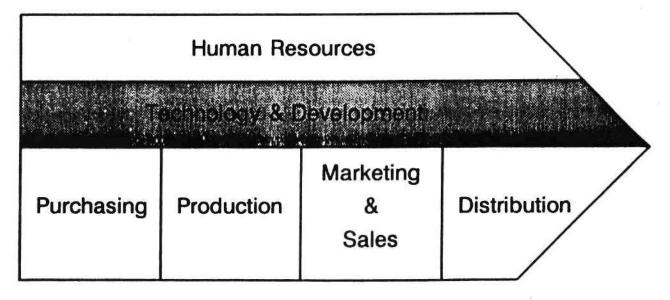
- Program not defined by EC
- Open to additional European states
- No community funding:
 - Industry
 - National government
- Non-European participation difficult
- 5000 million ECU's spent since 1985

JESSI

- Aims to restore leading edge capability
- Seven year program: 1989-1996
- 64Mbit DRAM by 1996
- Marries applications to process development:
 - HD-MAC
 - ISDN
 - GSM
- Awaiting 3.8 billion ECU's funding
 - 50% national government
 - 50% community

CROSS BORDER RESEARCH

- Central coordination
- Pan-European standards



Functions most affected

1992 - OVERALL IMPACT

- EVERY FUNCTION AFFECTED!
- Cannot ignore other dimensions
 - competition
 - fiscal
 - social

| Barrier dates and the same of |
|--|
| Burgan Person in Burgan Resources as the state of the sta |
| Technology & Development - * 1 - 1 - 1 - 1 - 1 |
| |
| Marketing 1 |
| Perchang Production: See & Distribution |
| Sales |
| 更是是是 是一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一 |



Functions most affected

1992 - SEMICONDUCTORS FOREIGN BUSINESS OPPORTUNITIES

- Invest in Europe?
- Local origin diffusion
- Floor prices on exports

FABRICATION IN EUROPE

• Announcements: Fujitsu, Intel, Texas Instruments

More announcements expected

Severe undercapacity - \$3 billion

1992 - SEMICONDUCTORS

LOCAL FABRICATION - OPPORTUNITIES

- Avoids local origin and floor prices issues
- Local Japanese producers become preferred suppliers
- Global customers need global suppliers
- Access to European standards

1992 - SEMICONDUCTORS

CLOSING REMARKS

European electronics believes in 1992

European industry is restructuring now

Beyond 1992 - new opportunities

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THE DRAM FUTURES MARKET

Hoon Won Chief Executive Officer Memory Clearing Corporation

Hoon Won is the Chief Executive Officer of Memory Clearing Corporation (MCC) and is in charge of business development. He is a former member of the Pacific Stock Exchange and was previously with LSI Logic. Mr. Won received both B.S. and M.S. degrees from the University of Massachusetts.

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San Francisco, California
February 12-13, 1990

Buying and Selling Semiconductors:
The Changing User-Supplier Relationship in the 1990s

THE DRAM FUTURES
MARKET
HOON WON
Chief Executive Officer
Memory Clearing Corporation

MEMORY CLEARING CORPORATION DRAM FUTURES

INTRODUCTION

The DRAM, An Important Global Market:

- An important product of the semiconductor industry.
- An essential raw material for the electronic systems industry.

The Problem: DRAM Price Volatility.

DRAM Futures: Financial Hedging Tools, for Manufacturers, Consumers, & Distributors of Semiconductor Memory.

Futures: A Familiar Risk Management Tool for Modern Business.

COMMODITY NATURE OF DRAMS

DRAMs exhibit a certain amount of physical interchangeability.

• Definition: Commodity

The DRAM market is fragmented into different sub-product categories.

The DRAM market compared to other commodity markets.

FUTURES CONTRACTS

Definition.

Futures as a Financial Tool.

Financial Interchangeability versus Physical Interchangeability.

| The Risk Associated with Price Proxies: Basis Risk. | | | | |
|--|--|--|--|--|
| | | | | |
| HEDGING | | | | |
| General. | | | | |
| Static Hedging. | | | | |
| Dynamic Hedging. | | | | |
| Considerations in Structuring A Hedging Program for Your Organization. | | | | |
| Summary. | | | | |
| | | | | |
| THE TRADING MACHINERY | | | | |
| The CFTC, Commodity Futures Trading Commission. | | | | |

The Use of Price Proxies.

The Exchange:

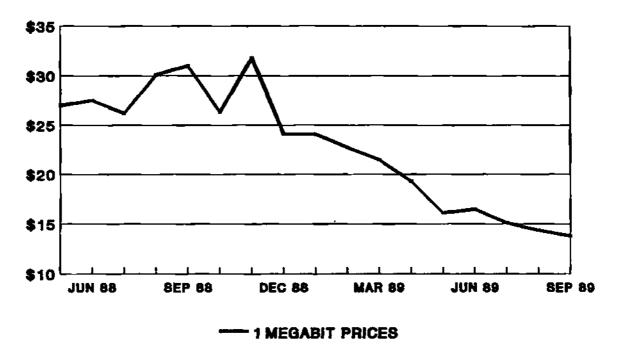
- Trading Capital,
- Clearing and Guarantee Function,
- Regulatory Interface,
- Surveillance/Compliance,
- Membership Services.

THE DRAM AN IMPORTANT GLOBAL MARKET



- AN IMPORTANT PRODUCT OF THE SEMICONDUCTOR INDUSTRY
- AN ESSENTIAL RAW MATERIAL FOR THE ELECTRONIC SYSTEMS INDUSTRY

THE PROBLEM: DRAM PRICE VOLATILITY



AVG PRICES - 150 NS PDIP

DRAM FUTURES:

FINANCIAL HEDGING TOOLS

TO

MANAGE THE ECONOMIC RISK OF PRICE VOLATILITY

FOR

MANUFACTURERS, DISTRIBUTORS AND CONSUMERS OF SEMICONDUCTOR MEMORY

FUTURES A FAMILIAR RISK MANAGEMENT TOOL

INDUSTRIAL USER

ALCOA

EASTMAN KODAK

CHASE MANHATTAN

ECHO BAY MINES

FORD MOTOR COMPANY

GENERAL FOODS

TEXACO

COMMODITY

ALUMINUM PRODUCTION

SILVER PURCHASES

CURRENCY FUTURES

GOLD PRODUCTION

PALLADIUM PURCHASES

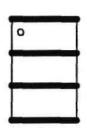
AGRICULTURAL PRODUCTS

OIL PRODUCTION









THE COMMODITY NATURE OF DRAMS

- DRAMS EXHIBIT A CERTAIN AMOUNT OF PHYSICAL INTERCHANGEABILITY
 - DEFINITION: COMMODITY
- THE DRAM MARKET IS FRAGMENTED INTO DIFFERENT SUB-PRODUCT CATEGORIES

MARKET COMPARISON

| MARKET | WORLDWIDE MARKET-SIZE | U.S. CONSUMPTION | VOLATILITY |
|-----------|--------------------------|---------------------|------------|
| CRUDE-OIL | \$250 BILLION | \$91 BILLION | 12% |
| SOYBEANS | \$12 BILLION | \$7 BILLION | 17% |
| DRAMS | \$9 BILLION | \$4 BILLION | 25% |

DEFINITION FUTURES: A RISK MANAGEMENT TOOL

OBLIGATION TO MAKE OR TAKE DELIVERY

- OF A SPECIFIED PRODUCT
- AT A SPECIFIED TIME
- AT A SPECIFIED PLACE
- AT A SPECIFIED PRICE

THIS OBLIGATION CAN BE:

- BOUGHT,
- SOLD, OR
- TRADED

COMMODITY NATURE OF DRAMS

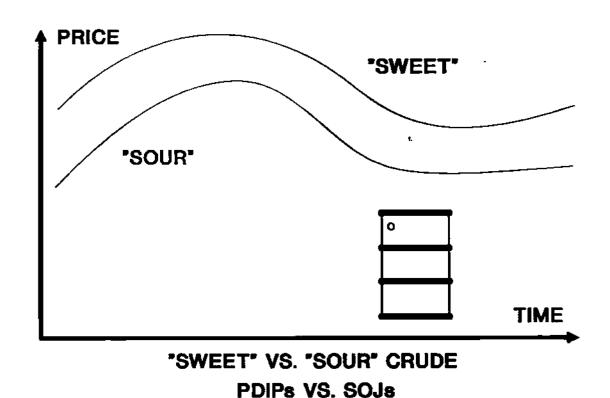
KEY CONCEPT:

FINANCIAL INTERCHANGEABILITY

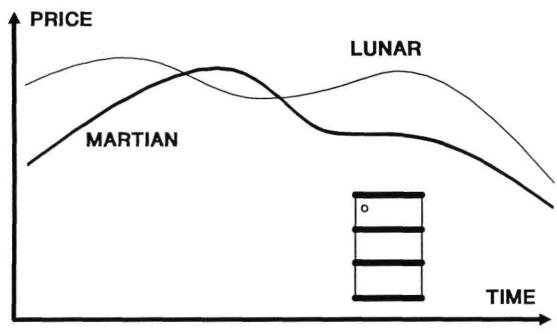
VS.

PHYSICAL INTERCHANGEABILITY

BASIS RISK



BASIS RISK



LUNAR "SWEET" VS. MARTIAN "SOUR"
DRAMS VS. EPROMS

HEDGING

A HEDGE IS DEFINED AS A TEMPORARY
SUBSTITUTE FOR A CASH POSITION
TO BE TAKEN AT A LATER DATE

THE OBJECTIVE OF A HEDGING PROGRAM
IS TO ESTABLISH A POSITION IN A
FUTURES CONTRACT IN ORDER TO
OFFSET AN EXISTING OR ANTICIPATED
FUTURE NEED IN THE CASH MARKET

STATIC HEDGING

OBJECTIVE: AVERAGE MARKET PRICE
(WITH BASIS ADJUSTMENT)
FOR PROCUREMENT/SALES OF COMMODITY

METHODOLOGY: FIXED PERCENTAGE
OF COMMODITY REQUIREMENT HEDGED

NO NEED FOR MARKET FORECASTING

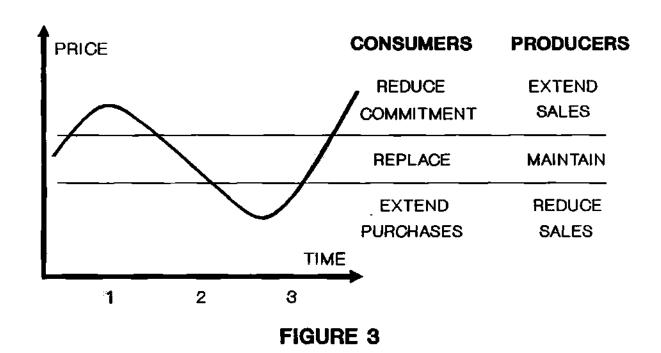
DYNAMIC HEDGING

OBJECTIVE: BETTER THAN AVERAGE
MARKET PRICE (WITH BASIS ADJUSTMENT)
FOR PROCUREMENT/SALES OF COMMODITY

METHODOLOGY: VARIABLE PERCENTAGE
OF COMMODITY REQUIREMENT HEDGED

REQUIRES MARKET FORECASTING

DYNAMIC HEDGING



STRUCTURING A HEDGING PROGRAM

- OBJECTIVES SHOULD BE CLEARLY STATED
- STRATEGIES SHOULD BE LONG-TERM, NOT SHORT-TERM
- HEDGING SHOULD BE CONSIDERED AN ADDITIONAL PROCUREMENT/SALES TOOL, NOT AN INDEPENDENT PROFIT CENTER
- POSSIBLE INTEGRATION OF TREASURY FUNCTION WITH PROCUREMENT/SALES EFFORT, TO COORDINATE HEDGING PROGRAM

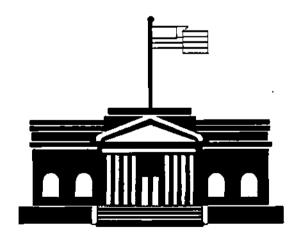
THE CFTC,

COMMODITIES FUTURES TRADING COMMISSION



THE EXCHANGE

- TRADING CAPITAL
- CLEARING AND GUARANTEE FUNCTION
- REGULATORY INTERFACE
- SURVEILLANCE/COMPLIANCE
- MEMBERSHIP SERVICES



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PRACTICAL PROCUREMENT AND DISTRIBUTION STRATEGIES IN A UNIFIED EUROPE

Jean-Pierre Melia
Purchasing Director
Magneti Marelli France
and
Member of the Board
Fiat Semelco

Jean-Pierre Melia is a Member of the Board of Fiat Semelco and Purchasing Director of their division, Magneti Marelli France. Previously, Mr. Melia was Purchasing Director at General Mills, Toys Group, London, England. Prior to that, he was Procurement and Purchasing Director at Benson, a division of Schlumberger. For the ten years before joining Benson, Mr. Melia was associated with BULL. During this period he spent two years as Quality Representative at Storage Technology Corporation in Colorado and one year as Unidata Coordinator at Siemens headquarters in Munich. Unidata was the result of a cooperation agreement between Siemens, BULL, and Phillips to produce common computer lines. Mr. Melia received an engineering degree is Automatics and Electronics from Toulouse University, France, and a DESS (French M.B.A.) in Purchasing Management from Grenoble University, France.

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Buying and Selling Semiconductors: The Changing User-Supplier Relationship in the 1990s

PRACTICAL PROCUREMENT AND DISTRIBUTION STRATEGIES IN THE UNIFIED EUROPE

IEAN-PIERRE MELIA

Purchasing Director Magneti Marelli France Member of the Board, Fiat Semelco





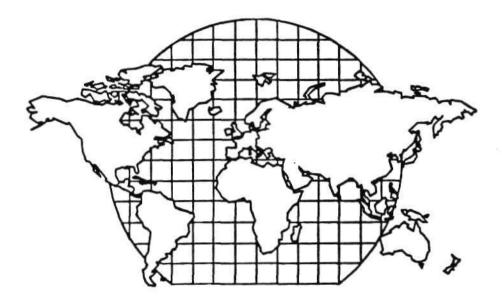
Joint venture, partnership, cooperation, technical agreements, exchange of technology...

Strange way to talk about it!

Barrier, quotas, strategy, fortress, survival...

And what about

The customer?...



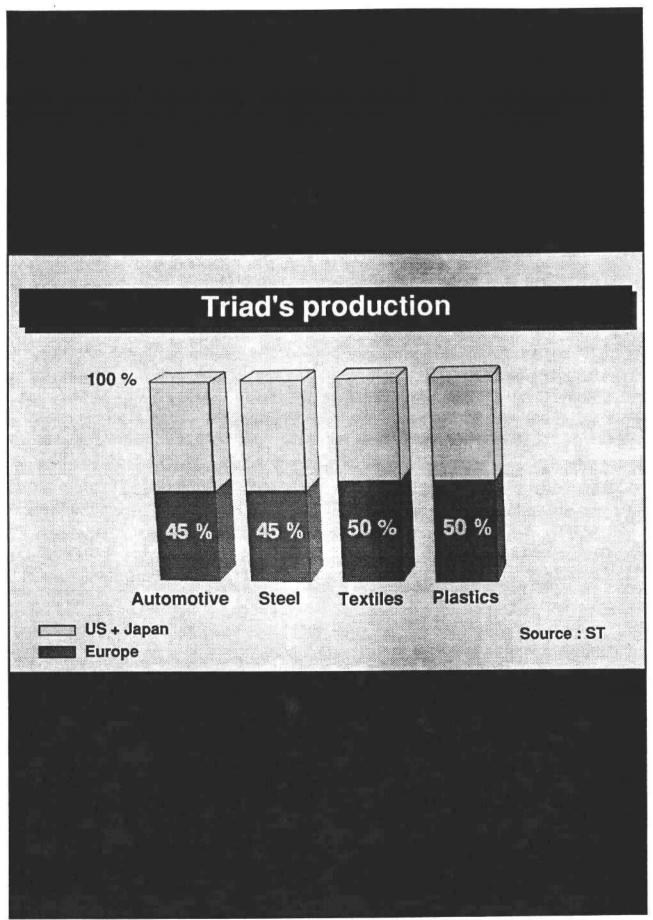
Source : DATAQUEST



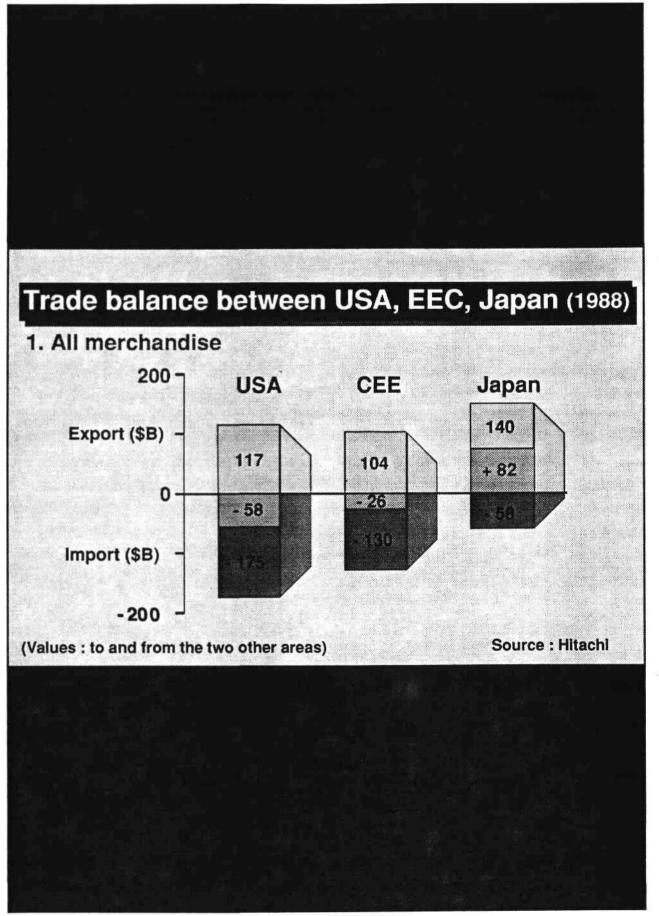
The triad

| | Population (M) | GNP (\$B) |
|--------------------|----------------|-----------|
| European community | 330 | 4,000 |
| United states | 244 | 4,100 |
| Japan | 122 | 2,300 |

Magneti Marelli SEMELCO







Trade balance between USA, EEC, Japan (1988) 2. Semiconductors Japan **EEC** USA Export (\$B) +3.32.2 0.6 0 - 0.9 - 2.4 Import (\$B) Source : Hitachi (Values : to and from the two other areas)

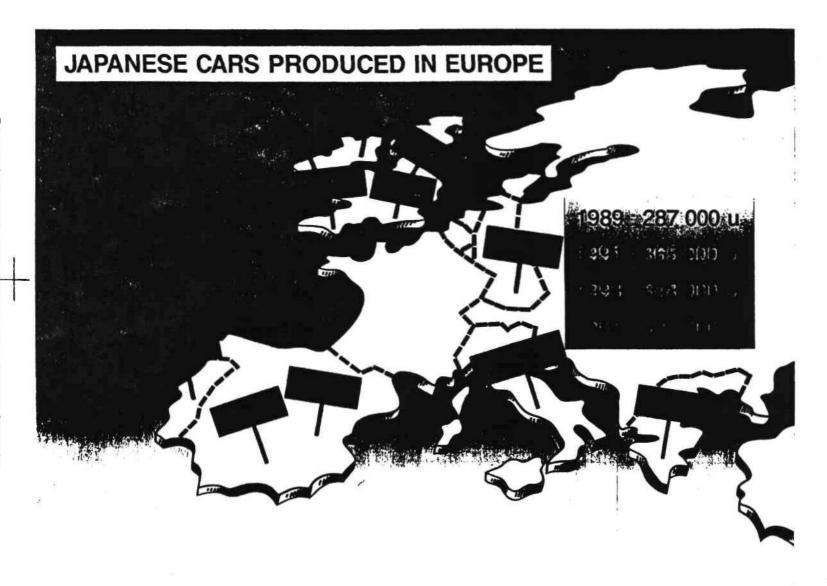
Procurement of semiconductors per area

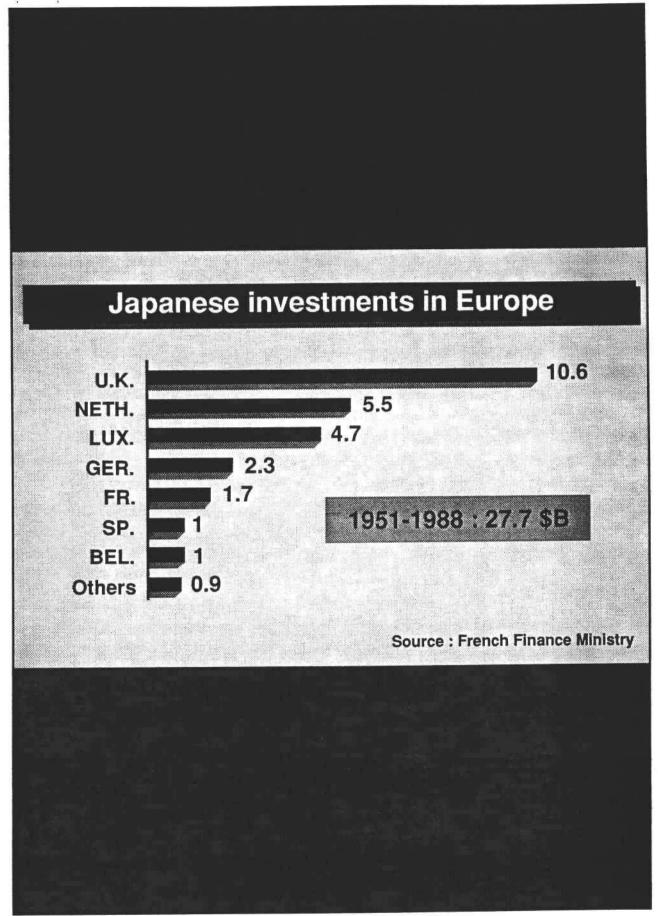
Supplied by (in %)

| c | US | JAP | EEC | ROW |
|---------------------------------|------|-----|------|-----|
| US S U M JAPAN P | (70) | 20 | 7 | 3 |
| M JAPAN | 10 | 89 | 1 | 0 |
| EEC | 44 | 6 | (37) | 13 |

Source: ST









None of these three scenario is acceptable!...

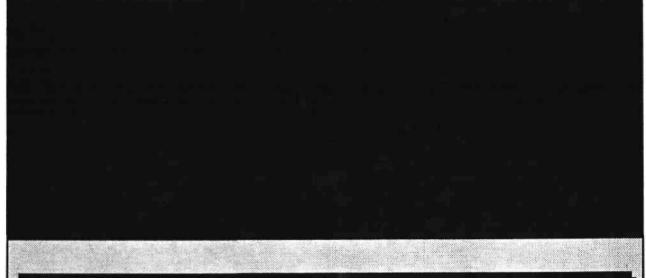
Magneti Marelli SEMELCO

Removal of trade barriers in 1993's Europe

- 1. Removal of all custom controls inside the community
- 2. Harmonization of all technical norms of specific products
- 3. Opening of public markets to suppliers of other European countries
- 4. Free circulation of people and harmonization of professionnal qualifications between countries
- 5. Free circulation of capital
- 6. Harmonization of indirect taxes (VAT)

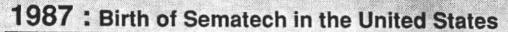
Magneti Maretti SEMELCO





What is changing for the European buyer?

- 1. Synergy for vendors : Sematech, US-memories, MCC, Jessi...
 Synergy for buyers : Stack, Semelco...
- 2. The new strategy for the next decade : can we ignore any of the big three ?
- 3. Price: easy to evaluate
 Quality: the concept of zero defect is very close
 Service and flexibility: the new key issue
- 4. The removal of trade barriers : changing professionnal competences



1989: Birth of Jessi programme in Europe (joint european submicron silicon)

- Eight years: 4.2 billion dollars funding

- SIEMENS brings DRAM technology PHILIPS brings SRAM technology SGS-Thomson brings EPROM technology

Objectives:

Materials, production equipment, advanced submicron devices, high level system applications

Forecast:

16 MBIT-DRAM (0,50 μ): 1993 64 MBIT-DRAM (0,35 μ): 1996



277,000 people - 40 billion dollars nett sales in 1989

Sectors: · Automobile

- Comm. vehicles
- Car components
- Tractors
- Metallurgical products
- · Ind. components
- Telecommunications
- · Civil engineering, rail systems, defense, aviation, publishing, bioengineering

SEMELCO (SEMiconductors ELectronic COmponents consortium)

Magneti Marelli - Telettra - Gilardini - Sorin Biomedica

- · 100 \$M of annual total S/C purchase potential
- Vendor rating
- · Global purchasing strategy
- Only five suppliers

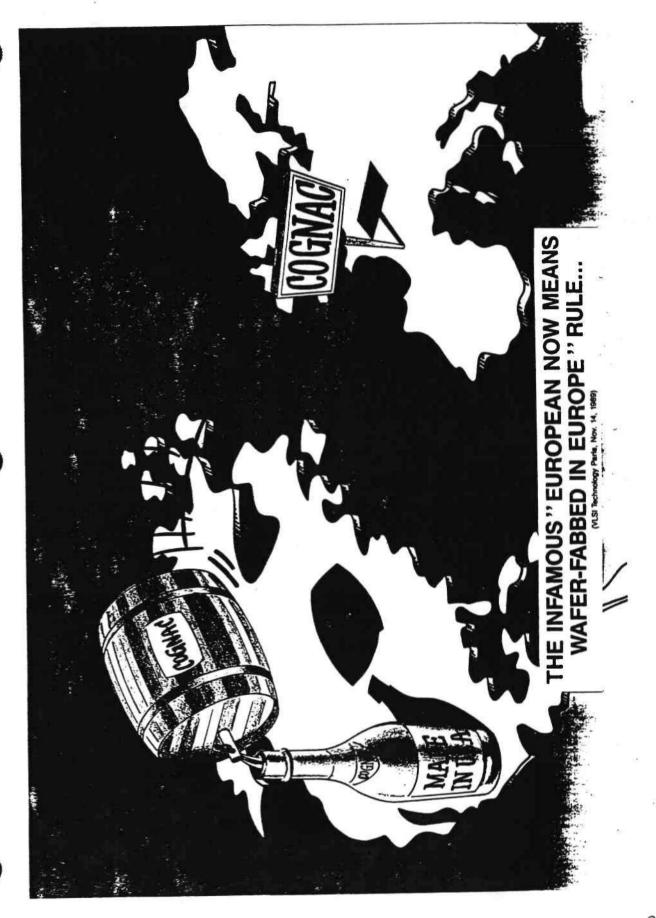
| | | | The second second | | |
|------------------|--------|---------|-------------------|--------|----|
| | . 07 | . 220/ | QQ | . Q0/2 | Ra |
| S.C market trend | : O/ · | + JJ /0 | 00 | T 3 /0 | UJ |

| 87 88 Nec 1 → 1 → 1 → Toshiba 2 → 2 → Hitachi 3 → 3 → Fujistu 6 → 6 → Mitsub. 9 → 8 → Matsush. 11 → 9 → Sharp 18 ≯ 15 ≯ | Motorola T.l. Intel N.S. AMD ATT | 87 88 $894 \rightarrow 4 \rightarrow 45 \rightarrow 5 \rightarrow 610 \nearrow 7 \rightarrow 88 \rightarrow 11 \rightarrow 1112 \rightarrow 13 \rightarrow 1815 \rightarrow 19 \rightarrow 20+25%$ $+3%$ |
|---|-------------------------------------|--|
| Sharp 18 15 2 Sanyo 14 → 14 2 Oki 17 → 17 2 Sony 19 2 16 2 + 41% +1 | 16 Philips 17 S.T. 19 Siemens | 7 → 10 → 10 13 ≠ 12 → 12 16 → 20 ≠ 15 +15% +15% |

What must change for the vendor?

- 1. Prove the willingness of cooperation, and not colonization, with Europe :
 - Local content rule
 - Local buffer stock
 - Local design center
- 2. Accept European trade standards:
 - FOB Tokyo, ex-works Dallas or CIF Roissy?
 - Payments in USD, FF or ECU?
 - Relationships in English or in Italian?

Magneti Marelli SEMELCO



What must change for the vendor?

- 3. Particular attention to specific products: ASIC's or ASSP's
- 4. How to enter the market?
 A solution: become a second source
- 5. Not the same culture in Italy, Great Britain, France or Germany. The secret for success:

Learn how to communicate

Magneti Marelli ______ SEMELCO

And for both vendor and buyer...

- 1. True partnerships:
 - Risk sharing
 - Forecast
 - Mutual longterm commitmen

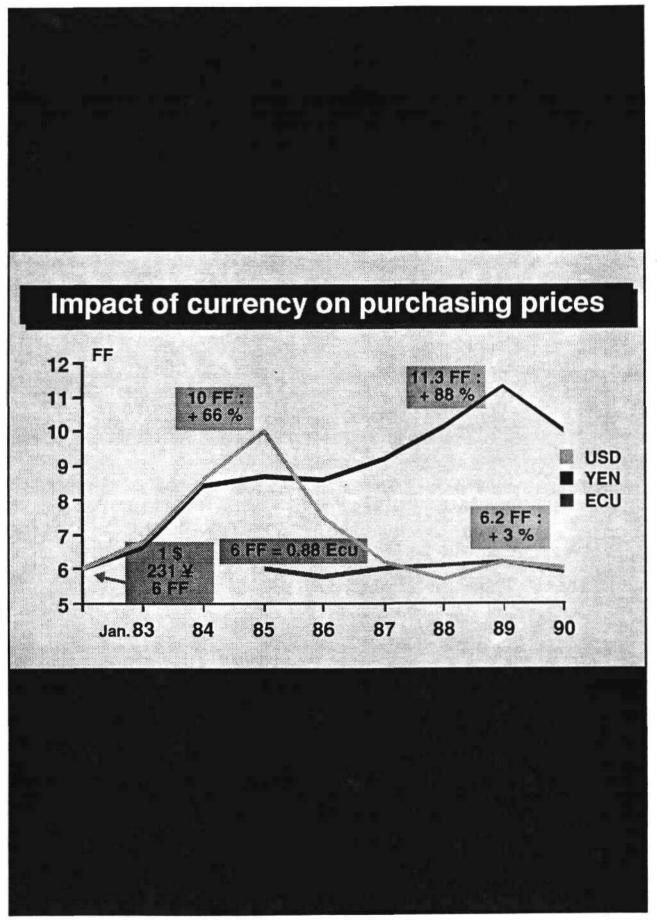
Technical cooperation

to preserve mutual interest in periods of boom or... crisis.

FAIR and FREE trade practises

- No longer import quotas
- No longer market reservation between any of the three!

Magneti Marelli SEMELCO



The ECU: European Currency Unit Sept. 20 th 1990 FRANC (Fr. 19 %) POUND (ir. 1.1 %) DRACHMA (Gr. 0.8 %) DM (Ger. 30.1 %) ESCUDO (Po. 0.8 %) CROWN (Da. 2.5 %) PESETA (Sp. 5.3 %) FRANC (Bel.Lux. 7.9 %) POUND (U.K. 13 %) FLORIN (Neth. 9.4 %) LIRA (lt. 10.1 %)

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INTERCONNECT TECHNOLOGY: IMPACT ON FUTURE IC BUYING AND SELLING

William Steingrandt
Director, Product Development and Marketing
Alcoa Electronic Packaging, Inc.

Dr. William Steingrandt is Director of Product Development and Marketing for Alcoa Electronic Packaging, Inc. He focuses on development of ceramic and thin film packages, both PGA and Multichip Modules, at the Rancho Bernardo, California facility. Prior to his association with Alcoa, Dr. Steingrandt worked with IBM Corporation, holding various positions with responsibility for computer performance measurement and prediction, CAD development, architecture, design, and technology development. His latest position with IBM was as its Director of Development for the General Technology Division and Manager of Packaging Products and Engineering at IBM East Fishkill. Dr. Steingrandt received both a B.S. degree in Engineering and a Ph.D. in Electrical Engineering from Northwestern University.

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February 12-13, 1990





DATAQUEST Semiconductor User And Applications Conference

February 12-13, 1990



OUTLINE

Interconnect Technology: Impact On Future IC Buying and Selling

- I. The Case For Multichip Modules
- 2. MCM Vs PWB
- 3. Challenges
- 4. Future Scenarios
- 5. Conclusions



INTRODUCTION

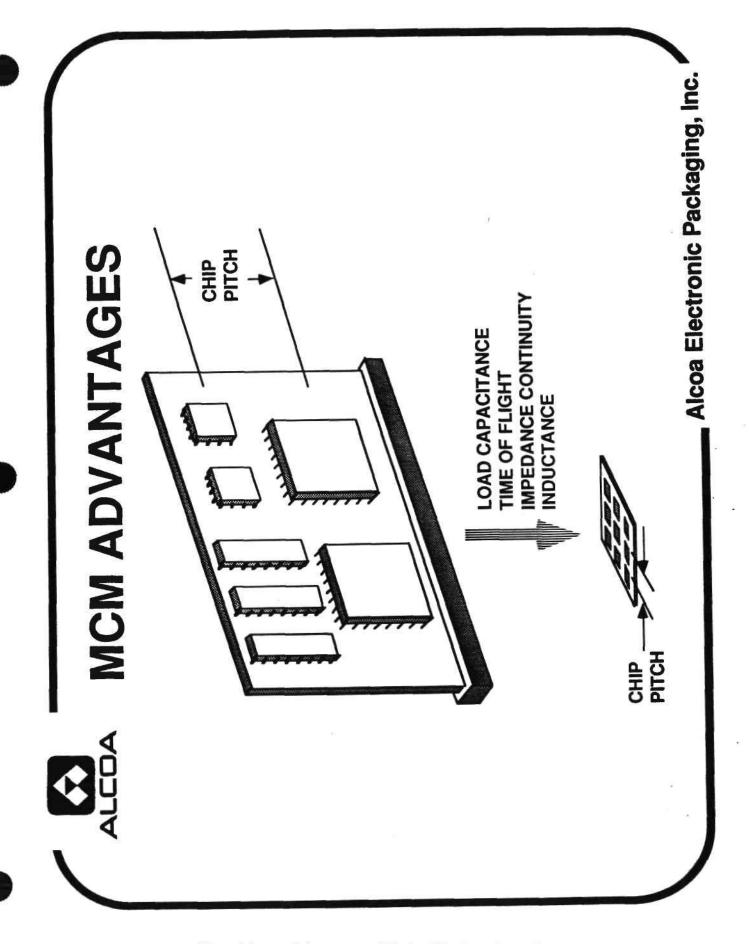
- The Case For Multichip Modules
- MCM Vs PWB
- Challenges
- Future Scenarios
- Conclusions

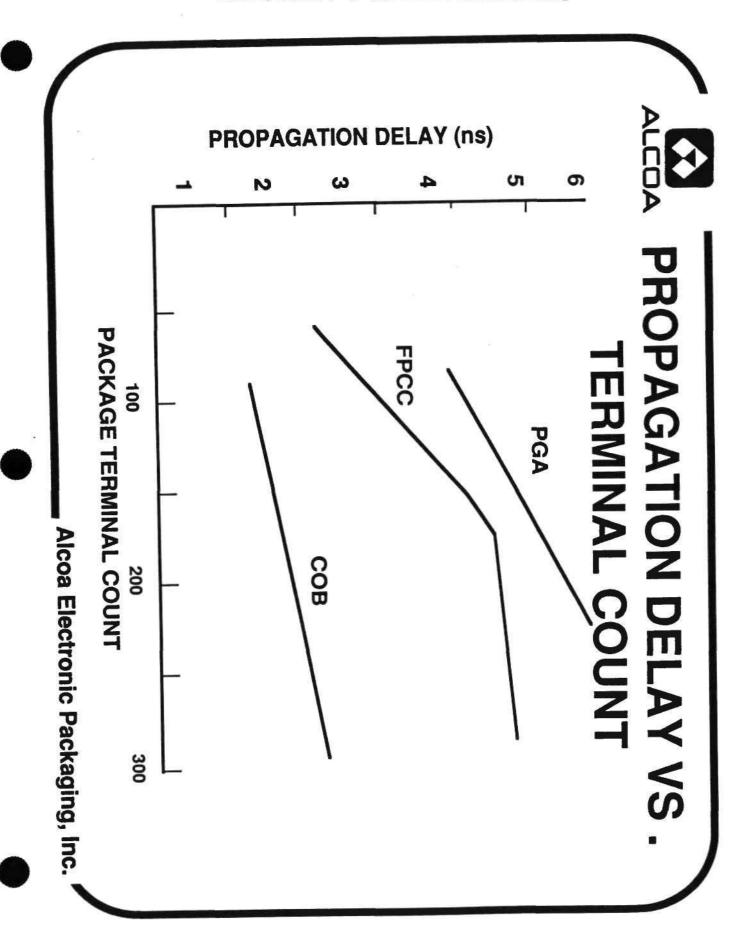


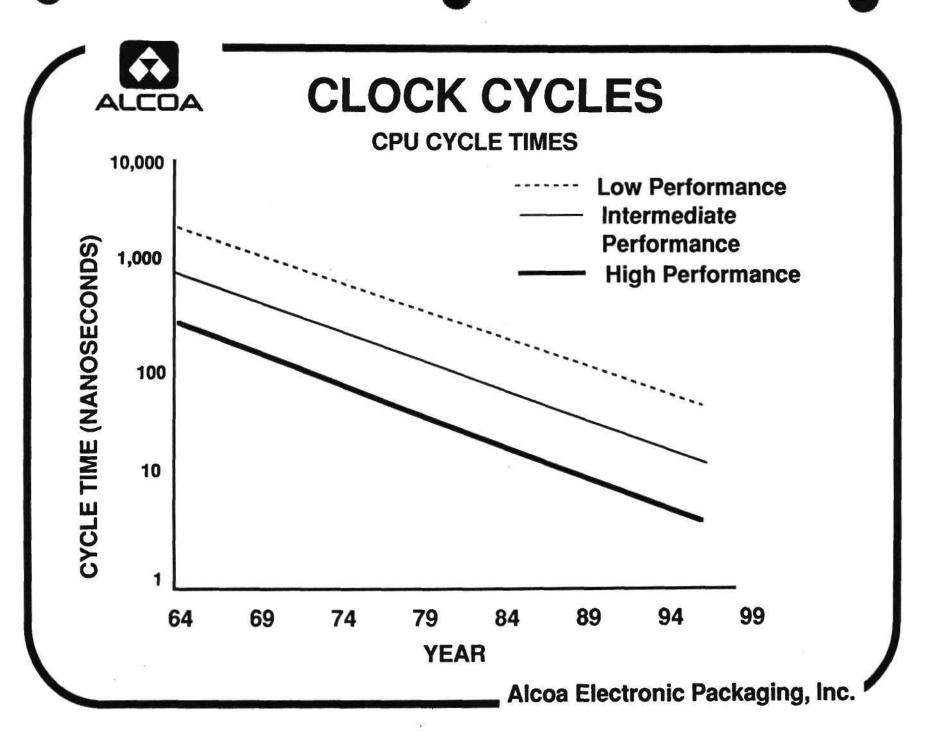
MULTICHIP MODULE DEFINITION

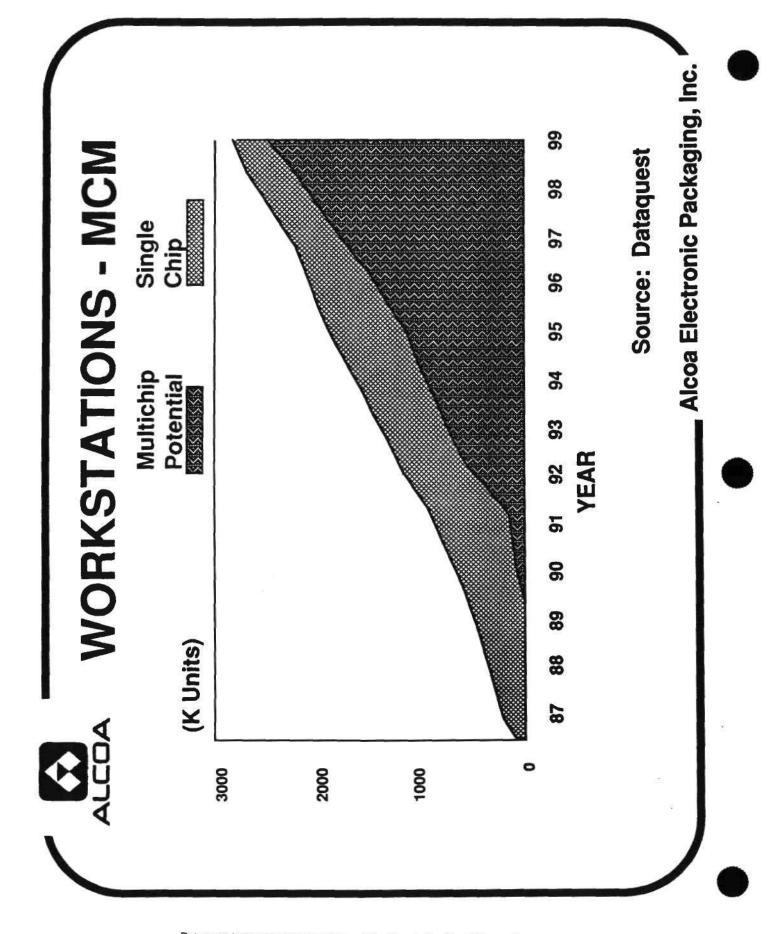
A Package Containing Two Or More VLSI Die Which Are Directly Attached To An Interconnect Medium Via Wire Bond, TAB, Flip Chip Or Other Direct Attachment.

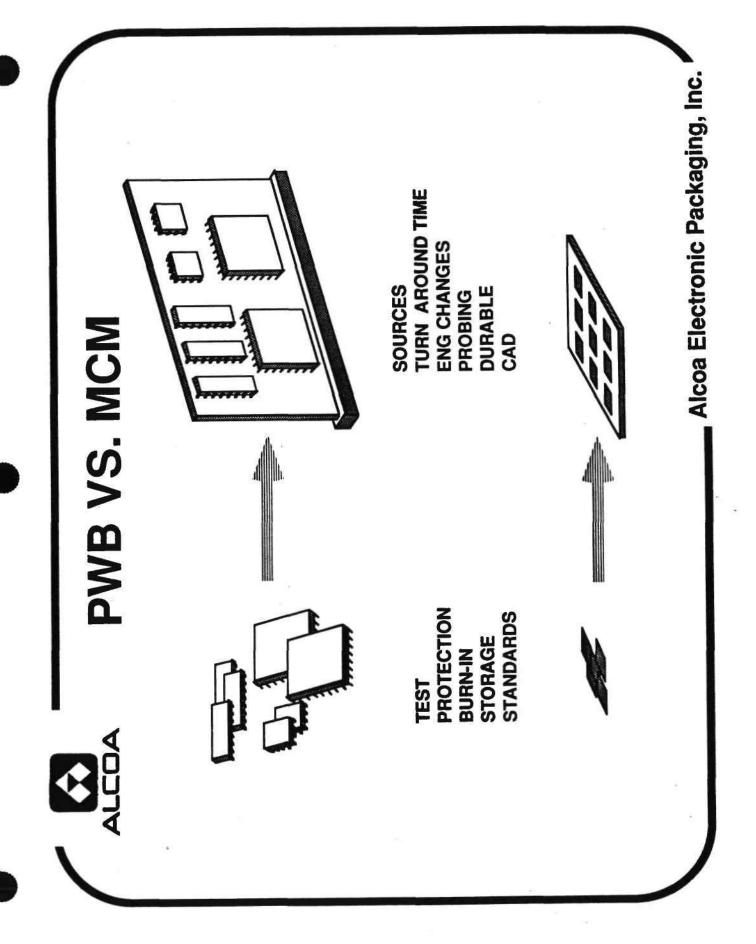
The Package is Generally Sealed As A Single Unit.













ALCOA TECHNICAL CHALLENGES

Turn Around Time

Module Test

Diagnostics

Chips/Wafers Shipment of Bare

Multiple Vendors ICs From

Engineering Changes

Compatibility Of Metallurgy Aicoa Electronic Packaging, Inc.

Dataquest Incorporated, a company of The Dun & Bradstreet Corporation 1290 Ridder Park Drive, San Jose, CA 95131-2398 / (408) 437-8000 / Telex 171973 / Fax (408) 437-0292

Rework

Burn-In

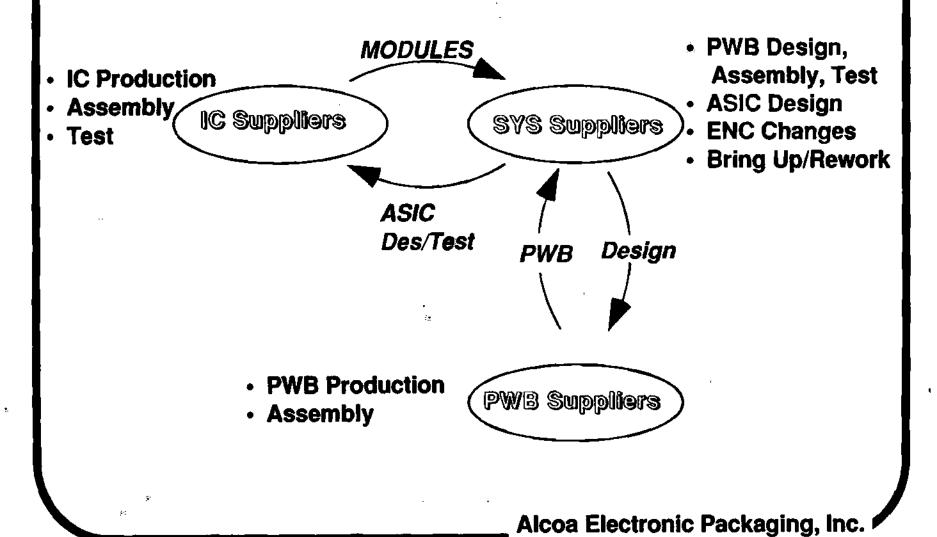


BUSINESS CHALLENGES

- Assembly And Test Value Add
- Knowledge Of Yields
- Proprietary Tests
- Who Guarantees Assembly Yields
- Lot Acceptance



IC & SYS SUPPLIERS





MCM ASSEMBLY/TEST

(The Critical Progress)

- Complex Process
- Who Guarantees Yield
- Proprietary Test Suites
 - -Chip
 - -System
- Diagnostics Are Applications Specific
- Bring-Up/Probing



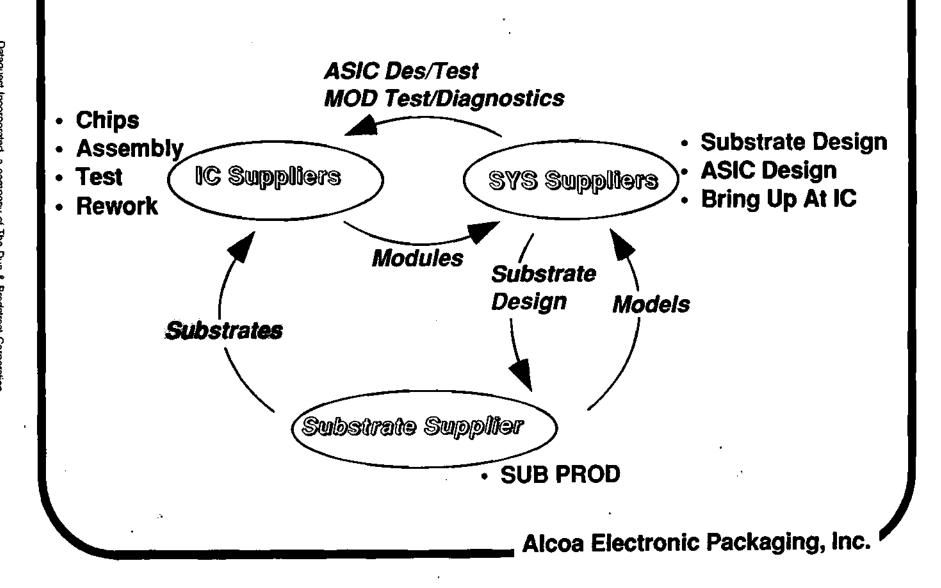
ASSEMBLY/TEST

Who's Going To Do It?

- System Supplier
- IC Supplier
- Package Supplier
- Combination



SINGLE IC SUPPLIER



Competitors

Shipment Of Bare Die

Differing Metallurgies

Responsibility For Assembly Yields

Alcoa Electronic Packaging, Inc.



CONCLUSIONS

- MCM Will Become Important Driven
 By Performance
- Relationships Between Single IC Supplier, System House, And Strong Package Supplier Are Required
- Initially Assembly Will Mostly Be Done By IC Supplier
- MCM's With VLSI Chips From More Than One Vender Will Lag.

Alcoa Electronic Packaging, Inc.



KEY DEVELOPMENTS REQUIRED

- General Test/Diagnostics Strategy
- Burn-In At Wafer Or MCM
- Rapid Package Engineering Changes
- Strong, Full Service Package Suppliers
 - Substrate
 - Design
 - Assembly Technology
 - TAT
 - Cost
 - Relationships With Key IC Suppliers

Alcoa Electronic Packaging, Inc.

Dataquest

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1990 PRICE OUTLOOK: COMMERCIAL AND MILITARY PRICES

Gregory L. Sheppard
Senior Industry Analyst
Semiconductor User and Applications Group
Dataquest Incorporated

Gregory Sheppard is a Senior Industry Analyst in Dataquest's Semiconductor User and Applications Group. Specifically he is responsible for the MilAero Technology Service. He also tracks the military, automotive, and industrial markets. Before joining Dataquest, Mr. Sheppard worked at Fairchild Semiconductor Corporation as Corporate Manager of Business Analysis. In that capacity, he managed corporate market research, performed product and market forecasts, provided competitive positioning assessments, and maintained the 10-year market plan. He was also a board member of Worldwide Semiconductor Trade Statistics, Inc., and was Fairchild's liaison to the SIA and the AEA. Earlier, Mr. Sheppard was a Hardware Design Manager and a Systems Engineer at GTE Government Systems. While there, he specialized in Colorado and an Mr. Sheppard received a B.S.E.E./C.S. degree from the University of Colorado and an M.S. degree in Systems Management from the University of Southern California.

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1990 PRICE OUTLOOK: COMMERCIAL AND MILITARY PRICES

Ronald A. Bohn
Industry Analyst
Semiconductor User and Applications Group
Dataguest Incorporated

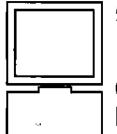
Ronald Bohn is an Industry Analyst for Dataquest's Semiconductor User and Applications Group. He is responsible for research and analysis in semiconductor pricing trends for the Semiconductor Application Markets (SAM) service. He also forecasts North American production of industrial electronics equipment and analyzes industrial system semiconductor-content trends for the Semiconductor User Information Service (SUIS). Mr. Bohn has developed a data base listing the top ranked electronic equipment producers purchasing locations and is an acknowledged authority on smart power products and technology. Prior to joining Dataquest, Mr. Bohn worked for a market research firm where he was involved in research and analysis of worldwide markets for electronic components and equipment. He has also served as International Market Research Manager for the Korea Trade Center in the U.S. Mr. Bohn received a B.A. degree from Cornell University, an M.B.A. degree from the University of California at Berkeley, and a J.D. degree from the Hastings College of Law.

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Buying and Selling Semiconductors: The Changing User-Supplier Relationship in the 1990s

1990 PRICE OUTLOOK: COMMERCIAL AND MILITARY PRICES

GREGORY L. SHEPPARD
Senior Industry Analyst
RONALD A. BOHN
Industry Analyst
Semiconductor User and Applications Group
Dataquest Incorporated

AGENDA

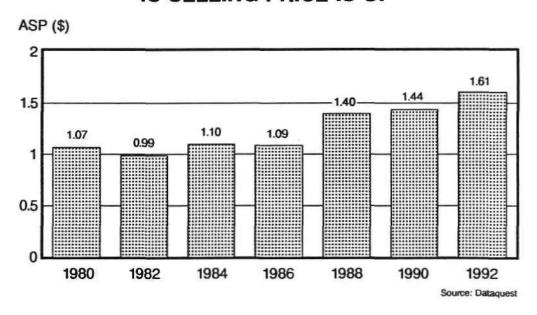
- Strategic pricing issues
- Key semiconductor price trends
- Conclusions and recommendations

8378020.MIS 6101966.BOH

TWO MAIN POINTS

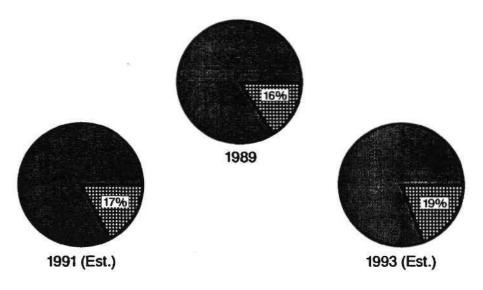
- Manage higher prices for added value
- Develop pricing/procurement strategies based on system cost impact approach

OVERALL AVERAGE IC SELLING PRICE IS UP



88376004 IMG 01/16/90 BOH

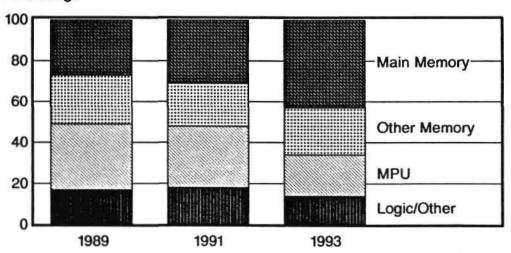
IC CONTENT VALUE AS A PERCENTAGE OF 386-BASED SYSTEM ASP



Source: Dataquest

IC CONTENT ANALYSIS OF 386-BASED SYSTEMS

Percentage



Source: Dataquest

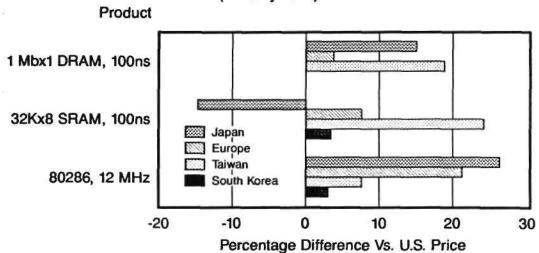
837600G.IMG 01/15/00:BUH

IMPLICATIONS OF IC ASP INCREASE

- Rollover to high value/priced ICs is accelerating
- Sticker shock is mitigated by value
- Single-source relationships
- Issues like testability become important, along with price and delivery

PRICE TRENDS BY WORLD REGION COMPARED WITH U.S. PRICE

(January 1990)



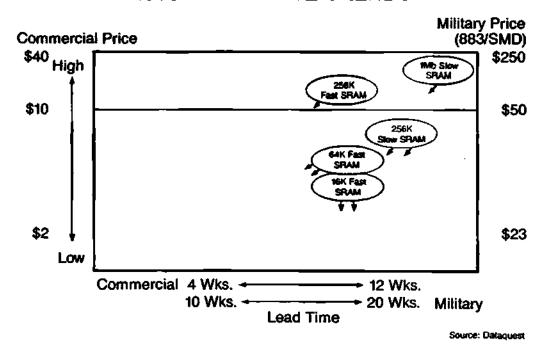
Source: Dataquest

8376008.IMG 01/19/90-BOH

UNDERSTANDING REGIONAL PRICING

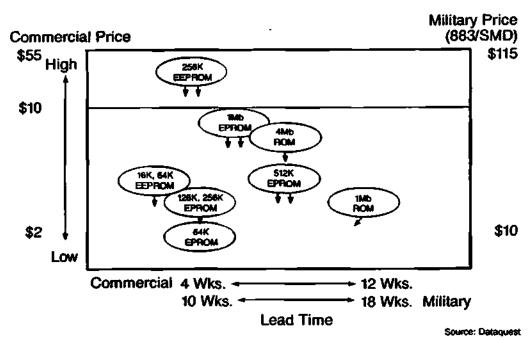
- Prices vary by region
- World prices dictated by strength and nature of regional application markets
- World prices influenced by home country/ region of major suppliers
- Need to manage continual arbitrage situations

1990 SRAM PRICE TRENDS

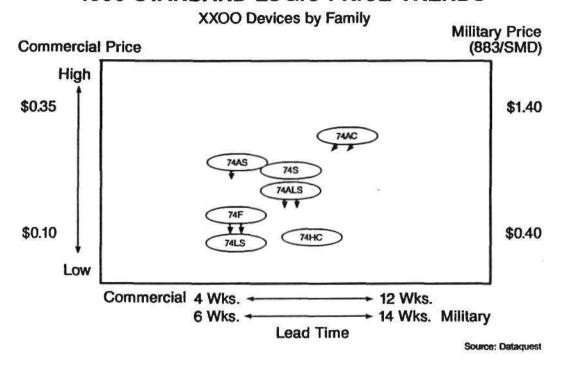


86376014 MAG 01/19/90/BOH

1990 NONVOLATILE MEMORY PRICE TRENDS



1990 STANDARD LOGIC PRICE TRENDS

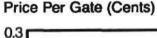


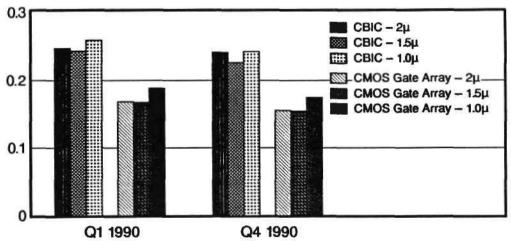
B8376017.IMG 01/16/90.BOH

Source: Dataquest

ASIC PRICE TRENDS

7,500-Gate CBIC or CMOS Gate Array





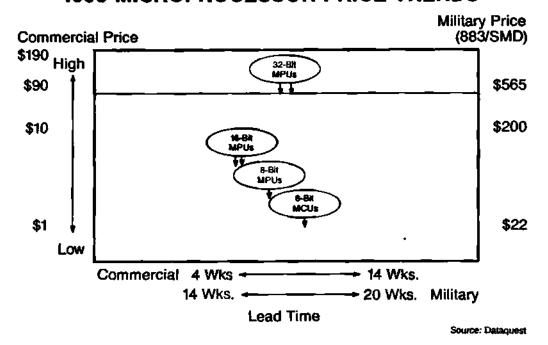
© 1990 Dataquest Incorporated February 12 - Reproduction Prohibited

AGENDA

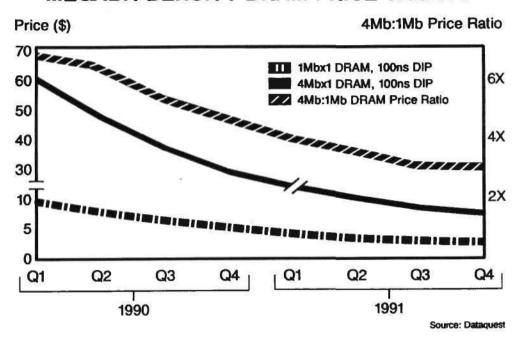
- Strategic pricing issues
- Key semiconductor price trends
- Conclusions and recommendations

\$1376010 BAS 01/19/50/\$CH

1990 MICROPROCESSOR PRICE TRENDS

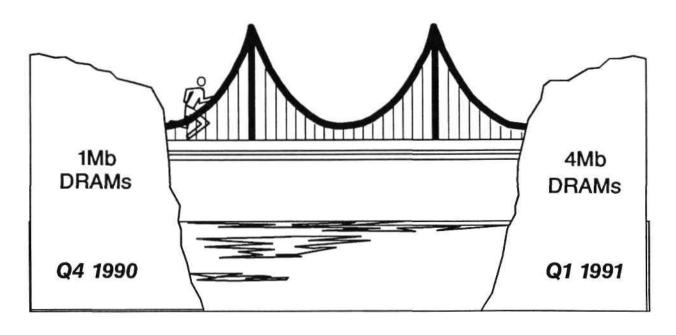


MEGABIT-DENSITY DRAM PRICE TRENDS



88376012 IMG 01/16/00 BOH

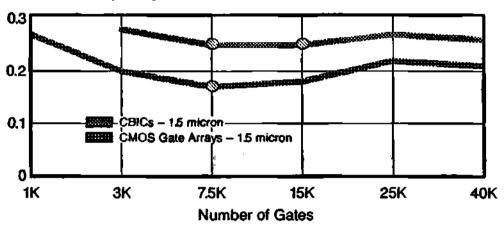
THE CROSSOVER FROM 1Mb DRAMs TO 4Mb DRAMs



CBICs VERSUS CMOS GATE ARRAYS

(Q1-1990) Volume: 10,000 Pieces

Price Per Gate (Cents)*



*Includes NRE

Source: Dataquest

HOROGENIO DMESTORIN

AGENDA

- Strategic pricing issues
- Key semiconductor price trends
- Conclusions and recommendations

RECOMMENDATIONS

- Manage higher prices for added value
- Manage competitiveness despite single-sourced products
- Develop pricing/procurement strategies based on system cost impact approach
- Carefully manage regional arbitrage situations
- Keep close to manufacturers' activities and production plans

Dataquest

The Dun & Bradstreet Corporation

Dataquest

a company of The Dun & Bradstreet Corporation

"SEMICOMPUTER" COMPANIES AND THE TRENDS TOWARD APPLICATION SPECIFIC STANDARD PRODUCTS

John Rizzo
Vice President of Marketing
Momenta Corporation

John Rizzo is Vice President of Marketing for Momenta Corporation. His concentration is with product definition, marketing channel strategy, long-range business strategy, and corporate communications. Previously, Mr. Rizzo was associated with Weitek Corporation as its Vice President of Marketing. In this position, he was responsible for contributing to their strategic business plan and its marketing implementation. Prior to joining Weitek, Mr. Rizzo was with Apple Computer. He was an early member of the Macintosh marketing team and assisted in its launch. During his tenure at Apple, he held positions as Macintosh Product Marketing Manager, Hardware Product Manager, and Peripherals Product Manager. Before joining Apple, Mr. Rizzo was with Intel, where he held a variety of technical, strategic, tactical, and product marketing and management positions in markets ranging from E PROM and other non-volatile memory components. Mr. Rizzo received a B.S.E.E. degree from Stanford University.

Dataquest Incorporated
Semiconductor User and Applications Conference
San Francisco, California
February 12-13, 1990

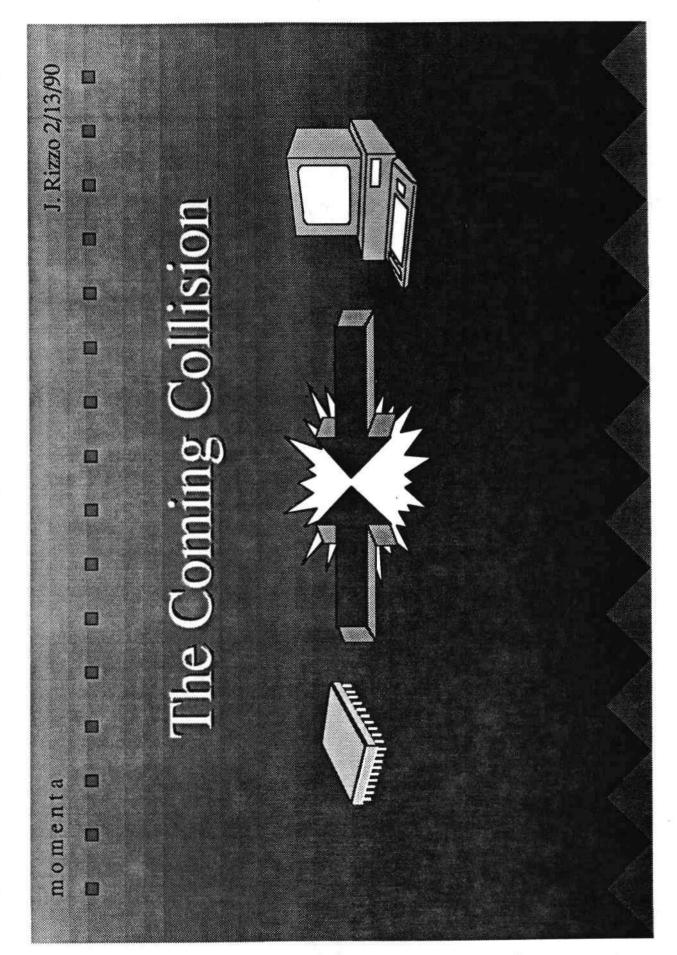


Buying and Selling Semiconductors: The Changing User-Supplier Relationship in the 1990s

"SEMICOMPUTER" COMPANIES AND THE TREND TOWARD APPLICATION-SPECIFIC STANDARD PRODUCTS (ASSPs)

JOHN F. RIZZO
Vice President

Vice President, Marketing Momenta Corporation



Dataquest Incorporated, a company of The Dun & Bradstreet Corporation 1290 Ridder Park Drive, San Jose, CA 95131-2398 / (408) 437-8000 / Telex 171973 / Fax (408) 437-0292

| Biston 2/13/90 Rizzo Background Intel Marketing (commodity memory) Apple Macintosh Marketing Weitek Marketing (ASSP) Momenta Marketing (PC) | |
|--|--|
|--|--|

J. Rizzo 2/13/90 Pathbreaking new personal productivity tool Momenta Background \$4M funding, December, 1989 \$1M funding, November, 1989 \$8M funding, January, 1990 Founded October, 1989 18 employees momenta

J. Rizzo 2/13/90 Systems Designers (ASSP's) Semi Designers (ASIC's) Far East he Answer System Suppliers Hi-Volume Chips Semi Suppliers попепта

J. Rizzo 2/13/90

momenta

-UB40

exas Instruments Vitsubishi 97860 J. Rizzo 2/13/90 6 Hitac 7 Fujits 8 Siem 9 AT&T 10 Sony 2024 momenta

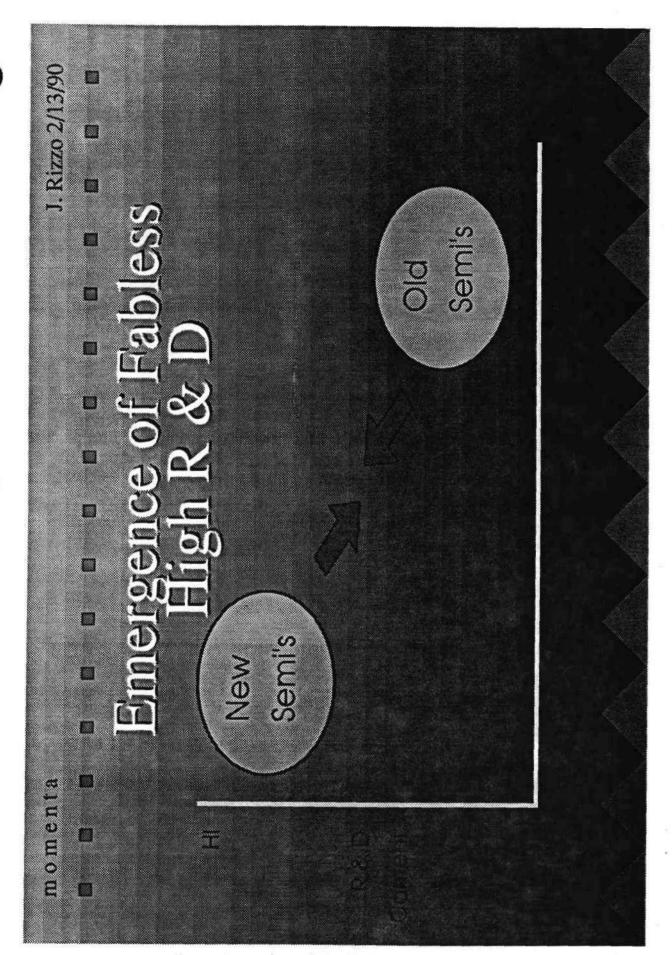
J. Rizzo 2/13/90 Far East ~ \$4B ~ \$500IM Hi-Volume (~ \$2B momenta

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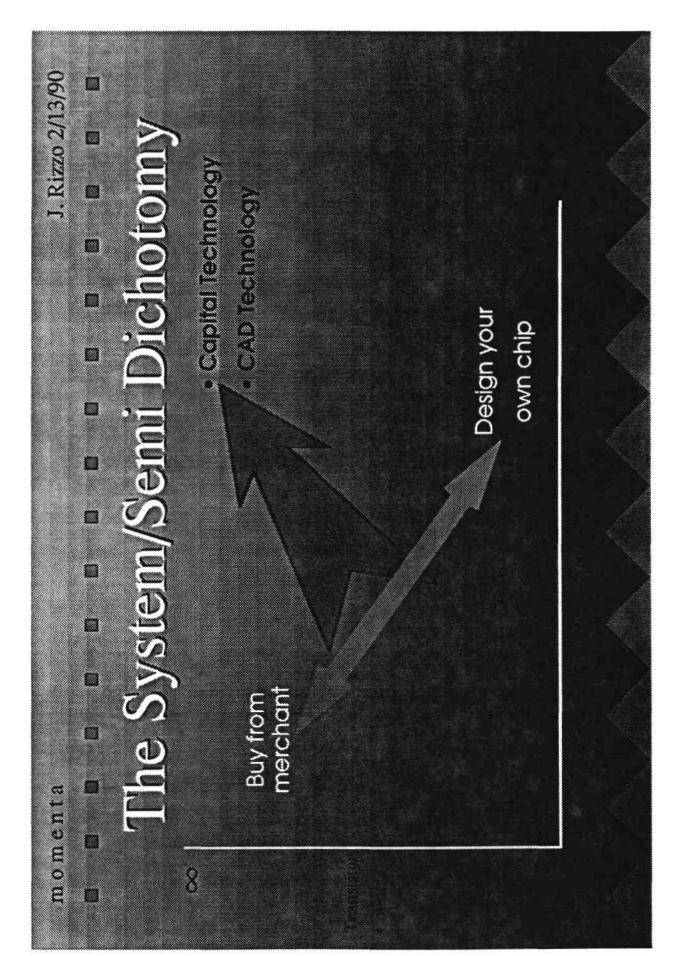
| J. Rizzo 2/13/90 | | | | |
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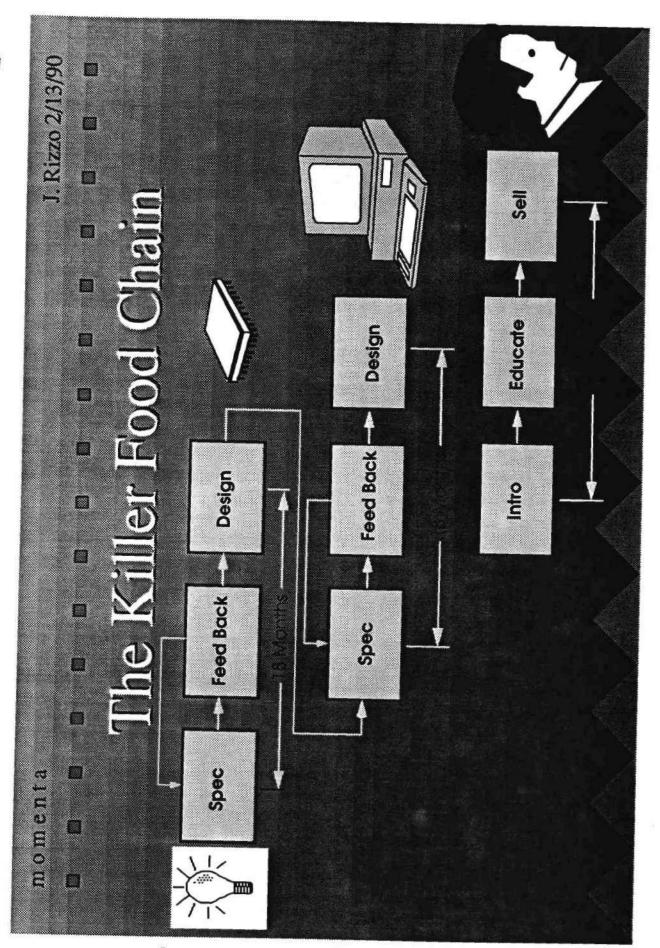
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J. Rizzo 2/13/90 Transistor Utilization Architecture Success Model Capital Utilization Implementation momenta

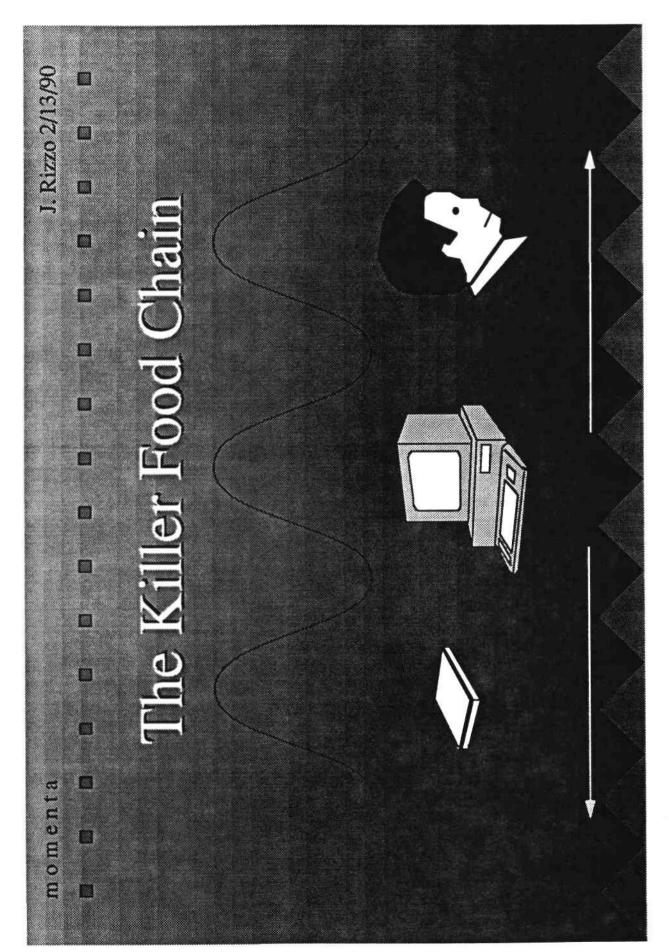


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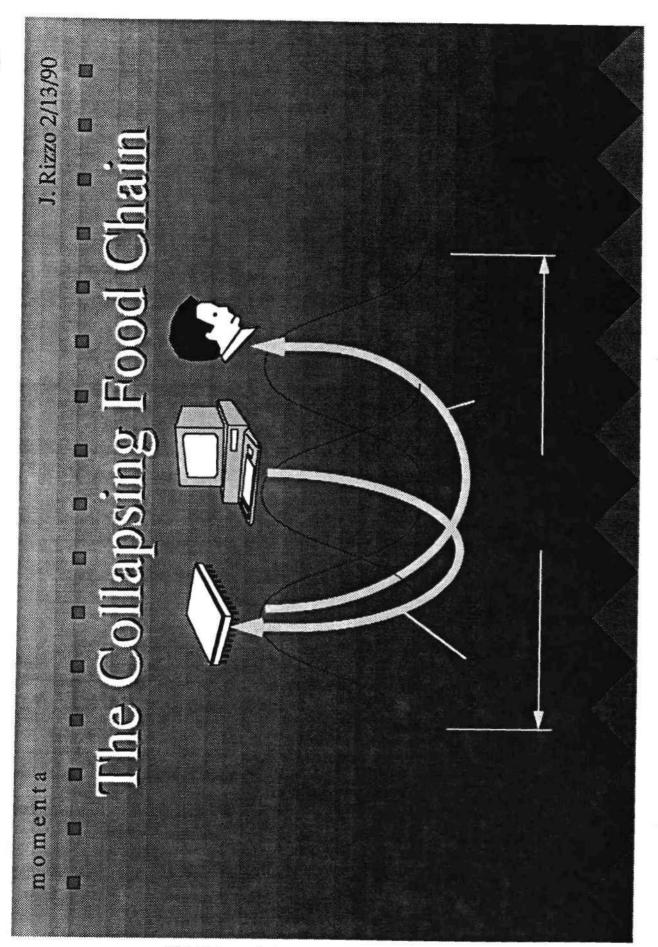




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J. Rizzo 2/13/90 The New C

momenta

- Take "Fabless" Seriously
- Invest in CAD IC Automation
- Broaden Value Added
- Don't Discount Semi System Designers

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MEMORY ICs: HAVE THE RULES CHANGED?

O. Fred Jones
Associate Director
Semiconductor Industry Service
Dataquest Incorporated

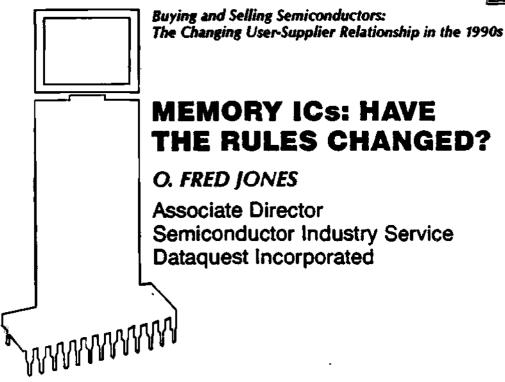
Fred Jones is Associate Director of Dataquest's Semiconductor Industry Service (SIS) and Manager of the memory segment. He is responsible for managing and directing all memory research activities worldwide. Prior to joining Dataquest, Mr. Jones was Vice President of Product Development for Triad Semiconductors, a producer of speciality memories. Previously, he spent approximately 20 years in memory and applications-related executive and engineering positions with Inmos Corporation, Mostek, Modular Computer, and Motorola. Mr. Jones has published more than 25 articles dealing with memories and applications for memories. He was the DRAM Task Group Leader for the JEDEC standardization committee from 1980 through 1987. Mr. Jones received a B.S.E.E. degree from the University of Florida.

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San Francisco, California

February 12-13, 1990



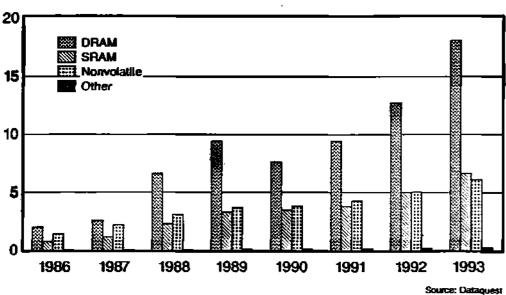
MEMORY ICs: HAVE THE RULES CHANGED?

- Memory forecast
- Market perspective
 - Past 1989 recap
 - Present 1990 outlook
 - Future 1991 and beyond
- Summary

B4000012 MAG 01/19/00 JUNI

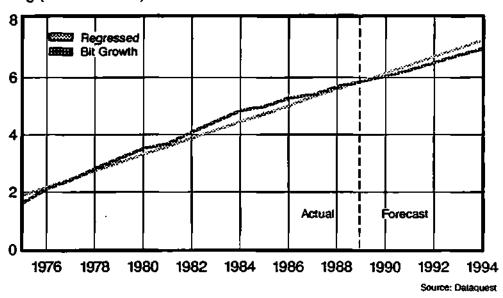
MOS MEMORY REVENUE FORECAST

Billions of Dollars



DRAM BIT GROWTH TRENDS

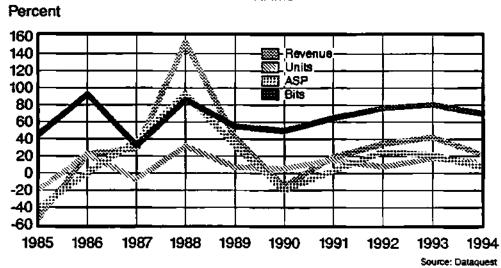
Log (Billions of Bits)



34370000 MG 01719/30 JUN

ESTIMATED PERCENT CHANGE OF KEY INDICATORS FROM PREVIOUS YEAR

All DRAMs



1989 - A GLIMPSE OF THE PAST

1Mb DRAM Market

- First half
 - Shortages
 - High ASPs
 - Japanese manage market

630000 M86 01/2G/50 JUN

1989 -- A GLIMPSE OF THE PAST

1Mb DRAM Market

- Third quarter
 - Entered economic slowdown
 - Shift to oversupply
 - Users reduce inventories
 - Non-Japanese suppliers gain market share
 - Emergence of multitier pricing

1989 -- A GLIMPSE OF THE PAST

1Mb DRAM Market

- Fourth quarter
 - Manufacturers reduce production
 - Continued oversupply
 - Severe price erosion
 - Spot business

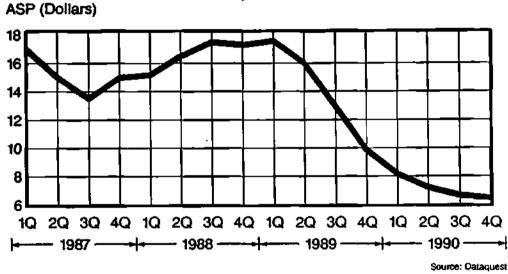
1360071.IMG 01/25/30 JUN

1990 - THE PRESENT OUTLOOK FOR 1Mb DRAMs

- First quarter oversupply
- Continued price erosion
- Possible political intervention
- Throttle-back of DRAM production
- Increased availability of SRAMs and PSRAMs
- Potential supply glitch during recovery
- Difficult 4Mb introduction

ESTIMATED WORLDWIDE 1Mb DRAM PRICING

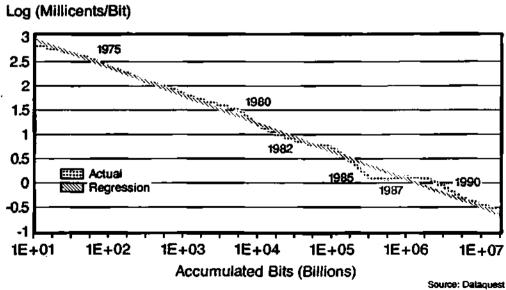
Quarterly: 1987-1990



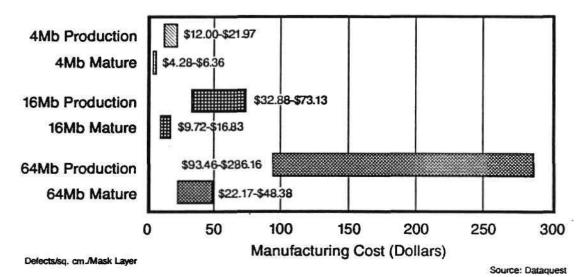
94360010.IMG 01/25/00.JUN

DRAM PRICE LEARNING CURVE

All Densities



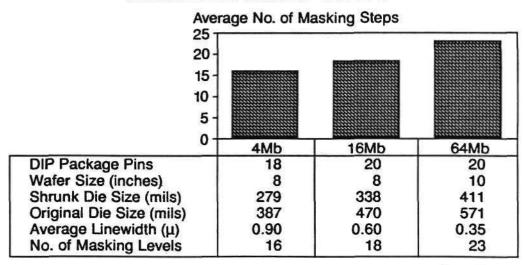
ESTIMATED MANUFACTURING COST FOR 4Mb, 16Mb, AND 64Mb DRAMs BASED ON DEFECTS (0.15-0.3)



B8300005 IMG 01/19/90:JUN

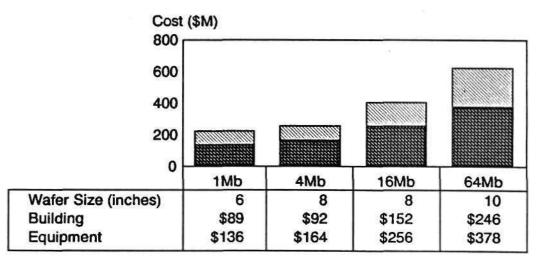
TE

4Mb, 16Mb, AND 64Mb DRAM MANUFACTURING COSTS



Source: Dataquest

CAPITAL EXPENDITURES TO SUPPORT 25KU DRAM WAFER STARTS/ FOUR-WEEK PERIOD



Source: Dataquest

83G0014.IMG 01/2G/30:JUN

1991 AND BEYOND -- THE FUTURE

- Market
 - Slowing bit demand
 - Government control
 - Foreign dependence
- Semiconductor manufacturers
 - Emphasis on profitability
 - Alliances
 - Rising capital investments
 - Higher risk

Source: Dataquest

MEMORY ICs

Have the rules changed?

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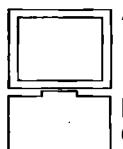


MARKET IMPACT OF GROVING ASIC COMPLEXITY

Jerry Banks
Senior Industry Analyst
Semiconductor Industry Service
Dataquest Incorporated

Jerry Banks is a Senior Industry Analyst for Dataquest's Semiconductor for analyzing Service (SIS). He is responsible Industry application-specific market environment and future technology trends. Prior to joining Dataquest, Mr. Banks spent 12 years in the electronics industry in various marketing and engineering roles. Most recently, he was Product Marketing Manager for WaferScale Integration, Inc. During his four years there, Mr. Banks was responsible for international marketing/sales support and product planning for the company's high-performance NVM and ASIC product Before joining WaferScale, Mr. Banks held marketing and applications lines. engineering positions at Signetics Corporation and engineering positions at Hewlett-Packard Company and Hughes Aircraft Company. Mr. Banks received a B.S. degree in Electrical and Electronic Engineering from California State University at Sacramento.

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February 12-13, 1990



Phillipping.

Buying and Selling Semiconductors: The Changing User-Supplier Relationship in the 1990s

MARKET IMPACT OF GROWING ASIC COMPLEXITY

IERRY BANKS

Senior Industry Analyst Manager, ASIC Service Segment Semiconductor Industry Service Dataquest Incorporated

AGENDA

- ASICs defined
- The ASIC usage model
- Changes to the model
- Summary

6317602 BAS 61/18/90 BAN

DEFINITIONS

ASICs

Integrated circuits that are dedicated to a single user

8347004.MG 01/22/00:BAN

Gate Array Mask-programmable interconnect

(includes generic or custom-

base wafers)

Cell-Based IC Full set of masks (<10% tweaks)

Custom Full set of masks (> 10% tweaks)

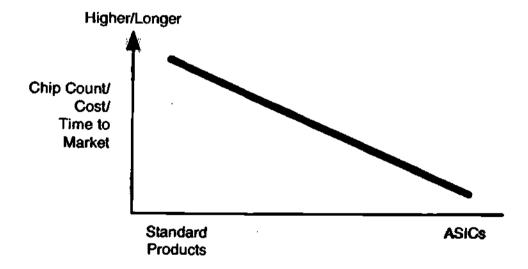
Programmable

Logic Device Customized after assembly

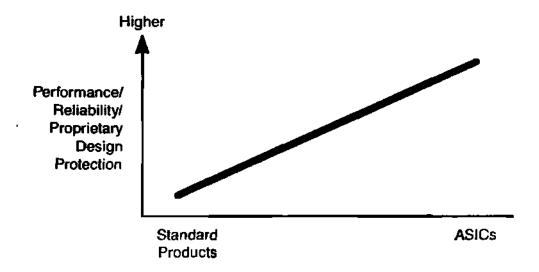
ASIC USAGE MODEL

8347606 MAG 617990 BAN

ASICs VS. STANDARD PRODUCTS

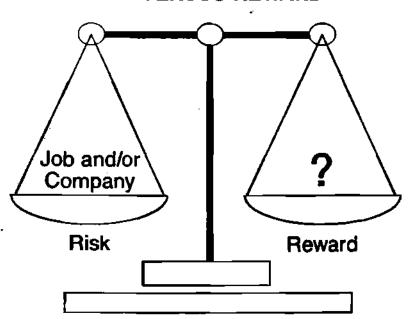


ASICS VS. STANDARD PRODUCTS

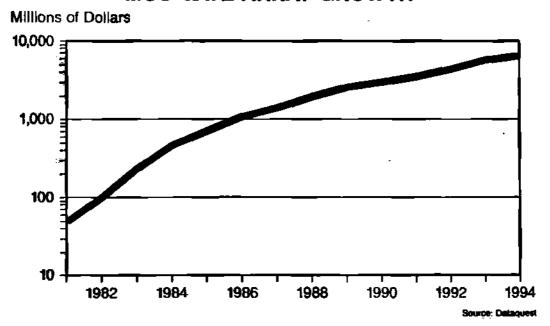


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RISK VERSUS REWARD

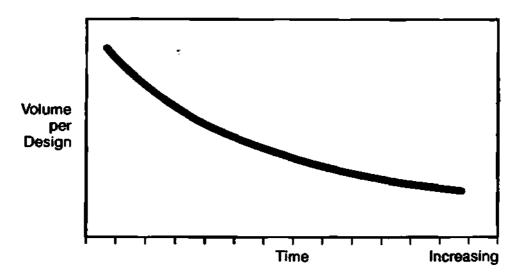


MOS GATE ARRAY GROWTH



8947018 MAG 81/24/90 BAN

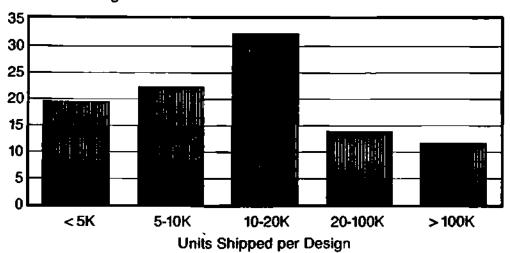
PERCEIVED BREAK-EVEN VOLUME



MOS GATE ARRAY UNITS

North America

Percent of Designs



Source: Dataquest

\$347012 NAG - 01/17/00:BAN

ASIC USAGE MODEL FOR THE 1980s

PLD Gate Array Cell-Based

Low density Medium-high density Special function

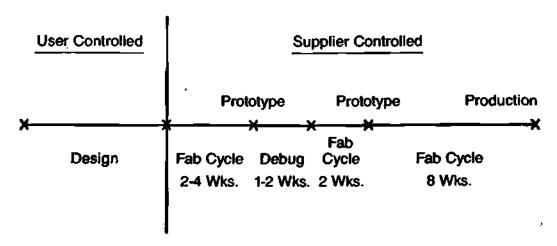
Any volume Medium-high volume and/or high volume

CHANGES TO THE MODEL

8347014 MAG 0W22700 BAN

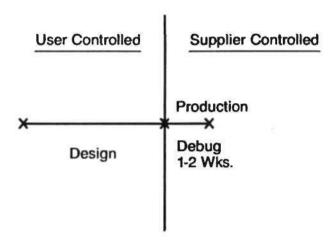
TIME TO MARKET (GATE ARRAY)

13 to 16 Weeks (Including Respin)



TIME TO MARKET (PLD)

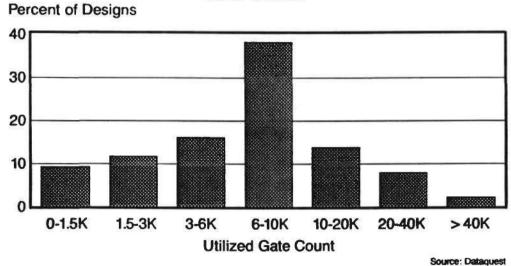
1 to 2 Weeks



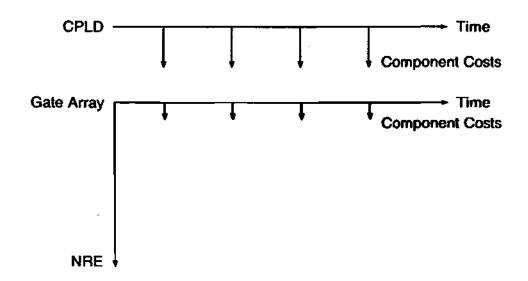
BR347016.MG 01/24/90.BAN

MOS GATE ARRAY DESIGN STARTS BY GATE COUNT

North America

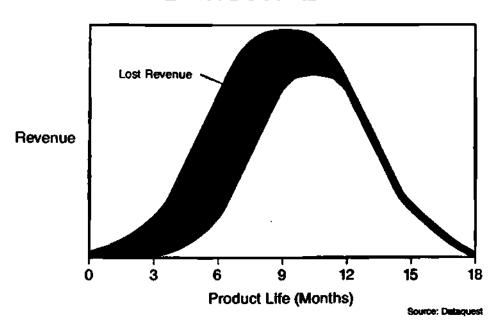


CPLD VS. GATE ARRAY



M347618.5MG 51/24/90 BAN

TOTAL PRODUCT REVENUE



THE PLD ADVANTAGE

Standard PLD

No fab cycle Instant prototypes Instant production Low density

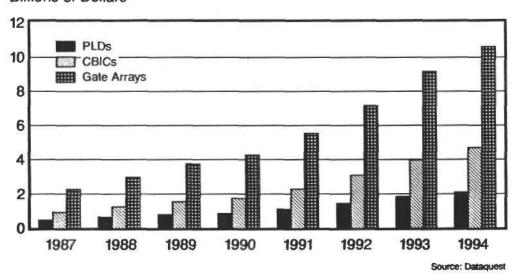
Complex PLD

No fab cycle Instant prototypes Instant production Medium density

88347020 MG 01/17/00 BAN

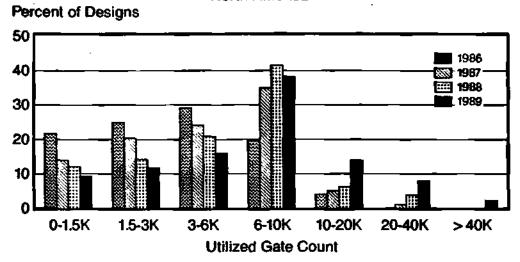
WORLDWIDE ASIC CONSUMPTION BY TECHNOLOGY

Billions of Dollars



MOS GATE ARRAY DESIGN STARTS BY GATE COUNT

North America

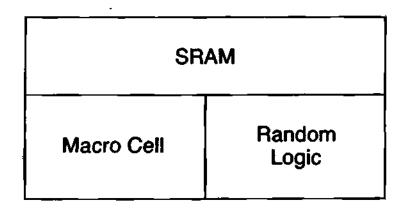


Source: Dataquest

38327822.845 3171790.84K

NEXT-GENERATION ASIC EXAMPLE

>10K Gates



SRAM DIE SIZE COMPARISON

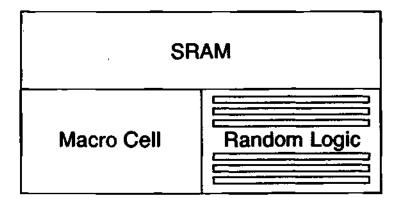
Gate-Based SRAM

Vs.

Cell-Based SRAM

\$45476gs,\$465 \$17778\$-\$444

CELL-BASED INTEGRATED CIRCUIT



EMBEDDED GATE ARRAY

| SRAM | | | |
|------------|--------------|--|--|
| Macro Cell | Random Logic | | |

85476203685 - 61/17/00-SAM

ASIC COMPARISON

Standard **Embedded Cell** Gate Array Gate Array Cell-Based IC Memory inefficient Memory efficient Memory efficient Smallest die Largest die Smaller die Highest cost Lowest cost Lower cost Speed = medium Speed = high Speed = medium-high

Source: Dataquest

ASIC COMPARISON

Standard Gate Array Embedded Cell Gate Array

Cell-Based IC

Quickest turn
Lowest risk
Lowest NRE
Many suppliers
Respin = 40% NRE

Gate array turn
Low risk
NRE = 1.25 x G.A.
Fewest suppliers
Respin = 40% NRE

Full-mask turn
Highest risk
NRE = 1.25 x G.A.
Few suppliers

Respin = 100% NRE

Source: Dataquest

ESITOTO BEE OUTTOO BALL

THE INNOVATORS

SUMMARY

What are your preferred suppliers' plans for:

- Complex PLDs (e.g., FPGAs)
- Embedded gate arrays

Dataquest

The Dun & Bradstreet Corporation



THE TREND TOWARDS MIXED ANALOG/DIGITAL ASICS

Gary J. Grandbois
Senior Industry Analyst
Semiconductor Industry Service
Dataquest Incorporated

Gary Grandbois is a Senior Industry Analyst for Dataquest's Semiconductor Industry Service (SIS). His responsibilities include market research and product, market, and industry analysis for analog and mixed signal products. Mr. Grandbois has had extensive experience in the semiconductor industry in both the application engineering and marketing areas. He has held positions as Applications Manager at Siliconix Inc., Product Marketing Manager at Precision Monolithics Inc., and Vice President of Marketing/Sales at Teledyne Semiconductor. Mr. Grandbois received B.S.E.E. and M.S.E.E. degrees from San Jose State University.

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February 12-13, 1990

28348025 AMG 01/12/90 SUA



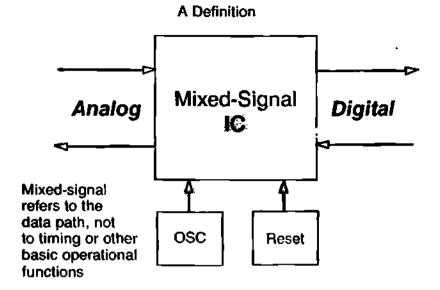
Buying and Selling Semiconductors: The Changing User-Supplier Relationship in the 1990s

THE TREND TOWARD MIXED ANALOG/DIGITAL ASICs

GARY I. GRANDBOIS

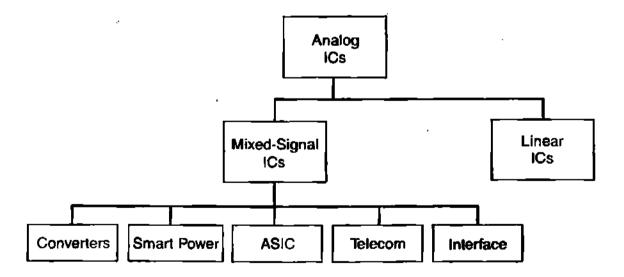
Senior Industry Analyst Semiconductor Industry Service Dataquest Incorporated

MIXED-SIGNAL ICs



88361002.84G 01/15/30 GRA

ANALOG IC CATEGORIES



MIXED-SIGNAL MARKET

Size: \$2.29 billion

Growth rate: 16.7%

 Mixed ASIC segment: \$235 million, 22% CAGR

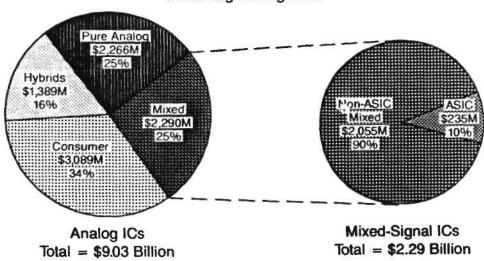
• Includes "smart" power ICs

Source: Dataquest

88361004 BMG 01/15/30 GRA

ANALOG ICs

Mixed-Signal Segment



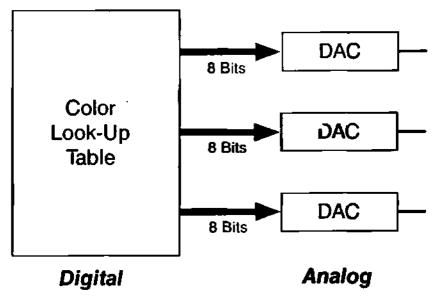
Source: Dataquest

WHY MIXED-MODE ICs?

- Reduce number of ICs
- Reduce interconnections
- Optimize operation
- Allow for application-specific subsystems

36361006 MG 01/15/30 GRA

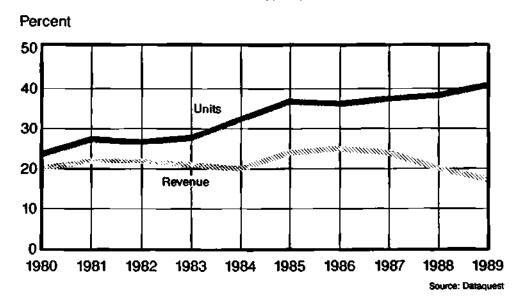
INTEGRATION MINIMIZES PINS



Source: Dataquest

ANALOG ICs

Percent of Total ICs Sold



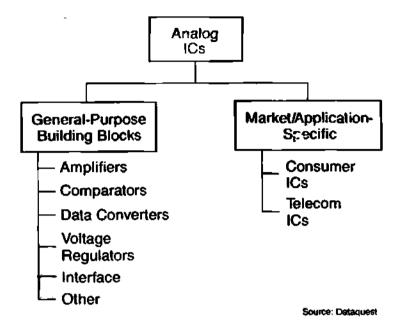
8351006 MG - 81/15/90 GRA

ANALOG INTEGRATION

Product Priority

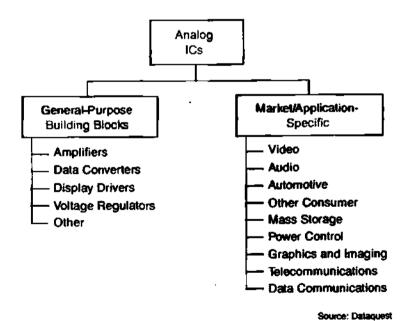
| <u>High</u> | Moderate | Low |
|--|---------------------------|-------------------------------------|
| Amplifiers PLLs Comparators References Analog switches Multiplexers Filters DC-DC converters | ADCs DACs Interface | Regulators Power amps Power drivers |
| | | 000.000 - 0000,000 |

ANALOG IC CATEGORIES -- 1989

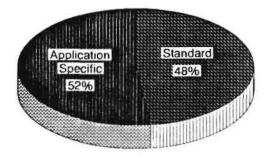


85307010.MG 01/10/30:GRA

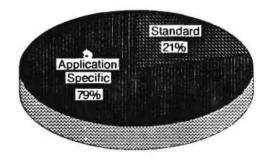
ANALOG IC CATEGORIES -- 1995



MARKETS WITH MANY APPLICATION-SPECIFIC ICs



Telecom IC Market



Consumer IC Market

Source: Dataquest

8361012 MG 01/18/90 GRA

APPLICATION-SPECIFIC, MIXED-MODE ICs

Effect on Users

- Reduced number of suppliers
- Reduced analog design requirements
- Reduced board complexity
- Increased reliability

MIXED-SIGNAL ASICs

The Convergence of Four Important Trends

- Application-specific products
- Increased analog integration
- Digital processing and storage
- Custom/semicustom designs for product differentiation

BSTOTA MG PUTS 90 GRA

APPLICATION-SPECIFIC, MIXED-SIGNAL IC TRADEOFFS

ASICs

| | Custom | Semicustom | ASSPs |
|--------------------|-----------------|------------|------------|
| Markets Served | All | Ali | Limited |
| Performance | Full range | Low | Full range |
| Differentiable | Yes | Yes | No |
| Development Costs | High | Moderate | None |
| IC Cost | Moferate to low | High | Low |
| Time to Market | Longest | Moderate | Lowest |
| Risks | Moderate | High | Low |
| Growth in the '90s | High | Moderate | High |

Source: Dataquest

MIXED-SIGNAL ASICs

Tradeoffs by Type

CBIC Custom Arrays Performance Moderate Minimum Maximum **User Tools** Simulate/specify Simulate/design Specify Risks Moderate **Highest** Low Growth in '90s Low Low High Market-focused CBICs and arrays needed in '90s

Source: Dataquest

AMERICA DE LA GRA

USER ISSUES

Mixed-Signal ASICs

- Vendor capabilities
- · User involvement in design
- Specification tools
- Testing and trust
- Single-sourcing
- Vendor/user relationship

SUPPLIERS IN THE '90s

The Age of the Specialist

- Application/market specialists
- Technology specialists
- Offer standard, semicustom, and custom ICs for specific applications
- Array functions and standard cells specialized for application
- Specific CAE/CAD tools for market/ application

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