European Semiconductor Industry Conference

May 29–31, 1991
Hotel Meliá Don Pepe
Marbella, Spain

Dataquest Europe Limited
Roussel House, Broadwater Park
Denham, Uxbridge, Middx UB9 5HP
England
0895-835050
Telex: 266195
Fax: 0895 835260

Sales/Service Offices:

UNITED STATES
Dataquest Incorporated
1290 Ridder Park Drive
San Jose, CA 95131-2398
USA
(408) 437-8000
Telex: 171973
Fax: (408) 437-0292

FRANCE
Dataquest Europe SA
Tour Galliéni 2
36, avenue du Général-de-Gaulle
93175 Bagnolet Cedex, France
(1) 48 97 31 00
Telex: 233 263
Fax: (1) 48 97 34 00

EASTERN US
Dataquest Boston
1740 Massachusetts Ave.
Boxborough, MA 01719-2209
USA
(508) 264-4373
Telex: 171973
Fax: (508) 635-0183

GERMANY
Dataquest GmbH
Kronstadter Strasse 9
8000 Munich 80
Germany
49 89 93 09 09 0
Fax: 49 89 930 3277

JAPAN
Dataquest Japan, Ltd.
Shinkawa Sanko Building
1-3-17 Shinkawa Chuo-ku
Tokyo 104 Japan
011-81-3-5566-0411
Fax: 011-81-3-5566-0425

KOREA
Dataquest Korea
Daeheung Bldg. 505
648-23 Yeoksam-dong
Kangnam-gu, Seoul 135 Korea
011-82-2-552-2332
Fax: 011-82-2-552-2661

SERVING THE SEMICONDUCTOR INDUSTRY

10 YEARS

Dataquest

Profit Through The Silicon Cycle: The Next Ten Years

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

1991 EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE

Profit Through the Silicon Cycle: The Next Ten Years

May 29–31, 1991
Hotel Meliá Don Pepe
Marbella, Spain

WEDNESDAY, May 29

1200 to 1400	**Registration**	*Salón Mediterráneo Foyer*
1400	**Welcome and Conference Introduction** Bipin Parmar Group Director and Conference Chairman European Semiconductor and Design Automation Group Dataquest Europe Limited	*Salón Mediterráneo*
1415	**Customer Satisfaction—Roadway to Profitability** H. Glen Haney President and CEO Dataquest Incorporated	*Salón Mediterráneo*
1445	**Ten Years of Serving the European Semiconductor Industry** Geoff Champion Corporate Vice President and General Manager Dataquest International	*Salón Mediterráneo*
1500	**Worldwide Semiconductor Market Overview: Profit Through the Silicon Cycle** Bipin Parmar Group Director, European Semiconductor and Design Automation Group Dataquest Europe Limited	*Salón Mediterráneo*
1540	**Coffee Break**	*Salón Mediterráneo Bar*
1600	**Successful Supplier Relationships and Enterprise Selling** Raiyo Shroff Senior Consultant Esprit Ltd.	*Salón Mediterráneo*
1630	**European Semiconductor Market Overview** Jim Eastlake/Mike Glennon/Byron Harding European Semiconductor Industry Service European Semiconductor and Design Automation Group Dataquest Europe Limited	*Salón Mediterráneo*
1715	**Video: "Spain's Premier Technology Park: Andalucía"** Felipe Romera Managing Director Andalucía Technology Park	*Salón Mediterráneo*
1730	Manuel Lazaro General Sub-Director of Information and Communication Technologies Ministry of Industry, Spanish Government	
1930	**Coaches depart from Meliá Don Pepe and Marbella Club hotels for Offsite Dinner at "La Consula"** **Cocktails and Dinner: Evening sponsored by the Andalucía Technology Park**	*Salón Mediterráneo Foyer*
2230	**Coach transportation to Meliá Don Pepe and Marbella Club hotels**	

(over)

THURSDAY, May 30

0845 **Introductory Remarks** . . . . . *Salón Mediterráneo*

0900 **Profiting from Emerging Applications** . . . . . *Salón Mediterráneo*
Jonathan Drazin
Manager, European Semiconductor Application Markets
European Semiconductor and Design Automation Group
Dataquest Europe Limited

0930 **Grasping ASSPs and Making Money** . . . . . *Salón Mediterráneo*
Douglas Dunn
Managing Director
GEC Plessey Semiconductors

1000 **Smart Cards** . . . . . *Salón Mediterráneo*
Marc Lassus
President, Chief Executive Officer
Gemplus Card International

1030 **Coffee Break** . . . . . *Salón Mediterráneo Bar*

1100 **Multimedia: Virtually a Reality Today** . . . . . *Salón Mediterráneo*
Dr. Andy Hopper
Director, Olivetti Research Ltd.
Olivetti

1130 **Multichip Modules: A Vehicle for Industry Integration** . . . . . *Salón Mediterráneo*
Dr. Michael F. Ehman
Director
Alcoa Electronic Packaging, Inc.

1200 **DISCUSSION SESSION: Success in Start-Ups** . . . . . *Salón Mediterráneo*
Zetex—Making the World of Difference
Bob Conway
Managing Director
Zetex plc
Semiconductor Start-Up Company Strategy for Profitability in the 1990s
David L. Angel
President
Information Storage Devices

1300 **Lunch** . . . . . *Main Restaurant*

1400 **Action Against Unfair Trade in Semiconductors by the European Community** . . . . . *Salón Mediterráneo*
Dr. Raimund Raith
Administrator
Commission of the European Communities

1430 **Procurement Trends in the '90s** . . . . . *Salón Mediterráneo*
Ewan Davidson
Purchasing Manager, Production Materials
Alcatel NV

1500 **Coffee Break** . . . . . *Salón Mediterráneo Bar*

1530 **PANEL SESSION I: Managing the Hidden Assets for Profit** . . . . . *Salón Mediterráneo*
(IPR, Technology, Training)
Chairman: *Ted Richardson*
Vice President and Director
Dataquest Europe Limited
Dave Manners
Editor
Electronics Weekly
Ray Reusser
Manager, Intellectual Property
AT&T
Hideharu Egawa
Senior Vice President and Director of the Board
Toshiba Corporation

(over)

Keith Chapple
European Corporate Marketing Manager
Intel
Jerry Sanders
Chairman and Chief Executive Officer
AMD

PANEL SESSION 2: Services: The Next Competitve Battleground .... *Salón Sierra Blanca*
Chairman: *Geoff Champion*
Corporate Vice President and General Manager
Dataquest Europe Limited
Hans Rohrer
Managing Director and Vice President
National Semiconductor Europe
Kazuo Kimbara
Executive Managing Director
Hitachi, Ltd.
Barry Waite
Corporate Vice President and General Manager
Motorola Inc.
Daniel Queyssac
Chief Operating Officer
SGS-Thomson
Robert A. Freischlag
President
Fujitsu Mikroelektronik GmbH

1730 **Panel Session Adjourns**

1930 **Cocktails** .... *Meliá Don Pepe, (Outside by Pool)*

2030 **Gala Dinner (Black Tie)** .... *Meliá Don Pepe, (Outside by Pool)*

FRIDAY, May 31

0845 **Introductory Remarks** .... *Salón Mediterráneo*

0900 **"Glocalization"** .... *Salón Mediterráneo*
Pat Weber
Executive Vice President, President Semiconductor Group
Texas Instruments

0930 **After the Monopoly: A New Era of Innovation** .... *Salón Mediterráneo*
Jerry Sanders
President and Chairman
Advanced Micro Devices

1000 **Changes in the Characteristics of the Japanese Semiconductor Market and User Needs** ..... *Salón Mediterráneo*
Tatsuo Tanaka
Senior Executive Vice President
INSEC

1030 **Coffee Break** .... *Salón Mediterráneo Bar*

1045 **New Products for Home and Office** .... *Salón Mediterráneo*
Dr. Peter Draheim
Director, Product Division Semiconductors
Philips International B.V.

1115 **Consistency, Predictability and Commitment—The Keys to Profitability** .... *Salón Mediterráneo*
John Gifford
President and CEO
Maxim Integrated Products, Inc.

1145 **Semiconductor Manufacturing Strategy and Capital Investment in the 1990s** .... *Salón Mediterráneo*
Kazuo Kimbara
Executive Managing Director
Hitachi, Ltd.

(over)

1215	**Lunch**	*Main Restaurant*
1300	**TBA** Steve Poole European General Manager Intel Corporation	*Salón Mediterráneo*
1330	**Costs and Risks in the Next Ten Years** Jürgen Knorr Senior Vice President and President of Semiconductor Group Siemens Corporation	*Salón Mediterráneo*
1400	**Semiconductor Strategic Alliances and Investment Trends in the '90s** Hideharu Egawa Senior Vice President and Director of the Board Toshiba Corporation	*Salón Mediterráneo*
1430	**The '90s: Progressing into the Marketing Phase of Microelectronics** Pasquale Pistorio President SGS-Thomson Microelectronics	*Salón Mediterráneo*
1500	**Closing Remarks**	*Salón Mediterráneo*
1530	**Conference Adjourns**	

FOR SPEAKER QUESTIONS

Name of speaker: ________________________________
Title of speech: ________________________________

If you have any questions, please write them down in the space provided below. A Dataquest representative will collect them at the end of the presentation.

No. 1: ________________________________

No. 2 ________________________________

Dataquest

a company of
The Dun & Bradstreet Corporation

EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE 1991
EVALUATION QUESTIONNAIRE

Marbella, Spain
May 29–31, 1991

Thank you for attending our European Semiconductor Industry Conference. Would you please assist us in planning our next conference by completing and returning this questionnaire.

1. Please rate each presentation on a scale of 1 to 10 (where 10 is highest in terms of your approval):

	CONTENT (1 to 10)	DELIVERY (1 to 10)	COMMENTS (Use reverse side if necessary)
Haney, Customer Satisfaction	______	______	______________________
Champion, Ten of Years Serving	______	______	______________________
Parmar, Worldwide Semiconductor Market	______	______	______________________
Shroff, Successful Supplier Relationships	______	______	______________________
European Semiconductor Market Overview:			
Eastlake	______	______	______________________
Glennon	______	______	______________________
Harding	______	______	______________________
Romera, Andalucía	______	______	______________________
Lazaro, TBA	______	______	______________________
Drazin, Profiting from Emerging Applications	______	______	______________________
Dunn, Grasping ASSPs and Making Money	______	______	______________________
Lassus, Smart Cards	______	______	______________________
Hopper, Multimedia: Virtually a Reality Today	______	______	______________________
Ehman, Multichip Modules: A Vehilce for Industry	______	______	______________________
DISCUSSION SESSION: Success in Start-Ups			
Conway, Zetex—Making the World of Difference	______	______	______________________
Angel, Semiconductor Start-Ups Company Strategy	______	______	______________________
Raith, Action Against Unfair Trade	______	______	______________________
Davidson, Procurement Trends in the '90s	______	______	______________________
PANEL SESSION 1:			
Managing the Hidden Assets for Profit			
Richardson	______	______	______________________
Manners	______	______	______________________
Reusser	______	______	______________________
Egawa	______	______	______________________
Chapple	______	______	______________________
Sanders	______	______	______________________

(over)

	CONTENT (1 to 10)	DELIVERY (1 to 10)	COMMENTS (Use reverse side if necessary)
PANEL SESSION 2:			
Services: The Next Competitive Battleground			
Champion	______	______	______
Rohrer	______	______	______
Kimbara	______	______	______
Waite	______	______	______
Queyssac	______	______	______
Freischlag	______	______	______
Weber, "Glocalization"	______	______	______
Sanders, After the Monopoly: A New Era	______	______	______
Tanaka, Changes in the Characteristics	______	______	______
Draheim, New Products for Home and Office	______	______	______
Gifford, Consistency, Predictability & Commitment	______	______	______
Kimbara, Semiconductor Manufacturing Strategy	______	______	______
Poole, TBA	______	______	______
Knorr, Costs and Risks in the Next Ten Years	______	______	______
Egawa, Semiconductor Strategic Alliances	______	______	______
Pistorio, The '90s: Progressing into Marketing	______	______	______

2. Overall meeting rating (1 to 10) ______
3. What did you like most about the conference? ______
4. In what areas do you think our conference could be improved? ______
5. At our next industry conference, would you prefer more ______ or fewer ______ Dataquest speakers?
6. Suggestions for the theme for next year's European Semiconductor Industry Conference: ______
7. Do you prefer the current three-day conference format? Yes ______ No ______
   Comments: ______
8. Would you prefer a full two-day conference (example: ALL day Thursday and Friday) a versus two-day conference agenda spread over three days? Yes ______ No ______
9. How would you rate the conference facilities (1 to 10)?
   Location ______ Guest Rooms ______ Meals ______ Meeting Rooms ______
10. How would you rate the Dataquest registration staff (1 to 10)?
    Courtesy ______ Efficiency ______
11. Comments: ______

Name and Company (optional) ______

Please hand this form to a member of Dataquest's staff.

X

X

X

First Day

Profit Through the Silicon Cycle: The Next Ten Years

WELCOME AND CONFERENCE INTRODUCTION

Bipin Parmar
Group Director
European Semiconductor and Design Automation Group
Dataquest Europe Limited

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

WELCOME AND CONFERENCE INTRODUCTION

Bipin Parmar
Group Director
European Semiconductor and
Design Automation Group
Dataquest Europe Limited

Mr. Parmar is Director of Dataquest's European Semiconductor and Design Automation Group (ESDA), based at Denham. He has more than 12 years of experience in the electronics industry. Prior to joining Dataquest, he was European Product Marketing Manager for ASICs at Fairchild Europe Semiconductor. Earlier, he was Strategic Product Planning Manager at Fairchild, responsible for launching the FACT advanced CMOS logic family and silicon system compiler technology. His previous marketing management experience was gained at General Instrument and General Electric Company plc in microcomputer and semi-custom/custom logic. Mr. Parmar also worked as Communications Systems Engineer at Marconi based in the Middle East and Far East. He graduated in Electronics and Communications Engineering from the University of Essex, England, and has attended various Business Administration courses at the Management Centre Europe in Brussels.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle:
The Next Ten Years

CUSTOMER SATISFACTION—ROADWAY TO PROFITABILITY

H. Glen Haney
President and CEO
Dataquest Incorporated

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

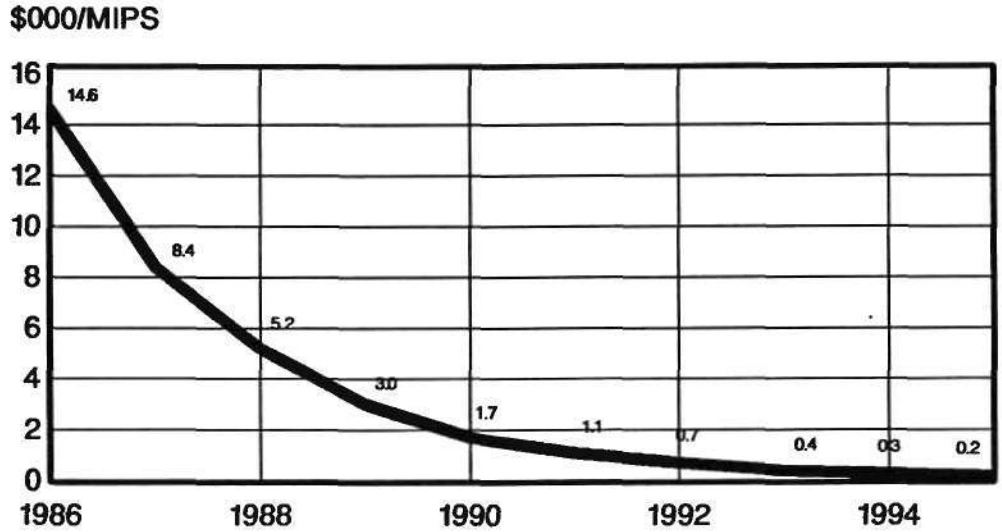
CUSTOMER SATISFACTION—ROADWAY TO PROFITABILITY

H. Glen Haney
President and CEO
Dataquest Incorporated

Mr. Haney is President and Chief Executive Officer of Dataquest Incorporated. He joined the company in 1989 and previously held the position of Executive Vice President, Sales and Marketing. Prior to joining Dataquest, Mr. Haney was President and CEO of Sterling Networks, a San Jose, California–based company that develops, manufactures, and markets a high-speed imaging network, workstation, and file server. He led the company through a start-up period of development, Asian manufacture of its product, and first customer delivery. Before Sterling Networks, Mr. Haney was President and CEO of Micropro International Corp. (now known as WordStar International Inc.), a manufacturer of word processing software. As head of Micropro, he managed the company's transition from a founder-directed private company to a public company. He began his career with Sperry Univac Corporation and served that company from 1956 to 1983. He led sales, marketing, development, and strategic planning organizations during a period of growth from $60 million to $2.5 billion. Mr. Haney earned a B.S. degree from Notre Dame University and an M.B.A. degree from Harvard University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

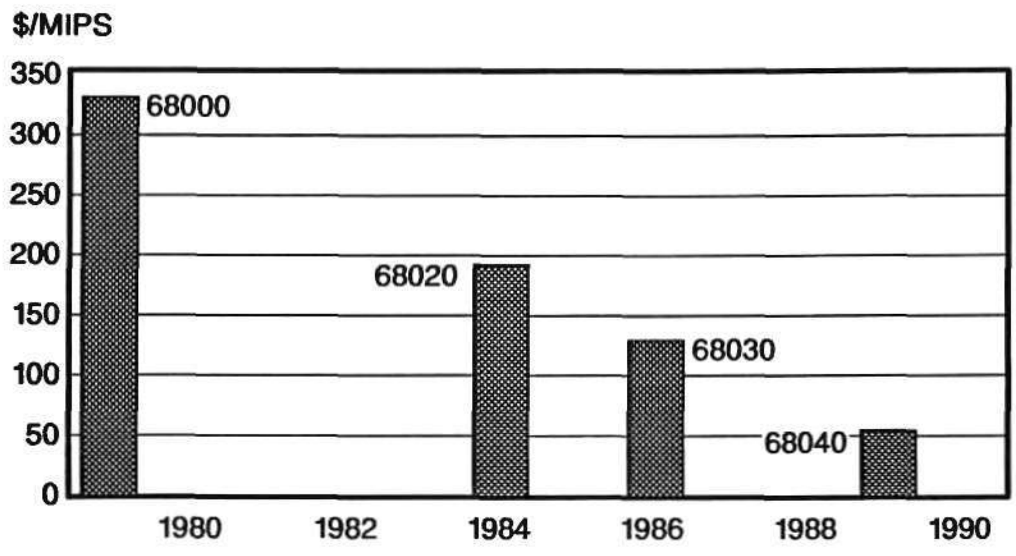
AVERAGE WORKSTATION PRICE/PERFORMANCE



Source: Dataquest

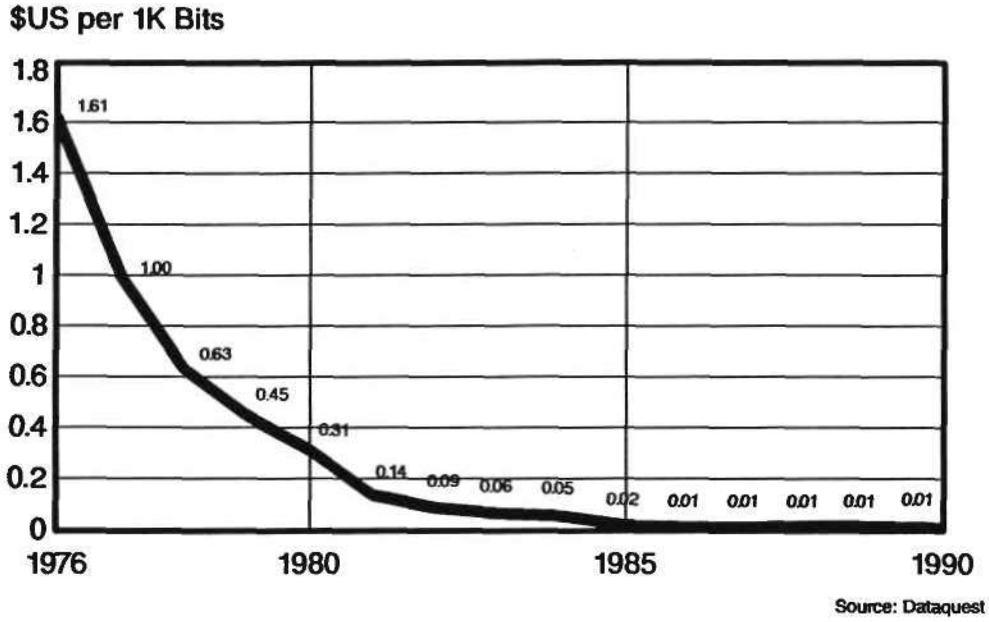
MICROPROCESSOR PRICE/PERFORMANCE

Motorola MPU at Introduction



Source: Dataquest

MEMORY PRICE -- DRAMs



- Price/performance: great curve
- Profits/margin: disaster curve
- Resolution: shift focus from lab to end user

"Your computer and communication customers' profit problems are also your problems"

"Engineering your way to profitability through product differentiation is unrealistic"

"Is your technical differentiation advantageous to your customers' end users?"

- Technology is a commodity
- Connectivity on the users' terms

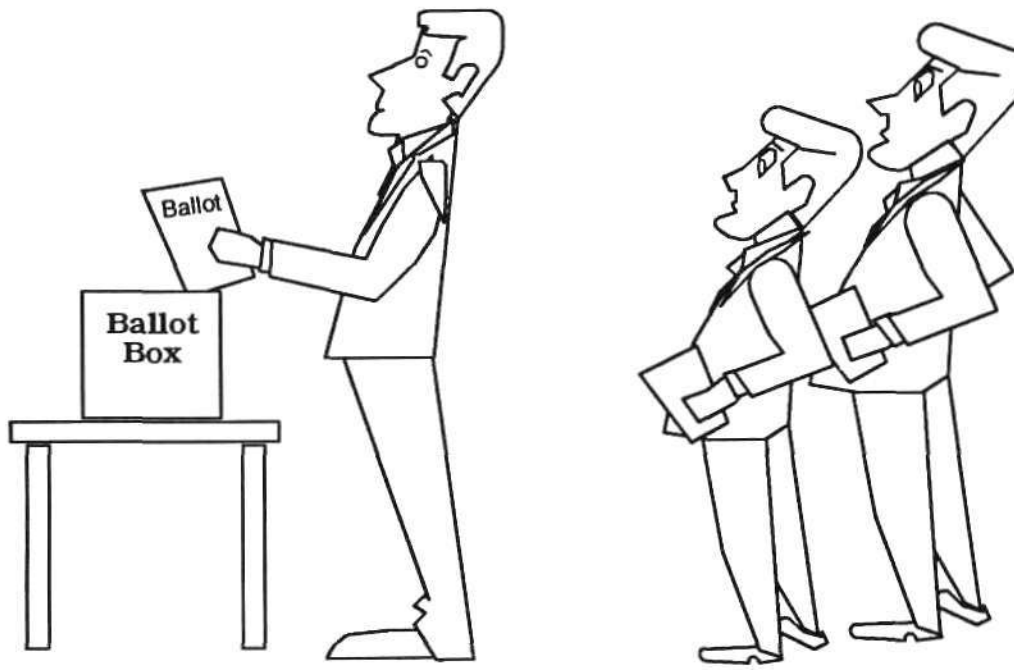
Quality

Customer Service

Customer Satisfaction

"Excellence means we are so in tune with our customers' needs, we not only read their requests, we can almost read their minds -- and never rest in our obsession to satisfy and delight them"

John F. Akers
Chairman of the Board
IBM Corporation



BORROW CONSUMER MARKETING TECHNIQUES

- Build database of user profiles
- Statistical sampling by:
  - Region
  - Platform
  - Distribution

"It's too expensive to lose a customer"

- Product and technology commoditization
- Price reduction
- Customer loyalty

1992 Dataquest Semiconductor Supplier-of-the-Year Award

SEMICONDUCTOR CONFERENCE
May 29-31, 1991
Marbella (Malaga), Spain
H. Glen Haney's Presentation

Good Morning! And may I add my welcome on behalf of Dataquest's home office.

I am honored that my first continental speech as President of Dataquest is to this--the most prestigious of Dataquest conferences. Among you sit the leaders of that part of the computer and communications industry that is itself a leader--the semiconductor industry. I shall be talking this morning about your relationships with your computer and communications customers and their customers.

When Dataquest was founded 20 years ago, one of our first services covered the semiconductor industry. In the intervening years, semiconductor logic and memory devices have become global both in terms of source as well as use. And today we see continuing, and frequently astonishing, advances made around the world without regard to political borders.

These logic and memory devices have also led the way, almost inexorably it seems, in developing an unbroken record of price performance improvements unmatched in any other industry in recorded business history.

Let me share with you three sets of numbers relative to MIPs, memory, and microprocessors that will illustrate my point. *(1)*In 1986, one MIP on a workstation cost, on average, $14,600. An average MIP in 1990 costs just over $1,000. *(2)*And, within the last month, Hewlett-Packard announced a 700 Series workstation at a MIP cost of $210.

*(3)*In memories, DRAM prices per 1K bit in 1976 was $1,600 which in 1990 has shrunk to 6 2/3 cents.

*(4)*In microprocessors, a 68000 MIP in 1979 cost $330, while in 1989 a MIP worth of power on a 68040 was approximately $50.00.

Those are stunning improvements in price performance. And yet, there is in that picture the kernel of a destructive force that is, in my view, symptomatic of a larger issue that is becoming more and more visible and with a greater and greater urgency for recognition and resolution. And that is the issue of profitability.

I shall spend the next several minutes discussing the flip side (the other side) of the price-performance picture which is one of declining margins and diminishing profitability. (5)This decline is the mirrored side of doing a great job in design, development, and production engineering. Finally, I shall share with you my assessment of the urgency to address margin declines and will conclude with a proposal to make a fundamental shift in product development focus from the laboratory to the user which, I believe, will improve profitability.

A few pieces of anecdotal evidence extracted from recent press clippings will be sufficient to affirm what you already know about shrinking margins within your largest and most important markets, i.e., computers and communications.

QUOTE:
H-P MARGINS DECLINE FROM 52% IN 1987 TO 47%. CAUSE; LOW MARGIN PRODUCTS LIKE PCs AND PRINTERS DISTRIBUTED THROUGH DEALERS.

COMPAGNIE BULL SEES $1B DEFICIT. CAUSE; UNABLE TO KEEP UP WITH RAPID CHANGES AND MARGIN DECLINES IN THE INDUSTRY.

PBX MAKERS SELLING AT A LOSS IN U.S. MARKET. CAUSES; URGENT REVENUE NEEDED TO OFFSET SWOLLEN R&D EXPENSES.

What these headlines do not show is that most of these profit problems are both profound and chronic. I would further argue that most cannot, and will not, be remedied by technological breakthroughs or startling new improvements in cost per MIP or cost per bit of storage.

(6)My assessment is that engineering your way to profitability through product differentiation is unrealistic. I believe such expectations at this stage of our evolution are based on false hopes. It is not an expectation on which you should "bet your company."

(7)While such differentiation may continue on occasion to allow a semiconductor house to surge ahead, it may or may not be an advantageous advancement for your customers and for your customers' end users. In the long term, it is clear that the health of your business is directly related to the health of your customers and theirs. I shall continue to refer to end users throughout this presentation for it is the end users' pull-through purchases that ultimately drives the computer and communications industries and through them, the semiconductor suppliers.

Of course the semiconductor suppliers' price performance improvements <u>have</u> contributed mightily to the growth of the computers and communications industry. The most remarkable fact being that in 1990 shipments of PCs alone exceeded 24M units!

Your success, however, in providing users with more and cheaper power, and more and cheaper memory has not been translated into comparable profit margin improvements for you and your direct customers.

Why?

*(8)*The growth of the computer industry from a small group of regional markets to a massive world market has contributed to the commoditization of basic technology building blocks and in turn the commoditization of thousands of hardware and software products. This evolutionary fact has caught many of your computer and communication customers by surprise. Surprising for a Fortune 1000 computer or communication giant to be faced with the same marketing and distribution problems as the makers of soap, of clothing! I think the reaction of surprise would be something like the following:

My company in a market where direct selling is not compulsory or even desired? My company in a market where reputation and image is often undermined by an unknown, upstart company almost overnight? How did I get here and how do I proceed so as to protect my investment, my market, and with profitability?

Now you may share the view that commoditization is a positive factor. But, I believe that if you want your products to find profitable world markets, you must be sensitive to the profit concerns commoditization is causing your world computer and communications customers.

I expect that someday we will see the products of computer and communications companies counted among what is today called the consumer electronics' industry.

What, then, does the computer and communications vendor, accustomed to serving industrial markets, do to survive and prosper in consumer markets?

I hope you won't be offended by my simple, low-tech, even mundane appraisal.

But my appraisal includes the following: The key differentiating attributes that winning vendors will build into their products in the future will spring from a new alliance between end users of your products and your engineers. This alliance must be real, enduring, and intimate. It must be blessed and nurtured from the Chief

Executive Officers of your companies. It will, in many companies, require a significant shift from depending on technology breakthroughs and price performance improvements, which assumes that that's what users want, to an attitude that accepts the need to commit long-term resources to find out from the users themselves what they like, what they expect, and what they will pay for.

In short, this envisions a fundamental shift from being driven by superior technology and engineering to being driven by a superior understanding of how satisfied your customers' customers are with the products and services you provide them. I am not proposing a lessening of your technology thrusts, but rather that your technology be supported and guided by accurate, continuous readings of customer satisfaction. I am also proposing that your long-term interests are best served by actively and creatively partnering with your OEMS and distributors to identify the needs of their end users.

In fact, I believe that sticking to the old engineering ways will lead to a sort of "fatal success," the state that some of the companies mentioned earlier are in. Typically when we plot how to compete, we count on engineering to provide the key differentiation. The validity of that mind-set is eroding rapidly.

Two emerging market shifts prompt a rethinking of placing responsibility for unique product differentiation on engineering. First, the competition catches up and leapfrogs our technology with distressing regularity and speed. (9)Technology itself has become a commodity and crosses political boundaries and the boundaries of engineering disciplines with increasing ease. Commodity pricing and margin erosion soon follows. Today, even proprietary products are subject to reverse engineering, cloning, and commoditization.

Second, the user demands connectivity. Connectivity on their terms. Unless you engineer your hardware and software with compatible interfaces to other related devices, your market potential shrinks. Knowing the precise measure of what connectivity is needed by your targeted customer set is a marketing, not an engineering, responsibility.

So basic is this shift, that using your own eyes and depending upon your own judgement may become your biggest competitive liability! You are challenged today to replace your own views of your product, your own vision of your markets,and your strategies with someone else's vision!

(10)To escape the commodity trap, many of us strive for quality and claim quality as a unique differentiation for our products. But through your substantial efforts of the past 10 years, this is now a "given" or standard feature. The result is that for the end user quality is no longer a distinguishing differentiation. (11)So, the term Customer Service is now used to denote a higher level of differentiation than quality.

(12)Today it is clear that both quality and customer service are part of a larger concept--and that is Customer Satisfaction. What makes the concept of Customer Satisfaction different? Most importantly it represents a shift in orientation from the vendor to the customer. Henceforth, success will come from reversing your perspective--no longer should it be you looking out at your customer, but you looking through your customers' eyes back at yourself. (13)IBM's John Akers put it this way at their recent stockholders meeting, "Excellence means we are so in tune with our customers' needs, we not only read their requests, we can almost read their minds -- and never rest in our obsession to satisfy and delight them."

Are quality and good service still important? Probably. But perhaps not. There is no way of knowing until you learn your specific customer's real expectations towards you.

Let me give you an example. To help you, our customers, gain new insight with your customers, we have recently begun to supplement supply-side market data, which we derive from vendors, with more and more demand-side data derived from your customers' end users. Our first such syndicated product called Score Reports for PCs was announced last quarter in which we query over 1,200 end users on a quarterly basis of 24 different PC vendors.

One of many interesting insights emanating from this type of report is that there is no universal template for satisfaction. We found, for example, in the area of service and support that Vendor A's customers expect their PCs to be repaired in an hour while Vendor B's users feel they've received equivalent attention if the service Tech arrives within 24 hours. It's a matter of perception and expectation. You can't even copy your most successful competitors.

The objective of customer satisfaction surveys such as this is to provide vendor-neutral surveys of users. Results are provided quarterly so manufacturers can track user satisfaction on the same topics over time.

Satisfaction surveys provide a base-line standard of user satisfaction for the industry. Individual companies can compare themselves to industry norms. Furthermore, companies can use the results of independent surveys as a check against their own proprietary surveys.

Armed with such knowledge, you will be able to differentiate your products in function, packaging, pricing, and channel availability to appeal uniquely to your targeted market niches.

If perpetual polling of your customers seems like a lot of trouble, well, it is. But so, in their day, were marketing, corporate communications, employee training, advertising, and a whole host of other operations the modern company now sees as a necessary part of doing business.

It is precisely at transition moments such as this when industries literally reshuffle their key players. At times like this when adaptive new firms gain industry leadership and established ones go out of the race. I think just such a moment has come, and success will go to those firms flexible enough to make the changes required.

What are some of those changes?

(15) Many consumer-oriented companies (which is where I think the computer and communications industries are headed) have spent years building profiles of customers to the point where today they are able to extract samples

from their data bases that are statistically representative of types of users, regions, users of specific channels of distribution, etc.

Some of you today use statistical tools and concepts to analyze product defects and track production quality. You can, and I believe you must, use similar techniques in marketing.

Begin to orient your marketing personnel towards an appreciation of the power of statistically-valid extrapolations of customer information from small to large universes. You will begin to hire statisticians and train them in the intricacies of your businesses. You will begin to team marketing, statisticians and engineers together to evaluate and analyze results from your own as well as surveys purchased from independent sources.

You will begin to determine which universities have the strongest syllabi in these areas of new interest, just as you have done for such a long time in engineering.

You will begin to form new links between yourselves, your computer and communications customers, and their end users to determine how best to differentiate your products so that what you provide is what they want and what they will pay a premium to get because they can get it only from you.

You will use this information to link strong, long-lasting bonds with your clients because the truth is you *(16)*can no longer afford to lose a customer. Increased competition and product commoditization has pushed the onset of profitability out to the third, fourth, or even fifth year of a new product family or architecture. That means most of your revenue and all of your <u>profits</u> must come from long-term and repeat customers.

All these factors combine to argue that from now on you must bind yourself closely with your customer base. That you must know everything salient about that customer's uses for your product.

Those, then, are today's emerging trends in our industry. *(17)*So now, if we accept as a fact the increasing commoditization and price reduction of our products, of the growing primacy of our customer relations, of the necessity of maintaining customer loyalty through enduring relationships -- if we accept all of these trends, and I believe we must -- then we must recognize that our industry is undergoing a fundamental shift from a supply to a demand orientation.

As we understand, accept, and master these shifts, I think the responsive/smart ones among us will rise to the top and begin to create beautiful profit margin improvement curves to match those beautiful price performance curves of which we are all so justly proud.

In conclusion, I would like to challenge you and your company to reap these profits by embracing the concept and commitment to customer satisfaction, a concept whose time has come. It will be a long and difficult journey, requiring vision and dedication, but I cannot envision a more qualified group of individuals to lead their companies in meeting this challenge.

*(18)*And, just as the longest journey begins with the first step, I would like to offer a modest first goal for you to aim for. For the last three years, Dataquest has sponsored a Semiconductor Supplier-of-the-Year Award. It crystallizes the recognition of semiconductor users for those semiconductor companies that provide world class excellence of delivery, price, quality, technical support, and customer service.

This year, the Award was changed from one U.S. award to three worldwide awards to reflect the global market of semiconductors and to acknowledge the excellence of large, medium, and niche suppliers. The winners in 1991 were Motorola, Analog Devices, and Maxim. Next year I would welcome the opportunity to include the name of your company among the winners.

Thank you for this opportunity to share my thoughts.

Profit Through the Silicon Cycle: The Next Ten Years

TEN YEARS OF SERVING THE EUROPEAN SEMICONDUCTOR INDUSTRY

Geoff Champion
Corporate Vice President
and General Manager
Dataquest International

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

TEN YEARS OF SERVING THE SEMICONDUCTOR INDUSTRY

Geoffrey M. Champion
Corporate Vice President
and General Manager
Dataquest International

Mr. Champion is the Corporate Vice President and General Manager for Dataquest's International Division. He is based at Dataquest's European headquarters at Denham, England, and is responsible for managing and developing Dataquest's markets outside the United States. Previously, he was responsible for Dataquest's three subsidiary companies in France, the United Kingdom and Germany. Before joining Dataquest Mr. Champion was Director of various operations in the Netherlands, London, Frankfurt, New York and Denver with McDonnell Douglas Information Systems. Mr. Champion received a B.Sc. degree in Engineering from the United States Military Academy at West Point in New York.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

This presentation was not available

at the time of publication

Dataquest

a company of The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle:
The Next Ten Years

WORLDWIDE SEMICONDUCTOR MARKET OVERVIEW: PROFIT THROUGH THE SILICON CYCLE

Bipin Parmar
Group Director
European Semiconductor and Design Automation Group
Dataquest Europe Limited

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

This presentation was not available

at the time of publication

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

SUCCESSFUL SUPPLIER RELATIONSHIPS AND ENTERPRISE SELLING

Raiyo Shroff
Senior Consultant
Esprit Ltd.

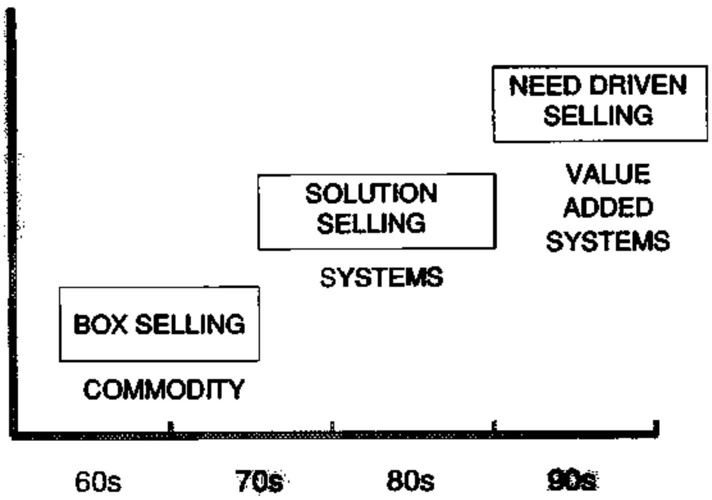
Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

SUCCESSFUL SUPPLIER RELATIONSHIPS AND ENTERPRISE SELLING

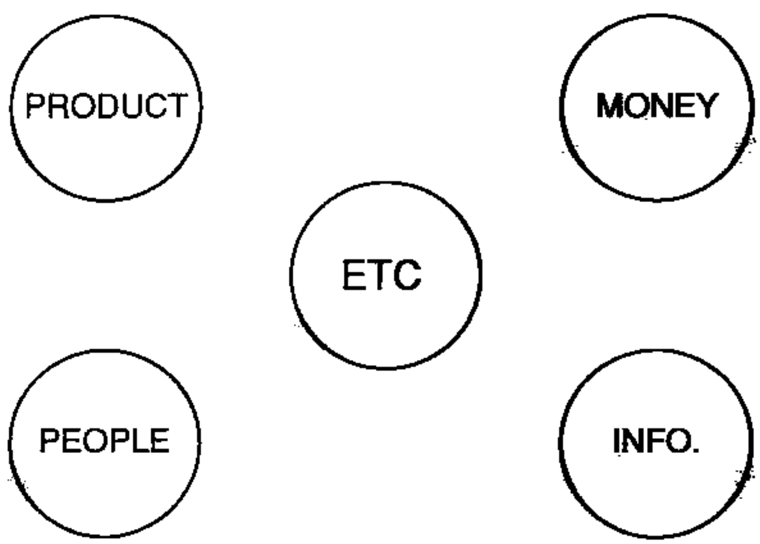
Raiyo Shroff
Senior Consultant
Esprit Ltd.

Mr. Shroff has been a Senior Consultant with Esprit Ltd since 1987. He has responsibility for the development and delivery of programs to implement performance improvement and change in the IT industry. Previously he was General Manager of Informatics UK, with responsibility for fourth-generation languages and enquiry tools. Mr. Shroff started his commercial career in advertising, and after 5 years moved to IBM. During his 12 years in IBM he was responsible for sales and account management in the finance industry. He also spent several years in internal training and executive education. He left IBM to help set up National Semiconductor's mainframe marketing company in the United Kingdom. Mr. Shroff left National Semiconductor in 1980 to set up a consultancy to help with the installation of microcomputers for both manufacturing and management purposes. He also established a company to design and market a British micro: these plans were shelved on IBM's launch of the PC. Mr. Shroff has a Law degree from Oxford.

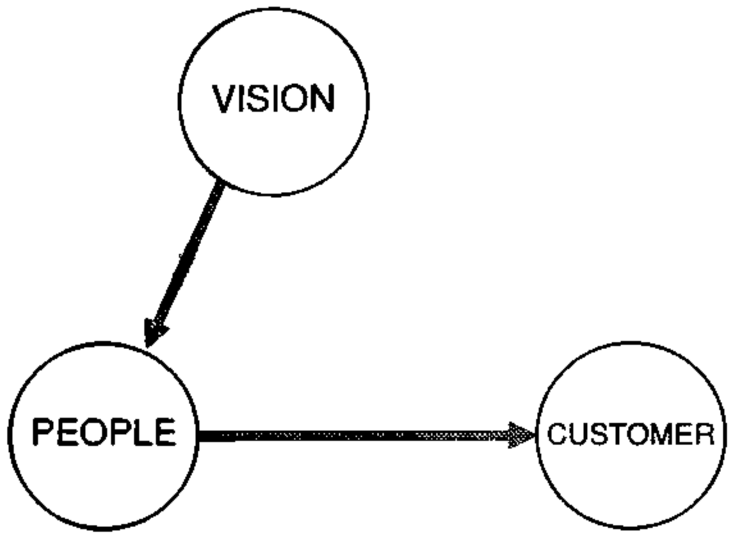
Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain


NEED DRIVEN SELLING
VALUE ADDED SYSTEMS
SOLUTION SELLING
SYSTEMS
BOX SELLING
COMMODITY
60s
70s
80s
90s

RESOURCES ?


PRODUCT
MONEY
ETC
PEOPLE
INFO.

RESOURCES



CHALLENGE

CREATE THE
CHANGE IN PERFORMANCE
TO
IMPLEMENT
THE
VISION

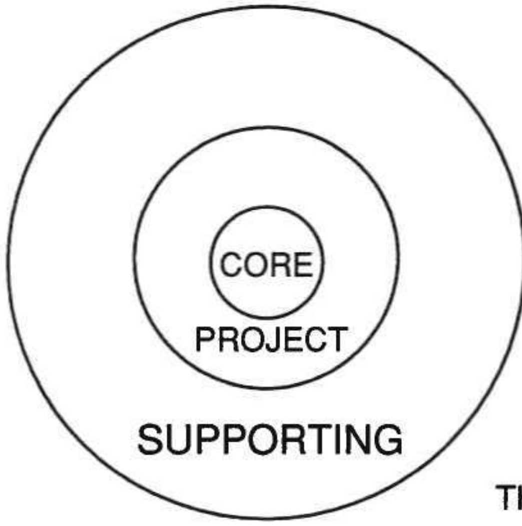
1. THE MAJOR CHANGE TO
   MEET THE MARKET

2. MAKING CHANGE
   HAPPEN

NO MORE BATMAN

THE CHANGE

USE THE PEOPLE
USE THE TEAM

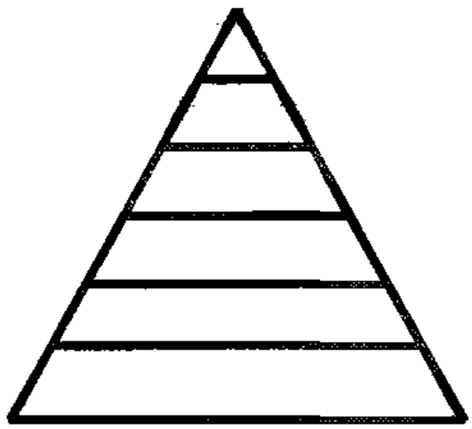


THE CHANGE

IMPLEMENT
BEHAVIOURAL
CHANGE
ACROSS
THE
COMPANY

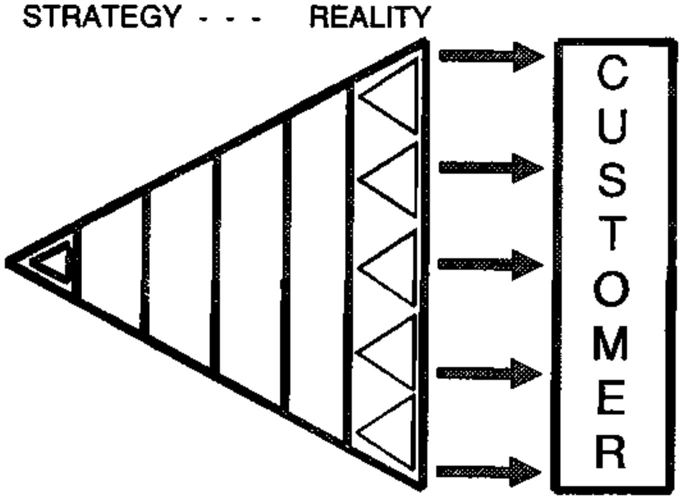
THE CHANGE

MANAGEMENT TRIANGLE



COMMUNICATE THE CHANGE?

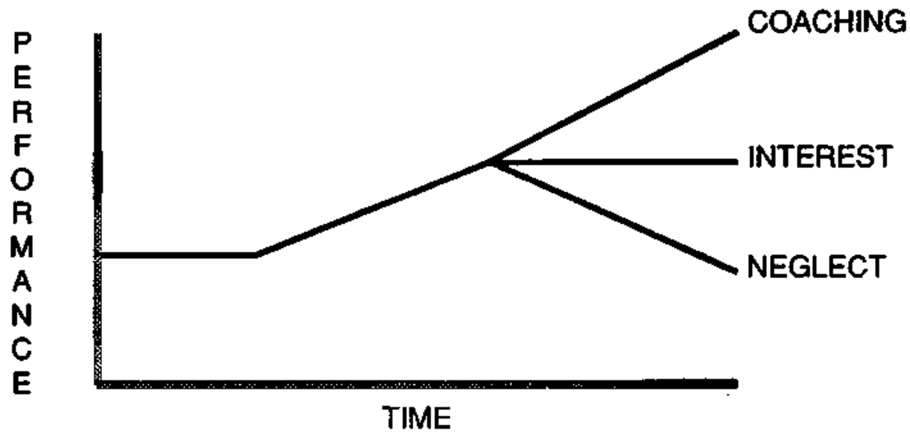
STRATEGY - - - REALITY



VISION - - - - ACTION

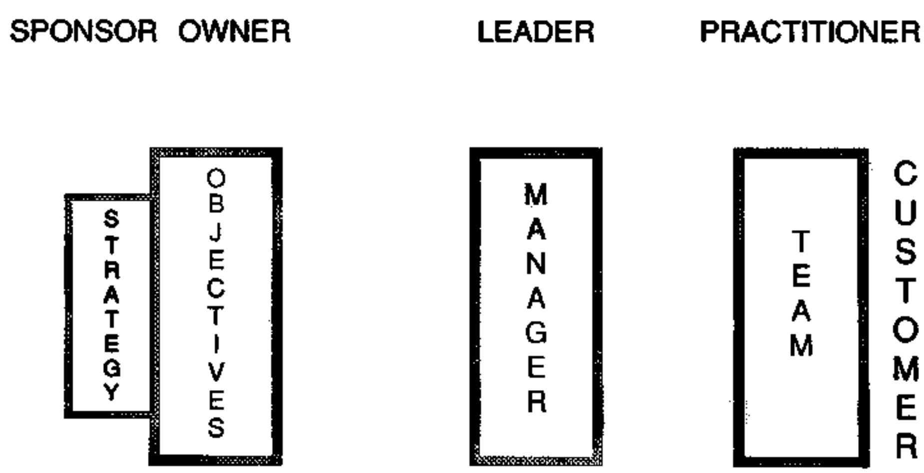
MAKING IT HAPPEN

TRAIN THE CHANGE?



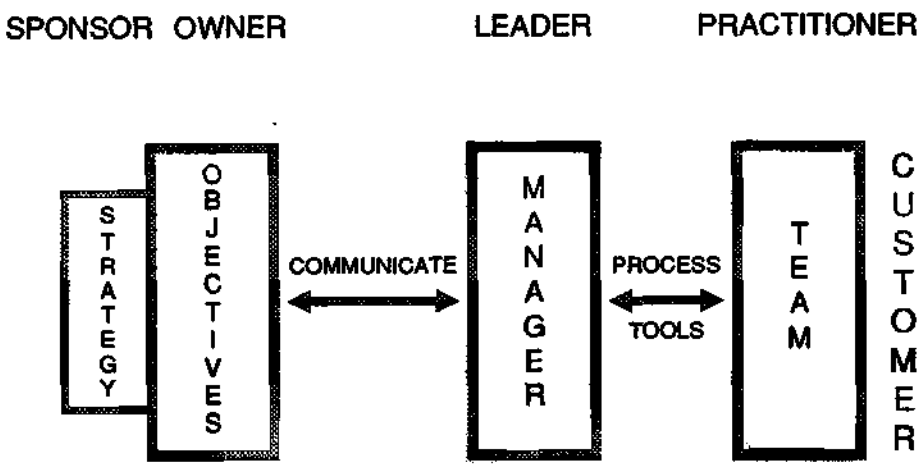
MAKING IT HAPPEN

GET OWNERSHIP OF CHANGE



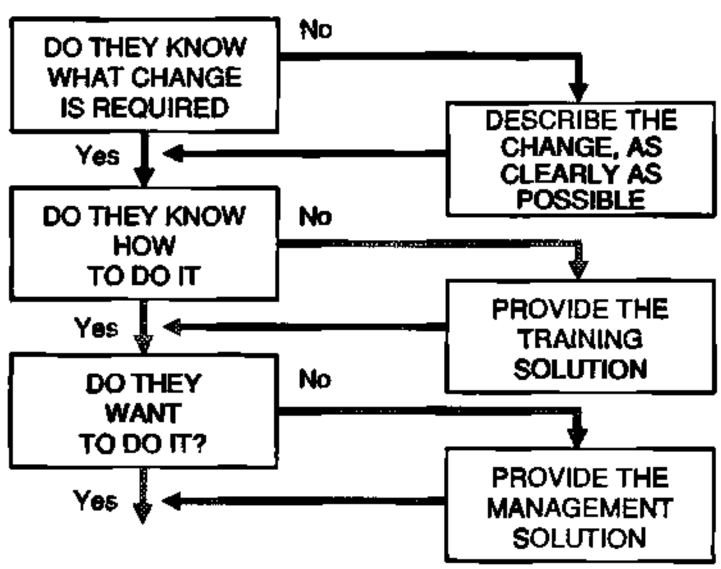
MAKING IT HAPPEN

GET OWNERSHIP OF CHANGE



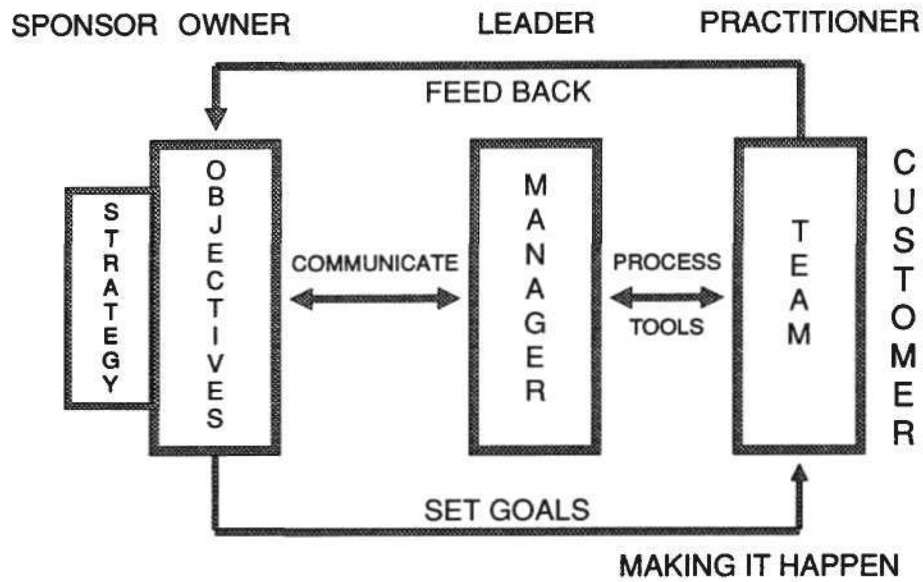
MAKING IT HAPPEN

COMMUNICATE THE CHANGE

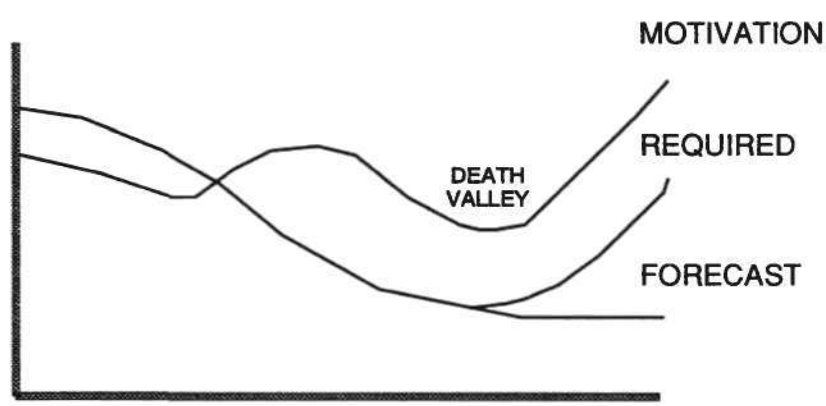


MAKING IT HAPPEN

GET OWNERSHIP OF CHANGE



MANAGE IT RELENTLESSLY



Profit Through the Silicon Cycle:
The Next Ten Years

EUROPEAN SEMICONDUCTOR MARKET OVERVIEW

Jim Eastlake
Mike Glennon
Byron Harding

European Semiconductor and Design Automation Group
Dataquest Europe Limited

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

EUROPEAN SEMICONDUCTOR MARKET OVERVIEW

Jim Eastlake
Senior Industry Analyst
European Semiconductor and
Design Automation Group
Dataquest Europe Limited

Mr. Eastlake is a Senior Industry Analyst for Dataquest's European Semiconductor and Design Automation Group (ESDA), based at Denham. He has more than 10 years of experience in the electronics industry. Prior to joining Dataquest, Mr. Eastlake was with Texas Instruments' Northern European Semiconductor Division. In his most recent position 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 from the University of Newcastle-on-Tyne, with an honors degree in Physics.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

EUROPEAN SEMICONDUCTOR MARKET OVERVIEW

Michael Glennon
Senior Industry Analyst
European Semiconductor and
Design Automation Group
Dataquest Europe Limited

Mr. Glennon is a Senior Industry Analyst for Dataquest's European Semiconductor and Design Automation Group (ESDA), based at Denham. He has 11 years of experience in the electronics industry. Prior to joining Dataquest, Mr. Glennon was with European Silicon Structures where he was North Europe Marketing Manager, responsible for ASICs and ASIC design software. Before this he was with Fairchild Europe Semiconductor, responsible for support for the advanced silicon computer design tool. Mr. Glennon's design experience was attained while developing Fairchild's advanced CMOS logic familiy and also in the development of its VLSI system design tool. Earlier, he worked as an IC designer at Marconi Electronic Devices. Mr. Glennon graduated from the University of London with an honors degree in Electronic Engineering.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

EUROPEAN SEMICONDUCTOR MARKET OVERVIEW

Byron Harding
Research Analyst
European Semiconductor and
Design Automation Group
Dataquest Europe Limited

Mr. Harding is a Research Analyst for Dataquest's European Semiconductor and Design Automation Group (ESDA), based at Denham. He is responsible for research into the European MOS memory market and semiconductor pricing trends for the DQ Monday report. Prior to joining Dataquest, Mr. Harding worked at the Royal Observatory, Edinburgh and more recently, worked in computer marketing. Mr. Harding received a B.Sc. degree in Mathematics and Physics from the University of Newcastle upon Tyne, England.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

AGENDA

- The European Semiconductor Market
- European MOS Memory Update
- European ASIC Issues
- European Microcomponent Status

AGENDA

- The European Long Range Forecast
- Europe's National Markets
- Behind the Silicon Cycle
- Product Breakdown

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

WORLDWIDE SEMICONDUCTOR FORECAST BY WORLD REGION

Region		1990	1991	91/90 AGR	1995	95/90 CAGR
North America	$M	17,386	18,761	7.9%	28,001	10.0%
Japan	$M	22,508	26,354	17.1%	40,762	12.6%
	ØB	3,241	3,529	8.3%	5,458	11.0%
Europe	$M	10,661	12,274	15.1%	20,764	14.3%
	ECU M	8,383	9,206	9.8%	15,573	13.2%
ROW	$M	7,670	8,834	15.2%	16,004	15.8%
Worldwide $M		58,225	66,223	13.7	105,531	12.6
Worldwide $M (At constant *exchange rate*)		58,225	63,818	9.6	101,574	11.8

Source: Dataquest May 1991

EUROPEAN SEMICONDUCTOR MARKET CONSUMPTION FORECAST

(Millions of ECUs)

Country	1990	1991	AGR 91/90	1995	CAGR 95/90
Total Europe	8,383	9,206	9.8%	15,573	13.2%
Benelux	440	466	6.0%	670	8.8%
France	1,204	1,266	5.1%	2,009	10.8%
Italy	927	997	7.6%	1,780	13.9%
Scandinavia	543	565	4.0%	830	8.8%
United Kingdom & Ireland	2,147	2,372	10.5%	4,358	15.2%
Germany	2,419	2,725	12.6%	4,359	12.5%
Rest of Europe	703	815	15.9%	1,567	17.4%

Source: Dataquest May 1991

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

EUROPEAN REGIONAL ANALYSIS

GERMANY

Applications Split 1990
(Millions of Deutsche Mark)

	EDP	Com.	Ind.	Con.	Mil.	Trn.	Total
Value (DM)	1,296	1,097	947	1,096	50	498	4,984
Percent (%)	26%	22%	19%	22%	1%	10%	100%

- Strongest and largest market in 1990 and 1991
- Reunification will impact medium-term economic growth
- Growth below European average over next five years

Source : Dataquest May 1991

ECONOMIC OUTLOOK

Output (Real GDP) Annual Percent Change

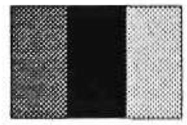
	1990	1991	1992
West Germany	4.5%	2.8%	1.9%
United Kingdom	0.6%	-2.1%	1.9%
USA	1.0%	0.2%	2.7%
Japan	5.6%	3.6%	3.9%
East Europe & Soviet Union	-3.8%	-4.1%	-2.2%
Worldwide	2.1%	1.2%	2.9%

Source : Financial Times/
IMF World Economic Outlook (April 1991)

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

EUROPEAN REGIONAL ANALYSIS

UNITED KINGDOM AND EIRE



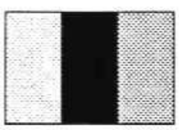
Applications Split 1990
(Millions of UK Pounds)

	EDP	Com.	Ind.	Con.	Mil.	Trn.	Total
Value (£)	551	291	306	229	76	76	1,529
Percent (%)	36%	19%	20%	15%	5%	5%	100%

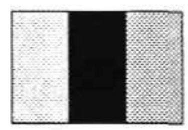
- Impacted by weak economy and decline in memory prices
- Increased presence of Japanese equipment manufacturers
- Growth above European average over next five years

Source : Dataquest May 1991

EUROPEAN REGIONAL ANALYSIS



FRANCE



Applications Split 1990
(Millions of French Francs)

	EDP	Com.	Ind.	Con.	Mil.	Trn.	Total
Value (FF)	1,832	1,916	1,666	1,166	1,083	667	8,330
Percent (%)	22%	23%	20%	14%	13%	8%	100%

- Market lacks base of fastest-growth applications
- Substantial military segment in recession
- Attracted little foreign investment in manufacturing

Source : Dataquest May 1991

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

EUROPEAN REGIONAL ANALYSIS

ITALY

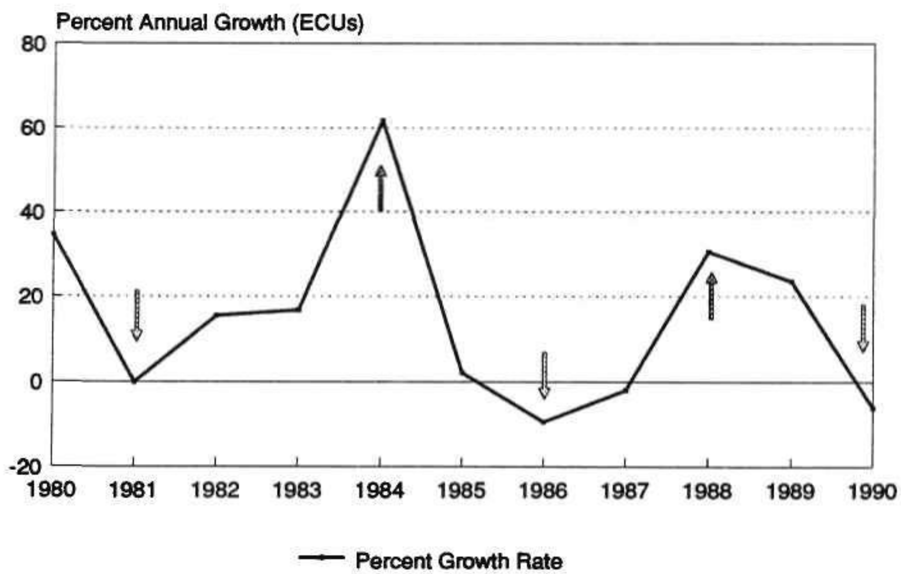
Applications Split 1990
(Billions of Italian Lira)

	EDP	Com.	Ind.	Con.	Mil.	Trn.	Total
Value (L)	523	282	268	169	56	113	1,411
Percent (%)	37%	20%	19%	12%	4%	8%	100%

- Overall market reflects trends at Olivetti
- Italy likely to attract increased foreign investment
- Strong EDP segment will ensure above average growth

Source : Dataquest May 1991

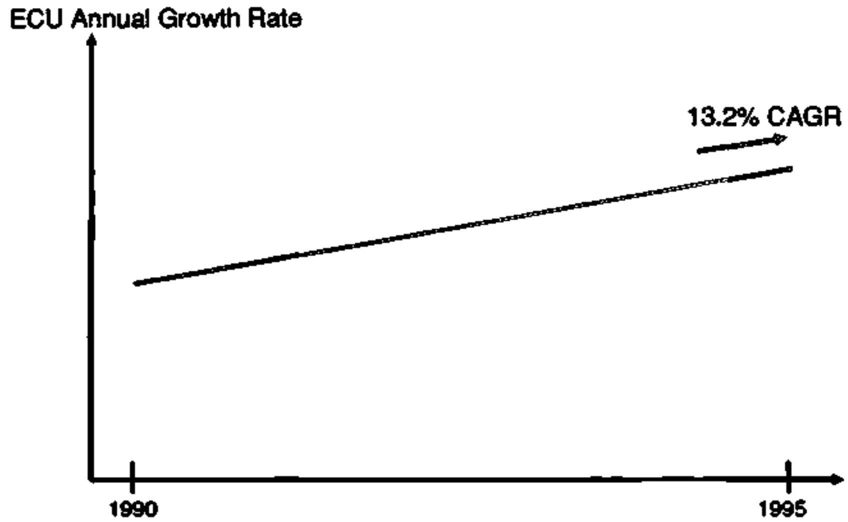
European Semiconductor Market



Source: Dataquest

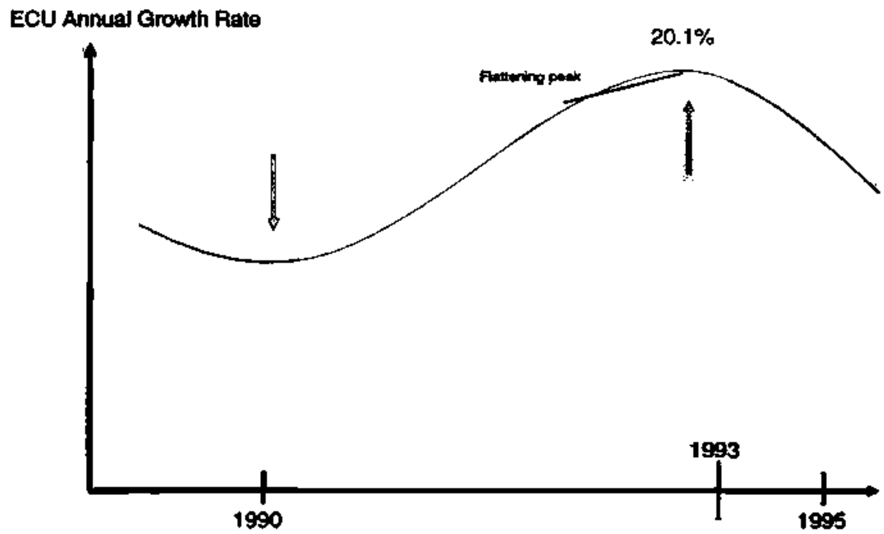
Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

European Semiconductor Market
Base Demand



Source: Dataquest May 1991

European Semiconductor Market
The Next Peak



Source: Dataquest May 1991

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

EUROPEAN SEMICONDUCTOR MARKET CONSUMPTION FORECAST

(Millions of ECUs)

	1990	1991	AGR	1995	CAGR
Total Semiconductor	8,383	9,206	9.8%	15,573	13.2%
Total IC	6,547	7,226	10.4%	12,854	14.4%
Bipolar Digital	454	428	-5.6%	302	-7.8%
Memory	46	43	-6.3%	24	-12.0%
Logic	408	386	-5.5%	278	-7.4%
MOS Digital	4,248	4,847	14.1%	9,568	17.6%
Memory	1,694	1,928	13.8%	3,855	17.9%
Microcomponent	1,444	1,669	15.6%	3,635	20.3%
Logic	1,111	1,250	12.5%	2,078	13.3%
Analog	1,845	1,951	5.8%	2,984	10.1%
Discrete	1,506	1,634	8.5%	2,236	8.2%
Optoelectronic	330	347	4.9	484	7.9

Source: Dataquest
May 1991

AGENDA

- The European Semiconductor Market
- European MOS Memory Update
- European ASIC Issues
- European Microcomponent Status

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

AGENDA

- Memory Market Analysis
- Memory Vendor Analysis
- Key Product Issues
- Summary

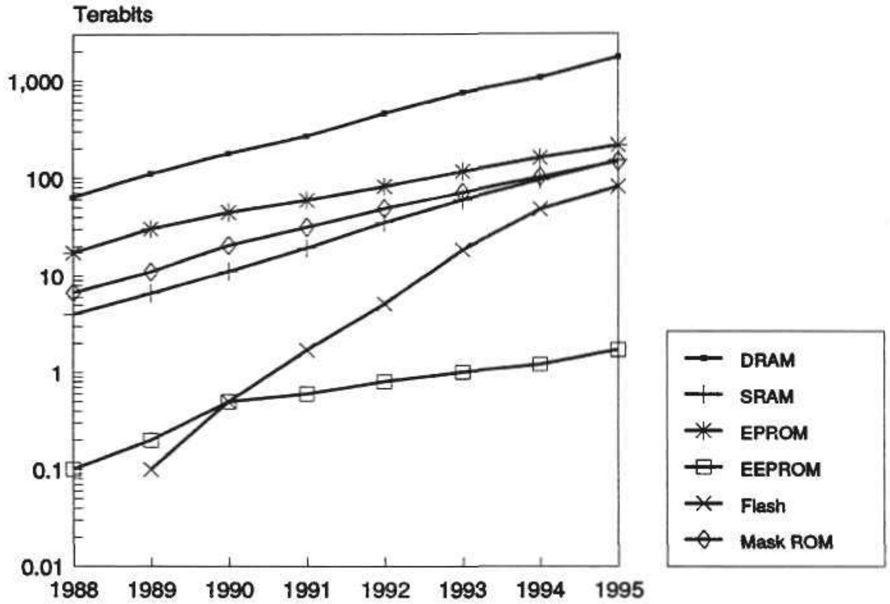
EUROPEAN MOS MEMORY MARKET

BIT GROWTH FORECAST 1990-1995

- DRAM bit growth steady at 60 percent
- SRAM bit growth steady at 70 percent
- EPROM, EEPROM, and Mask ROM bit growth slowdown after 1990 to below 50 percent
- Flash memory taking up old and new sockets with a projected bit growth of 170 percent

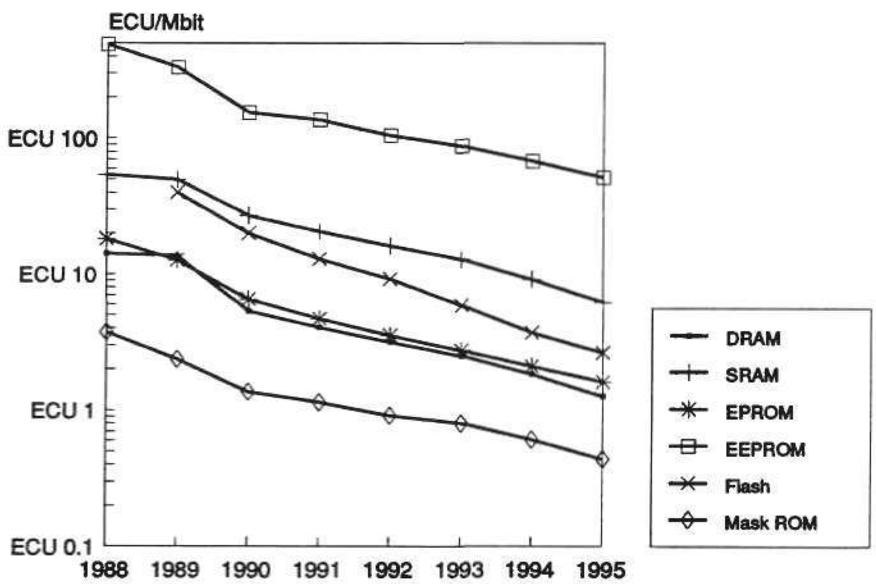
Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

European MOS Memory Consumption



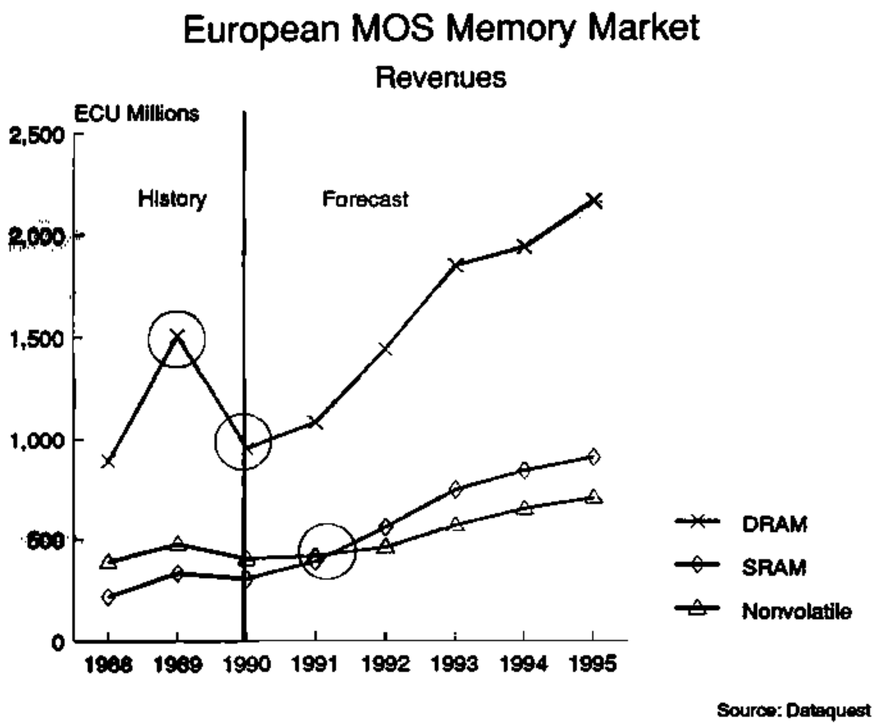
Source: Dataquest

European MOS Memory Cost/Mbit
(Average Across All Densities)



Source: Dataquest

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260



EUROPEAN MOS MEMORY MARKET

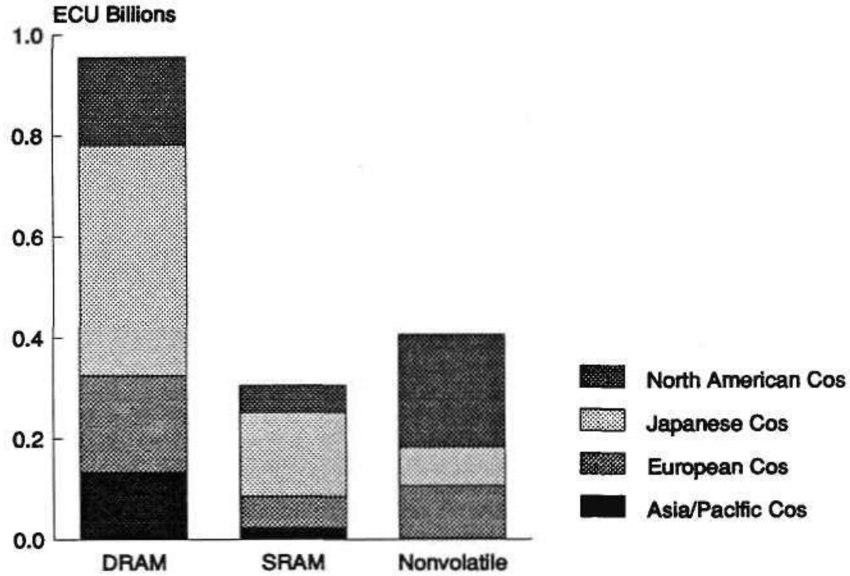
Nonvolatile Memory at the Crossroads

- No EPROM development beyond 16M
- No EEPROM development beyond 4M
- Flash memory
  - Market takes off at 8M density
  - Intel standard dominant
  - Reference prices for Japan

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

European MOS Memory Market

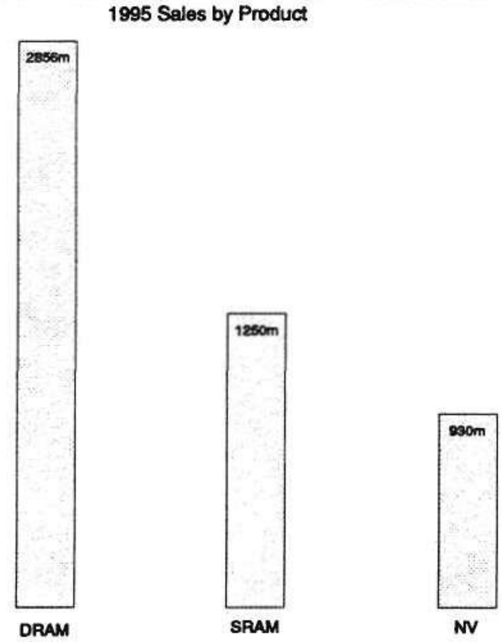
1990 Sales by Company Base



Source: Dataquest

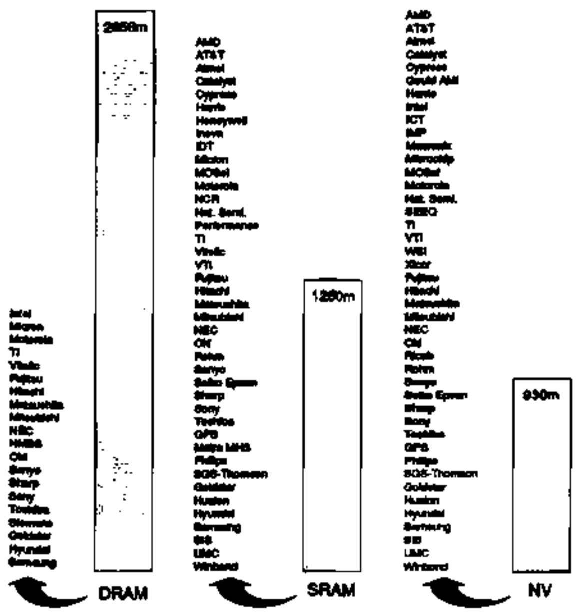
EUROPEAN MOS MEMORY MARKET

1995 Sales by Product



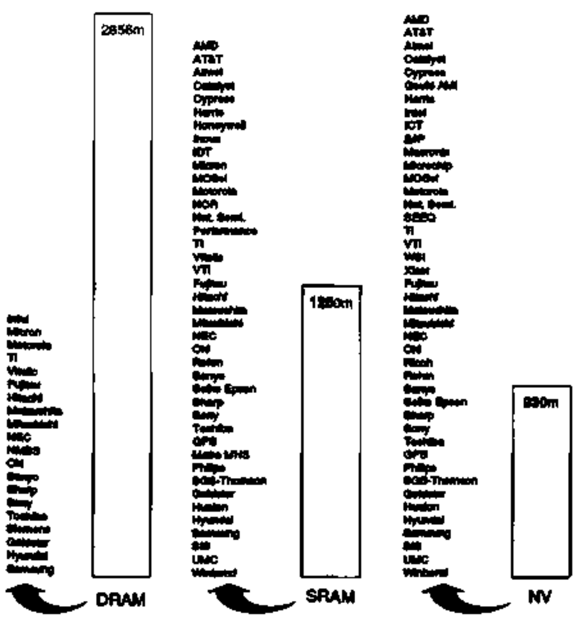
EUROPEAN MOS MEMORY MARKET

1995 Sales by Product



EUROPEAN MOS MEMORY MARKET

1995 Sales by Product



Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

DRAM REFERENCE PRICE AGREEMENT

- In operation since January 26 1990
- Japanese companies supplied 47.1 percent of all DRAMs in Europe in 1990
- Market prices of 1M and 4M jump between each quarter
- Japanese suppliers use RP as a floor price; others use the RP as a ceiling price
- 1M RP expected to continue to rise; 4M RP expected to start to drop

ESTIMATED EUROPEAN 4M DRAM PRODUCTION

(Millions of Units)

4M DRAM	1990	1991	1992	1993	1994	1995
Fujitsu		0.2	5.0	15.0	22.0	25.0
Hitachi			5.0	18.0	25.0	25.0
Mitsubishi			5.0	15.0	25.0	25.0
NEC		0.8	8.0	15.0	22.0	25.0
Siemens	0.2	7.0	15.0	20.0	25.0	25.0
TI		0.1	8.0	15.0	20.0	25.0
Production	0.2	8.1	47.0	98.0	139.0	150.0
Demand	2.3	17.2	67.0	133.0	180.0	205.0
Production/Demand	9.1%	47.1%	70.1%	73.7%	77.2%	73.2%

Source: Dataquest

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

SUMMARY

- Price/bit erosion slowdown
  - profit fed back into R&D
- Product diversification
  - servicing the customers' needs
- New production capacity
  - trade controls impotent
- New applications
  - portable = Consumer = high volume

AGENDA

- The European Semiconductor Market
- European MOS Memory Update
- European ASIC Issues
- European Microcomponent Status

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

Agenda

- The European ASIC Market

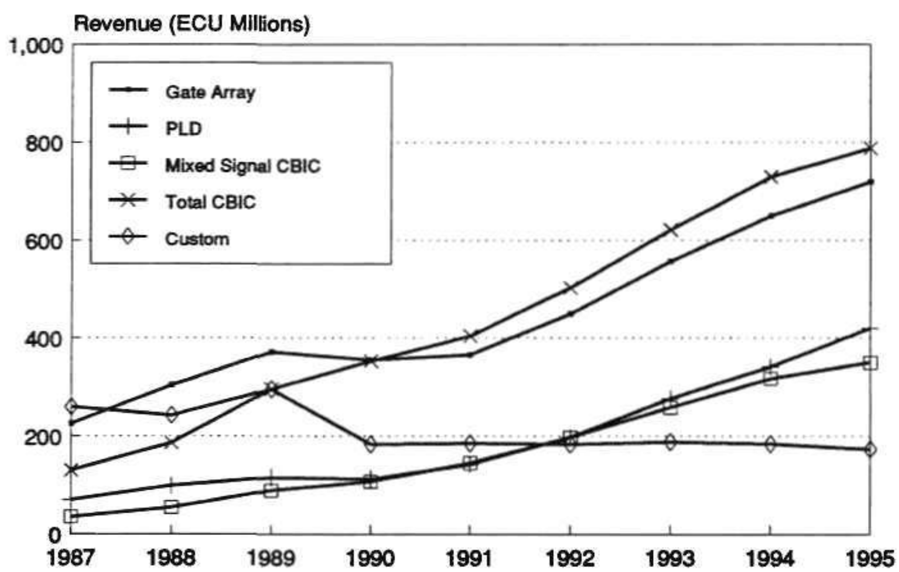
  - Mixed Signal ASICs
  - Requirements for Success in ASIC

- The European Microcomponent Market

  - the last 10 years
  - the next 10 years

- Summary

European ASIC Market



Source: Dataquest
May 1991

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

TOP TELECOM MANUFACTURERS WORLDWIDE

(Billions of ECUs)

1989 Rank	Name	1989 Revenue
1	AT&T	11.79
2	Alcatel	11.09
3	Siemens	6.72
4	Northern Telecom	5.59
5	NEC	5.32
6	Ericsson	4.74
7	Motorola	3.71
8	Fujitsu	2.49
9	Bosch	1.55
10	GPT	1.71

Source: Dataquest May 1991

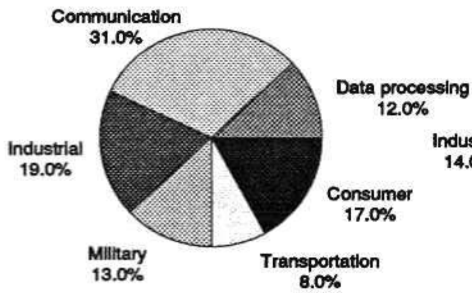
Mixed Signal ASICs

- Europe is the world leader in Telecoms manufacturing
- Telecoms needs high-performance mixed digital and analog functions
- Mixed signal ASICs need CBICs to meet the performance needs of telecoms
- CBICs will overtake gate array in revenue this year
- Revenue growth comes from mixed signal cell-based ASICs

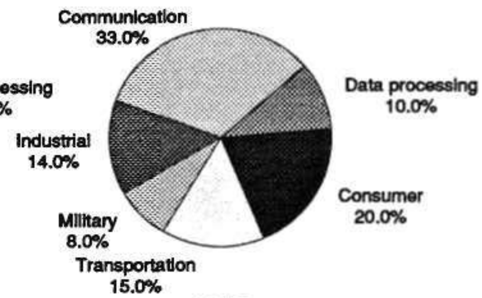
Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

Mixed Signal CBIC

Consumption by Application



1989
Total = ECU 90 Million



1995
Total = ECU 350 Million

Source: Dataquest
May 1991

CELL BASED IC SUPPLIER RANKINGS

(Millions of Dollars)

1987 Rank	Name	1987 Revenue	1989 Rank	Name	1989 Revenue
1	VLSI	$13	1	Mietec	$31
2	AMS	$11	2	Texas Instr.	$27
3	Rifa	$ 8	3	VLSI	$26
4	ES2	$ 5	4	AMS	$25
5	MEDL	$ 4	5	MEDL	$17
6	Mietec	$ 4	6	SGS-Thomson	$17
7	Texas Inst.	$ 4	7	ES2	$16
8	GE Solid St.	$ 3	8	Siemens	$16
9	LSI Logic	$ 3	9	IMP Europe	$10
10	Zymos	$ 3	10	LSI Logic	$10

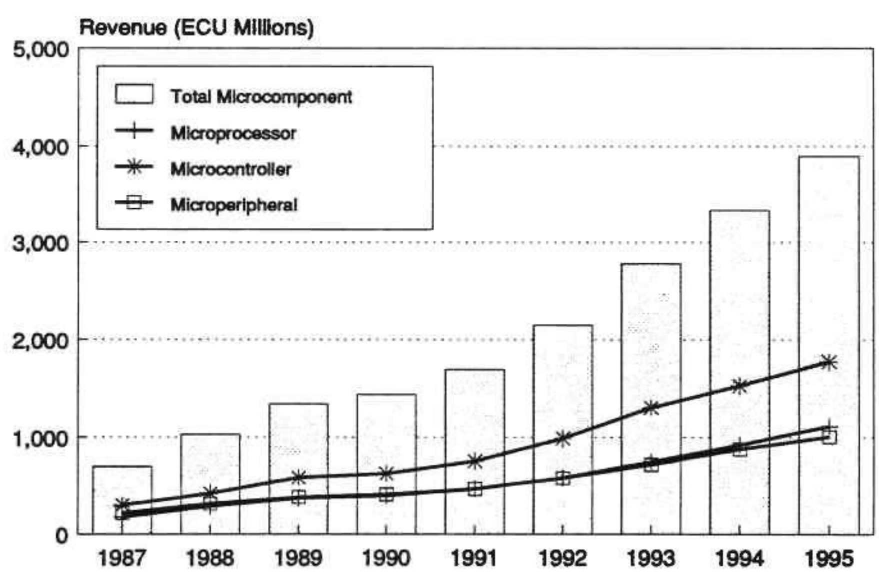
Source: Dataquest May 1991

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

REQUIREMENTS FOR SUCCESS IN ASIC

- High-performance mixed signal CBIC needs BiCMOS
- Testing mixed signal ASIC will require very high investment
- Revenue is limited by the design center throughput
- Software tools are not helping yet

European Microcomponent Market



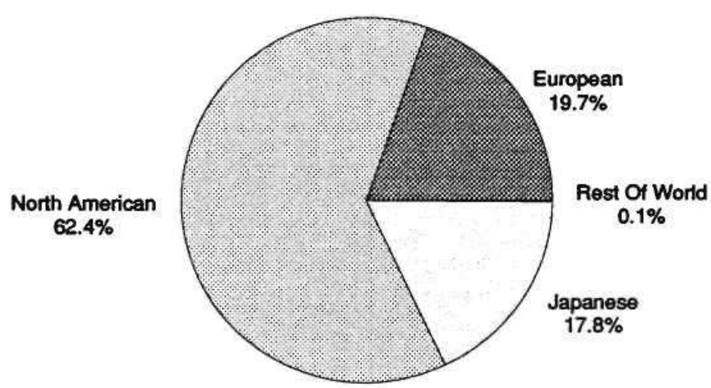
Source: Dataquest
May 1991

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

MICROCOMPONENTS - THE LAST 10 YEARS

- PCs have dominated the processor and peripheral market.
- There was a high demand for single-chip controllers
- Controllers performed control rather than compute functions
- Success was product-related
- The dominance by data processing applications has been US-based

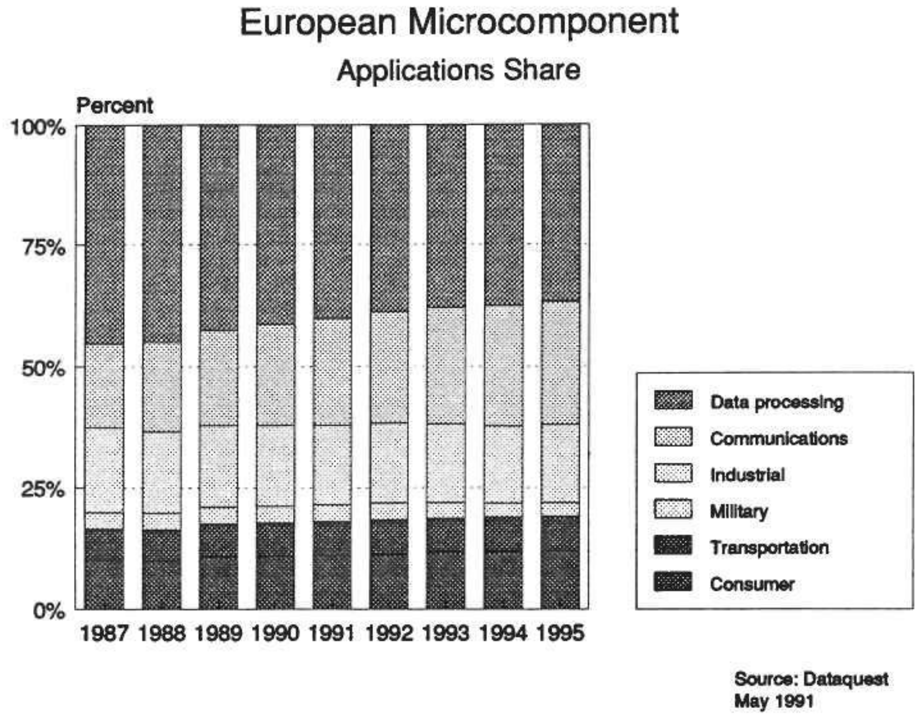
European MOS Microcomponent
by Vendor Origin



1990

Source: Dataquest
May 1991

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260



MICROCOMPONENTS - THE NEXT 10 YEARS

- Data processing will still dominate the processor and peripheral market
- Software applications will decide the future PC market
- The RISC/CISC battle will be for a place on the desk
- Customers are changing from PC user to the software supplier
- Data processing will be more consumer and telecoms oriented

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

RISC ARCHITECTURE LICENCES

Company	Design	Sources
Sun	Sparc	BIT, Cypress, LSI Logic, Philips Texas Instruments, Matra MHS Fujitsu, Matsushita
MIPS	Rxxxx	IDT, LSI Logic, Siemens, Performance, NEC, Sony
Intergraph	Clipper	Intergraph, Samsung
Hewlett-Packard	Spectrum PA	Hitachi, Samsung

Source: Dataquest May 1991

MICROCOMPONENTS - THE NEXT 10 YEARS

- There will be a greater need for computation with microcontroller applications
- Controllers will be more application-specific
- Suppliers will need to understand the end-user markets
- The market will pass from MCU to MPU for compute-intense applications

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

SUMMARY

- Mixed signal CBIC needs a high investment in design to succeed
- Microcontrollers also need a high investment in design support
- The emphasis is changing from products to support for the customer
- The solution is to "be the customer"

SUMMARY

- The European market will grow above the world average
- A flattened silicon cycle peak will occur in 1993
- Profitability remains the primary issue in Memories
- There will be increasing product diversification in Memories
- ASICs and Micros require increasing investment in design support
- ASICs and Micros are an example of where there is a change from product support to customer support

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

Profit Through the Silicon Cycle:
The Next Ten Years

ANDALUCÍA TECHNOLOGY PARK

Felipe Romera
Managing Director
Andalucía Technology Park

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

ANDALUCÍA TECHNOLOGY PARK

Felipe Romera
Managing Director
Andalucía Technology Park

Mr. Romera is Managing Director of Andalucía Technology Park, located in Malaga City. The Park is packed by Andalucía's regional government and Malaga's Town Hall, which give aid to telecommunications, information technology and electronics companies setting up R&D and manufacturing facilities. Since 1982, he has been Director of the research and development department for Fujitsu España based in Malaga. He has also been Secretary of the Malaga University Social Council since 1987. Mr. Romera is a Telecommunications Engineer, having graduated from Madrid Technical University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

SPAIN

E-0

SPAIN

EXTENSION	504.800 Km² (124.313.000 Acres)	(22% of E.E.C.)
INHABITANTS	39.000.000.-	(12% of E.E.C.)
DENSITY	77 Inh./Km²	(E.E.C.: 144 Inh./Km²)

E-1

SPAIN

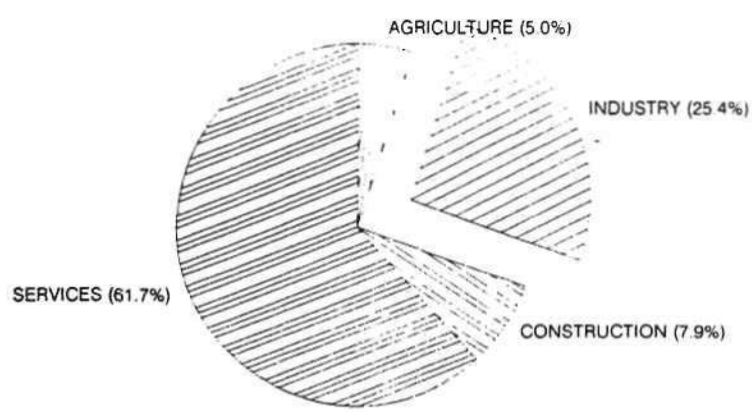
G.N.P.:	345.000.000.000 ECU	(8% of E.E.C.)
G.N.P../INH.	8.846 ECU/Inh.	(13.585 in E.E.C.)

IDEA!

E-2

SPAIN

G.N.P. DISTRIBUTION BY SECTORS



IDEA!

E-3

ANDALUSIA

A-0

ANDALUSIA

EXTENSION	87.268 Km^2 (21.491.000 Acres)	(17% of SPAIN)
INHABITANTS	7.019.285	(18% of SPAIN)
DENSITY	80 Inh./Km^2	

A-1

ANDALUSIA

G.N.P.: 44.681.000.000 ECU (13% of SPAIN)

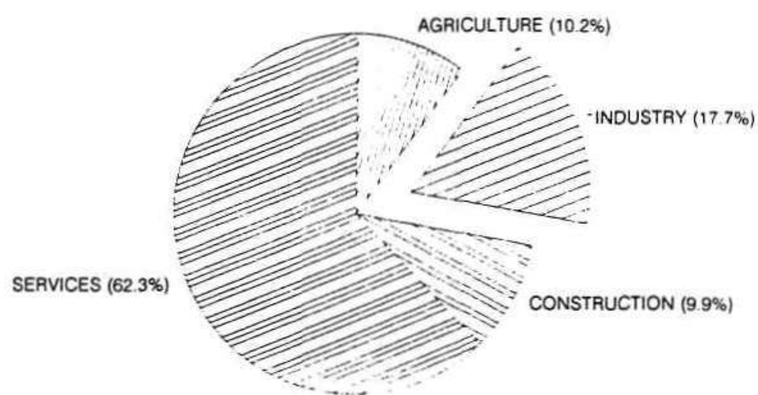
G.N.P./INH.: 6.365 ECU

IDEA!

A-2

ANDALUSIA

G.N.P. DISTRIBUTION BY SECTORS



IDEA!

A-3

MALAGA

M-0

MALAGA PROVINCE

EXTENSION:	7.276 Km^2 (1.792.000 Acres)	(8% of ANDALUSIA)
INHABITANTS:	1.203.724	
DENSITY:	165 Inh./Km^2	

M-1

MALAGA

G.N.P. **8.355.000.000 ECU**

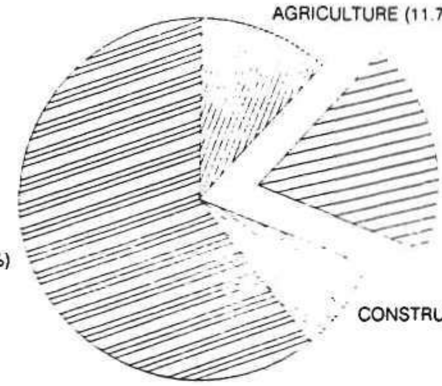
G.N.P./INH.: **6.941 ECU**

IDEA!

M-2

MALAGA

G.N.P. DISTRIBUTION BY SECTORS

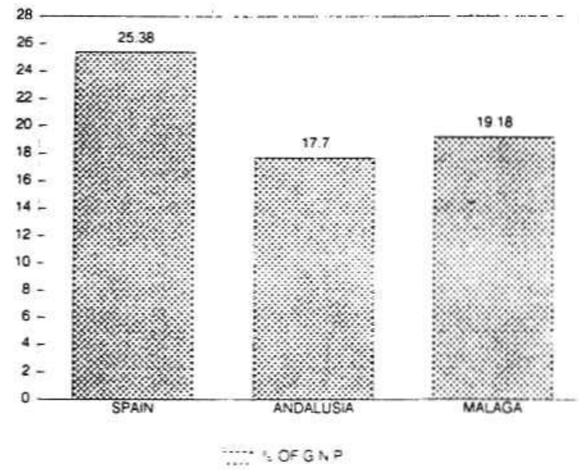


IDEA!

M-2 (a)

MALAGA

PARTICIPATION OF INDUSTRY IN G.N.P.



IDEA!

M-2 (b)

MALAGA'S CLIMATE

AVERAGE TEMPERATURE	18ºC/64ºF
RAINFALL AVERAGE	570 l./m²/YEAR (11,7 Gall (UK)/Sq.foot/Year)
AVERAGE HOURS OF SUN	2.900 H./YEAR

IDEA!

M-3.

MALAGA

MAIN FACTORIES ALREADY INSTALLED IN MALAGA:

ALCATEL

FUJITSU

SIEMENS-MATSUSHITA

IDEA!

M-4.

MALAGA COMMUNICATIONS

AIRPORT

More than 200 Flights/Week

(50 International)

One stop flights to all the world

TRAINS / ROADS

Passangers & Merchandise to Europe

HARBOUR

2.000.000 Tm./Year transported

200.000 Passangers transported

IDEA!

M-5.

MALAGA UNIVERSITY

FACULTIES

Technical (Electronics, Mechanical, Telecommunications, etc.)
Scientists (Biology, Mathematics, etc...)
Economics
Law
Medicine
Arts (Languages, etc...)

25.000 STUDENTS

IDEA!

M-6

CULTURE AND SPORTS IN MALAGA

More than 50 Theater / Music shows per year

Archeological and arts museums

More than 100 Sport Centers

30 Golf Courses in service

10 Marinas

IDEA!

M-7

ANDALUCIA
TECHNOLOGY PARK

IDEA!

P-0

ANDALUCIA TECHNOLOGY PARK

BACKED BY

- ANDALUSIAN REGIONAL GOVERNMENT

- MALAGA'S CITY HALL

IDEA!

P-1 (a)

ANDALUCIA TECHNOLOGY PARK

LOCATION

13 Kms. from Málaga City by Highway

Close to the Airport
Close to the University

IDEA!

P-1 (b)

ANDALUCIA TECHNOLOGY PARK

PARK DESIGN

R&D PLOTS	87.721 M²	(22 Acres)
R&D&MANUFACTURING PLOTS	146.780 M²	(36 Acres)
MANUFACTURING PLOTS	86.172 M²	(21 Acres)
RESERVE PLOTS	162.863 M²	(40 Acres)
SERVICE PLOTS	72.830 M²	(18 Acres)
RECREATION ZONES	128.833 M²	(278 Acres)
TOTAL AREA	**1.685.199 M²**	(415 Acres)

IDEA!

P-2

ANDALUCIA TECHNOLOGY PARK

PARK-PLANNING NORMS
R&D ZONE

Minimum Surface Plot	2.500 M^2	(0,6 Acres)
Maximum Altitude	10 M	
Building Volume	2.4 m^3/m^2	
Exploitation of Plot	0,6	

IDEA!

P-3(a)

ANDALUCIA TECHNOLOGY PARK

PARK-PLANNING NORMS
MANUFACTURING ZONE

Minimum Plot	10.000 M^2	(2,5 Acres)
Maximum Altitude	15 M.	
Building Volume	5 M^3/M^2	
Exploitation of Plot	1.00	

IDEA!

P-3(b)

ANDALUCIA TECHNOLOGY PARK

TECHNICAL SERVICES

Homologation Laboratory for Telecommunication Devices

Business Innovation Center

Integrated Services Office

Telecommunication Services:

- Narrow Band Services
- Broad Band Services
- Communications Office

IDEA!

ANDALUCIA TECHNOLOGY PARK

OTHER SERVICES

Hotel and Commercial Center

Social Club

Sporting (Tennis, Golf Course, etc...)

Security Services

Etc...

IDEA!

ANDALUCIA TECHNOLOGY PARK

ADMISSION POLICY

COMPANIES DEDICATED TO INNOVATION PROCESSES AND NEW TECHNOLOGIES:

Microelectronics, computer, telecommunication, laser, automation, new materials, renewable energies, etc...

COMPANIES MUST INVEST MORE THAN 4% OF SALES IN R&D

AND

HAVE BETWEEN 25% AND 40% OF UNIVERSITY GRADUATES IN STAFF

IDEA!

P-6

ANDALUCIA TECHNOLOGY PARK

THE AIDS TO INVESTMENTS

REGIONAL ECONOMIC INCENTIVES

(Free Subsidy of up to 30% investment)

AIDS TO COMPANIES THAT ESTABLISH THEMSELVES IN ANDALUCIA TECHNOLOGY PARK

(Free Subsidy of up to 30% investment)

Maximum subsidies allowed is 50% of total investment

LOAN AND VENTURE CAPITALS FACILITIES

STAFF TRAINING AIDS

IDEA!

P-7

ANDALUCIA TECHNOLOGY PARK

COMPANIES ALREADY INSTALLED

HUGHES MICROELECTRONICS EUROPA

RWTÜV

TELEFONICA

ESAMAT

IDEA!

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle:
The Next Ten Years

Manuel Lazaro
General Sub-Director of Information
and Communication Technologies
Ministry of Industry
Spanish Government

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

This presentation was not available

at the time of publication

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

X

Profit Through the Silicon Cycle: The Next Ten Years

PROFTING FROM EMERGING APPLICATIONS

Jonathan Drazin
Manager
European Semiconductor and Design Automation Group
Dataquest Europe Limited

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

PROFIT FROM EMERGING APPLICATIONS

Jonathan P.V. Drazin
Senior Industry Analyst
European Semiconductor and
Design Automation Group
Dataquest Europe Limited

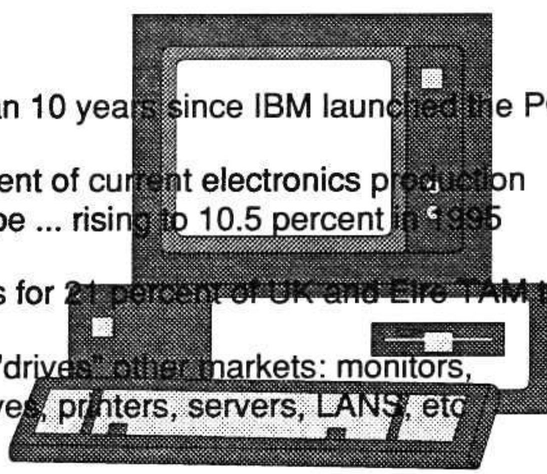
Dr. Drazin is a Senior Industry Analyst in Dataquest's European Semiconductor and Design Automation Group (ESDA), based at Denham. He manages the European Semiconductor Application Markets (ESAM) service, which gives strategic market intelligence on semiconductor consumption by application. Prior to joining Dataquest, Dr. Drazin was a Principal Research Engineer for STC Technology Limited in Harlow, where he worked on VLSI design and semiconductor process characterization. Previously, he was a postdoctoral fellow at Imperial College, London, where he researched e-beam lithography. Dr. Drazin has a B.Sc. degree in Physics and a Ph.D. in Semiconductor Materials from Imperial College, London. He also holds an M.B.A. degree from City Business School, London and is a Member of the Institution of Electrical Engineers.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

AGENDA

- A Case History of the '80s: The PC
- Towards the PC of the '90s: VIDEO
- Image Compression
- Wireless Communication
- Conclusions

A CASE HISTORY OF THE 80s: THE PC



- Less than 10 years since IBM launched the PC
- 8.5 percent of current electronics production in Europe ... rising to 10.5 percent in 1995
- Accounts for 21 percent of UK and Eire TAM today
- The PC "drives" other markets: monitors, disk drives, printers, servers, LANS, etc

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

ESTIMATED EUROPEAN PRODUCTION BY MAIN APPLICATION

Application	Production 1991	CAGR Growth 91/95
Personal Computers	$19.8 billion	18.3 percent
Mainframe Computers	$ 9.8 billion	10.5 percent
Color Televisions	$ 7.7 billion	1.1 percent
CO Switch/line-cards	$ 6.1 billion	0.1 percent
Microwave Ovens	$ 5.9 billion	23.1 percent
Standard Telephones	$ 4.8 billion	1.8 percent

Source: Dataquest

PCs TODAY - MARKET PRESSURES

- 8 million PCs sold into Europe (1991)
  - only 57 percent made locally
- 18 percent production growth is unique to Europe
  - reflects shifts to local production
  - NOT the underlying market
- Market saturation: 1 in 4 white collar workers already use PCs
- Performance refinements: diminishing utility
- Slowing end-user market growth

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

PRICE FORECAST FOR LCD MODULES

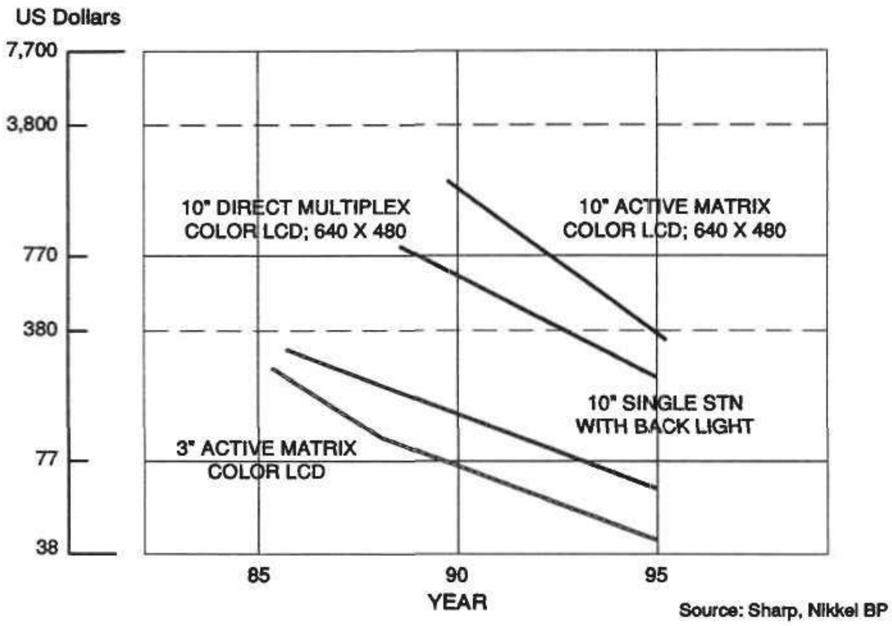


IMAGE COMPRESSION

- The MOST fundamental revolution in the 1990s!
- International standards are opening markets:
  - Video-conferencing/telephony (H.261)
  - Digital cameras, copiers, printers (JPEG)
  - Multimedia (MPEG)
- Compression reduces costs of:
  - Communication
  - Storage and archiving

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

IMAGE COMPRESSION

APPLICATIONS

- Consumer
  - Interactive education
  - Entertainment
  - Digital video recording
  - High Definition TV
  - Games
- Communication
  - Video-telephone
  - Video-conference
  - Color facsimile
- Computer
  - Information transfer
  - Printers and copiers
  - Interactive training
  - Desktop publishing
  - Point-of-sale
- Industrial
  - Medical imaging
  - Security/surveillance
  - Process control

STILL IMAGE COMPRESSION - JPEG

- JPEG affects a wide range of imaging applications
- Reduces memory/bandwidth requirement typically by 50 times
- Layered approach to performance:
  - Low: Software only
  - Medium: Generic DSP
  - High: Hardwired DSP
- Hardware silicon available: C-Cube, LSI Logic, SGS-Thomson
- Color in the office will be major driver

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

VIDEO-CONFERENCING

- International standard (H.261) replaces proprietary ones
- European system market worth $100 million this year
- Reluctance to travel: cost and fear
- Users confined to private networks

VIDEO-CONFERENCING

- ISDN permits video "dial-up" between organisations
- "Inter" replaces "intra" company communication
- H.261 lowers the cost of ownership
- The standard H.261 satisfies a wide range of bandwidths
- Users can establish links comparable to cost of normal phone call, eg:

  London to Los Angeles: $150 per hour

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

VIDEO-CONFERENCING - HARDWARE COSTS

- Dramatic reductions in video-codec costs:
  1982: $250,000 1991: $30,000
- Standardization/competition will reinforce downward trend
- $500 typical semiconductor content today
- $7,000 codecs by end-1992

VIDEO-TELEPHONES AND PCs CONVERGE?

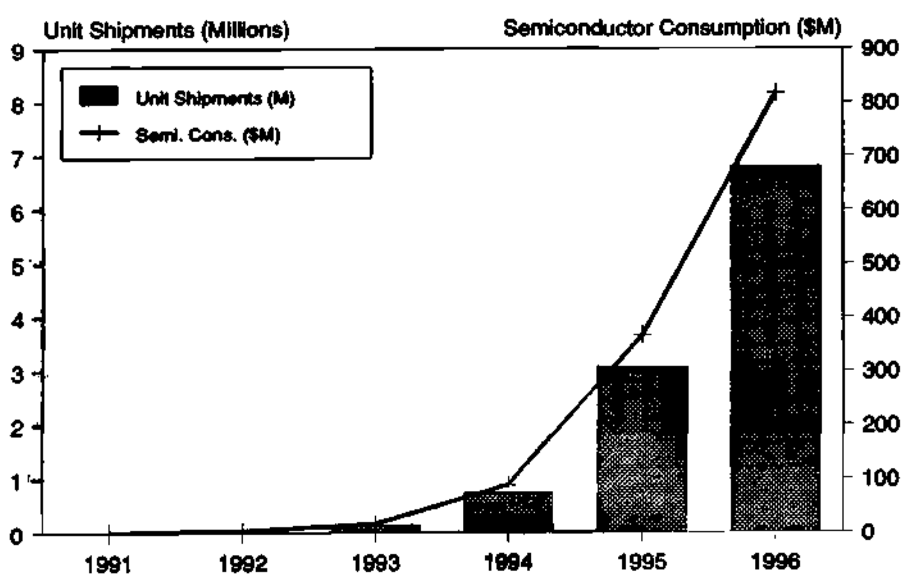
- Many European plans to introduce video-telephones over next couple of years
- Prices expected to approach "personal" business levels within 2-3 years
- Potential to enjoy a faster growth curve than the PC
- Video-telephony will integrate into desktop PC

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

MULTIMEDIA

- Audio, text, graphics and moving images
- In transition from "analog" to "digital"
- "Analog" systems:
  - analog inputs: VCRs, LaserDiscs
  - high communication costs
  - high authoring costs
- "Digital" systems:
  - employ image compression
  - CD-ROM storage/ISDN transmission
  - new standards emerging: MPEG

EUROPEAN PC-BASED MULTIMEDIA MARKET ESTIMATION



Source: Dataquest

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

MULTIMEDIA

- MPEG dedicated ICs: many applications
- Consumer based multimedia - another major source of demand
- ... strong interest from most manufacturers
- Introduction awaiting:
  - titles development
  - MPEG standard completion

WIRELESS COMMUNICATION

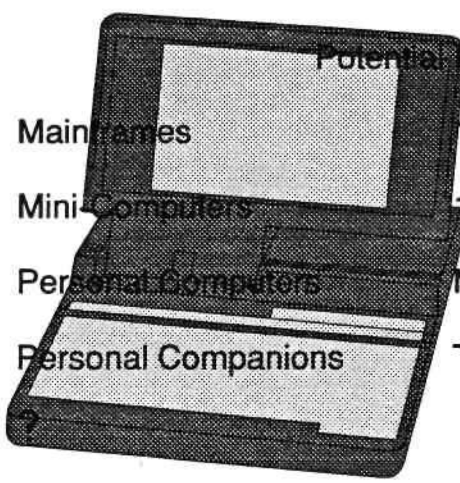
- Wireless video-telephony - still a fantasy
- Wide area coverage: wireless laptop "modems" have greatest potential for growth
  - based on cellular GSM network
- Local area coverage: growing interest in "wireless LANs"
  - Motorola (Altair)
  - NCR (WaveLAN)
  - BICC (InfraLAN)
- Major issues: spectrum allocation, standards

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

CONCLUSIONS

- Imaging and wireless communications - key technologies for the 1990s
- Standards developments dominate both areas - vital to follow and participate closely
- Growing omni-presence of DSP applications
- JPEG, MPEG, H.26l: strong similarities

THE PC - A CONTINUING TRANSITION TO CONSUMERISM



		Potential Market - Europe
1960s	Mainframes	100s
1970s	Mini-Computers	10,000s
1980s	Personal Computers	Millions
1990s	Personal Companions	Tens of Millions
2000	?	

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / +895 835050 / Tlx 266195 / Fax +895 835260

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle:
The Next Ten Years

GRASPING ASSPs AND MAKING MONEY

Douglas Dunn
Managing Director
GEC Plessey Semiconductors

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

GRASPING ASSPs AND MAKING MONEY

Doug Dunn
Managing Director
GEC Plessey Semiconductors

Mr. Dunn was appointed Managing Director of GEC Plessey Semiconductors on its formation in July 1990. Previously he was Managing Director of Plessey Semiconductors Limited—a post he held since joining the company in May 1980. During his time there, he took the company to a leading position in the market. He was also responsible for the introduction of major new technologies including a leading-edge CMOS process. Mr. Dunn joined Plessey from Motorola Semiconductors Ltd. where he worked for eleven years. He was Operations Manager for N-Channel memory and microprocessor products with Motorola and, later, Assistant General Manager at East Kilbride (Scotland). He also served with Motorola in the United States at Phoenix, Arizona. Prior to joining Motorola, Mr. Dunn was with STC, involved in the design and development of the company's digital telephone exchange systems. Mr. Dunn was educated at Rotherham Grammar School and Sheffield Polytechnic. He has a degree in Electrical Engineering.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Grasping ASSPs & Making Money

Doug Dunn
Managing Director
GEC Plessey Semiconductors

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

1. Profitability Credentials
2. GEC Plessey Semiconductors overview
3. Product Philosophy for the 90s
4. Wake - up call

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

GPS CREDENTIALS

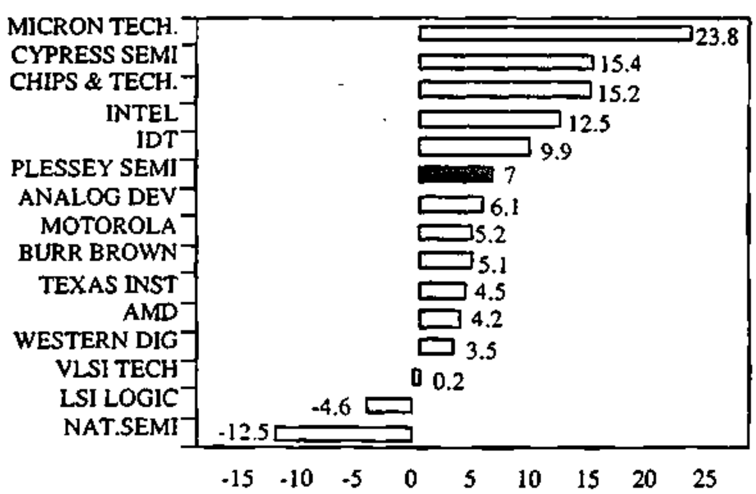
- 11 Years Profitability
- 11.6% Average PBit
- 10 Times Growth in Sales

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

PROFIT AS A PERCENTAGE OF REVENUE - FISCAL 1989

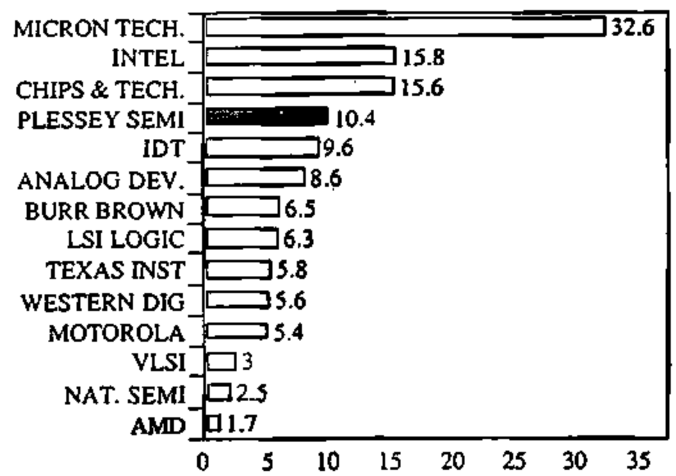


GEC PLESSEY SEMICONDUCTORS

SOURCE: ELECTRONIC BUSINESS JULY 90

GEC PLESSEY SEMICONDUCTORS

PROFIT AS A PERCENTAGE OF REVENUE - FISCAL 1988



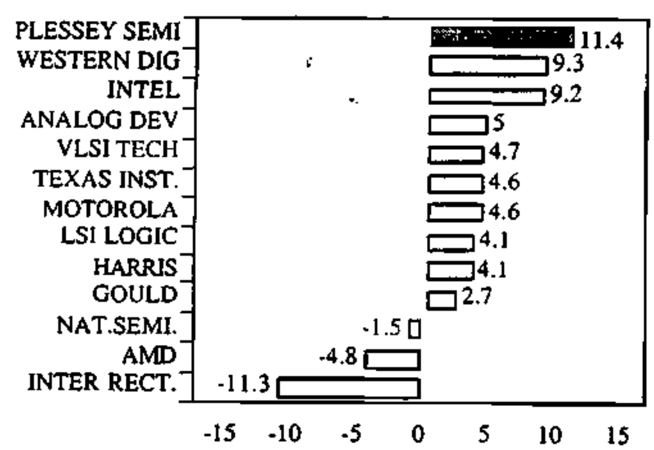
GEC PLESSEY SEMICONDUCTORS

SOURCE: ELECTRONIC BUSINESS JAN 90

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

PROFIT AS A PERCENTAGE OF REVENUE - FISCAL 1987



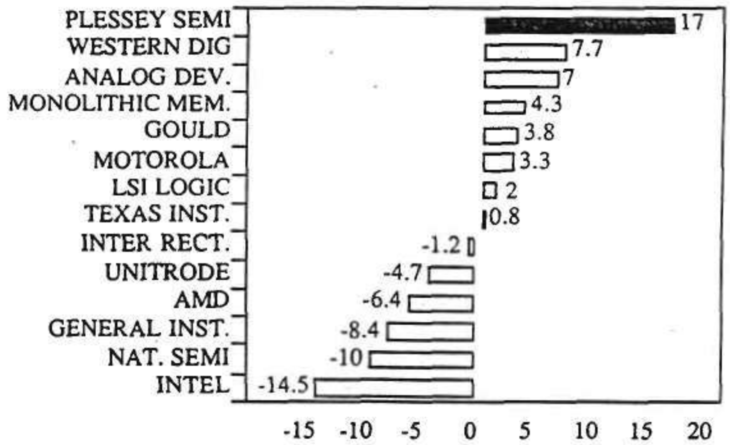
GEC PLESSEY SEMICONDUCTORS

SOURCE: ELECTRONIC BUSINESS JULY 88

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

PROFIT AS A PERCENTAGE OF REVENUE - FISCAL 1986



GEC PLESSEY SEMICONDUCTORS

SOURCE: ELECTRONIC BUSINESS JULY 87

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

A global operation

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

- 7 MANUFACTURING SITES WORLDWIDE
- SALES IN OVER 100 COUNTRIES
- APPROX 4000 EMPLOYEES
- $375M SALES 1990/91
- 15% OF REVENUE ON R&D

GEC PLESSEY SEMICONDUCTORS

In 1990 GPS were 26th in the world in ICs

In 1990 we were 7th in Gate Arrays

In 1990 we were 12th in ASICS

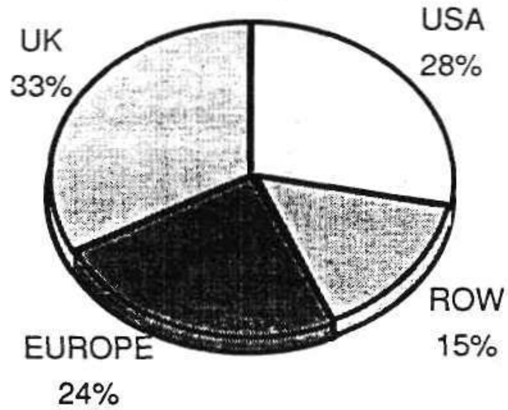
GEC PLESSEY SEMICONDUCTORS

STRENGTHS

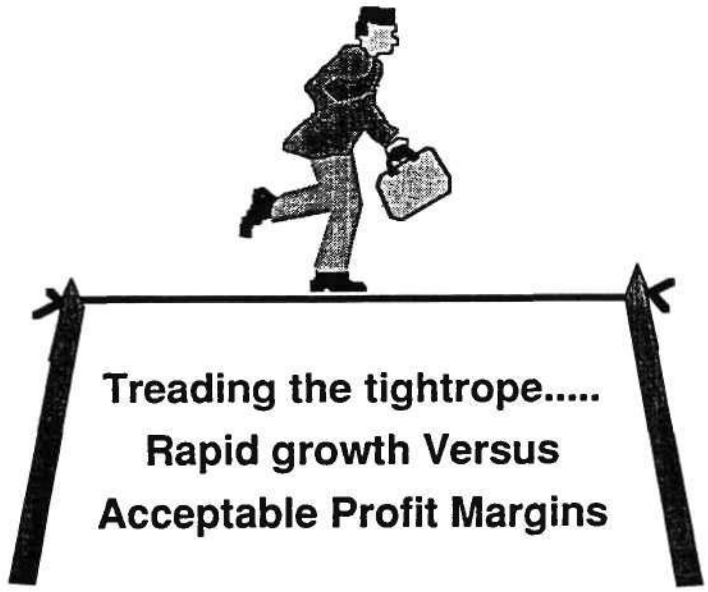
- Multiple technology base
- European & USA manufacture - without government subsidy
- Comprehensive circuit design skills
- Worldwide customer service support
- Expertise in silicon ICs, microwave & power
- State-of-the-art production facilities

GEC PLESSEY SEMICONDUCTORS

$375M Sales in 1990/91
" The 10th consecutive year of profit"



GEC PLESSEY SEMICONDUCTORS



GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

Application Specific Standard Products
(ASSPs)
are the Key Products
for the 1990s

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

ASSP....

The route by which our customers access the technology to give them success - and profit - in their markets

GEC PLESSEY SEMICONDUCTORS

Success in ASSPs requires

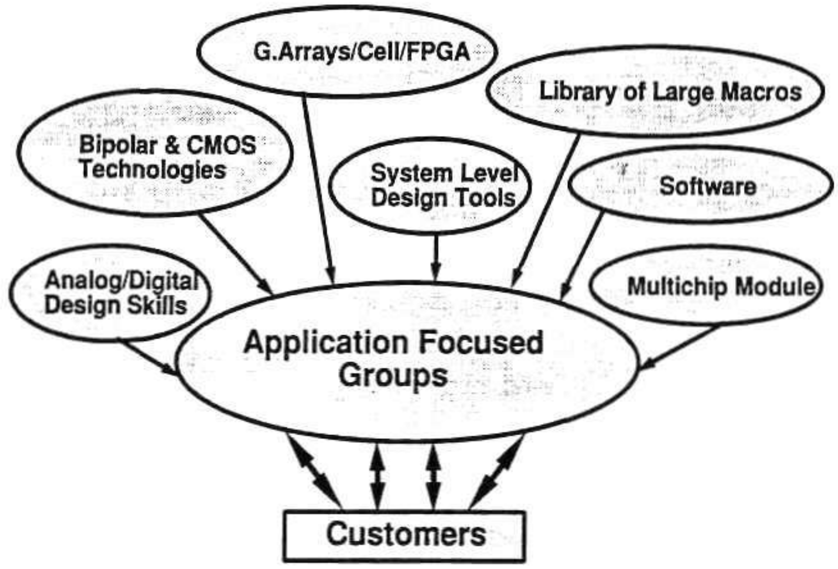
- **System Software and Application knowledge**
- **Leading edge Analog/Digital design skills**
- **Innovative Architectures**
- **Rapid product introductions targeted at specific market applications**

GEC PLESSEY SEMICONDUCTORS

ASSP Focus in.....

- Personal Communications
- Computer Peripherals
- Terrestrial and Satellite TV
- MultiMedia

GEC PLESSEY SEMICONDUCTORS



GEC PLESSEY SEMICONDUCTORS

ASSP Examples

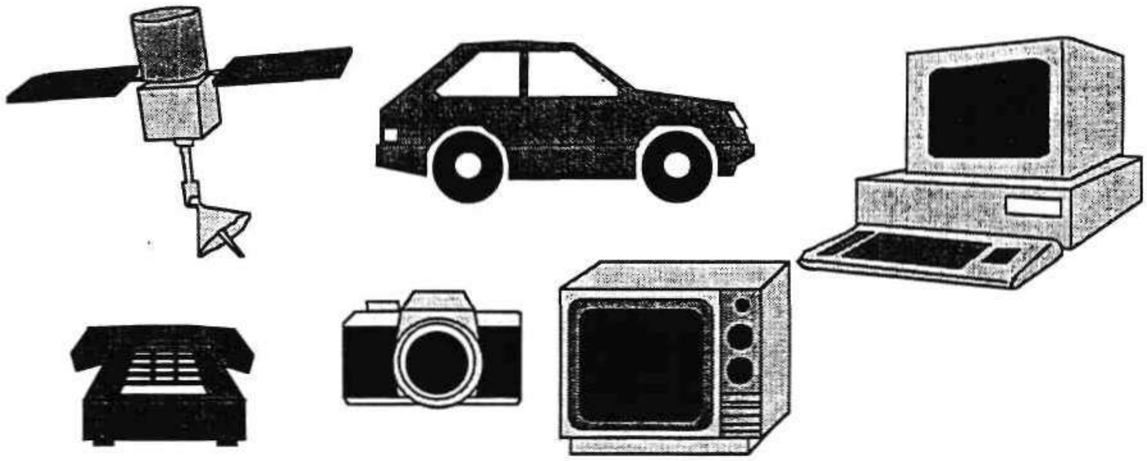
- Single chip TELETEXT (Consumer)
- Single chip PAGER (Personal Comms)
- SLAC (Telecomms)
- 8 by 8 CONVOLVER (IMAGING)
- Single chip FFT (Military)
- SYNTHESISERS (CONSUMER TV)
- GPS (Satellite Comms)

GEC PLESSEY SEMICONDUCTORS

AND WHAT DOES THE FUTURE HOLD ?

GEC PLESSEY SEMICONDUCTORS

ASSPs......APPLICATIONS BY THE SCORE



GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

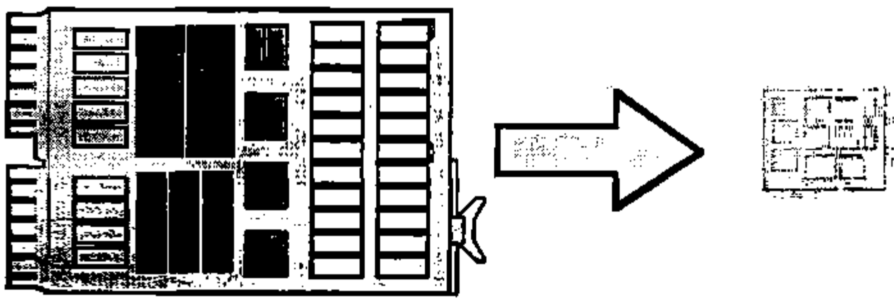
Dramatic changes lie ahead

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

Advanced Interconnection
such as Multi - chip Modules
will enable true Systems in silicon



GEC PLESSEY SEMICONDUCTORS

The combination of ICs, Multi - chip Module technology, and Microwave skills

............SUPERCOMPONENTS

SOON

- **Miniature LNB module for Satellite T.V.**
- **Collision avoidance modules for Autos**
- **Wrist watch Pager modules**
- **Personal Comms / Satellite Subsystems**
- **Megabit NVSram MCM**
- **Intelligent Tagging Modules**

GEC PLESSEY SEMICONDUCTORS

SUPERCOMPONENTS

The future

- **Cellular Videophone**
- **>30k Usable Gate FPGAs**
- **Handheld GPS receiver with active map**
- **Ultra - thin lightweight Notebook PCs**

and then..........

The HITCH - HIKERS GUIDE to the GALAXY.??????

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

Ten Years of Profitable Performance making ASSPS wasn't just Luck.

GEC PLESSEY SEMICONDUCTORS

DJD/MAY/1991

GEC PLESSEY SEMICONDUCTORS

IN CONCLUSION. . . THE PROVEN ROUTE TO SUCCESS

ASSPs are certainly not NEW... GPS has been in this business for the last 10 years.

Our philosophy has been to offer our customers a Complete System Solution in Silicon

Our unique blend of Analog & Digital skills coupled with strong Semi - Custom Capability has enabled us to form long term Strategic relationships with key OEMs.

GEC PLESSEY SEMICONDUCTORS

My View.....

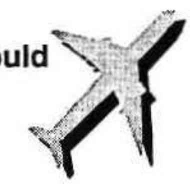
- To realise profit - focus your efforts on what you're good at!

  And GPS is good at ASSPs

GEC PLESSEY SEMICONDUCTORS

A FINAL THOUGHT. . . .

"Things could be worse....We could be in the Airline business"



Dataquest

a company of
The Dun & Bradstreet Corporation

Dataquest

a company of The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

SMART CARDS

Marc Lassus
President
Gemplus Card International

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

SMART CARDS

Marc Lassus
President
Gemplus Card International

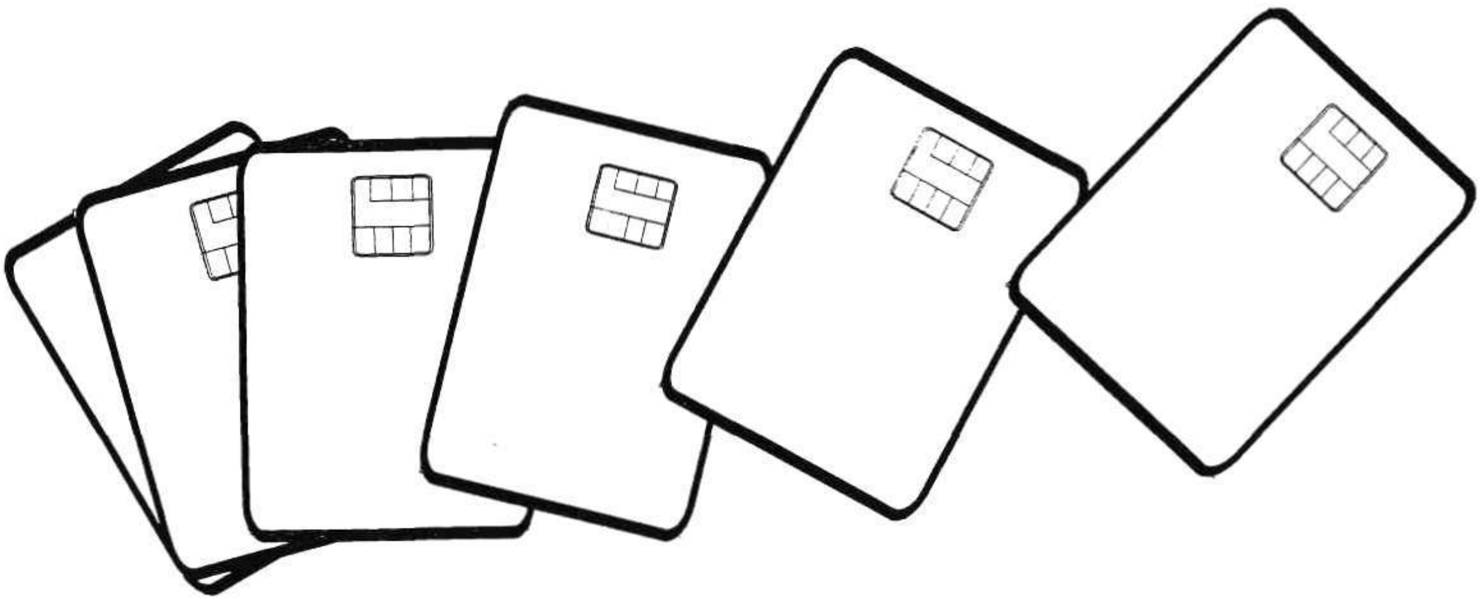
Mr. Lassus is President of Gemplus Card International, the French company which he founded in 1988. He previously held senior management positions with Thomson Semiconductors from 1984 to 1988, and Matra-Harris Semiconductors in France from 1980 to 1984. Mr. Lassus started his career with Motorola in 1967 in Phoenix, Arizona and subsequently was at Motorola operations in France and Scotland. Mr. Lassus has a B.S. degree in Applied Physics from Lyon Institute of Technology, and a Ph.D. in Solid State Physics from the University of Lyon.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

SMART CARDS :

GEMPLUS

A NEW CHAPTER . . .



M. LASSUS - GEMPLUS CARD INT al

SMART CARDS - A NEW CHAPTER !

By Dr Marc LASSUS
President & CEO - GEMPLUS CARD INTERNATIONAL

ABSTRACT

After 10 years of a "gestation" period in EUROPE Smart Cards are finally entering everyday's life.

Applications ranging from public telephone, to banking, medical care, computer security, physical access control, encrypted television, mobile telephones, games, remote secured transactions, etc. are blooming everywhere.

The 100 million mark of Smart Card consumption per year have been largely passed in 1990. By 1995 the billion yearly usage will be reached. Since every Smart Card contains either a secured memory chip or a microcomputer chip, and since all card readers are using large amount of semiconductors the Smart Card industry represents an unique opportunity for semiconductor manufacturers !

The European market is largely leading the world market in Smart Cards today.

By reinforcing its expertise in secured components, card manufacturing technology, communication software, chip operating systems, application and system integration, the European industry has the unique challenge ahead to lead the Smart Card world for the next decade.

Ladies & Gentlemen,

First of all I would like to thank DATAQUEST's staff for taking the risk of inviting me at its Tenth Annual Semiconductor Industry Conference.

Why indeed a person who deserted 3 years ago the very exciting and difficult semiconductor world should be invited for a comeback ?

What kind of contribution could bring somebody who forgot everything about your business like : market share, megabits, ASP'S, submicron technologies, SRAMS, DRAMS, CMOS, EPROMS, downturns, and... believe it or not even Japanese competition !

Well, I guess that DATAQUEST's people may have scent something which could smell like a new promising product, a new market opportunity for semiconductor manufacturers.

Finally, I do believe that they are completely right, something major is happening to your industry which will have a significant impact for this decade. And thanks again for giving me the opportunity to talk about it...

- What is happening is the advent of SMART CARDS and SMART CARDS SYSTEMS !

I - HISTORY.

It all started in the mid 70's when Roland MORENO, a French inventor, applied for a patent describing a "portable object" using a semiconductor chip in order to secure personal transactions of any kind : payment -physical access - logical access.The chip was originally thought to be inserted in "personal objects" such as a ring, a watch or something like a soldier tag. However it appeared very soon that the only applications of potential volume which could be addressed in a reasonable time frame were with the French Banks.

It became then mandatory to insert the chip in a credit card format. Not a trivial packaging challenge in the late 70's ! In addition to make the story simpler the chip were to include a complete 8bit CMOS microcomputer with RAM, ROM and EPROM !
Needless to say that almost the whole industry turned down the offer ! The poor -(at that time!)- Roland MORENO heard comments such as :

- it will never work !
- how can you put a MOS chip into a nylon pocket shirt with 10 to 20 K volts electrostatic discharges ?
- what will happen when bending the card ?
- single CMOS microcomputer chips will not be available for several years !

and... the ultimate, arguments were :

you, French inventor, you want to convert a credit card into a debit card ! Good for the banks, not for the consumer ! It's going to be another flop like the CONCORDE ! It's a solution looking for a problem...And so on...

Well, today, 10 years later "poor MORENO" became "rich MORENO". He sold his licence 120 times worlwide and he is getting multimillion royalty revenues every month !

Let's see what happened...

First of all HONEYWELL BULL in FRANCE and MOTOROLA SEMICONDUCTORS in EUROPE teamed up in the early 80's to develop the first Smart Card with a single microcomputer chip for the French Banks.
Then FRANCE TELECOM decided in 1983 to launch a major program to convert, on a country wide basis, the old coin operated public telephones into Smart Cards telephone. This project received a lot of criticisms at the beginning but became eventually a major success ! This year alone, in 1991, FRANCE TELECOM will be selling 90 millions prepaid Smart Cards with a park of 90 K public telephones installed.

The following slide outlines some of the benefits of the French public telephones using Smart Cards.

The next chart indicates that Smart Cards for public telephones are not anymore a French "gadget". Several countries adopted a similar system : GERMANY - SPAIN - IRELAND - LUXEMBOURG - SCANDINAVIAN COUNTRIES - many more are at the testing stage. Important recent news also came from JAPAN - EASTERN COUNTRIES (HUNGARY - TCHECOSLOVAQUIA...) - INDIA and CENTRAL AMERICA.

As shown in the attached table the Smart Card market is getting out of the Infancy stage to enter the Maturity phase with new markets developing such as : banking - encrypted TV - health - mobile telephones - secured accesses (people access control and logical access control for computers) - vending machines and miscellaneous applications like city cards - public parkings - company cards - games - lotteries - ID cards etc. etc.
More than 150 millions Smart Cards will be sold in 1991 world wide. Even if the bulk of the volume is coming from prepaid telephone cards using small secured memory chips (EPROMS or EEPROMS) the market sees a shift towards more high end applications using microcomputer chips. More sophisticated chips are required when security is key as well as when more computing power is needed.
Before analyzing the evolution of the market for the major applications segments identified today one should spend some time in defining Smart Cards versus other "portable objetcts" such as memory cards which are also becoming extremely popular.

- MEMORY CARDS
  A memory card integrates a large memory capacity through a multichip packaging concept. Memory cards are thicker (2 - 3 mm) than the Smart Card (ISO STD : 0.7 mm) and have no security. They use edge connectors with large number of pins. The Japanese industry is by far the largest producer of memory cards.

- SMART CARDS
  Smart Cards use so far a single chip approach. The major fixture is security and thus the connecting function is done through a surface contact interface with 8 contacts maximum. Smart Cards have a credit card format.

II -SMART CARDS - A NEW CHAPTER

As seen in the previous charts public telephone is the major contributor to the existing Smart Card market. However new applications are rapidly developing worlwide. A more detailed analysis for each market application segment is needed to predict the overall future of Smart Cards.

SMART CARDS -FRENCH PUBLIC TELEPHONE.

GEMPLUS

* FRAUD AND VANDALISM COST TO "FRANCE TELECOM".
* 80.000 TONS OF COINS HANDLED PER YEAR.
* ALLOWS PREPAID SERVICES AND SUBSCRIBERS CARDS.
* SYSTEM COST LOWER THAN MAGNETIC & OPTICAL APPROACHES.

❑ SIDE BENEFITS :

- CASH GENERATED BY PREPAYMENTS
- ADVERTISING ON THE CARD
- COLLECTORS ITEM
- FIRST MOVE TOWARDS A PANEUROPEAN SYSTEM.

M. LASSUS - GEMPLUS CARD INT al

SMART CARDS - PUBLIC TELEPHONE.

GEMPLUS

❑ STATUS & PROSPECTS

* 8 COUNTRIES ADOPTED THE CONCEPT
* 15 COUTRIES W.W. BY END OF 1991
* COULD BE 25 BY 1995 ...

❑ LATEST IMPORTANT EVENTS

* JAPAN = 5 MILLIONS SMART CARD TELEPHONES BY 1995
* EASTERN COUNTRIES -INDIA -CENTRAL AMERICA ARE TESTING THE CONCEPT.

SMART CARDS - MARKET

(MILLION UNITS)	1991	1995
- PUBLIC TELEPHONE	135	?
- BANKING	10	
- ENCRYPTED TV	5	
- HEALTH	2	
- MOBILE TELEPHONE	0,2	
- SECURED ACCESSES	0,2	
- VENDING	1	
- MISCELLANEOUS	0,2	
TOTAL :	153.6	

M. LASSUS - GEMPLUS CARD INT al

1. <u>BANKING SECTOR</u>
As said above it all started in FRANCE and NORWAY. Security has been the major driving force towards a shift to Smart Cards. However this point has been really questionned during last decade for two basic reasons :

- large investments already made with magnetic tape credit cards.
- fraud, even if important, is never good to recognize. It only encourages people to go more and more around the system.

. However let me quote Bob CARTER Technology Planning Manager at MIDLAND BANK who said at the recent Smart Card 91 Conference held last March in LONDON :

> *"When the French introduced the Smart Card as their payment card, part of the rationale offered was that it would help tackle fraud. At that time the U.K seemed not to accept that argument... with fraud losses now approaching U .K L150 millions and rising, maybe we do now have a problem !!."*

The following slide shows that also the USA have a major problem even if real figures are never publicized.
The 4 basics reasons for fraud are :

. counterfeit cards
. fraudulent account applications
. not "received" cards
. lost/stolen cards.

Smart Card Banking cards are not only solving the security issue but also offer many more advantages which are exploited at a large scale in new programs in ITALY (CARIPLO/CONFCOMERCIO), in SOUTH AFRICA and under test in many other countries. The new advantages brought by the smart banking card are fixtures such as :

. multiapplications
. multiissuers
. insurances
. credit revolving
. pin code selection
. frequent users programs, etc., etc.

The bank Smart Card is not a replacement product solving solely security problems it is a new product offering to the customer and to the card issuer a spectrum of functions which will facilitate all kinds of transactions (not only financial). These transactions can take place anywhere (including from home) as will be described below.
The cost argument which has always been opposed to the advent of Smart Card is not valid any longer since we are talking about a completely <u>new product</u>. One should only talk about the replacement cost of existing systems and compare it to the cost of the fraud to the financial institutions and the additional benefits brought by the new services.

However according to the French banking institutions the sole security's criteria justifies the conversion to Smart Cards. Indeed since, with Smart Cards, the cost for frauding becomes higher than the individual benefits to the cheater, then the rate of fraud decreases drastically.

- BANKING WITH STANDARD CARDS -

GEMPLUS

SMART MOVES NEEDED TO FIGHT FRAUD MENACE

* UK = £ 150 MILLIONS A YEAR AND RISING

* USA = IN EXCESS OF A US $ 1 BILLION ...

Source: CARD WORLD NEWS - MARCH 1991.

M. LASSUS - GEMPLUS CARD INT[al]

SMART CARDS - BANKING -

GEMPLUS

* FRANCE AND NORWAY PIONEERED THE CONCEPT

* ITALY AND SOUTH AFRICA IMPLEMENTING ADVANCED MULTISERVICE LARGE SCALE SYSTEMS.

* MULTISERVICES - MULTIAPPLICATIONS - MULTI ISSUERS - IN ADDITION TO SECURITY.

* MAJOR EXPERIMENTS UNDERWAY IN : JAPAN - SWITZERLAND
  SINGAPORE - HOLLAND
  TAIWAN - UNITED KINDOM ...

SMART CARDS - BANKING -

GEMPLUS

❑ SECURITY

- PIN CODE
- "CUSTOMIZED" CREDIT LINE
- ACTIVITY MONITORING
- DIFFICULT COUNTERFEITING

❑ NEW SERVICES

- MULTI APPLICATIONS
- MULTI ISSUERS
- CREDIT REVOLVING
- PIN CODE SELECTION
- INSURANCES
- FREQUENT USERS PROGRAMS

There is no question in our mind that the banking institutions and the large credit card issuers will switch to Smart Cards before the end of the decade. A significant number of countries are under advanced testing phases at this point of time.

2. ENCRYPTED TELEVISION

Last year, in 1990, encrypted television became in a very short period of time a major market for high security Smart Cards. Indeed the volume of Smart Cards shipped to this market segment exceeded the banking segment. This happened during Q2 and Q3 1990 when SKY CHANNEL in the U.K. and then CANAL+ in SPAIN and GERMANY started to build up a complete network of paid TV using Smart Cards or "Smart Keys" as the ultimate replaceable security element. With the event of pay per view, cable and satellite television it becomes more and more important for the TV service providers to get revenues from subscriptions. However, here again, fraud is becoming a major plague. It has been evaluated that in some areas 2/3 of the viewers are pirates ! Hardware (decoders) copies are often sold to the open market. Like radar detectors"it is not illegal to sell and to buy such equipments it's just unlawful to use them"... Good grief !

The next two slides give some details on the use of Smart Cards for encrypted TV. The SKY CHANNEL/BSB satellite TV systems in operation in the U.K. are also described. CANAL+ in SPAIN and GERMANY is using a"smart key" and soon the system will be extended to FRANCE.

The Smart Card approach is the most secure way against piracy as well as the cheapest one. In addition flexibility is much higher since it is always much easier and cheaper to distribute cards or "keys" than decoders. Smart Cards allow also prepaid services for pay-per-view programs and elegant implementation of frequent viewer programs. Many more services should be offered in the future.

The "incubation" time for using Smart Cards in television has been oustandingly short in EUROPE. It took less than a year for SKY CHANNEL to implement it ! Needless to say that other broadcasters around the world will also move fast towards this technology !

Encrypted TV business was faced with a major problem. Smart Card was the solution...

In addition to solving the security problem Smart Cards are bringing many other advantages in the service area. Exactly like for banking...

3. SMART CARDS IN MOBILE TELEPHONE

The mobile telephone program in EUROPE called the GSM System which stands for "Global System for Mobile Communication" was facing several difficult challenges. How to move from a country by country independant non compatible systems to a paneuropean network ? How to insure distribution of eventually 20 millions sets, 20 millions dedicated telephone lines, scattered over 17 different countries with close to 50 different operators and how to solve the compensation problems between the countries. A nightmare...

Here again Smart Cards is the solution !

All mobile telephone sets distributed all over EUROPE will be "anonymous" with no dedicated telephone number allocated to them. It's only by plugging a Smart Card into them that a line, your line, will be in operation. This means that your Smart Card allows personalization of the set you are using, your identification and compensation...

SMART CARDS - ENCRYPTED TELEVISION.

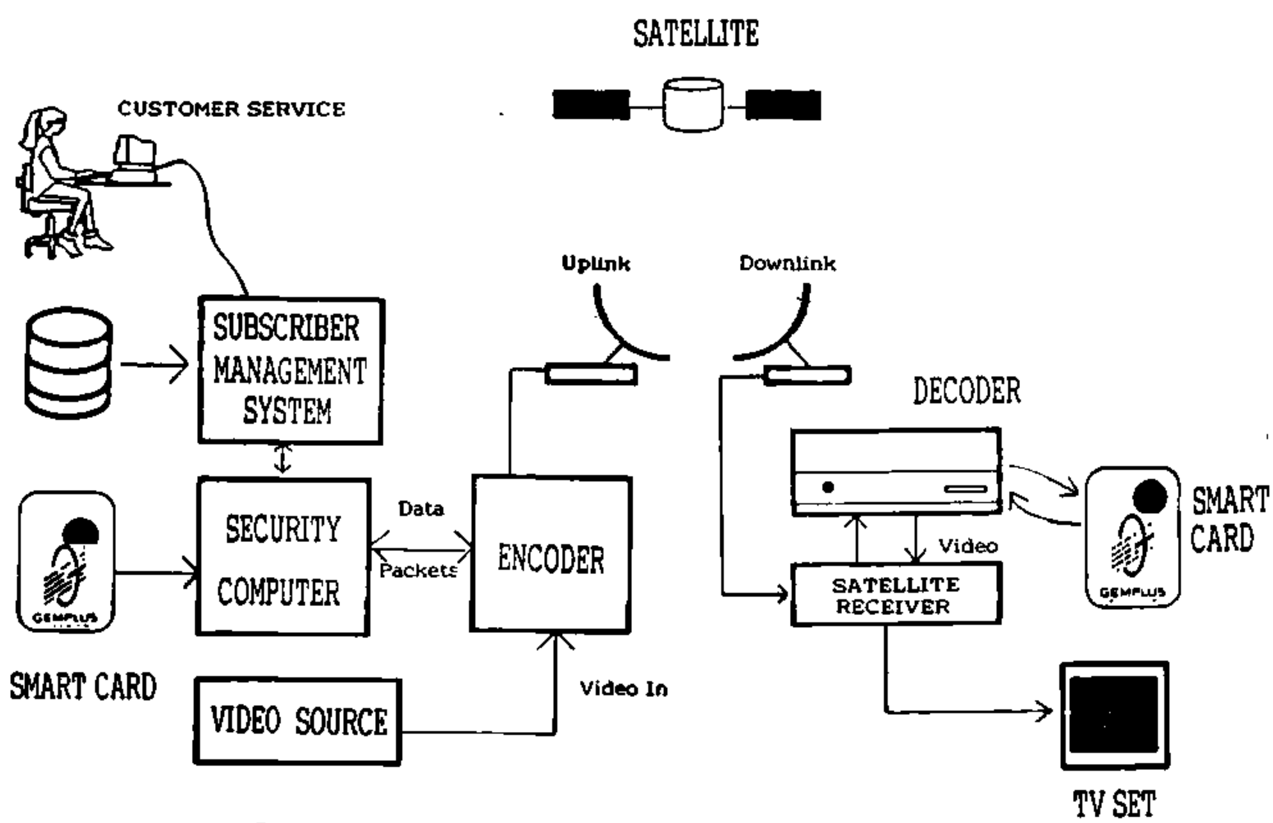
GEMPLUS

* EXISTING ENCRYPTION SYSTEMS HAVE UNDERGONE EXTENSIVE PIRATE ATTACKS
* MOST OF CURRENT SYSTEMS HAVE BEEN COMPROMISED
* LOST REVENUES EXCEED US $ 500 MILLIONS FOR USA AND EUROPE PER YEAR

AND ...

SMART CARDS AND "SMART KEYS" HAVE BEEN SELECTED AS THE ULTIMATE REPLACEABLE SECURITY ELEMENT !

M. LASSUS - GEMPLUS CARD INT al

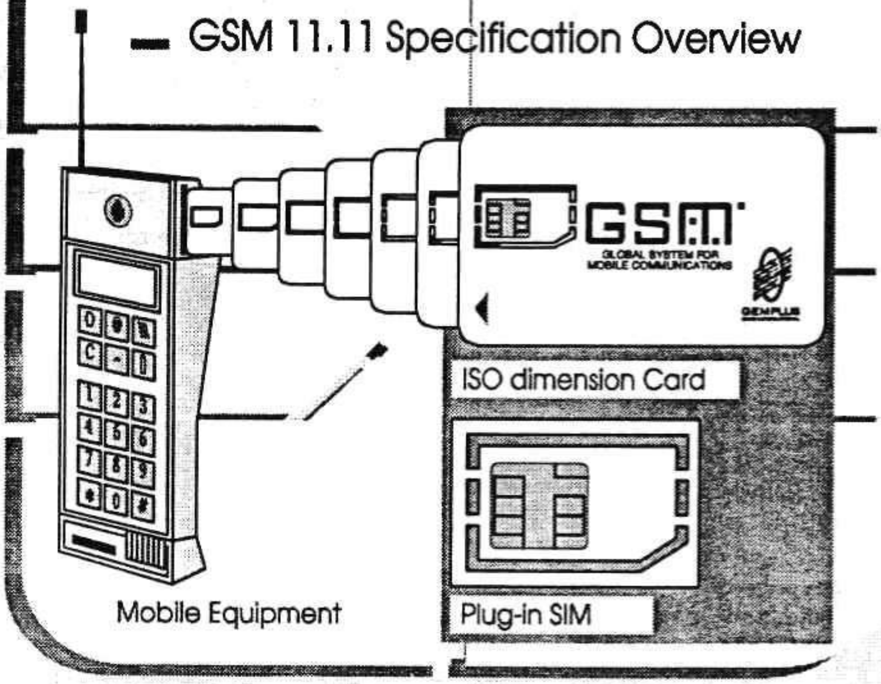


GEMPLUS CARD INTERNATIONAL

Smart-Card based Pay Television

APPLICATION OVERVIEW

— GSM 11.11 Specification Overview



GEMPLUS
CARD INTERNATIONAL

It will be possible to call(and to be called !) anywhere in EUROPE from a taxi, a rental car, your pocket telephone, your friends telephone set just by plugging either your personal card or your "smart business card". Every businessman will have at least two cards and he will be able to go skiing or playing glolf sounding like sitting in his office or stocked in a traffic jam ! Isn't it a major progress ?
There is no question in our mind that this system will also proliferate outside EUROPE. Many countries are already very much interested and talking to us.
This is a major challenge for all of us in EUROPE both for the cards, the telephone sets, the system integrators and the service providers. Let's not miss that opportunity !

4. SMART CARDS IN VENDING MACHINES

The following slide outlines some caracteristics of the vending machine business worldwide. In this business again Smart Cards will bring major advantages on cost, service and security.
Major projects are already under progress in ITALY - GERMANY and JAPAN.
Converting existing vending machines to a card reading machine is very simple and cheap. Building new machines is even simpler.
We anticipate to see a boom for Smart Cards in this market segment as well. Smart Cards for this application can be made very cheap (like for public telephone) because the transaction is simple and security is not a major issue.

5. SMART CARDS FOR MEDICAL AND HEALTH APPLICATIONS

This market segment will be eventually the largest user of Smart Cards. However due to lot of inertia and obstacles to develop a standard, to put together doctors, health organization, insurance companies, hospitals etc. etc , it will take some time before large scale implementation at a country, or even more at continent level takes place...
In addition the ultimum "portable medical data file" needed for every individual requires today very large memory capacity which would make the card quite expensive.

However many small/medium scale experiments are going on in many different countries in the world. The major advantages brought by Smart Cards are :

- Security : protection of personal data, immediate information on medical key (parameters/allergies-blood, etc.)
- Cost : paperwork, suppression of redondant tests, etc.
- Flexibility : off line and on line processing - easy updates.

Many interesting new technologies are developped to provide the ultimate "portable medical data file" all using Smart Cards, with data compression techniques, combination with optical media or, better, with advanced magnetic materials(see KIOTA Card). The following charts show some specific applications of Smart Card in the Health sector.

6. OTHER IMPORTANT SMART CARD APPLICATIONS

Many potential applications for Smart Cards are under advanced test. They are so numerous that we can only give a short list and a limited description :

- THE G S M SYSTEM -

GEMPLUS

GLOBAL SYSTEM FOR MOBILE COMMUNICATION

* A PAN EUROPEAN SYSTEM
* 17 COUNTRIES ADHERED TO IT
* FULLY CELLULAR AND DIGITAL
* GROWTH FROM 3 M. TO 20 M. SUBSCRIBERS
* A 15 TO 20 BILLION US $ PROGRAM

AND ...

SMART CARDS USED FOR IDENTIFICATION PERSONALIZATION AND COMPENSATIONS ...

12

SMART CARDS - VENDING MACHINES

GEMPLUS

* 5 MILLIONS VENDING MACHINES INSTALLED IN JAPAN
* 7 MILLIONS IN THE R.O.W.
* MORE THAN 1 MILLION TON OF COINS HANDLED EVERY YEAR
* COIN MECHANISMS ARE EXPENSIVE
* SECURITY AND VANDALISM ARE PROBLEMS

AND ...

PREPAID, RELOADABLE SMART CARD SYSTEM BRING :

- SAVINGS & CASH
- SECURITY
- FLEXIBILITY / EVOLUTION.

SMART CARDS - PATIENT RECORD

GEMPLUS

REDUCE

- MEDICAL ADMINISTRATIVE WORK
- DUPLICATION
- MANUAL TRANSCRIPTION ERRORS
- LACK OF INFORMATION TRANSFERT
- PAPER USE AND STORAGE

INCREASE

- PREVENTION
- EMERGENCY DATA ACCESS
- UNAMBIGOUS PRESCRIPTION
- INFORMATION INTERCHANGE
- APPROPRIATE INVESTIGATION AND MANAGEMENT
- HEALTH CARE QUALITY

AND ... LINKS SHARE CARE.

SMART CARDS - MARKET

GEMPLUS

(MILLION UNITS)	1991	1995	GROWTH PATTERN
- PUBLIC TELEPHONE	135	550	~
- BANKING	10	100	~
- ENCRYPTED TV	5	50	+
- HEALTH	2	100	+++
- MOBILE TELEPHONE	0,2	20	+
- SECURED ACCESSES	0,2	100	+++
- VENDING	1	100	+
- MISCELLANEOUS	0,2	50	++
TOTAL :	153.6	1070	

- Logical Access Control (Computer Security) :
Many companies in the world are developping secured systems using Smart Cards to fight computer piracy. IBM has a product on the market since several months.

- Physical Access Control : Many companies or organizations are using Smart Cards for access control. Most of the time the card is a powerful substitute to the badging system offering many additional fixtures which cannot be integrated on a magnetic badge or are not secure enough. One interesting application uses image compression to store a picture in the chip.

- Parking cards : Many experiments are in progress. The city of PARIS decided to use Smart Cards for all street and public parking. A multimillion cards a year program !

- City cards : for transportation, schooling, social events, sports, children and elderly programs, food stamps etc. etc.

Every single day new applications are developping. We are going to conclude our list with two of them which could lead to very large volumes.

- ID Cards : One can assume that every passport or ID card or driver's licence be concentrated on a Smart Card.

- Remote transaction cards : Secured transactions could be performed from home or the office by using a PC, a teletext terminal or a TV set. A small card reader (as shown below) can be added to the terminal allowing secure banking, ticket reservations, utilities payment, access to data bases, telemarketing, gambling, lotteries and ticketing etc. By the way, do you know how many counterfeit plane tickets are generated every year ?
This segment of remote transaction alone could lead to hundreds millions of cards !

One should remember that by 1991 the standard credit card market alone will be close to 500 milions cards worlwide... In summary with the following chart we are giving our prediction on the market growth from 1991 til 1995 for Smart Cards. The billion yearly consumption should be reached by 1995. We talk here in units of cards because it is more meaningful for semiconductor manufacturers since any Smart Card contains at least one chip !
As far as card revenues are concerned it should go from US S 200 millions in 1991 to close to US S 2 billions in 1995 ! Smart Cards prices varying largely with the applications since the chips can be either a single secured memory or a complete sophisticated microcomputer chip with ROM - RAM and EEPROM on board.

However Smart Card is only the "Tip of the Iceberg".It is not a component business like people could think at a first glance.Smart Cards are only an element of a complete system ! Smart Cards manufacturers more and more realize that the end applications are leading the business and that customers want a complete system solution.

III -SMART CARDS : THE TIP OF THE ICEBERG !

The following slide summarizes the idea behind the "system concept" which is always present when talking about Smart Cards applications.

Unlike the public telephone where the operators are large Public Institutions who are providing networking, system integration and then buy separately cards and hardware, for any other cards application, hardware and very often services are to be offered as a "package".
Alliances are required between card manufacturers, hardware manufacturers and software houses to offer a complete system. But more and more the cards manufacturers are migrating from a card suppliers to a hardware, software and even service providers. The basic reason is because we are facing a completely new concept and if a "brick" is missing in the building there is no business ! In addition know-how of the chip architecture, security fixtures (such as security algorithms) card interface with readers and applications software are critical and the card/chip performances can become the weakest link of the whole chain.

1. HARDWARE
   The next slide gives a list of dedicated Smart Card hardware equipments which are essential building blocks in any given Smart Card system. They are :
   - reading systems
   - personalization equipments
   - communication devices.

2. SOFTWARE
   Software is another essential link in the chain.
   It starts first with the software embedded in the chip of the card. An Operating System is of a prime importance for any microcomputer card. It then goes with advanced security algorithms, image compression software and software interface between the cards and hardware. Then dedicated software packages are needed for every specific application. All of this represent an enormous development effort.

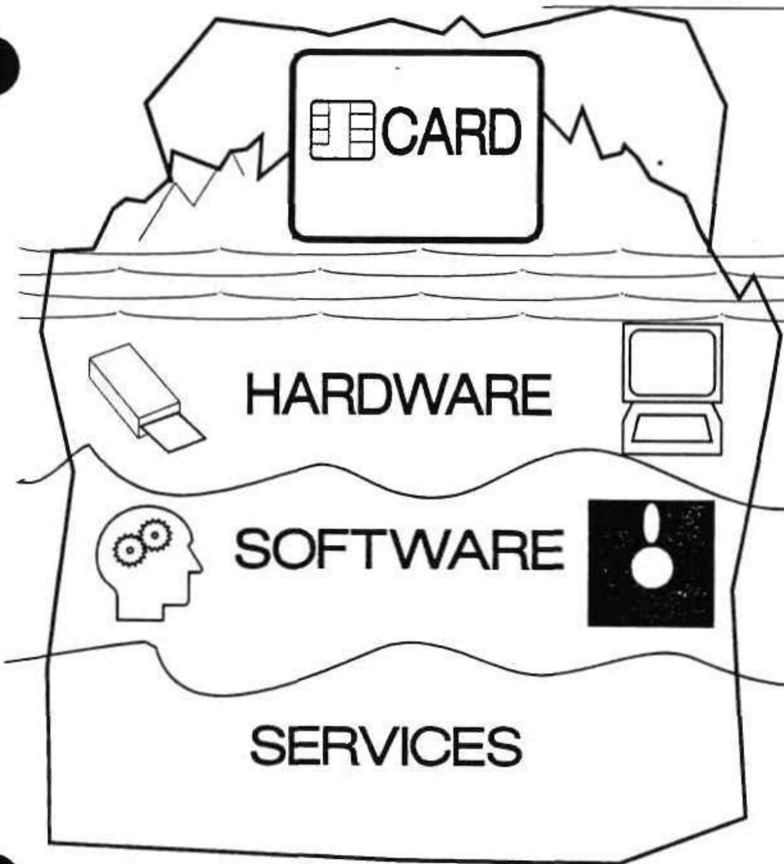
3. SERVICES
   Cards need to be tested, coded and personalized to the end customer (s) requirements.
   They also need to be distributed and serviced.
   Most of the time a card by card personalization service is required.
   Very often also the "service providers" such as the TV broadcasting entities, mobile telephone operators, banking institutions are looking for an outside entity to support the card distribution. This for many reasons :

   - it is outside their basic expertise
   - it is a very new activity
   - economy of scale to support expensive operations
   - secure environment required.

   Consequently fully integrated Smart Card manufacturers will be offering more and more a global service (see following slide).
   Revenues at stake are very high. The EIAJ (Electronic Industries Association of JAPAN) predicts that 1 S of Smart Card sales will generate 14 S of hardware - software and services associated.
   That's why we pretend that Smart Cards are just the "Tip of the Iceberg".

SMART CARDS . . .
THE TIP OF THE ICEBERG

GEMPLUS



. CHIP
. MICROPACKAGING
. TESTING-CODING

. READERS
. PERSONALIZATION
. COMMUNICATION

. CHIP OPERATING SYSTEMS
. COMMUNICATION SOFTWARE
. ENCRYPTION ALGORITHMS
. APPLICATIONS SOFTWARE

. PERSONALIZATION
. SUBSCRIBERS MANAGEMENT
. SECURED TRANSACTIONS
. SYSTEM INTEGRATION

M. LASSUS - GEMPLUS CARD INT

- HARDWARE FOR SMART CARDS -

GEMPLUS

☐ READING SYSTEMS

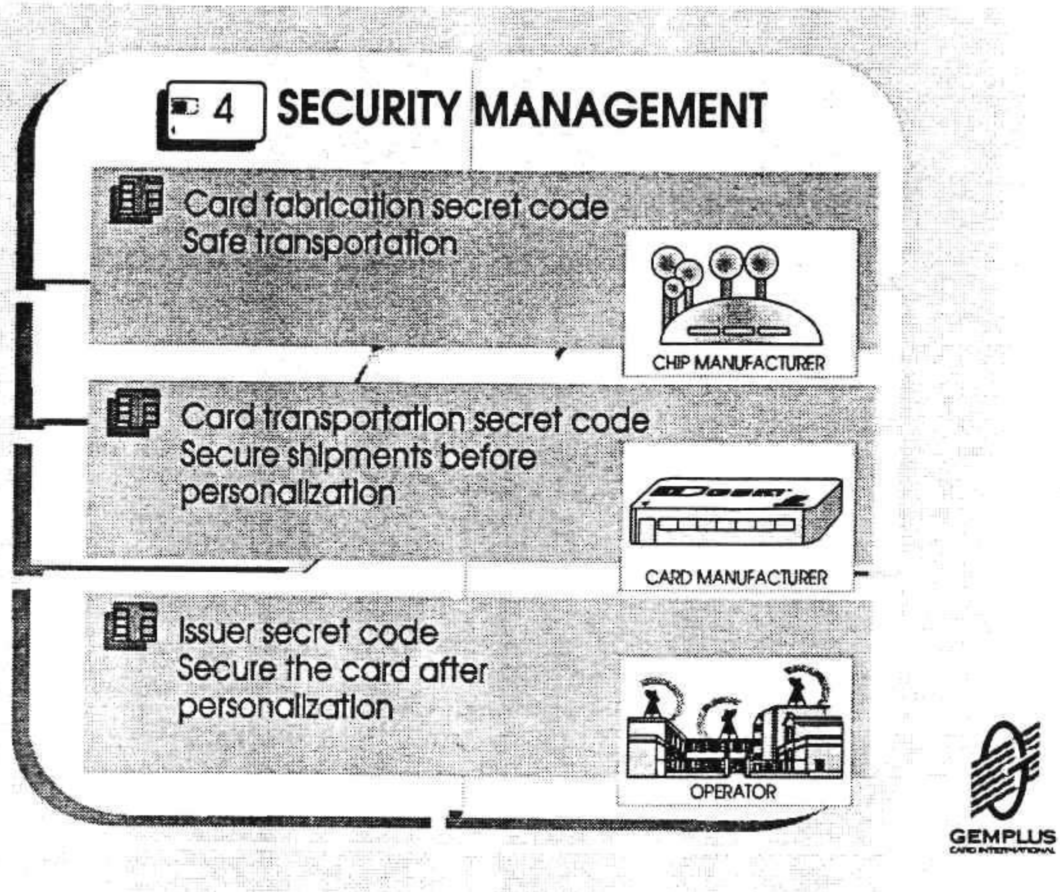
- P.O.S TERMINALS / PUBLIC TELEPHONES
- PHYSICAL ACCESS TERMINALS
- LOGICAL ACCESS (PC's - TELETEXT)
- VENDING MACHINES KITS
- ENCRYPTED TV DECODERS

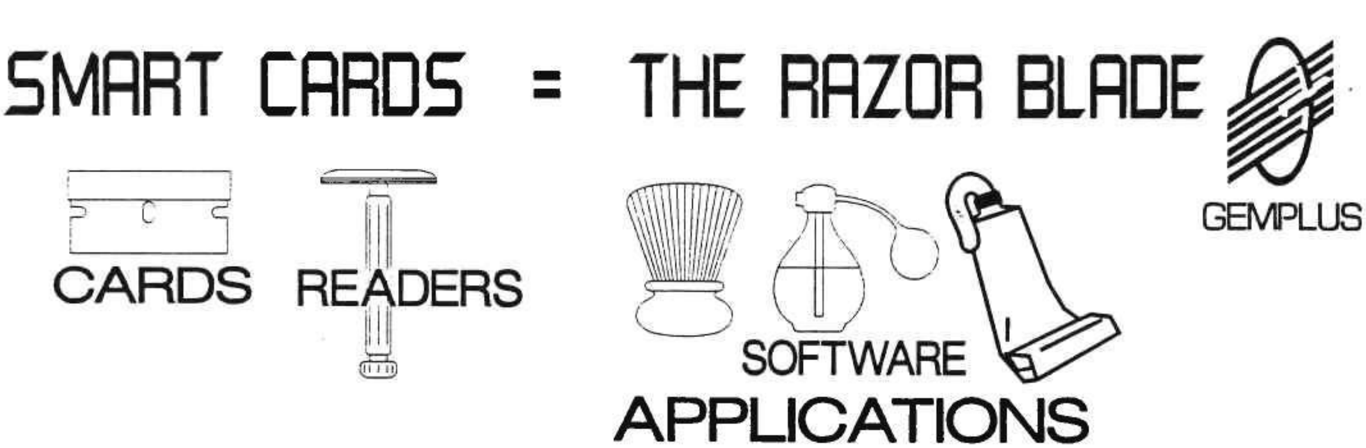
☐ PERSONALIZATION SYSTEMS

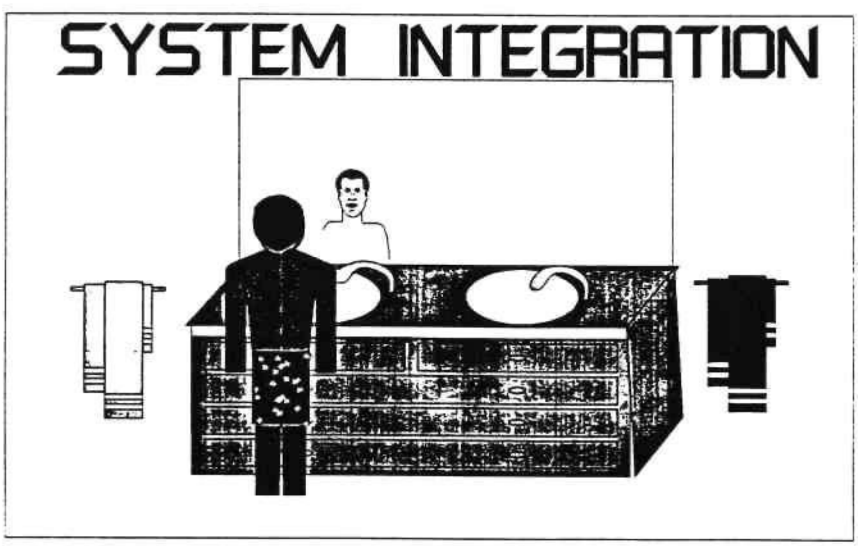
- ELECTRICAL : TESTING
- GRAPHICAL : PRINTING - PHOTOGRAPHS ...

☐ COMMUNICATION SYSTEMS

- "CONTACTLESS" SMART CARD SYSTEMS
- G S M SETS
- UNIVERSAL "ZAPPER"


4 SECURITY MANAGEMENT
Card fabrication secret code
Safe transportation
CHIP MANUFACTURER
Card transportation secret code
Secure shipments before personalization
CARD MANUFACTURER
Issuer secret code
Secure the card after personalization
OPERATOR
GEMPLUS


SMART CARDS = THE RAZOR BLADE
GEMPLUS
CARDS
READERS
SOFTWARE
APPLICATIONS


SYSTEM INTEGRATION

IV -THE CHALLENGE FOR SEMICONDUCTOR MANUFACTURERS

The message to semiconductor manufacturers is very simple and straightforward as summarized in the next slide. A lot of chips and I/C's will have to be supplied both for cards and associated hardware. This new business could be as important as the one generated by the advent of the PC...

By the end of the day, microcomputers are coming in everybody's pocket ! And don't believe that one Smart computer Card will do everything... Security, memory capacity and different applications will require different cards. Competition between different operators too ! Can one believe to mix banking cards, with company cards, TV cards, health cards, parking cards, ID cards, telephone cards, vending machine cards in a single product ? Not really.

How one could run all these services together ?

At least not for tomorrow. In the meantime there is a lot of business for all of us !

My last message goes to the European Industry.
Don't forget :

- Smart Cards started in EUROPE, EUROPE is by far today the largest market, the first continentwide, program is taking place with the GSM mobile telephone project, soon I am convinced that public telephones and banks should and will merge into an unique European standard and later on why not ID cards (the European passport) and finally the European Health card ?

With all the activity generated for semiconductor chips, hardware, software and services we all have a tremendous challenge ahead of us.

Ladies and Gentlemens let's takle it !

Thank you very much for your attention.

THE CHALLENGE FOR SEMICONDUCTORS MANUFACTURERS

GEMPLUS

TO PROVIDE

* BILLIONS OF CHIPS DURING THE NEXT DECADE !
* NEW CHIPS ARCHITECTURES
  - SECURITY
  - OPTIMUM DIE SIZE
* DENSE EEPROM ACCROSS THE BOARD
* LARGER MEMORY CAPACITY
* EXTREMELY LARGE AMOUTS OF I/C's FOR HARDWARE
  - MICROPROCESSORS
  - MEMORIES
  - ASIC's
  - IMAGE COMPRESSION I/C's

M. LASSUS - GEMPLUS CARD INT al

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

MULTIMEDIA: VIRTUALLY A REALITY TODAY

Andy Hopper
Director, Olivetti Research Ltd
Olivetti

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

MULTIMEDIA: VIRTUALLY A REALITY TODAY

Andy Hopper
Director, Olivetti Research Ltd
Olivetti

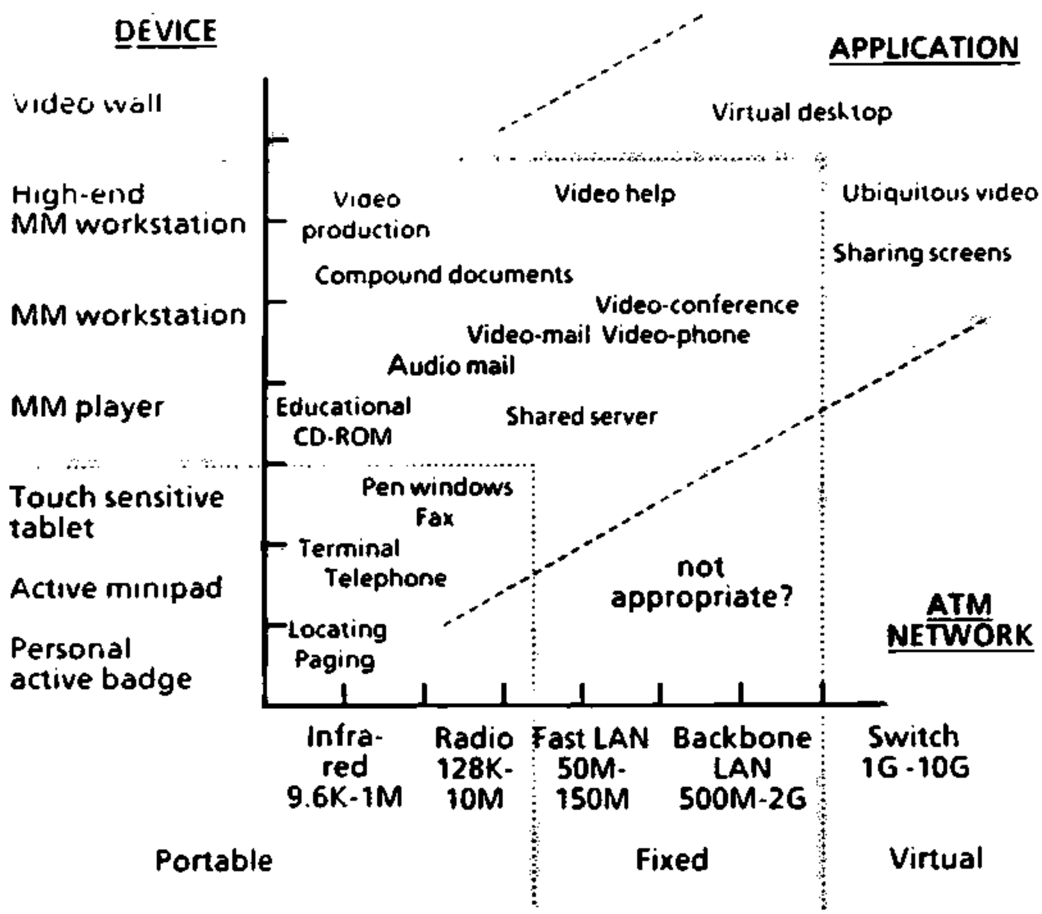
Dr. Hopper is Director of the Olivetti Research Laboratory. Most of the research at ORL is undertaken in close cooperation with the University of Cambridge and currently focuses on high-speed communications, multi-media systems and personal computing objects. Dr. Hopper is a lecturer at the university and a Fellow of Corpus Cristi College. Following two years as a research assistant at the University of Cambridge, in 1979 Dr. Hopper set up a company called Orbis and was a founding director of Acorn Computers, with Herman Hauser and Chris Curry. As research director, he was one of the designers of the BBC Micro and Econet local area network. In 1985, Dr. Hopper helped to establish another new Cambridge company, Qudos, providing training and software for VLSI design. Qudos also manufacturers semiconductor devices using direct e-beam techniques. He has a B.Sc. from University of Wales, University College of Swansea and a Ph.D. in Computer Science from the University of Cambridge.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

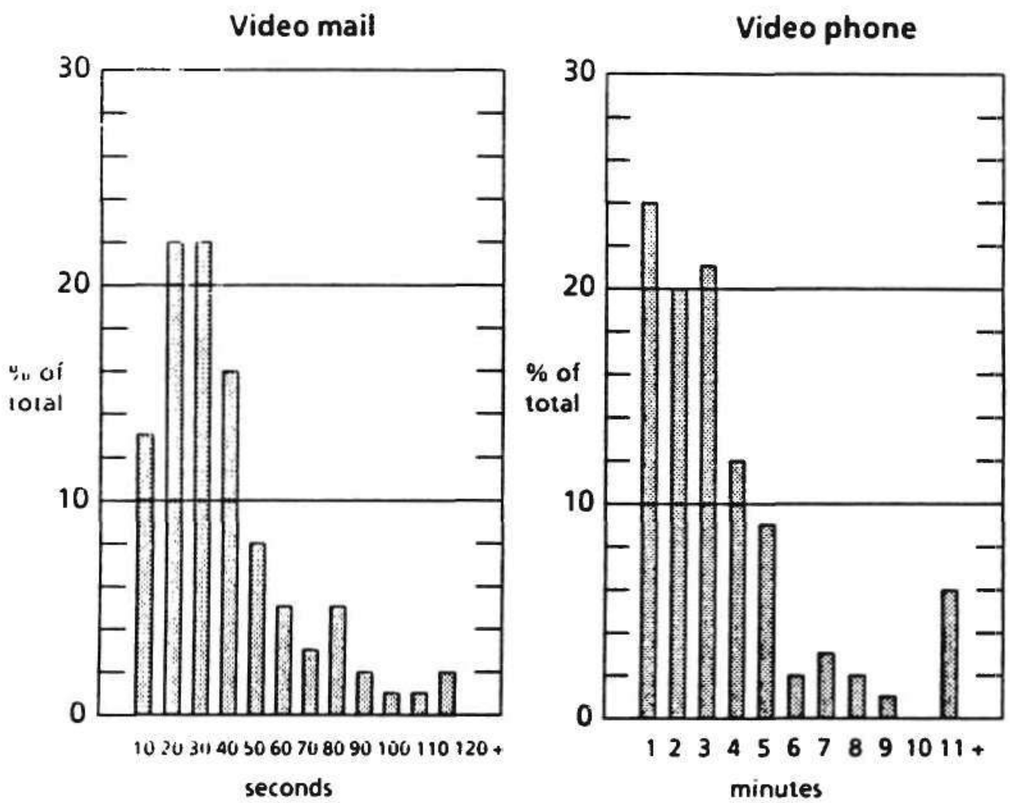
Multi-media:

Virtually a Reality Today

The Multi-media space



New desktop video applications

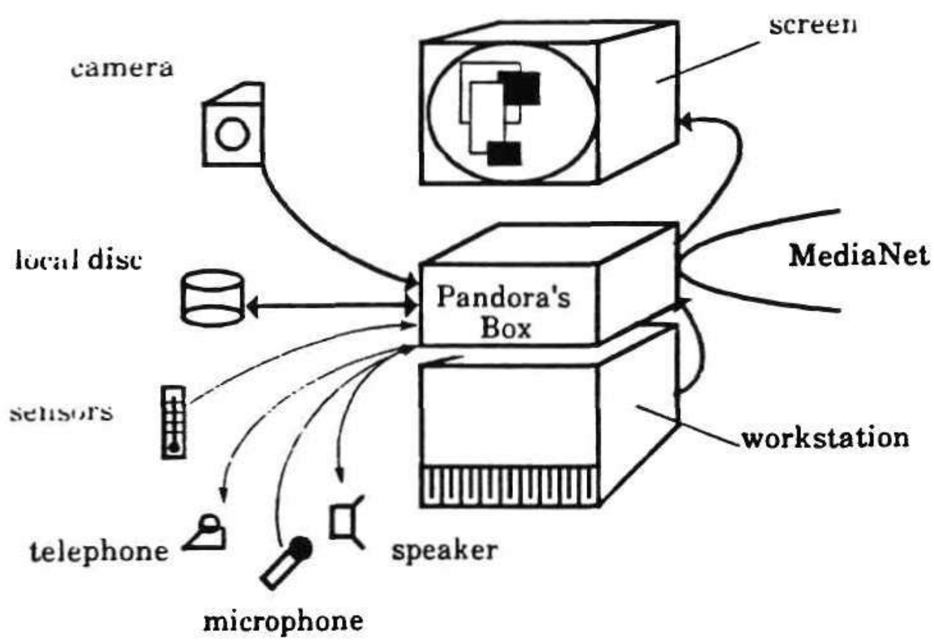


Others: latest news, weather, soap

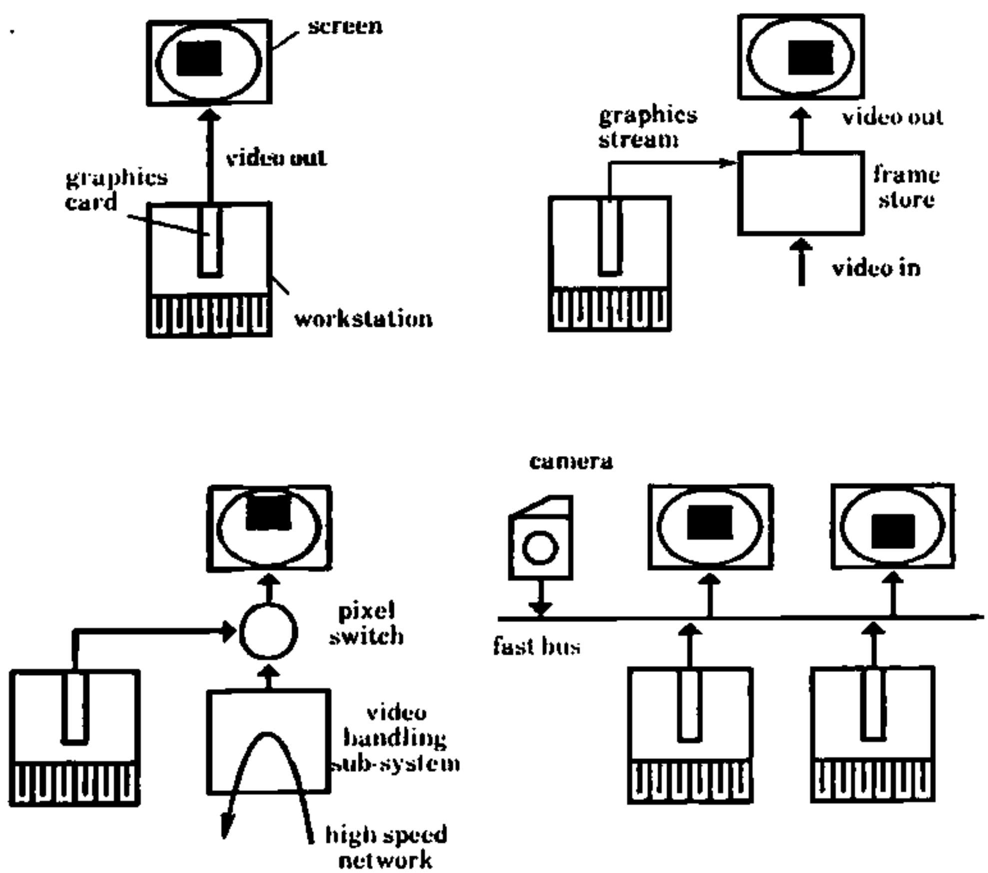
personnel introductions

...

Pandora's Box



Video in a workstation



Suggestions

Workstation architecture
- Very fast busses / bus interfaces
- FIFO's
- Bus concentrators

Capture
- camera on chip
- multiple cameras
- separate out compression
- composite video and RGB representations

Display
- look-up tables with DAC's
- video RAM managment
- low-end displays for portables

Compression/expansion
- idempotent schemes
- DSP approach
- filtering/re-sampling

Network
- Asynchronous Transfer Mode (ATM)
- low-latency interfaces

General
- fast state changes
- timers
- lots of interrupts
- priority schemes

Profit Through the Silicon Cycle: The Next Ten Years

MULTICHIP MODULES: A VEHICLE FOR INDUSTRY INTEGRATION

Michael F. Ehman
Director
Alcoa Electronic Packaging, Inc.

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

MULTICHIP MODULES: A VEHICLE FOR INDUSTRY INTEGRATION

Michael F. Ehman
Director
Alcoa Electronic Packaging, Inc.

Dr. Ehman is a Director of Alcoa Electronic Packaging, Inc., a wholly owned subsidiary of the Aluminium Company of America. He is based in Warrendale, Pennyslvania. His current responsibilities include the development and manufacturing of multichip substrates, along with the assembly and test of multichip modules. Before joining Alcoa, Dr. Ehman held various managerial positions in the electronics industry with Rockwell International, TRW, and most recently as President and General Manager of the Morgan Semiconductor Division of Ethyl Corporation. He received his B.A. degree in Minerology from Miami University, an M.B.A. from Southern Methodist University, and his Doctorate in Solid State Science from Pennsylvania State University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Dr. Michael F. Ehman
Director
Alcoa Electronic Packaging, Inc.

ALCOA

TRENDS FORCING USE OF MCMs

SYSTEMS

- **REDUCED SYSTEM DELAY**
- **PROXIMITY TO COMPLEMENTARY FUNCTIONS**
  - **Graphics Processors**
  - **RISC and Sparc Chip Sets**
- **SIZE REDUCTION**
- **THERMAL MANAGEMENT**
- **COST REDUCTION**

TRENDS FORCING USE OF MCMs

SEMICONDUCTORS

HIGH I/Os

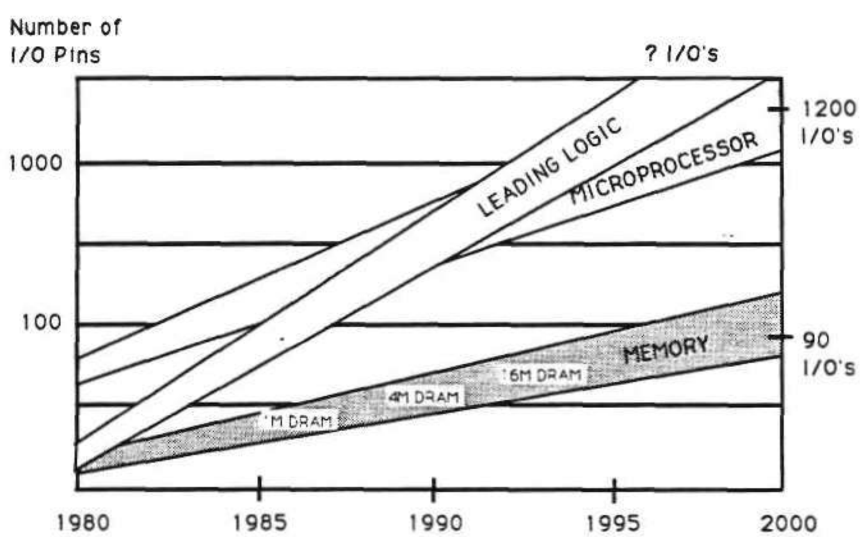
CLOCK RATES > 50 MHz

MANUFACTURING YIELDS LIMIT DIE SIZE

CHIP PITCH

·CAPTURE VALUE ADD OF CHIP SETS

TYPICAL PIN COUNT PER INTEGRATED CIRCUIT



WHY MCMs?

SPACE TRANSFORMATION

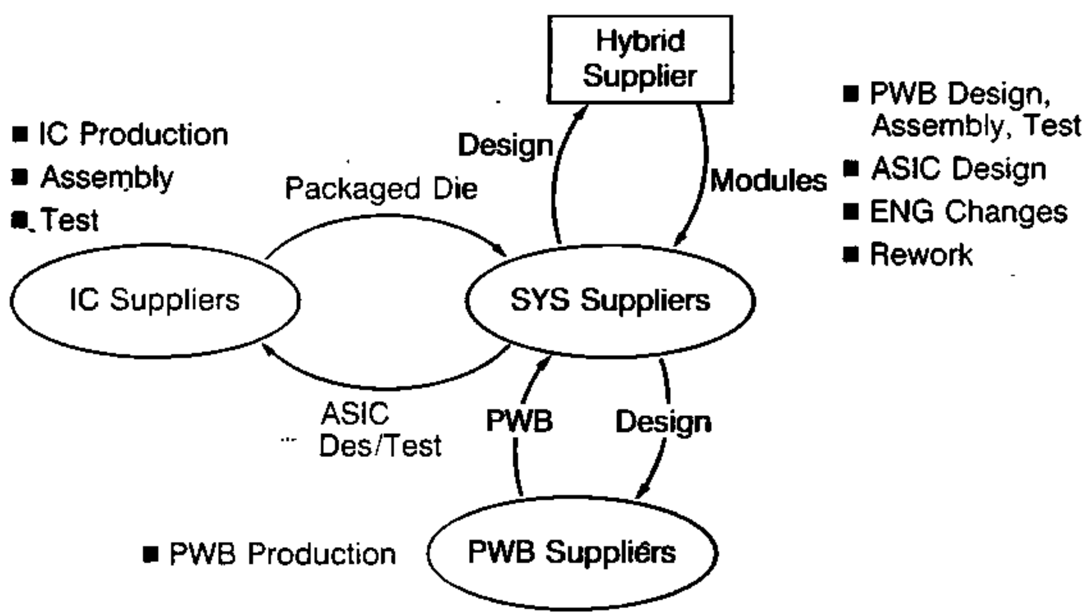
INTERCHIP WIRING

- **Terminating Resistors**
- **Integral Capacitors**
- **Impedence Matching**

MANUFACTURABILITY

- **Treat As A Component**
- **Rugged Handling**
- **Reduced Handling**
- **Simpler PC or Mother Boards**

Current Vendor Relationships



DESIGN

CAD TOOLS INADEQUATE

PC Board Routing

Hybrid Layout

IC Layout

CAD REQUIREMENTS

Subsystem Level Simulation

Functional Partitioning

Electrical Simulation

Thermal Simulation

Computer Added Manufacturing Data

TEST

DESIGN FOR TESTABILITY

Critical For costs
Boundary Scan
Self Test

MIXED TECHNOLOGY TESTING

Digital and Linear Devices
Silicon and Gallium Arsenide
Multiple Power Levels

DIE LEVEL OR WAFER LEVEL

Parametric Testing
Test at Speed
Diagnostic Testing. . . Fault Finding

REWORK

INTOLERABLE

MAJOR CAUSES

Interconnect Failures

IC Performance vs. Specification

Clock Rates
Power Distribution
Threshold Voltages

REWORK

MAJOR IMPACT

Cost

Time to Market

Frustration of Customer

Distrust of Vendors

Confusion of Personnel

WHAT IS THE SOLUTION?

INTEGRATED QUALITY

PROCESSES

In Control

Capable

FOCUS ON DESIGN/PERFORMANCE INTERFACE

Systems Requirements

Component Limitations

EXAMINE CUMULATIVE TOLERANCE WINDOWS

WHAT IS THE SOLUTION?

TRUST. . .

UNDERSTANDING NEEDS

Materials

Components

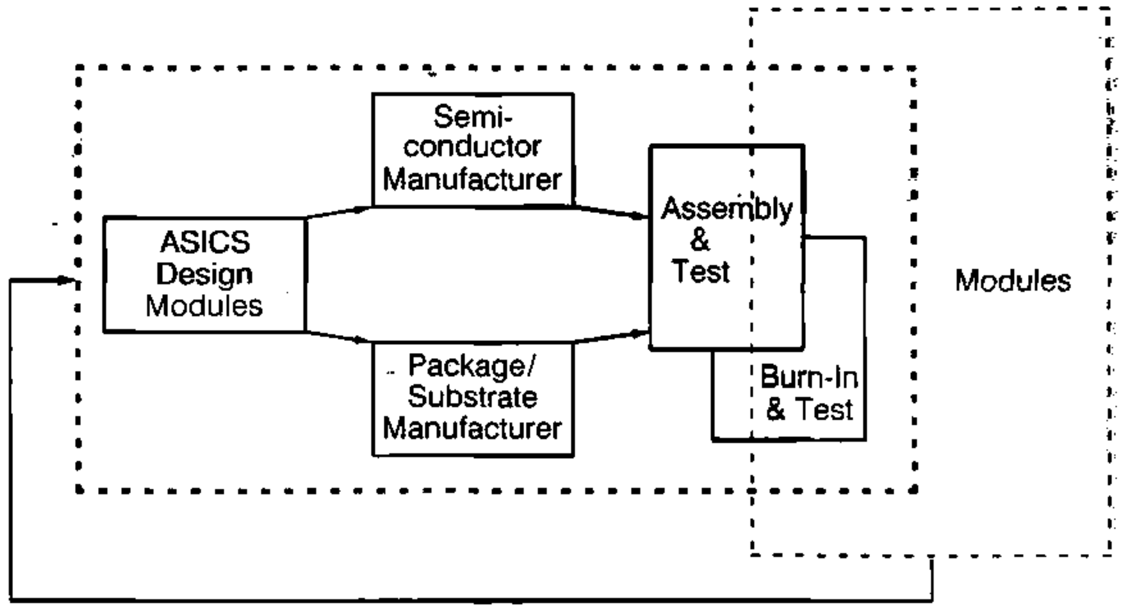
Systems

UNDERSTANDING PROBLEMS

UNDERSTANDING STRATEGIC DIRECTIONS

. . .ALLIANCES

Required Vendor Relationships



Profit Through the Silicon Cycle: The Next Ten Years

ZETEX—MAKING THE WORLD OF DIFFERENCE

Bob Conway
Managing Director
Zetex plc

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

ZETEX—MAKING THE WORLD OF DIFFERENCE

Bob Conway
Managing Director
Zetex plc

Mr. Conway has spent more than 25 years in the semiconductor industry as designer, developer and manufacturer of both discrete and integrated components, digital and linear, signal and power devices across a wide range of process technologies. The divestment by the UK Plessey Semiconductors Ltd of a non-core manufacturing activity in early 1989 gave him the opportunity to lead the establishment of a new UK-based company, Zetex plc. As Managing Director of Zetex, he has led the new company in its development into a profitable and widely respected international group with subsidiaries in the United States, Germany and Hong Kong. Close global partnering in technology, manufacturing and trading, all bonded by the rigorous Zetex disciplines of excellence in "customer satisfaction" and "product differentation," is the hallmark of his future development plans.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

DATAQUEST SEMICONDUCTOR INDUSTRY CONFERENCE

DISCUSSION SESSION: SUCCESS IN START-UPS

Thursday May 30th 12:00

BOB CONWAY

ZETEX - MAKING THE WORLD OF DIFFERENCE

This presentation is unashamedly aimed at the representatives of the larger European component companies and of those multinationals with major interests in Europe. I am European and I have a vested interest in Europe finding an effective niche on the global electronics stage. That stage must have a full cast of players - not for the sake of parochial regional economic power but for the sake of effective industrial development and strategic political balance.

For this to happen Europeans must develop and exploit all of their strengths, especially those embedded in people. Remember, it is mankind alone who conceive, invent, trade and make profit. It is the ingenious and motivated people who develop the products and applications that provide the market 'engines'. It is enlightened people who understand the clear requirements for long term corporate success. This enlightenment comes from exposure to an adventurous business environment linked with the discipline of effective ownership and immediate accountability for the corporate assets. In the semiconductor industry of today, the dim light shines on but a few.

Our industry in Europe desperately needs a culture shift away from the narrow and inbred rigors of big corporation mentality. Our brains are undoubtedly as inventive as ever but look behind you, they are being cleverly tapped and exploited by others. Europe urgently needs more truly competent semiconductor and electronic technologists and industrialists.

Europe has too few, concentrated in too few places.

A mere scratch in time saw Europe descend from being the adventurous rulers of world trade and industry to become a lacklustre collection of independent industrial states. Today the local semiconductor industry reflects the birth pains of a new Europe, as it struggles to escape from the many chains of the 'heavy' industrial revolution.

Throughout the recent past, many of our adventurers set sail for the West, whilst others went East. Europe now needs to regenerate new strategic industries by actively encouraging a new generation of adventurers - technological and industrial.

Continued/......

For those involved in my own company, Zetex is one such small adventure.

ZETEX IS DIFFERENT FROM THE EUROPEAN REST.

Zetex PLC is a new, independent UK based semiconductor company that operates globally (and there are not many). We specialise in relatively low end process technology from which we produce some unique products. We have fostered international partnerships. We have a reputation for world-class customer service to major international companies. We are profitable. Our strategy is to continue to enhance the difference.

Examples of current Zetex product differentiation include the world's smallest power transistors, the world's quietest audio transistors and the world's highest operating temperature plastic encapsulated discretes.

Zetex was not the classic start-up, driven by an individual product or technology concept and financed by venture funds. It was supported by an industrial partner with funds and with strong entrepreneurial spirit, Telemetrix PLC, a UK quoted company.

The Zetex start-up acquired unwanted assets and technology from an established UK semiconductor house through the vehicle of an MBO. Plessey Semiconductors Ltd, as it was in early 1989, had a clear strategy with a tight focus on products, technologies and markets. This meant that certain activities, for example discrete semiconductors, were outside that focal range. This provided myself and a small number of colleagues the 'opportunity' to feed an 'urge'.

Our experiences during the adventure so far, seemingly insignificant by many of your standards, act as an example; and as an object lesson. Whatever the future provides, Zetex will have contributed to enhancing Europe's stock of semiconductor adventurers. It is this issue which I want to explore further.

For the next decade, as European semiconductor companies continue to search for new ways to remain in the big league and at the same time to show a competitive return on their investments, a much broader and longer term attitude will need to develop.

The decision to divest the assets which were eventually used by Zetex as the foundation for a successful start-up, was made for two reasons:- market strategy and simple economics. It is my contention that a third reason must now be considered within the Board rooms of the major European component manufacturers - survival of the European electronics industry through people with the 'urge' to exploit an 'opportunity' - however improbable it might seem.

Continued/......

That is, people with the 'urge' to get back to business basics with the 'opportunity' to establish small and medium sized businesses which can be a platform for specialized innovation and development. More importantly to become vehicles for technologists and managers to understand what it means to be market lead and that customer satisfaction is the Holy Grail, that a healthy balance sheet and high returns are the keys to future existence, growth and employment in Europe.

The majority of our European colleagues and competitors fall mainly into two groups :-

(i) Component Divisions of integrated multinationals.
The grand dictators who set the stage for the European fight to beat the East and whip the West.

(ii) Small/Medium independent specialists.
The rare snakes who slither to survive against the global odds.

Despite the outstanding inventiveness and determination of some individuals and companies in both of these groups and despite some significant financial commitments by governments and corporations, Europe is generally continuing to show poor returns for its efforts in the electronic component field. Perhaps, however, it is not the amount of money and equipment which is the problem, perhaps it is the operating environment and the resulting capability and performance of people.

Even though the USA semiconductor industry has its share of problems, it still has the advantage of operating within a nation-wide industrial culture dominated by entrepreneurship and reward for achievement.

Even though Japan, at least from our viewpoint, is weak in fundamental research, it still has the advantages of superb production carefully positioned by aggressive global marketing seeking 100% market share and operating in a relatively low inertia industrial bureaucracy.

Europe however, despite its rich ingenuity, seems burdened by a variety of different national approaches to the industry, together with what is becoming an increasingly high inertia, anti-entrepreneurial bureaucracy and corporate cultures which seem better suited to the production of heavy armaments.

The people who really make this industry tick at any level tend to be single minded, need high levels of independence but eagerly accept strict financial accountability, enjoy risk, have keen market judgment, encourage cross-fertilization, think globally and react to success with increased commitment.

Continued/......

The European components industries now have too many of their best people in too few corporate bodies. Economies of scale have gone wrong. Strategic investments are apparently failing to perform, dragging businesses and eventually their people down - inhibiting and stifling any regional competitive edge.

Large technology driven projects obviously need critical corporate 'size' to finance and support them. However, without acute awareness of the long term effects on balance sheets, the operational managers of these projects risk eroding the entire regional industry base. Maybe Pasquale Pistorio's call for a huge united Euro-Semi is the only way to tackle certain issues. But a mega-beast with a voracious appetite for all things will not ensure lasting fitness and ability. A population of one? Very lonely and very vulnerable. What happens when it dies?

The larger the corporate body, the more difficult it seems to be to apply effective long term balance sheet accountability at the levels which really matter. The greater the danger that optimistic 'technical' machoism will be allowed to rule because the key technologists are distanced from the vital understanding of strategic performance.

In the long term, if Europe is to retain a vibrant electronics industry, then the industry itself needs to foster a spectrum of businesses, from small start-ups through medium sized hive-offs to the large, established multinationals. The large should encourage, support and partner the small, despite the risk of some minimal overlap. Then these small and medium companies will eventually feed the large with concepts, applications and that vital ingredient, enlightened human material.

I am not suggesting any free meal tickets for those wishing to go it alone or those arguing to establish smaller and more autonomous subsidiaries. But I am suggesting a future vision in which more people are directly exposed to the realities of commercial judgment and real responsibility for assets. This needs the active encouragement of Europe's semiconductor majors, before they discover that their industry foundations are crumbling.

Zetex exist because a medium sized European company decided not to scrap its unwanted assets but to dispose of them in good faith to some of its managers.

Zetex was born from an MBO, encouraged by a willing parent. Zetex has survived the infant mortality zone, it is profitable and is innovating for the future. Zetex is operating globally at a process technology level which most of you might struggle to recall but which can produce superb components for many critical applications. Zetex has a reputation for customer service which, I hazard to suggest, is far superior to that of the vast majority of your companies. But then, of course, it needs to be !

Continued/......

From our perspective here beside the sea, Zetex was launched as a rowing boat from a top class ocean yacht. It did not sink when it hit the water and it is now fast becoming a contender for the junior yacht race. The water right now is rough, very rough, but the crew on board now understand better than the crews in the larger boats how to bail and batten down the hatches and how to set the sails for calmer water. They also now know more about the art of boat building.

Today you Captains of the luxury liners have problems. Big problems. Your crews are working blind. They are trapped below decks, most working hard in the hope that the Captain and the Navigator know what they are doing. But, of course, quite a few of them are sleeping in their comfortable cabins or 'resting' in the bar. And they are definitely not thinking about the hidden rocks !

My message is simple and obvious but, in some circles, apparently difficult to accept. As the huge ocean liners struggle to stay afloat and they begin to dismantle the fringes of their operations and as the slick yachts change the colour of their sails, - look forward. Do not abandon anything in Europe which has the slightest chance of success. Encourage a smaller organisation with different aspirations to take it on. Launch the adventurers. Be generous. Above all, avoid industrial totalitarianism !

Europe must strive to develop a new approach, trapped as it seems to be between the East and the West.

The European semiconductor industry must develop a new vision and set an example to the rest of industry. The big must regenerate through mutual existence with the adventurous small.

THANK YOU.

Dataquest

a company of
The Dun & Bradstreet Corporation

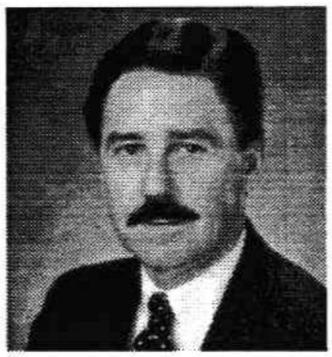
Profit Through the Silicon Cycle: The Next Ten Years

SEMICONDUCTOR START-UP COMPANY STRATEGY FOR PROFITABILITY IN THE 1990s

David L. Angel
President
Information Storage Devices

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

SEMICONDUCTOR START-UP COMPANY STRATEGY FOR PROFITABILITY IN THE 1990s



David L. Angel
President
Information Storage Devices

Mr. Angel is President and member of the board of directors of Information Storage Devices (ISD), of San Jose, California. ISD is a semiconductor company whose technology is based on the invention and development of the world's first analog storage integrated circuits. Mr. Angel came to ISD from Dataquest, where he was Semiconductor Group vice president. He joined Dataquest in 1988 following the successful creation and launch of an affiliated venture, DQ Alliances (DQA), two years earlier. As managing Director of DQA, he was responsible for business development, administration and management of merger, acquisition and strategic alliance projects. Mr. Angel is the founder and CEO of Almaden Ventures, a high-technology seed fund and venture capital consultation firm. Through Almaden Ventures, Mr. Angel has served as president, executive vice president and chief operating officer of several start-up companies and turnaround situations. Earlier, he was a founder of Signetics Memory Systems. He was also the Director of American Microsystems Inc.'s Image Technology Center. He is considered to be an expert in semiconductor lithography. At the outset of this career, Angel participated in the development of several of the earliest integrated circuits. Mr. Angel has written more than 100 publications dealing with high technology, lithographic imaging, venture financing, business strategies and management. Educated at Marietta College (Marietta, Ohio), Williams College (Williamstown, Massachusetts) and LaSalle University (Chicago, Illinois), Mr. Angel's academic background is in, respectively, Physical Chemistry, Business and Law.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

SEMICONDUCTOR START UP COMPANY STRATEGY FOR PROFITABILITY IN THE 1990s.

David L. Angel

President
Information Storage Devices, Inc.
San Jose, California, USA

In the foothills of the Sierra Nevada Mountains, approximately 100 kilometers east of the Silicon Valley, lies the California Gold Country. When the discovery was made at Sutter's Mill in 1849, the gold was so abundant and the retrieval so easy that many became wealthy overnight. In the 1970s, new semiconductor start up companies appeared monthly, if not more frequently. Innovation and creativity flowed so freely that most of the entrepreneurs became wealthy, almost overnight. Most people believe that all of the gold has been excavated from the California Gold Country. The region is now largely occupied by ghost towns and abandoned claims. However, a recent article in the San Francisco Chronicle, a major Northern California newspaper, noted that there is still substantial gold in the Sierra foothills and, a few companies are reaping good profits from gold mining activities in the Sierras. However, the skill and knowledge required to find the gold is vastly different than in the days of the California gold miners. The decade of the 1980s brought a certain gloom to the Silicon Valley. For the first time, entrepreneurs who started new semiconductor ventures were no longer assured of success, let alone, instant wealth. Worse yet, the decade saw several well financed, technology rich, semiconductor ventures fail! The investors, collectively, lost hundreds of millions of dollars. The old formula no longer appears to work.

There is still gold to be found in the hills East of San Francisco and there is still great success to be realized in semiconductor start ups in the Silicon Valley. However, the skills, the strategies and the methods of management are dramatically different from the heady days of the 1970s.

Today, I want to talk about two subjects. I would like to briefly expose you to the exciting new technology of direct, non-volatile, analog storage. This science has never been accomplished before, and it is going to open up an entire new market in the semiconductor industry. But mostly, I want to address the question of what is the new formula that semiconductor start up companies must employ to achieve success and profitability in the 1990s? We hear the term "distinctive competence" used often in describing the requirement for survivability in this decade, meaning, I guess, that a start up company must possess some special attribute that sets it apart from the rest of the pack. I don't disagree with that notion. It obviously applies in virtually all forms of businesses. But the companies that appear to be well positioned for profitability in the 1990s clearly have more than just distinctive competence. I would like to offer some ideas on what we see as necessary for sustainable profitability in this decade.

ESSENTIAL ATTRIBUTES FOR PROFITABILITY IN THE 1990s:

- O DISTINCTIVE INNOVATION VERSUS INCREMENTAL IMPROVEMENT
- O SIGNIFICANT VALUE ADDED TO THE CUSTOMER
- O SUSTAINABLE COMPETITIVE ADVANTAGE
- O STRATEGIC PARTNERSHIPS
- O LUCK

Now I come to the difficult part of my talk. As some of you may remember, before becoming the President of Information Storage Devices, I was Group Vice President in charge of Dataquest's Semiconductor Business. I enjoyed my work at Dataquest and truly regretted leaving. When conference time came around at Dataquest there were very few rules concerning conduct by the speakers. But one core tenet is that the speaker will not use his time at the podium to make a company sales pitch . . . I fear that I am about to tread heavily on that cardinal rule. I want to use what we are doing at ISD as a way to illustrate what we believe are the essentials for distinctive success in a start up company. Having given my "mea culpa," I hope you will forgive me if my enthusiasm gets too commercial.

DISTINCTIVE INNOVATION:

In the old days of the industry, we were astounded almost daily by technical breakthroughs. However, by the time of the mid-eighties, the venture capitals didn't want to fund high risk semiconductor ideas. The sheer and pure innovation of a decade earlier, has been replaced by incremental improvement. Today, we appear to be entangled in a "my MIPs is better than your MIPs, I can do what you are doing three nanoseconds faster, my cell size is smaller than your cell size" mentality. The problem with that approach is that it is very difficult to sustain growth and profitability in a company for any extended period of time. Let's use SRAMs as an example. Currently, according to Dataquest, there are 18 companies participating in the fast CMOS SRAM market. The current nanosecond leader comes in at twelve nanoseconds. The problem is, that at least ten other companies in the market are aggressively performing incremental improvement to develop a twelve nanosecond part. When that happens, as it surely will, prices and hence profits will fall. A new nanosecond leader will be established and the entire process will start again. There just isn't sufficient innovation to get in the lead and separate oneself from the rest of the pack. What do I mean by distinctive innovation?

ISD has developed the technology to store analog signals on a silicon device. Nobody, in history, to the best of our ability to research that issue, has ever been able to achieve that accomplishment. It is pure analog storage. There is no internal conversion to digital, there are no external converters required, and for the coup de grace, it is non-volatile. One can record and playback an analog signal thousands of times or you can record a signal and store it faithfully for tens of years with no standby power required. We think that is highly innovative. We live in an analog world. Sound, vibration, motion, acceleration, video, environment, temperature, and physiological activities are but a very few examples. However, to date, the industry has elected to deal with analog signals by converting them to digital pulses. This is incremental improvement but it is also inefficient. Let's compare the two methods:

COMPARISON OF WRITABLE STORAGE

ANALOG	**DIGITAL**
Dense 8X	Inefficient
Direct	Indirect - Converters
Nonvolatile	Volatile - Batteries
No Software	Software Required

Start up semiconductor companies who are going to stand out in this decade are going to have to break away from the mind set of incremental improvement and open their creative minds to bold innovation. There will be fewer start up ventures. Innovation of the type that I have just described is scarce. But it is, I submit, a path to profitability.

SIGNIFICANT VALUE ADDED TO THE CUSTOMER

Some of us have lost sight of just how much value the semiconductor industry brought to the customer in earlier days. I like to think of this in terms of enabling technology. The integrated circuit enabled or made possible credit card calculators, hand held computers, shirt pocket telephones and so on and so forth. This value added created new markets that fundamentally is the driving force of the electronics industry. Its not clear, at least to me, that a few less nanoseconds or a few more MIPS are sufficient to create that many new markets. We need to return to the days of deeply understanding our customer's markets and bringing them products that will allow them to gain a distinctive competitive advantage. I am going to again use my own company as an illustration. This is an illustration of one of ISD's products compared to the identical digital solution. The physical size comparison is obvious. The ISD product, however, is not just an analog storage chip. It is a complete electronic system. All of the convertors, filters, regulators, automatic gain control, analog storage, microprocessor interface, and amplifiers are integrated into one chip. It accepts a microphone directly and it drives a speaker directly. In fact, to use the chip, one attaches a microphone, speaker and power source and voila, you are on the air. Initially, users were confused as to how the chip was programmed. Let me see if I can illustrate the procedure. You program the product by talking to it.

DEMONSTRATION

This capability allows users to set themselves apart from their competition. It requires very little space, has exceedingly high fidelity, it requires no battery backup, and the design in time is next too nothing. Customers are reporting back to us that the incorporation of voice storage and playback in their equipment is allowing them to raise prices and increase market share. Understanding a customer's market, his competition, his product limitations and then offering a solution that lets your customer increase his profit margins and open new markets is essential strategy for the Nineties.

SUSTAINABLE COMPETITIVE ADVANTAGE

Some new companies appear, achieve brief fame and then sink down to the "land of the barely profitable." Why does that happen? I suggest that it is a result of a lack of a sustainable competitive advantage. Part of the problem is the incremental improvement mentality we discussed earlier. I asked Dataquest to develop a profile of new semiconductor start up activity in the last two years. In that time, at least ten more companies entered the PC chip set business. All are fighting to perform the function in fewer packages or at a faster speed than the other competitors. Dataquest advises that there are thirty companies competing in the PC chip set business, a $500 million/year market with a forecasted compounded annual growth rates of 12%. Simple mathematics reveals that the average market share per competitor is but $17.0 million. Chips and Technologies already has $250.0 million of the market so the situation is even worse than it initially appears. It is difficult to see how any of these companies can develop much of a sustainable competitive advantage over the other. Intel had a text book example of a sustainable competitive advantage with its 80386 microprocessor product.

Recently, AMD announced its 386 chip. Our intelligence suggest that there are at least six other companies quietly working on a 386 chip. While these companies are preparing to fight each other over the 386 market, Intel is superbly positioned to dominate with its 80486 product, where, of course, it has no competition. Intel's sustainable competitive advantage should be required reading for all entrepreneurs contemplating a semiconductor start up. Let me share with you how we feel we have achieved a sustainable competitive advantage at ISD.

- O The company is three years old yet, the industry only discovered us early this year. We operated in what is now being called quiet development. We did not reveal what we were doing until we had fully perfected the technology and had developed a line of products. We shipped our first production orders on the day of our product announcement. In doing so, ISD maintained a two year advantage over any would be competitors. The strategy is that a young company needs a significant head start. If you can't get that head start, maybe you shouldn't go into business.

- O ISD has patents granted covering the basic technology in the US, Europe and Japan and currently we have eight more patents pending. A company must create a strong barrier to prevent exploitation of its technology. Additionally, an arsenal of patents is useful when others suggest that your company's products violates one of their patents.

- O Patents are valuable, however, they are costly to enforce. The ISD products incorporate Analog, Digital, High Voltage, EEPROM, CMOS and Bipolar technologies all on the same chip. Very few would be competitors have that complement of skills. We made the products very hard to copy. The innovation is in the design and the way that the sub-systems are used on the chip. The wafer fabrication is almost pedestrian. We use two micron design rules with a process than can be manufactured in a wide variety of foundries. Test, on the other hand is critical. Special knowledge is required to efficiently test the product. We perform the testing in-house so as to prevent any would be competitor from gaining insight into this aspect of the product. The message is "Don't teach your competitors."

- O We are already in the pre-production phase of our next generation product. Never give the competition a fair chance. This is the 80386 - 80486 strategy. By the time would be competitors have gained a little understanding of your technology and product, you must be in the marketplace with the next generation technology and product. ISD has an entire family of third generation and non-voice analog storage products starting to work their way into the queue. If you can't find a way to maintain a sizeable distance between your company and your nearest competitor, your sustainable competitive advantage is questionable.

O Keep costs at a realistic level. Too many start up companies go through $5 or even $10 million before they even get to market with their first product. Yes, there has to be some financial suffering on the part of the entrepreneurs early on, but if they have the correct strategy and have done their jobs right, the rewards will ultimately be great. If you can develop a culture that permits you to develop technology and products at a cost that is much less than the competition, you have a good grasp on a sustainable advantage. By way of illustration, ISD required only $2.2 million total to develop the technology, create the product line and ship the initial production orders. That may well be a record!

STRATEGIC PARTNERSHIPS

So much has been said and written about this topic that I am going to be brief. ISD's initial market focus was in the communications area. We developed a strong partnership with one of the world's leading suppliers of communications products. ISD's products bring high value added to our partner and is permitting them to enlarge market share and contemplate new markets. In return, our partner provides ISD with insight into future applications and helps us to avoid wasting precious resources creating products with limited value added. Our partner is a good customer that provides the financial stability we need at this point. Young companies need big brothers. Don't overlook the value that the right corporate partner can bring to a start up venture.

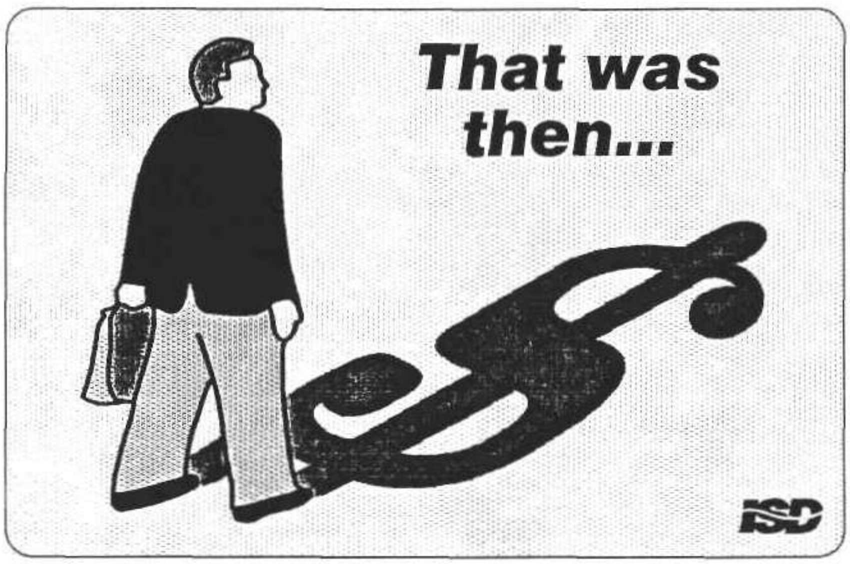
LUCK

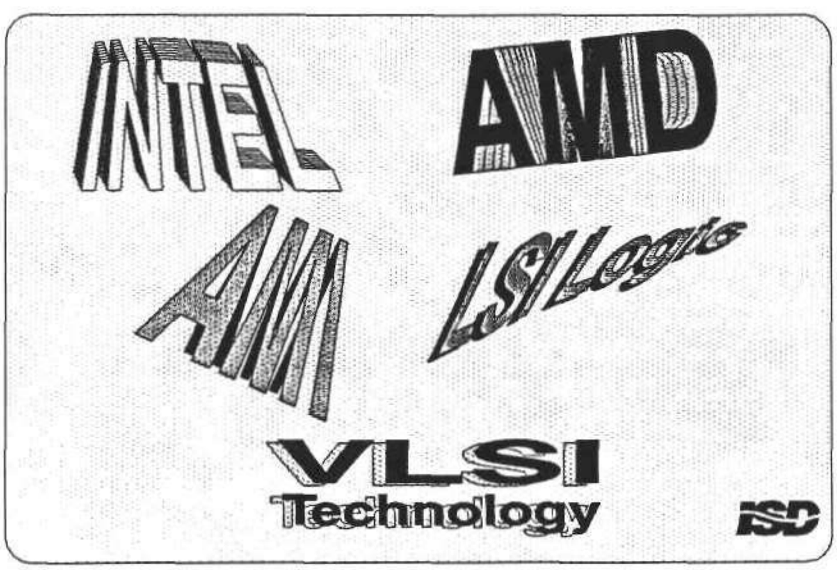
Dataquest has made a study of start up companies in the Semiconductor Industry. A review of this study reveals that some of the companies that are successful today should not have made it. Intel didn't set out to be a microprocessor company. The business today of several leading young companies has no relationship to its original business plan. Hence, we must assume that some additional force is at work. I guess that even if you do everything right, there is no certain guarantee of success. It appears that one still needs a little luck. I prefer the former Prime Minister, Margaret Thatcher's, definition of luck. Mrs. Thatcher states that:

> LUCK IS NOTHING MORE THAN OPPORTUNITY BEING INTRODUCED TO READINESS.

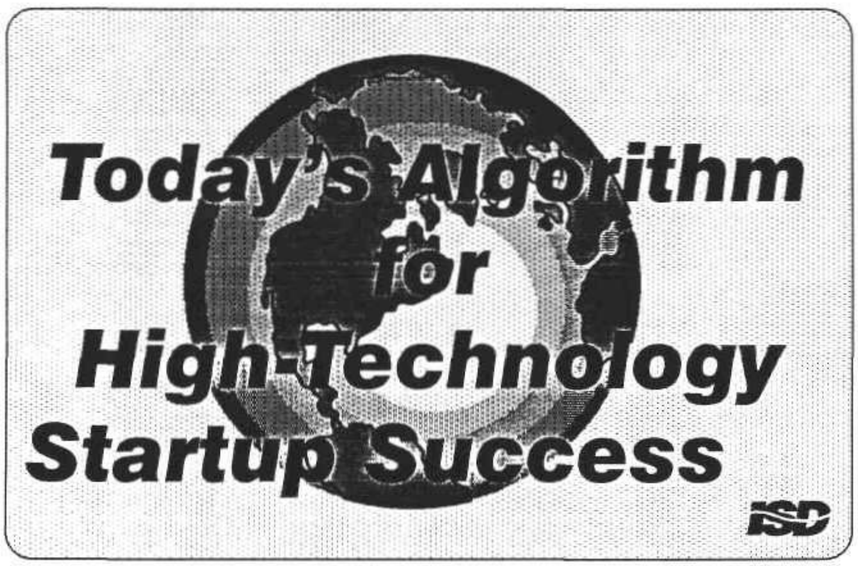
If your young start up company can cultivate distinctive innovation, create significant value added, achieve a sustainable competitive advantage and pair all of that with a mutually beneficial partnership, you'll create your own luck. There is still gold in them there hills in California and there are still great riches to be found in the semiconductor industry. I thank you for your attention . . . and Bon Chance...Good Luck.

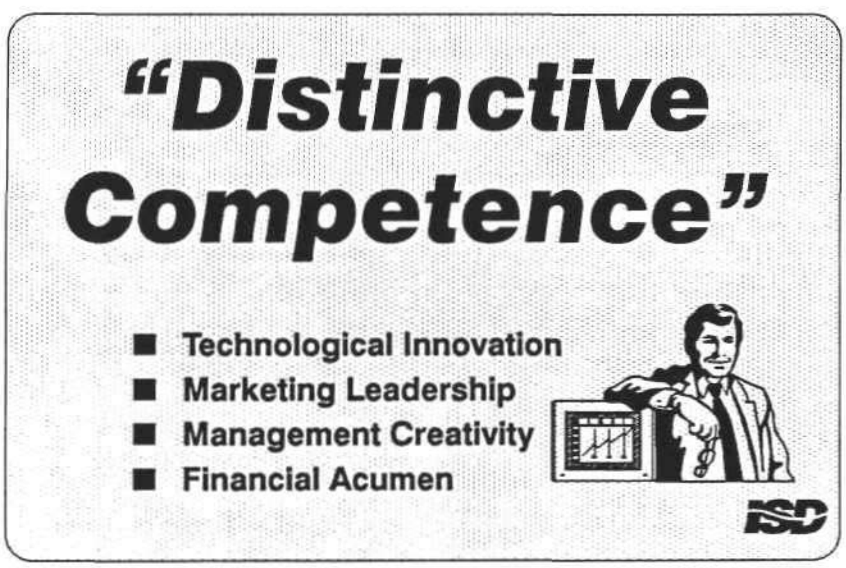

"Semiconductor
Start-up Strategy for
Profitability in the 1990's"
David L. Angel, President
Information Storage Devices, Inc.
San Jose, Ca., U.S.A


That was
then...


INTEL
AMD
AM
LSI Logic
VLSI
Technology


...This is now
ISD


Today's Algorithm
for
High-Technology
Startup Success
ISD

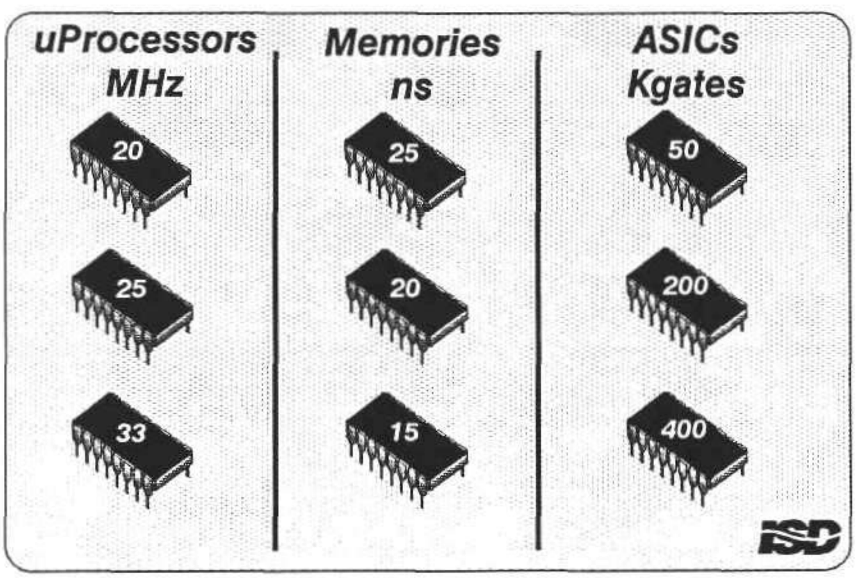

"Distinctive
Competence"
■ Technological Innovation
■ Marketing Leadership
■ Management Creativity
■ Financial Acumen
ISD

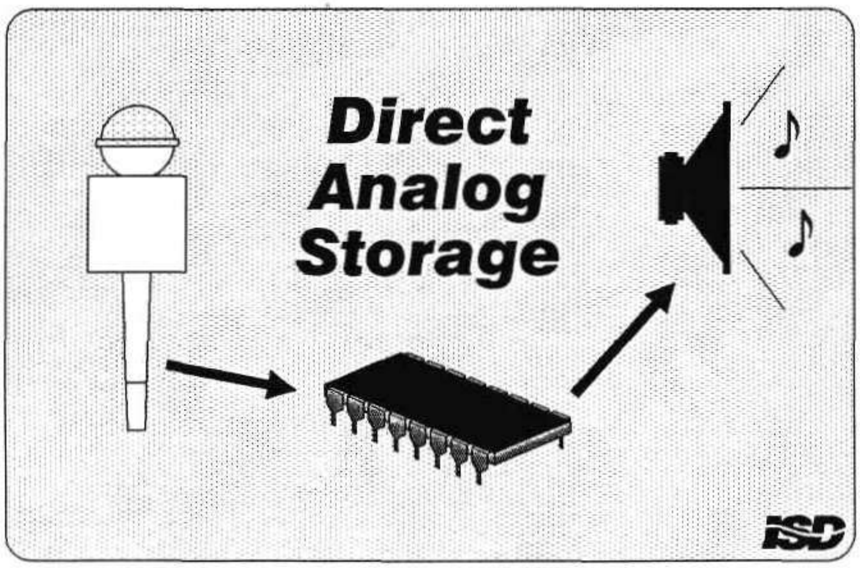
in the '90s...

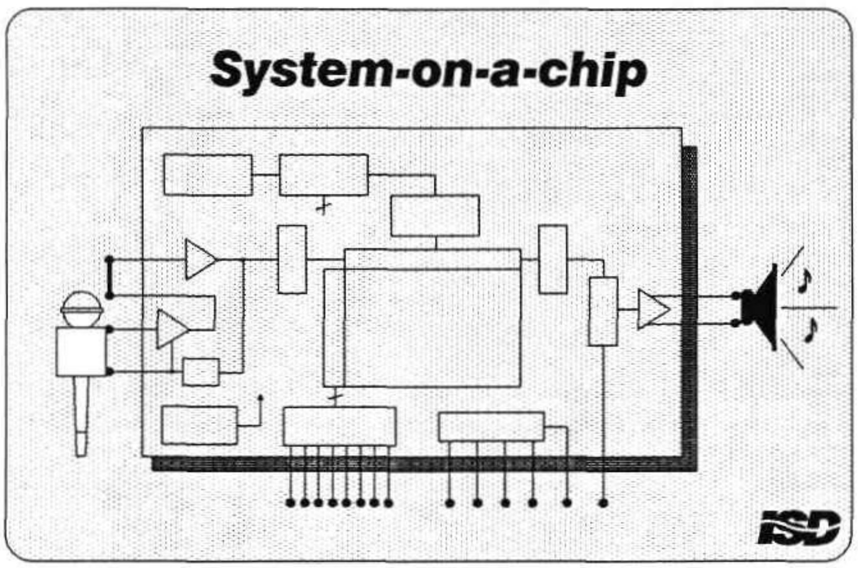
Essential Attributes for Profitability

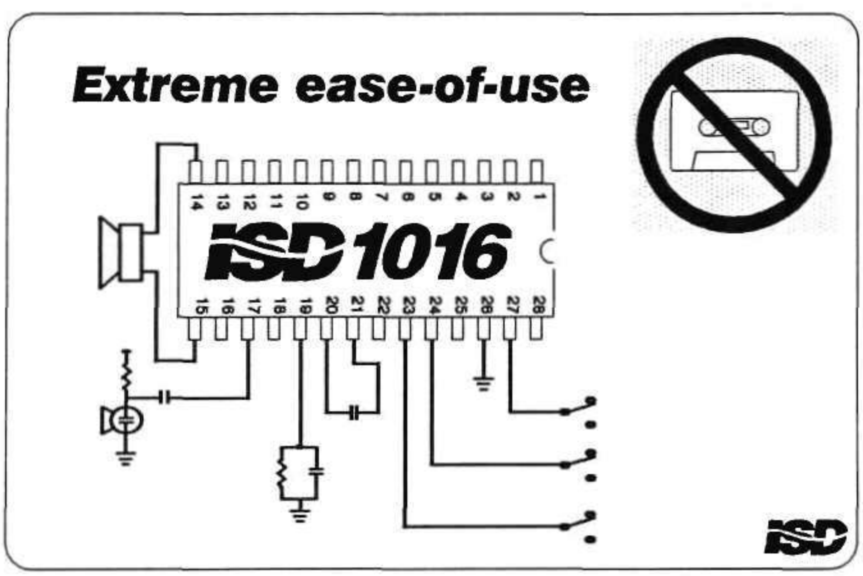
- Distinctive innovation vs. incremental improvement
- Significant value-added to the customer
- Sustainable competitive advantage
- Strategic partnerships
- Luck

"Distinctive Innovation"




Direct
Analog
Storage
ISD


System-on-a-chip
ISD

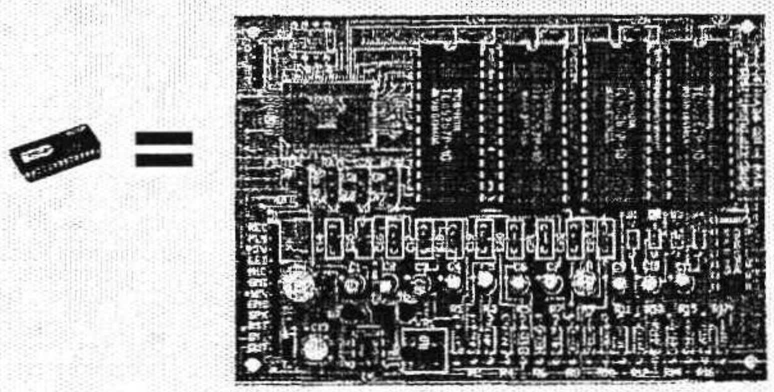

Extreme ease-of-use
14 13 12 11 10 9 8 7 6 5 4 3 2 1
ISD1016
15 16 17 18 19 20 21 22 23 24 25 26 27 28
ISD

Comparison of Writable Storage

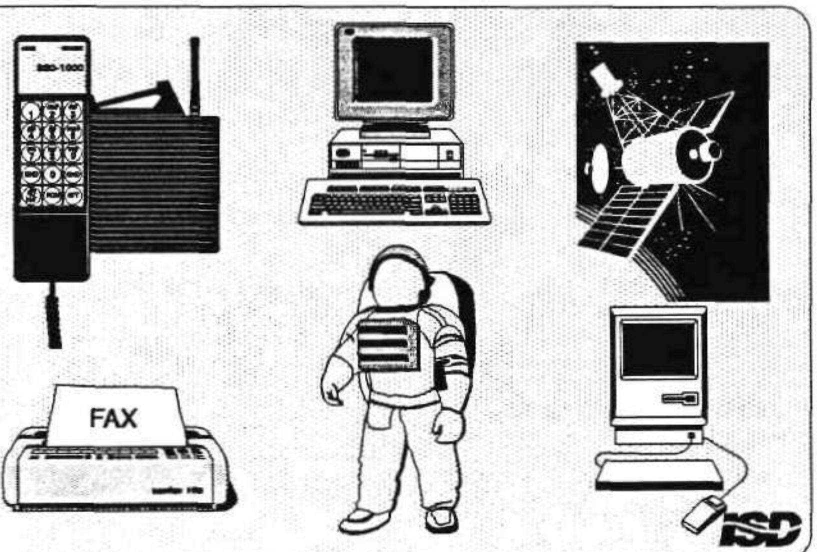
ANALOG	DIGITAL
Dense (8X)	*Inefficient*
Direct	*Indirect - Converters*
Nonvolatile	*Volatile - Batteries*
No Software	*Software Required*

ISD

Significant Value-Added



ISD



Customer Benefits

- Requires very little space
- Provides high fidelity
- Battery backup not needed
- Nearly zero design-in time
- Higher ASPs & profit margins
- Increasing market share
- Enables new markets

ISD

"Sustainable Competitive Advantage"

ISD

Sustainable Competitive Advantage

- Don't reveal the technology until it's perfect and ready for shipment:

  — a two-year advantage!

ISD

Sustainable Competitive Advantage

- Protect your intellectual property:

  — *Advantage is the strong barrier to competitive exploitation*

ISD

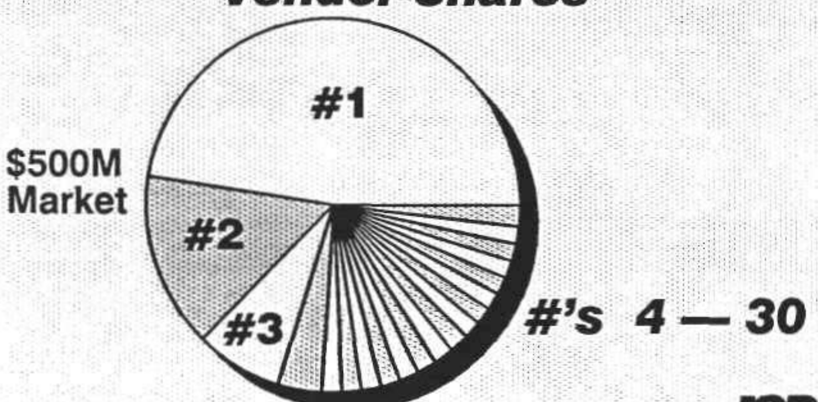
Sustainable Competitive Advantage

- Don't teach your competitors:

  — *Hard-to-copy products have a clear advantage*

ISD

PC Chip Set Business Vendor Shares



ISD

Sustainable Competitive Advantage

- Continue to show your product development tail:

  — *Maintain your advantage through sizeable competitive distance*

ISD

Sustainable Competitive Advantage

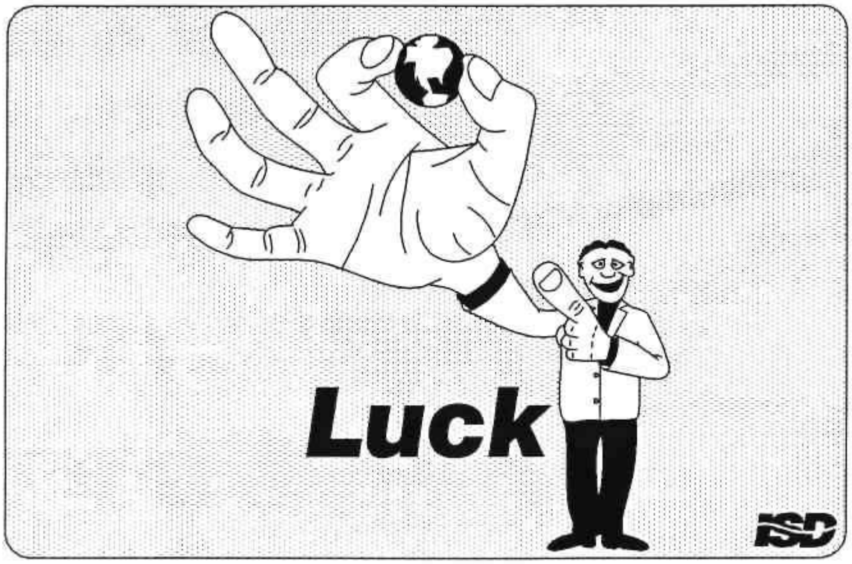
- Set and maintain a low-cost culture:

  — *This advantage breaks the competition's will*

ISD

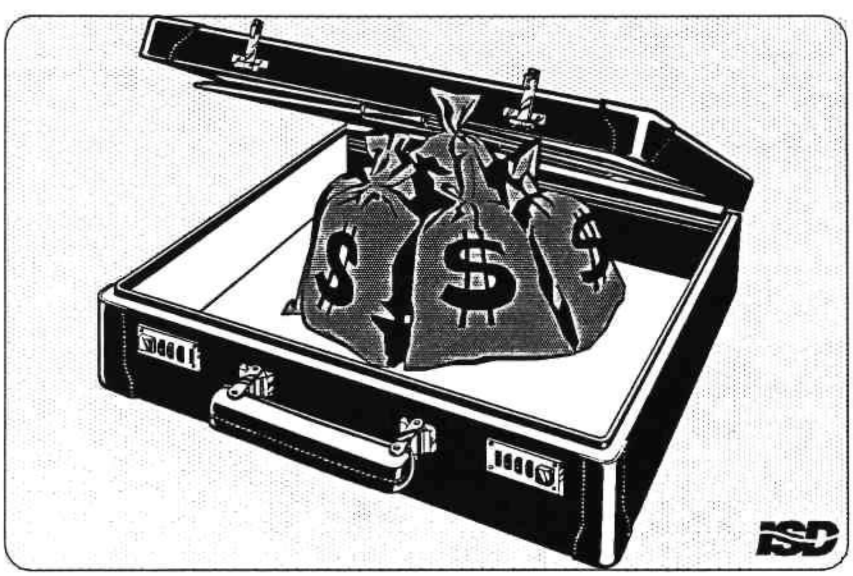
Strategic Partnerships

ISD



"Luck is nothing more than opportunity being introduced to readiness"

— Margaret Thatcher



Dataquest

a company of
The Dun & Bradstreet Corporation

ACTION AGAINST UNFAIR TRADE IN SEMICONDUCTORS BY THE EUROPEAN COMMUNITY

Raimund T. Raith
Administrator
Directorate General for External Relations
Commission of the European Communities

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

ACTION AGAINST UNFAIR TRADE IN SEMICONDUCTORS BY THE EUROPEAN COMMUNITY

Raimund T. Raith
Administrator
Directorate General for External Relations
Commission of the European Communities

Dr. Raith has been until recently the responsible case handler for the antidumping procedures conducted by the Commission of the European Communities concerning DRAMs and EPROMs from Japan, and DRAMs from Korea. His new responsibilities are in the area of intellectual property and investment. Previously he was an administrator in the Commission's tax department. Before joining the EC Commission he was an assistant professor at the European University Institute in Florence, Italy. Dr. Raith studied law and economics at the Universities of Tübingen, Geneva and Michigan, and he holds a doctorate from the Law School of the University of Tübingen, two law degrees (Referendar and Assessorexam) from the State of Baden-Württemberg, a Master of Laws degree from the University of Michigan Law School and is a member of the New York Bar.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE

29 - 31 May 1991,

Marbella, Spain

ACTION AGAINST UNFAIR TRADE IN SEMICONDUCTORS

BY THE

EUROPEAN COMMUNITIES

presented by

Dr Raimund Raith, Administrator,

Commission of the European Communities*

* The views expressed are those of the author and not necessarily those of the Community Institutions

Ladies and Gentlemen,

The Commission of the European Communities welcomes the opportunity offered by Dataquest to address this most distinguished audience and it is a particular pleasure and honour for myself to speak to you today.

My presentation will be subdivided into three parts.

The first part will try to explain what the EC has done in the anti-dumping proceeding concerning DRAMs from Japan. This case has attracted great attention and is in effect economically the most significant of all semiconductor cases dealt with by the EC so far. This in a certain sense historic exercise appears to be worthwile in the light of often poorly informed and modestly reasoned coverage in the press. From this latter judgement I would like to expressly exclude the reports prepared by Dataquest, not for the sake of politeness vis-à-vis the host of this reunion, but because Dataquest has continiously sought the dialogue with us. This does of course not mean that Dataquest applauded everything we did, neither does it mean that we fully agreed with all what Dataquest wrote.

The second part will deal with the effects of the measures in the DRAM case in so far as one can reasonably appreciate them over the relatively short period of just over one year.

Finally the third part of this presentation will briefly address the case EPROMs from Japan and the recently opened procedure concerning DRAMs from Korea. Eventually I will attempt to give a short outlook.

To come back to my starting point, what have we done in the DRAM case and why have we done this?

In late 1986 the European Electronic Component Manufactures' Association (EECA) approached the Commission complaining about heavy dumping by Japanese DRAM exporters causing material injury to the Community DRAM industry. The formal complaint has been submitted in February 1987 and the Commission has opened the proceeding in July 1987.

In order to better understand this move it is helpful to quickly have a look at what has happened in 1985/86 in the US. In the US three anti-dumping procedures concerning DRAMs and EPROMs from Japan were pursued. These investigations showed dumping margins for DRAMs of up to more than 100 %. In the light of these findings the US concluded with Japan the US-Japan Semiconductor Agreement in mid 1986. Subsequently suspension agreements were concluded with the Japanese DRAM and EPROM exporters to settle the anti-dumping procedures. These suspension agreements provided for Fair Market Values (FMVs) which the Japanese exporters agreed to respect in the US. This system is still in place as of today, but is supposed to lapse soon. To this latter aspect I will have to come back in the third part of this presentation.

Given that the overall conditions of the DRAM market did not dramatically change from 1985 to 1986, but continued to be characterised by a situation of huge oversupply, it came as no surprise that the dumping investigation carried out by the Commission for the period April 1986 to March 1987 showed extremely heavy dumping margins of up to more than 200 %.

The injury analysis showed a very significant increase in Japanese sales in the EC by a factor of more than fourteen from 1983 to 1986 and more than a tripling of its market share for the same period.

The price analysis showed a dramatic decline worldwide and this to a much higher degree than could be expected from economies of scale and the so-called learning curve effect which is typical for this industry.

When looking at the injurious effects suffered by the Community industry it became apparent that it had made detailed plans for investment, production and marketing with a view to commercial DRAM production in the Community. For the implementation of these plans huge amounts of funds were made available and already prior to the investigation period several hundred million Ecus have been spent preparing for DRAM production.

As a consequence of the dramatically low prices the start of mass production of DRAMs was delayed for significant periods of time. These delays have in turn caused heavy financial losses to the companies concerned.

The seriousness of the injury and the degree of shock under which the EC DRAM industry was at the time can also be highlighted by the following anecdote.

One EC company was effectively close to commercial DRAM production prior to the investigation period and had to indefinitely suspend this project because of heavy Japanese dumping. When the Commission investigators visited this firm it turned out quite difficult to find employees who were prepared to talk about the company's DRAM project, because most were in the meanwhile scattered over the entire group and it was obvious that no one wanted to be reminded of the heavy losses suffered, not to speak about being associated with this event in any way.

After having established - with all the complexities of this industry - heavy dumping and material injury, the most delicate task was still ahead of us. This task consisted in finding measures which would on the one hand safeguard the legitimate interests of the Community DRAM industry and on the other hand not unduely harm the Community DRAM user industries. In effect this process of bridging the gap between these conflicting interests has taken longer than the investigation properly speaking.

It was relatively clear from early on that the imposition of ad valorem duties would not be a satisfactory solution and many Japanese exporters indicated at an early stage that they were prepared to offer price undertakings; this course of action was, in principle, welcomed by the complainants and most Member States.

At the beginning EUROBIT representing an important part of the user industries was adamently opposed to any anti-dumping measures for the double reason that on the one hand its members had an interest to source DRAMs at the lowest prices possible, if at dumped levels the better so. This latter aspect on the other hand has to do with the fact that many user industries are in direct competition with some of the Japanese DRAM producers, these being vertically integrated companies. And it is clear that lost profits due to dumping with DRAMs can weaken the potential for expenditures in these Japanese companies' computer businesses for example.

It took extensive discussions, in effect the most extensive discussions ever held with users in the Community anti-dumping history, to make EUROBIT abandon this approach.

Probably the most important argument used in this context was the food chain phenomenon. In a situation where both the Community semiconductor industry, of which the DRAM industry is a pivotal part, and the user industries are both relatively weak compared to world standards, both industries can only survive together. It is most improbable to see one flourish at the detriment of the other.

EECA has accepted this premise from early on. This can probably be explained by the fact that the company most interested in DRAMs was at the same time one of the important users and purchasers in the Community thus having to take both perspectives into consideration.

After further discussions it turned out that measures creating a kind of safety net against the recurrence of heavy dumping would on the one hand be acceptable to the complaints, while on the other hand appease the concerns of the users.

In extremely intense meetings with EECA, EUROBIT, the Japanese exporters and some particularly interested Member States the final text of the undertakings has been negotiated.

These undertakings provide for minimum prices per density based on weighted average cost of production for the cheapest device type. The weighing is done on the basis of each producers sales volume in the Community and a modest margin for profit was added. Given that the producers with the lowest costs tend generally to be the ones with the high sales volumes, it could be expected that the reference prices would be rather close to the cost of production of the lower cost producers. In effect our calculations at the time showed that the reference prices would be situated in the lower third of the weighted average of cost of production for all devices within a density by all producers concerned.

The reference prices thus established are revised quarterly on the basis of the most up to date cost data supplied by the Japanese producers.

Furthermore special provisions were included to facilitate the introduction of new generation products and to deal with samples.

This approach differs in some significant aspects from the approach taken by the US administration in their suspension agreements. They provide for FMVs which are in principle based on cost of production for each individual device by each individual Japanese producer plus a statutory margin for profit.

The solution adopted by the Community is not only more user friendly in so far as it is based on the cheapest device type within each density but also because it allows by weighing of the costs of all producers, for a greater number of Japanese producers to be present on the Community market.

This latter element was considered important in the light of the fact that Japanese DRAM producers are by no means homogenious but show greatly different performances in DRAMs and thus greatly different cost structures.

Such undertakings have eventually been offered by eleven Japanese DRAM producers, which account for virtually all Japanese imports into the Community.

In January 1990 the Community has accepted these undertakings and imposed a residual duty for all other Japanese companies. This latter duty has been made definitive in July 1990.

Now I will come to the second part of my presentation and talk about the effects of the measures which have been in place for a little more than one year.

Let us turn first to the effects on the EC DRAM industry. Here it can be realized that one of the complainant companies held in 1990 a market share of about 25 % for the 1 M density, which continued to be by far the most important DRAM product group. This company was probably the single most important supplier in the EC. Furthermore another complainant held a market share of 4 - 5 % for the same product.

Added up this represents a market share of about 30 % of the Community market held by Community producers. This has to be compared with virtually no market share at the end of the investigation period.

It is of course speculative to ask what would have been the situation in the absence of anti-dumping measures. To me there exists, however, no doubt that in the absence of anti-dumping measures, and looked at this problem from earlier on, in the absence of a reasonable expectation for such measures, the Community DRAM industry would at best hold a much smaller market share or more realistically would only hold a marginal share on the way to totally disappear from this business, as was the fate of American DRAM production.

Having said this, it is clear that there existed also other factors which contributed to this positive development, such as relatively high DRAM prices during 1988/1989.

Let me underline that this is one of the, unfortunately, rare cases, where a Community industry was able to recover in such a positive way as a consequence of the adoption of anti-dumping measures.

In order to see the impact of the measures on the users, it appears first appropriate to have a look at the development of the reference prices and of the market prices in the Community.

From first quarter 1990 to first quarter 1991 reference prices have declined for the 1 M by about 30 % and for the 4 M by more than 60 %.

For the same period market prices in the Community have - according to Dataquest - declined for the 1 M by approximately 45 % and for the 4 M by more than 70 %.

It could also be established for the same period that reference prices were generally significantly below market prices in the Community.

In this context it is eventually instructive to look at the comparison of the market prices in Japan, the US and the Community. The Dataquest figures show that for 1990 prices in the Community for the 1 M were generally significantly lower than in Japan and on the average at least not higher than in the US. For the 4 M a similar pattern existed.

To appreciate this situation fully, it has to be recalled that the Community imposes a 14 % customs duty on imported DRAMs, whereby the US impose no duty and Japan has virtually no DRAM imports and that the purchasing power of the Community buyers tend to be not as strong as that of their Japanese or US competitors.

These facts clearly demonstrate that the Community DRAM user industries did not suffer form the existence of the anti-dumping measures.

To the contrary they could benefit from the increased competition afforded from the greater number of suppliers present in the market. This is further evidenced by the fact that despite the existence of unfavourable conditions such as the customs duty and their comparatively weaker purchasing power, their purchase prices for DRAMs in the EC were generally more favourable than for their competitors in the US and Japan. Some observers such as Dataquest have attributed this latter phenomenon to the very existence of the Community's anti-dumping measures.

Looking now more specifically at the last months, it is true that the reference prices have increased for the first two quarters 1991. However, this did not really come as a surprise, because it was already common knowledge in fall 1990 that some important Japanese producers would reduce production volume for the 1 M product. The consequences, at least temporary, of such a shift are of course an increase of costs and a reduction of supply. Furthermore significantly increased expenses for research and development have a potential to contribute to higher costs and higher reference prices.

This event together with an increase of market prices in the EC and a decrease of prices in the US and Japan caused concerns in some parts of the user community. The Commission services will closely monitor these developments. But it is expected that after the shift from 1 M to 4 M DRAMs will be completed by the major Japanese producers that reference prices will at least for the 4 M significantly decrease.

Let me now turn to the last part of my exposé.

First some short remarks on two other anti-dumping cases concerning semiconductor products in which we are presently involved.

The case EPROMs from Japan was opened some months before the DRAM case and was investigated together with the DRAM case. The results of the EPROM case were in so far similar to the DRAMs that heavy dumping of up to more than 90 % and material injury caused to the Community EPROM industry were found. The EPROM case was much less controversial than the DRAM case. This was primarily due to the circumstance that most of the problems have already been addressed in the discussions on DRAMs and also because of an almost complete absence of the user industries form this case.

The measures adopted for EPROMs in March of this year follow largely the DRAM pattern, but the reference prices are calculated in a way to not only constitute a safety net against the recurrence of heavy dumping, but to eliminate the effects of Japanese EPROM dumping all together.

Given that the EPROM measures have only been in place for two months there are not yet any statistically relevant data available to allow an analysis of their effects.

In March of this year the Commission has opened an anti-dumping investigation concerning DRAMs from Korea on a complaint lodged by EECA last year. Here no findings are yet available and can reasonably not be expected before the end of the year.

As regards the future of these measures, I am somewhat hesitant to utter any views. Nevertheless let me try to sketch a modest extrapolition.

To start with it can be said that our anti-dumping measures have generally a period of validity of five years.

Within this five year period the measures can be reviewed and if warranted modified or repealed at any time.

In effect the Commission is prepared to carry out a review, if an effective and definitive termination of the measures adopted by the US would significantly affect the EC market.

In this respect we are aware of the negotiations between Japan and the US on a renewal of their semiconductor agreement. Even though it appears that the FMV system will be abandoned, it seems reasonably clear that other provisions against the recurrence of Japanese dumping in semiconductors will be included into the new agreement and at least a part of the US anti-dumping orders will, in principle, stay in place.

If these new measures will effectively prevent the recurrence of dumping on the US market, they should not have a major impact on price differentials between the US and the Community markets.

This is further underlined if one recalls the "rock bottom" safety net character of our DRAM measures which allows "soft dumping" but intends to safeguard only against heavy dumping.

In the light of these considerations it appears far from being obvious that the modification of the US-Japan semiconductor agreement will create a need to fundamentally reconsider our measures.

Having said this, one could of course imagine a joint request by the Community semiconductor and user industries asking the Communities to do away with the anti-dumping measures for semiconductor products.

However, I do not dispose of any information which would indicate such an event to occur in the forseeable future; but maybe, Ladies and Gentlemen, I am only lacking fantasy.

Ladies and Gentlemen, thank you very much for your patience and if time still permits I would be pleased to reply to your questions.

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle:
The Next Ten Years

PROCUREMENT TRENDS IN THE '90s

Ewan Davidson
Purchasing Manager, Production Materials
Alcatel NV

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

PROCUREMENT TRENDS IN THE '90s

Ewan Davidson
Purchasing Manager, Production Materials
Alcatel NV

Mr. Davidson is Purchasing Manager of production materials in the Corporate Purchasing Department of Alcatel NV. He is based in its Paris headquarters and is responsible for building common procurement programs for production materials within the Alcatel group. Before joining Alcatel, Mr. Davidson worked in the International Telecommunications Center in Brussels. He received a B.Sc. Honors degree in Economics and Economic History from Bristol University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

This presentation was not available

at the time of publication

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

PANEL SESSION 1:
MANAGING THE HIDDEN ASSETS FOR PROFIT

Chaired by Ted Richardson
Dataquest Europe Limited

Dave Manners
Electronics Weekly

Ray Reusser
AT&T

Hideharu Egawa
Toshiba Corporation

Keith Chapple
Intel

Jerry Sanders
AMD

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

MANAGING THE HIDDEN ASSETS FOR PROFIT

Ted Richardson
Vice President and Director
Dataquest Europe Limited

Mr. Richardson is Vice President and Director of Dataquest Europe Limited and is located in the company's UK office at Denham. He is responsible for the Telecommunications, Semiconductor, Copiers, CAD/CAM and Printer Groups in the United Kingdom. Before joining Dataquest, Mr. Richardson was European Marketing Manager for Infotron Systems Corporation. During his 5 years at Infotron, Mr. Richardson was responsible for European product marketing and for setting up a development laboratory in the United Kingdom. Prior to joining Infotron, he spent 11 years in British Telecom headquarters. During this time, he was responsible for modem and multiplexer standards for British Telecom and was also the technical manager for the telex service. Mr. Richardson received a B.Sc. degree in Electronics from Portsmouth Polytechnic in England. He is a Chartered Engineer and a member of the Institute of Electrical Engineers.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Dataquest

a company of
The Dun & Bradstreet Corporation

MANAGING THE HIDDEN ASSETS FOR PROFIT

David Manners
Editor
Electronics Weekly

Mr. Manners worked in the electronics industry for five years before changing over to write about it. He has written for most of the quality daily newspapers in the United Kingdom and for magazines in the United Kingdom and United States. For six years he has covered components for *Electronics Weekly* and last year published "The Hitchhiker's Guide to Electronics in the '90s"—a layman's guide to the industry and its future. Mr. Manners is a graduate of Wadham College, Oxford.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Intellectual Property Panel
David Manners
Electronics Weekly

Whether it's jeans or karaoke, good ideas don't take long to spread across the world.

But for the originators of good ideas, it is painful to see other people adopt and profit from them.

The job of reconciling the human urge to copy good ideas with the legitimate claims of their creators is done by the law in three ways:

Patent -
The most comprehensive form of protection granting a monopoly right which stops anyone from using the protected material even if they don't know about it. Protection lasts for 17 years in the US, 20 years in most countries. It needs to be registered.

Copyright -
Does not give a monopoly right but prevents proved copying i.e. if you create something without having seen a copyrighted article then you cannot infringe a copyright. Only if it can be proved that you have copied can copyright protection operate. That distinguishes copyright from patent where it makes no difference whether or not the patented material is known about. Protection lasts for the life of the author plus 50 years. Registration is not required - a copyright notice on the article to be protected is enough.

Trademark -
Has to be registered for a particular class of goods of which there are some 30 different classes. Doesn't apply to goods except in the class for which the mark is registered i.e. a firm making computer software could probably adopt the trade mark of a firm making beer. But in some cases trademarks become so well known - say Kodak or Oxo - that they can be registered to apply to all classes of goods. Trademark protection lasts in perpetuity - the Bass red triangle was registered in the last century - but the registration has to be renewed every seven years. The holder of the trademark has to keep using it to retain protection.

So much for the theory. In practice the law has to take account of commercial realities and the public interest.
Clearly it is just as undesirable to leave intellectual property unprotected as it is to leave it unexploited.

In the 1970s there was the case of Xerox which refused to license its copier technology. In a court case the company was ordered to license its technology at a level of licence fee set by the court.

So a balance has to be struck between property rights and the public good and this is where there have been some notable differences of opinion in the semiconductor industry recently.

There have been three major catalysts for the spate of law actions: first the use of the GATT mechanism to insist that trading partners accept intellectual property obligations; second the fact that the law is beginning to catch up with the technology; third because the US industry started to lose money.

In the 60s and 70s US companies, which invented the chip industry, were prepared to license widely and take low royalties - in the range of 1-2% on sales. That has been in the tradition of the notably generous American attitude towards semiconductor licensing going back to 1952 when AT&T sold manufacturing licenses for the transistor for a flat $25,000.

That era has passed. Now, both Intel and Texas Instruments point to industry economics to justify their recent extensive litigations. Intel says it is spending $1bn on capital additions and $600m on R&D this year; TI claim $575m and $560m respectively.

As costs have mounted, growth has slowed and prices have slumped. According to New York stockbrokers Goldman Sachs the US semiconductor industry has had negative cash-flow for the past ten years. As Pat Weber, President of TI's semiconductor division said recently "Our industry has the smartest people in the world, we take the highest level of risk, and yet we can't make money."

Is this a sufficient justification for the recent lawsuits? No, say those on the receiving end, the issue is not as simple as that. LSI Logic's lawyer complains that TI is, in effect, saying "Pay us now for what we should have licensed to you years ago."

For instance, AMD say they are entitled to share the fruits of the 86 market because they pioneered it at a time when IBM required a second source. Intel reply that others beside AMD - IBM, Compaq, Microsoft and some 500 other vendors - helped pioneer the 86 market and that the profits derived from it at the time should be sufficient reward without expecting a right to participate in perpetuity.

Whatever the rights and wrongs, the AMD/Intel dispute has been a milestone in setting legal precedents in the semiconductor industry. It covered all the avaialble legal remedies - patents, copyrights and trademarks. As of today it seems that the trademark issue has been resolved in that it has been decided that '386' is not a trademark, the patent issue has not been resolved because no transfer of the Intel386 technology has yet been ordered and because the AM386 has apparently been engineered to avoid infringing Intel patents, the copyright issue has been partly resolved in deciding that microcode is protectable but is partly unresolved in that no decision has been made on whether AMD is entitled to use Intel's 386 microcode.

So much for Intel's attitude to asserting its intellectual property rights. TI's attitude is somewhat different. Whereas Intel uses it to win in the market; TI uses it to make money. That is possibly because Intel has recently been good at doing this whereas TI, recently, has not. For instance Intel has been climbing up the Dataquest world rankings - to No.5 in 1990, whereas TI has been dropping down - to No.7 in 1990.

However TI has been notably successful in turning its intellectual property into revenue. TI's royalty stream is estimated at $700m from 1985 to 1990 and $300m a year throughout the 90s. According to Merrill Lynch TI made more money in 1990 from royalties than it did from profits on operations - a situation it expects to continue this year and next.

Is TI acting to the detriment of the industry? According to the industry grapevine, TI asked Toshiba for 12 per cent royalties in respect of the Kilby patent and settled for 8 per cent. T.J.Rodgers, President of Cypress Semiconductor, calls TI's levels of royalty "Going out of business payments".

On the other hand TI might say that 12 per cent is around the percentage of sales the semiconductor industry commonly pays for its R&D so 8 per cent is generous especially if you consider that R&D budgets pay for bad ideas as well as good whereas licensees only pay for good ideas.

However Toshiba and other companies on the sharp end of the TI legal machinery may well take the view that the
proper way to deal with intellectual property issues is to offer a patent swap rather than go simply for royalties. Especially when the technology involved is often many years old. In reply TI says it adjusts its royalty level in accordance with the quality of patent portfolios offered in return.

If TI is genuinely interested in patent swaps and this is the general industry position, then it is an
encouraging sign. is that many more intellectual property disputes are being settled in the traditional industry way of negotiation and patent swaps than in high profile legal disputes. Last year, for instance, Motorola extracted $100m from Mitsubishi for patent rights without any public legal involvement.

So, although times have changed and the old ways will never return, a rule much older than the semiconductor industry seems to apply: settle out of court.

Dataquest

a company of
The Dun & Bradstreet Corporation

MANAGING THE HIDDEN ASSETS FOR PROFIT

Raymond E. Reusser
Manager, Intellectual Property
AT&T

Mr. Reusser is currently Manager, Intellectual Property in AT&T's Corporate Intellectual Property Division. He is based in Warren, New Jersey and is responsible for the management and licensing of AT&T intellectual property, primarily relative to US and European companies. Previously, he has served AT&T in a wide variety of engineering, strategic planning, R&D and manufacturing capacities. Mr. Reusser received a B.S. Engineering degree from Purdue University, West Lafayette, Indiana and an M.S. Engineering degree from Lehigh University, Bethlehem, Pennsylvania.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

AT&T

Managing Hidden Assets For Profit- The Intellectual Property Asset

- What Is Intellectual Property (IP)?
- Asset Inventory Concept
- Realizing Value (or "Profit")
- Summary

AT&T

Managing Hidden Assets For Profit- The Intellectual Property Asset

- What Is Intellectual Property (IP)?
  - Patents, Technical Information, Software, Copyrights, Trademarks
  - Patent Legal Characteristics
  - Patent Life Cycle Concept

AT&T

Patent Legal Characteristics

> Infringement

... Whoever without authority makes, uses, or sells any patented invention, infringes the patent

... A patent license gives that authority

AT&T

Patent Legal Characteristics

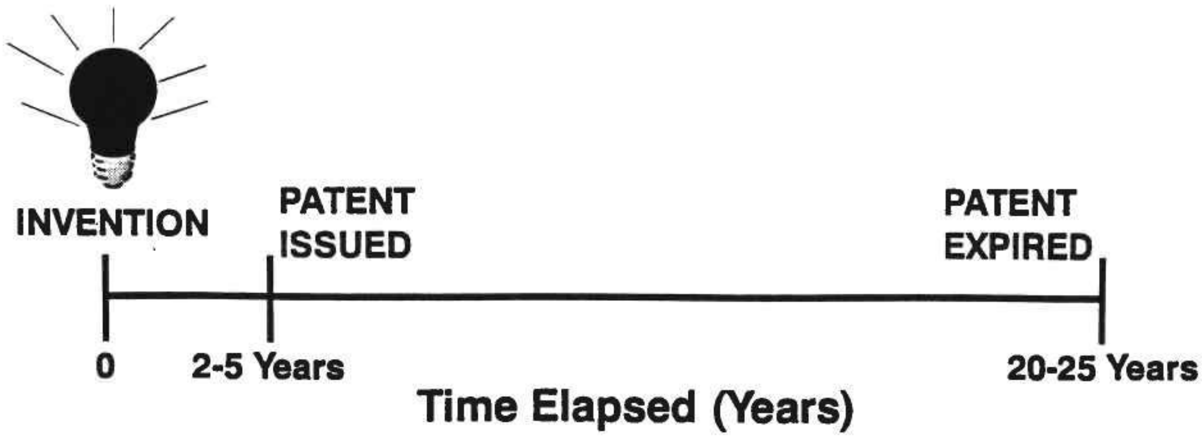
(continued)

> Patentability

... New and useful: process, machine, manufacture, composition of matter

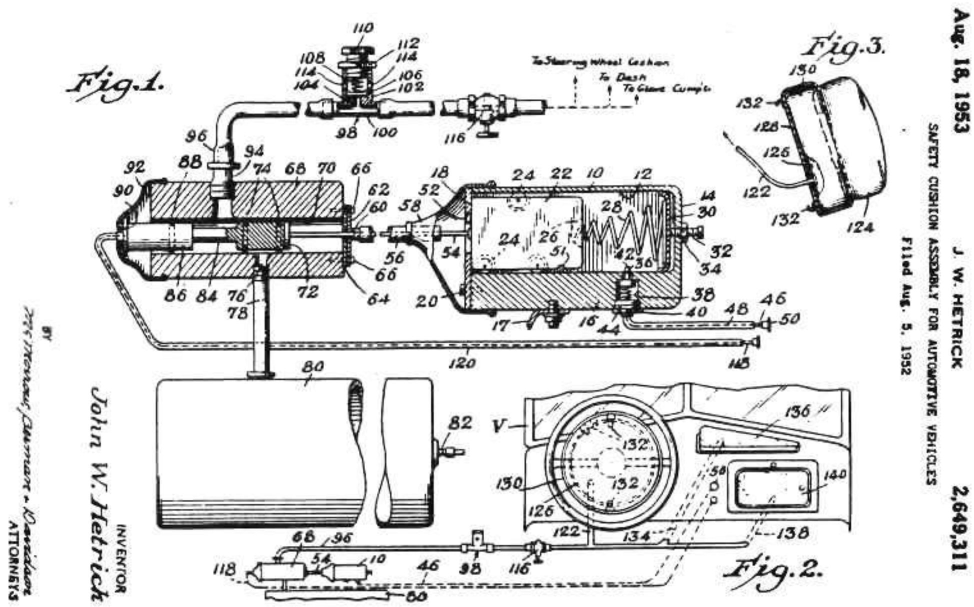
... Conditions: original to inventor, non-obvious to one skilled in the art, not abandoned

AT&T Patent Life Cycle Concept



What is claimed is:

1. A safety cushion assembly for automotive vehicles comprising: normally stationary means arranged to shift in position responsive to a predetermined deceleration of a vehicle; a normally closed valve connected to said means to move to open position on shifting of said means; an air accumulator: at least one inflatable cushion adapted for mounting within a vehicle; and a conduit extending between said accumulator and cushion and normally closed by the valve, for passage of air from the accumulator to the cushion for inflating the same responsive to opening of the valve.

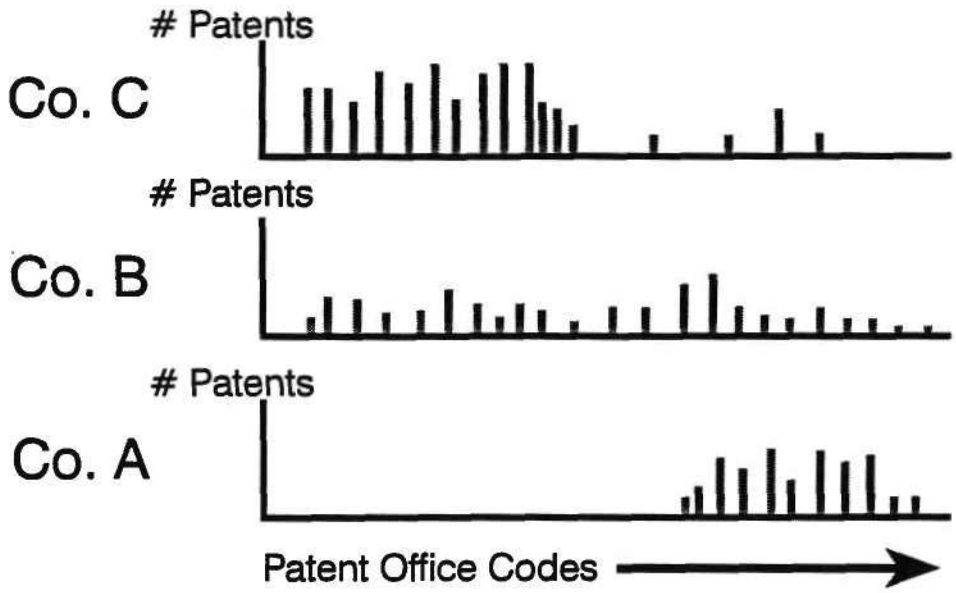


AT&T

Managing Hidden Assets For Profit- The Intellectual Property Asset

- Asset Inventory Concept
  - Technical Breadth and Depth
  - Geographic Coverage
  - Portfolio Dynamics
  - Patent Claim Relevance and Coverage

AT&T **Technical Breadth and Depth**



AT&T **Potential Patent Coverage**

AT&T

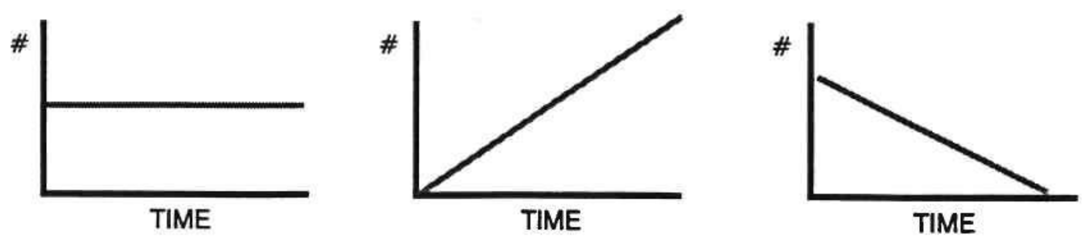
Current AT&T Patent Coverage

AT&T

Portfolio Dynamics

Patents Issuing → **WORLD-WIDE PATENT PORTFOLIO** → Patents Expiring

THREE CASES:



AT&T Patent Claim Relevance And Coverage

COVERAGE:
Carburetor
vs.
Total Car

RELEVANCE:
Plastic Tire
vs.
Rubber Tire

AT&T Managing Hidden Assets For Profit- The Intellectual Property Asset

- Realizing Value (or "Profit")
  - License
    - > Bilateral or Unilateral
    - > Financial
    - > Non-Financial
      - ... R&D Access
      - ... Strategic Positioning
      - ... Other Considerations

Patented Oct. 3, 1950 | 2,524,035

UNITED STATES PATENT OFFICE

2,524,035

THREE-ELECTRODE CIRCUIT ELEMENT UTILIZING SEMICONDUCTIVE MATERIALS

John Bardeen, Summit, and Walter H. Brattain, Morristown, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application June 17, 1948, Serial No. 33,466

40 Claims. (Cl. 179—171)

Patented Sept. 25, 1951 | 2,569,347

UNITED STATES PATENT OFFICE

2,569,347

CIRCUIT ELEMENT UTILIZING SEMICONDUCTIVE MATERIAL

William Shockley, Madison, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application June 26, 1948, Serial No. 35,423

34 Claims. (Cl. 332—52)

Patented Nov. 11, 1952 | 2,617,865

UNITED STATES PATENT OFFICE

2,617,865

SEMICONDUCTOR AMPLIFIER AND ELECTRODE STRUCTURES THEREFOR

John Bardeen, Summit, and Walter H. Brattain, Morristown, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Original application June 17, 1948, Serial No. 33,466, now Patent No. 2,524,035, dated October 3, 1950. Divided and this application September 15, 1949, Serial No. 115,838

17 Claims. (Cl. 175—366)

Managing Hidden Assets For Profit- The Intellectual Property Asset

- Realizing Value (or "Profit") continued
  - No License
    - > Blocking Concept
    - > Restricted Market Access
    - > Strategic Positioning
    - > Patent Will Be Tested

DIFFUSION TRANSFER PROCESSES UTILIZING PHOTOSENSITIVE ELEMENTS CONTAINING POLYMERIC ACID SPACER LAYERS

Filed May 1, 1963

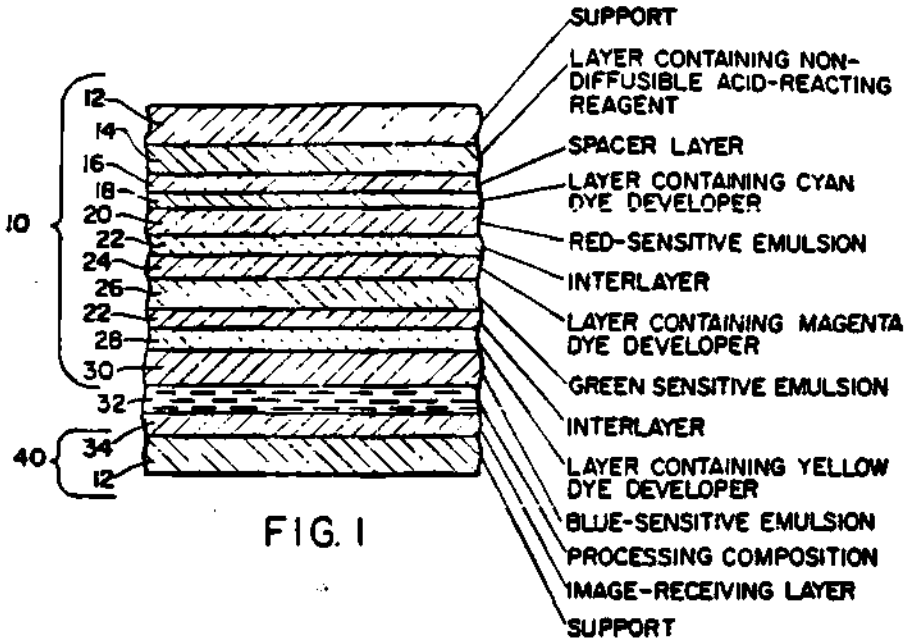


FIG. 1

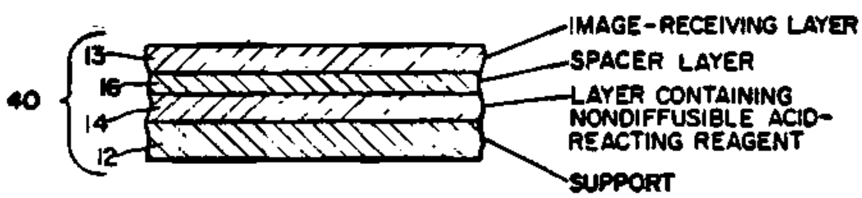


FIG. 2

INVENTOR
Edwin H. Land
BY Brown and Nicholls
and
Stanley H. Mervis
ATTORNEYS

NOVEL PHOTOGRAPHIC PRODUCTS AND PROCESSES

Filed May 22, 1970 4 Sheets-Sheet 1

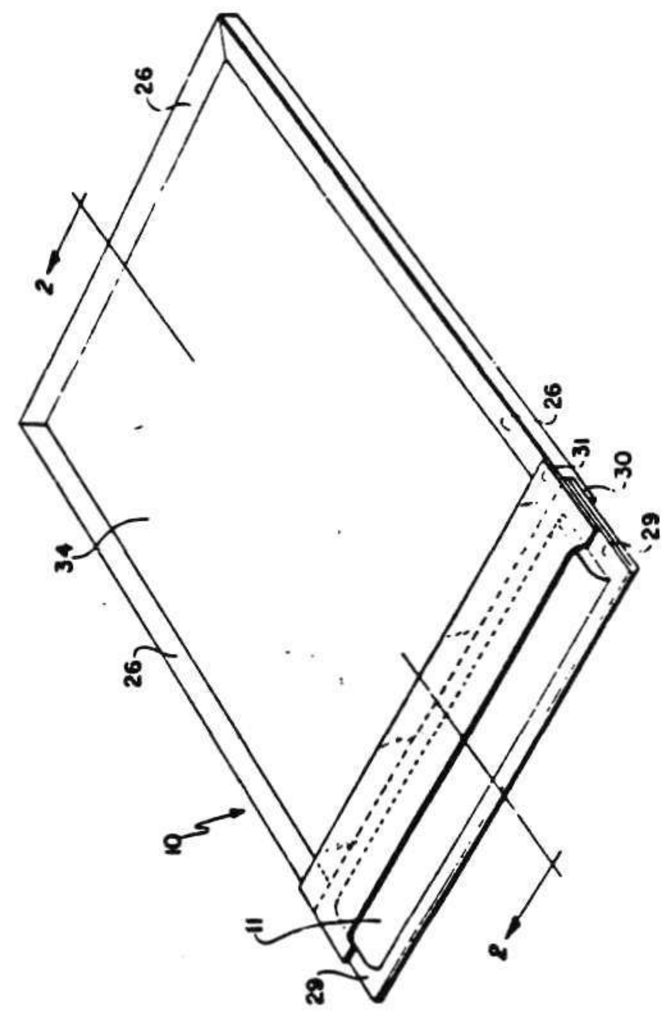


FIG. 1

INVENTOR
Howard G. Rogers

BY

Brown and Mikulka
and
Robert M. Ford
ATTORNEYS

United States Patent [19]

Blinow et al.

[11] **3,709,122**

[45] **Jan. 9, 1973**

[54] **FILM ADVANCING APPARATUS**

[75] Inventors: **Igor Blinow**, Millis; **Robert D. Ledue**, Marlboro, both of Mass.

[73] Assignee: **Polaroid Corporation**, Cambridge, Mass.

[22] Filed: **May 10, 1971**

[21] Appl. No.: **141,553**

[52] **U.S. Cl.** ....**95/11 R**, 95/13

[51] **Int. Cl.** **G03b 19/02**

[58] **Field of Search** ....95/11 R, 13

[56] **References Cited**

UNITED STATES PATENTS

3,563,145	2/1971	Bendoni	95/13
3,511,152	5/1970	Erlichman	95/13
3,447,437	6/1969	Tiffany	95/13
3,589,262	6/1971	Chen	95/13 X

Primary Examiner—Samuel S. Matthews

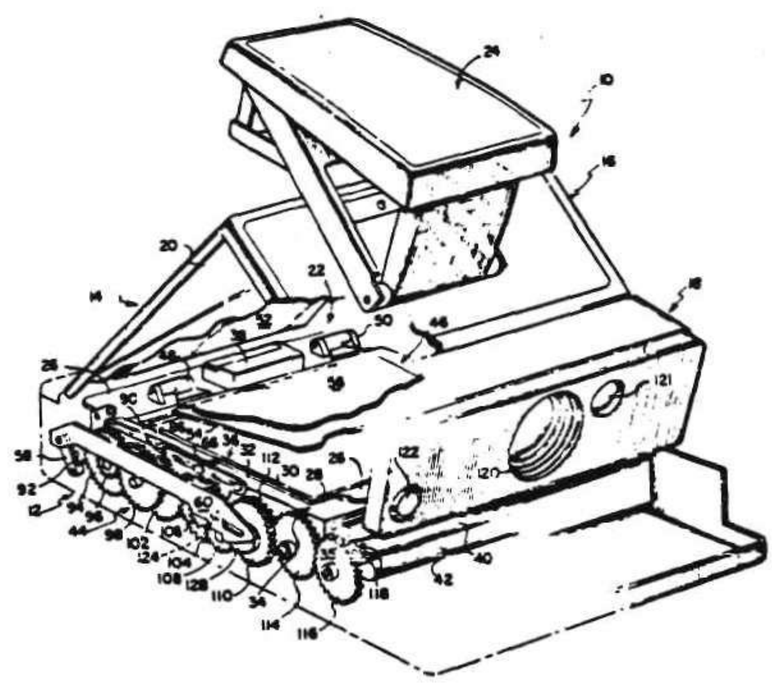
Assistant Examiner—Kenneth C. Hutchison

Attorney—Brown & Mikulka and Alfred E. Corrigan

[57] **ABSTRACT**

Photographic apparatus including a motor mounted near one end of a film positioning structure, a pair of rolls mounted adjacent an opposite end of the positioning structure and an elongated gear train extending between the motor and the rolls and along a side of the film positioning structure. Film-advancing apparatus is actuated by a component of the gear train to move an exposed film unit from its exposure position within the positioning structure into the bite of the rolls for subsequent movement of the film unit toward the exterior of the apparatus. A latch is provided for disenabling the film-advancing apparatus from moving another film unit from its exposure position until the preceding film unit has moved out of engagement with the rolls.

14 Claims, 4 Drawing Figures



Managing Hidden Assets For Profit- The Intellectual Property Asset

- Realizing Value (or "Profit") continued
  - Asset Management Processes
    > Filing
    > Maintenance
    > Licensing Decision/Implementation
    > Contract Structure
    > Legal Enforcement

Managing Hidden Assets For Profit- The Intellectual Property Asset

- What Is Intellectual Property (IP)?

- Asset Inventory Concept

- Realizing Value (or "Profit")

MANAGING THE HIDDEN ASSETS FOR PROFIT

Hideharu Egawa
Senior Vice President
and Director of the Board
Toshiba Corporation

Mr. Egawa is Senior Vice President and Director of the Board of Toshiba Corporation, as well as Group Executive of the Semiconductor Group. Since joining Toshiba Corporation in 1955, he has held various manufacturing and management positions including Group Executive Technology of the Semiconductor Group, General Manager of the Integrated Circuit Division, and Vice President, Group Executive of the Semiconductor Group. In June 1990, he was appointed to his present position. Mr. Egawa graduated from the Department of Engineering, Tokyo University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

MANAGING THE HIDDEN ASSETS FOR PROFIT

Keith Chapple
Managing Director
Intel Corporation

Mr. Chapple has been Managing Director with Intel Corporation for the last 20 years; he joined the company at its inception in Europe in 1970. During that time he was responsible for creating and developing the sales and marketing division in the United Kingdom. He is currently responsible for marketing policy, business development and external relations on a Europe-wide basis. Previously he was responsible for European services and initializing ASIC activities. Mr. Chapple has an honorary Doctorate from Loughborough University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

MANAGING THE HIDDEN ASSETS FOR PROFIT

K. Chapple
Director, European
Corporate Marketing
Intel Corporation

TWO TRUTHS

- Pace of change is faster than ever
- Investment needed is enormous

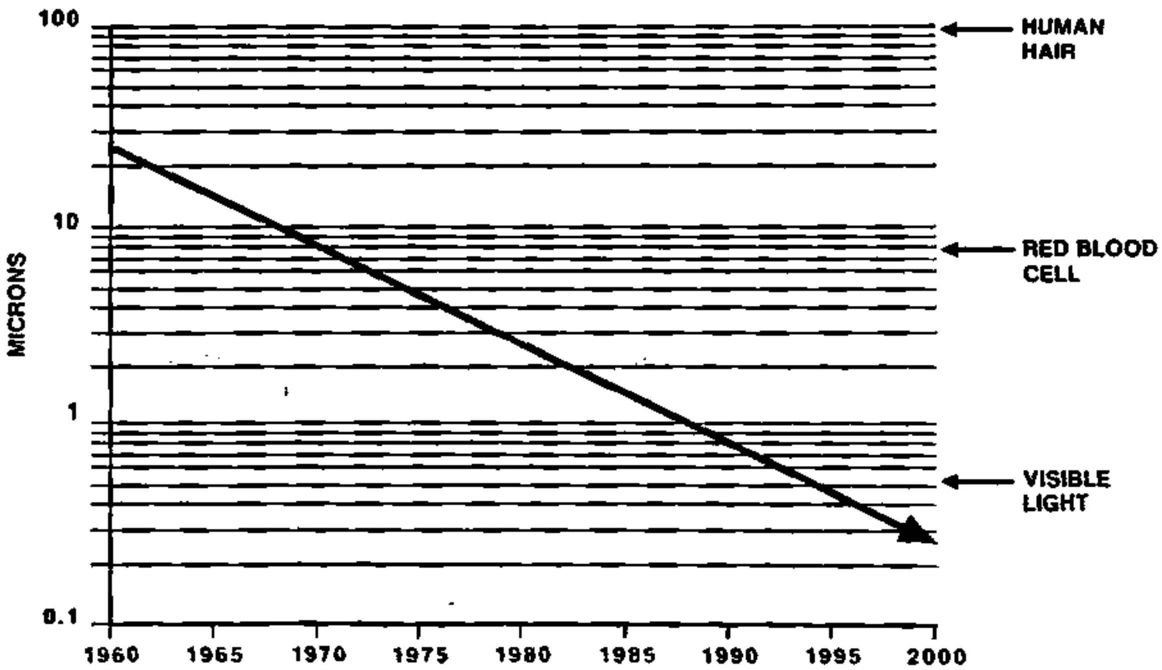
③

A HISTORY OF INNOVATION

- 1970 → 1103, 1st LSI Dynamic Random Access Memory
- 1971 → 4004, 1st microprocessor
  → 1702, 1st EPROM
- 1976 → iSBC* 80/10, 1st single-board computer
- 1979 → 8088 CPU - force behind personal computer revolution
- 1985 → Intel386™ CPU - 32-bit computing to the desktop
- 1989 → i860™ CPU - 1st million-transistor chip
  → i960™ CPU - 1st superscalar chip
  → Intel486™ CPU - 50x faster than 8088 CPU
- 1990 → i750® video processor - DVI® technology to the desktop

④

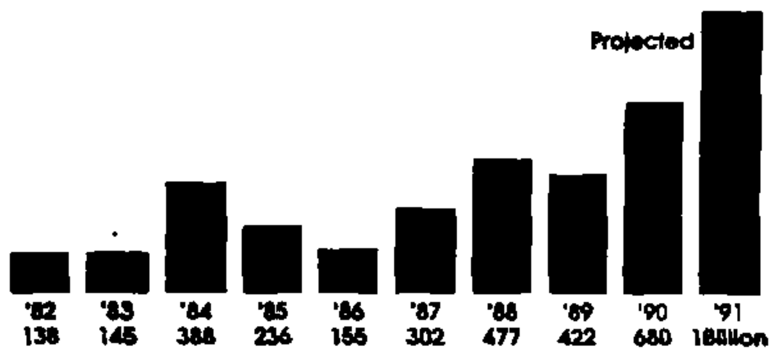
MINIMUM FEATURE SIZE



Capital Additions

To Property, Plant, and Equipment

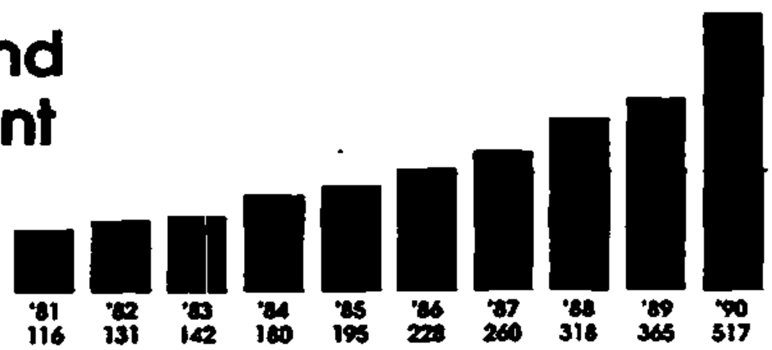
(Dollars in Millions)



(6)

Research and Development

(Dollars in Millions)

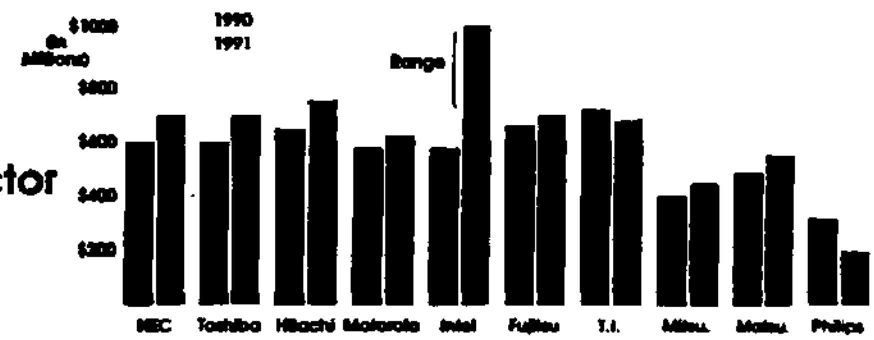


9

16

408 765 1482 P.16

Capital Spending By Top Ten Semiconductor Companies



Sources: Dataquest, Intel

6

THE COMPUTER INDUSTRY IN TRANSFORMATION

OLD		NEW
• Closed • Proprietary • Unique Applications	→	• Open • Standards • Standard Applications

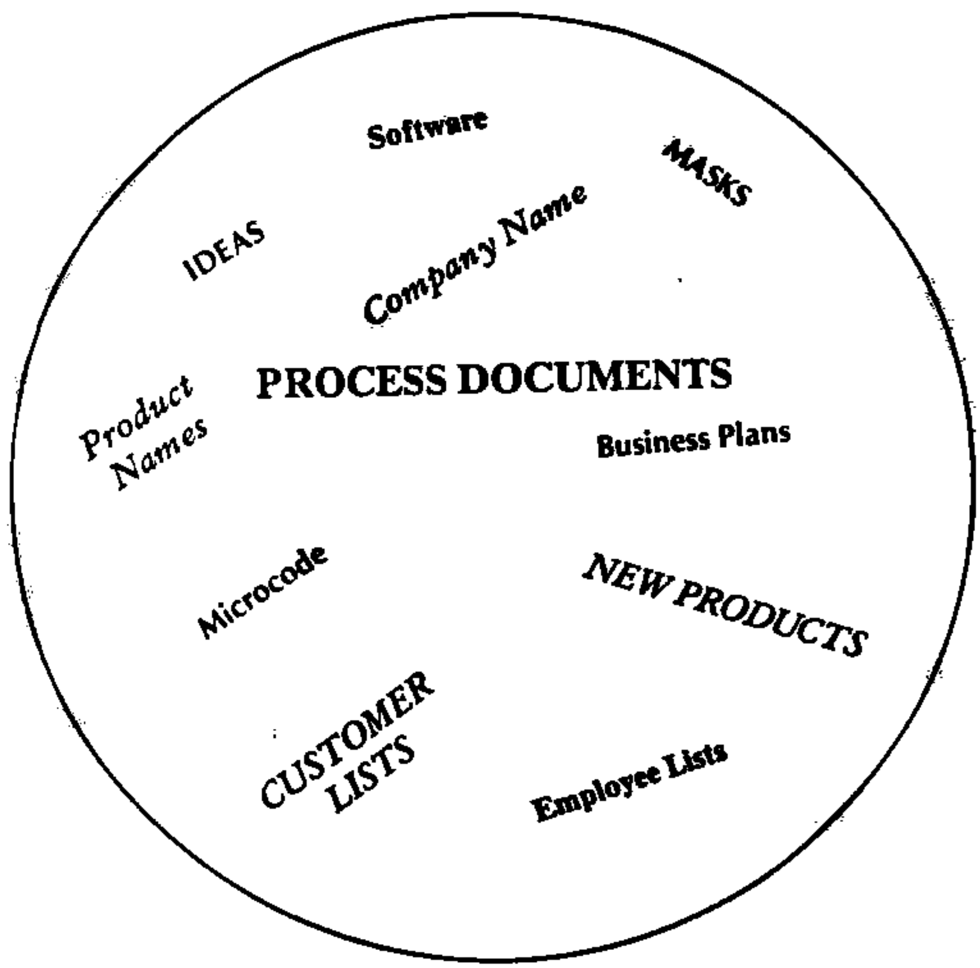
RESULT

- RISKS ARE HUGE

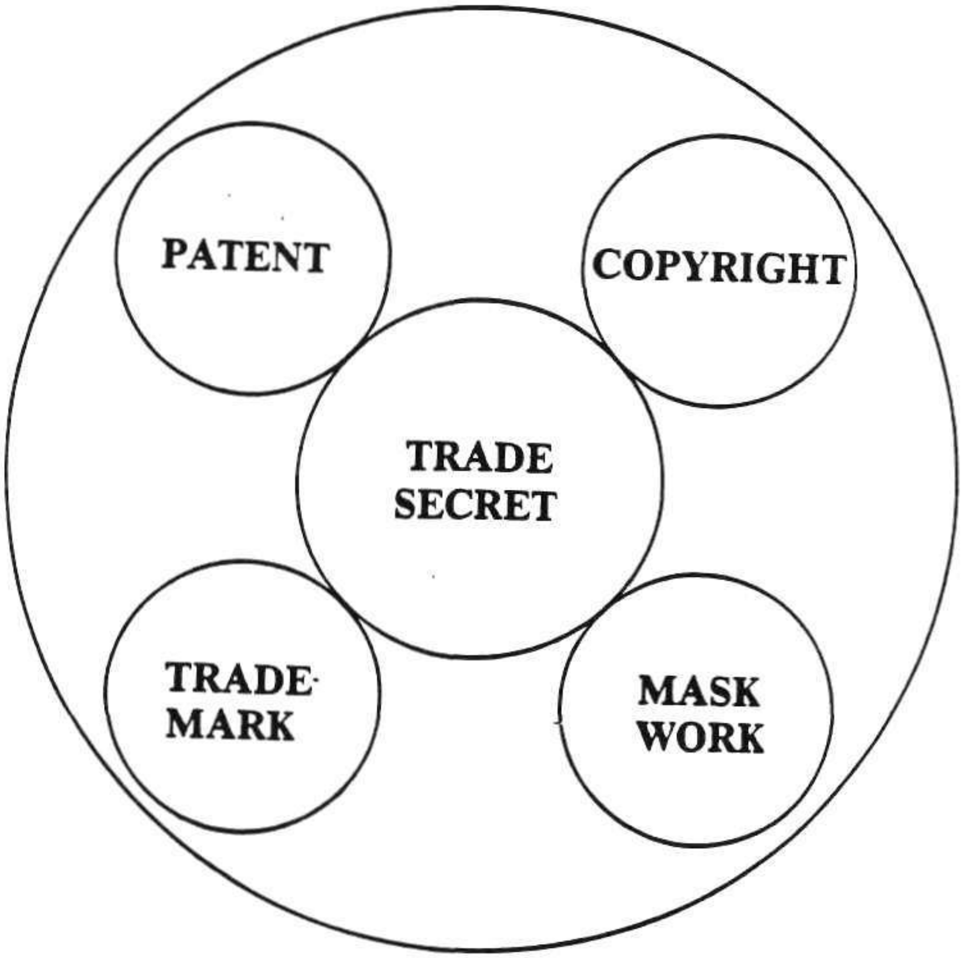
- REDEPLOYMENT OF RESOURCE IS CONTINUOUS

(10)

Intellectual Property



Intellectual Property



WE MUST

- PROTECT OUR INVESTMENTS
- CONNECT TRAINING TO BUSINESS DIRECTION

MANAGING THE HIDDEN ASSETS FOR PROFIT

W. J. Sanders III
Chairman of the Board
and Chief Executive Officer
Advanced Micro Devices

Mr. Sanders and seven other cofounders launched Advanced Micro Devices in 1969, and the company has since grown to be the fifth-largest US-based merchant semiconductor manufacturer and a member of the Fortune 500 with well over $1 billion in annual revenues. Mr. Sanders started his career with the engineering department of Douglas Aircraft Co, where he achieved two important "firsts:" his first management experience in which he headed a project to design the air-conditioning system for the DC-8 jetliner; and his first work with semiconductors. Shortly thereafter, Mr. Sanders joined Motorola Semiconductor and turned from engineering design to sales and marketing. In 1961 he moved to the Semiconductor Division of the Fairchild Camera and Instrument Corporation, beginning as a sales engineer and later advancing to positions as regional sales manager, area sales manager, department head, director of marketing and eventually group director of marketing worldwide from 1967 to 1969. Mr. Sanders is a cofounder of the Semiconductor Industry Association (SIA), cofounder of the Santa Clara Country Manufacturing Group, Semiconductor Research Corporation (SRC) and the Microelectronics & Computer Technology Corporation (MCC) and a founding member of the board of directors of Sematech. He is a member of the board of directors of Donaldson, Lufkin and Jenrette, and also a member of the Bay Area Council and the California Roundtable. He was also named by The Wall Street Transcript as the Best Chief Executive Officer in the semiconductor industry for three years 1983, 1984 and 1985. Mr. Sanders graduated from the University of Illinois College of Engineering in 1958 with a B.S. degree in Electrical Engineering.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Profit Through the Silicon Cycle: The Next Ten Years

PANEL SESSION 2:
SERVICES: THE NEXT COMPETITIVE BATTLEGROUND

Chaired by Geoff Champion
Dataquest Incorporated

Hans Rohrer
National Semiconductor Group

Kazuo Kimbara
Hitachi, Ltd.

Barry Waite
Motorola Inc.

Daniel Queyssac
SGS-Thomson

Robert Freischlag
Fujitsu Mikroelektronik GmbH

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

Dataquest

a company of
The Dun & Bradstreet Corporation

SERVICES: THE NEXT COMPETITIVE BATTLEGROUND

Hans Rohrer
Vice President and Managing Director
National Semiconductor Group

Mr. Rohrer is Vice President and Managing Director for National Semiconductor Europe. Prior to his recent promotion, he was responsible for National Semiconductor's VLSI Division in Europe and was also the General Manager for the German operation. In his new position, Mr. Rohrer operates from National Semiconductor's two major business centres, in Swindon, UK and Munich, Germany. Mr. Rohrer's career in the semiconductor industry started 14 years ago with a marketing position in Texas Instruments, Germany. He worked for a number of years in research and development for Diehl Datasystems, developing computer systems for the scientific market segment. Mr. Rohrer holds a Masters Degree in Electronic Engineering from Aalen University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE

29-31ST MAY 1991

HANS ROHRER

VICE PRESIDENT AND GENERAL MANAGER

NATIONAL SEMICONDUCTOR EUROPE

GOOD AFTERNOON LADIES AND GENTLEMEN,

WHEN I STARTED TO PREPARE MY REMARKS FOR TODAYS PANEL SESSION, I BEGAN BY LOOKING INTO THE BINDERS OF PREVIOUS DATAQUEST CONFERENCES STARTING WITH LAST YEAR'S AND THE 1989 CONFERENCE. THEN I WENT EVEN FURTHER BACK AND MY FINDINGS CONFIRFMED MY SUSPICION THAT OUR THEME OF TODAY "SERVICES, THE NEXT COMPETITIVE BATTLEGROUND"

HAS BEEN OF INTEREST FOR A LONG TIME AND CONSEQUENTLY THERE HAS BEEN NO CONFERENCE OVER THE LAST HALF DECADE WHERE SERVICE DID NOT PLAY, AND RIGHTFULLY SO, A SIGNIFICANT ROLE.

AS WE ALL KNOW AND AS IT WAS UNDERLINED TODAY AGAIN, THE BATTLE IS IN FULL SWING AND THEREFORE I FEEL IT IS MORE THAN APPROPRIATE TO STAND BACK AND REVIEW THE VARIOUS ATTACKS AND COMMANDOS WITHIN THE BATTLE, DETERMINE THE CURRENT POSITION AND MORE IMPORTANTLY EXPAND THE QUESTION - ARE WE WINNING A BATTLE AND LOSING THE WAR?

LET ME EXPAND ON THIS BY OUTLINING THE OBJECTIVE OF THE WAR, TRYING TO PUT THE SERVICE BATTLE INTO CONTEXT, AND DRAWING SOME CONCLUSIONS.
I AM AFRAID, I THEN WILL HAVE TO RAISE SOME MORE QUESTIONS.

LET ME START WITH THE BATTLEFIELD WHICH IS NOTHING LESS THAN THE WORLDS <u>BIGGEST SINGLE MARKET</u> CALLED <u>EUROPE</u>.

THERE ARE MORE THAN 360 MILLION CONSUMERS IN EUROPE AND MORE THAN 600 MILLION IF YOU WANT TO INCLUDE EASTERN EUROPE. EVEN EXCLUDING EASTERN EUROPE, THE GNP AMOUNTS TO 5,5 B $ WHICH IS ABOUT 6% HIGHER THAN THE U.S. GNP AND ALMOST TWICE AS HIGH COMPARED TO JAPAN. EUROPE'S ECONOMIC GROWTH DURING THE 90'S IS EXPECTED TO BE ON THE SAME LEVEL AS THE JAPANESE GROWTH AND WELL AHEAD OF THE PREDICTED GROWTH FOR THE U.S.
JUST TO COMPLETE THE PICTURE, THE SEMICONDUCTOR TAM OF 7.6B$ IS EXPECTED TO GROW FASTER THAN ALMOST ANYWHERE ELSE.

IN SUMMARY, THE EUROPEAN MARKET IS VERY IMPORTANT TODAY AND WILL INCREASE ITS IMPORTANCE EVEN FURTHER IN EXPECTATION OF THE SINGLE MARKET AND THE EXPECTED GROWTH RATES. IT IS THIS EUROPEAN MARKET AND IT IS THE WORLD MARKET WHERE AN INDUSTRIALISED EUROPE, OUR CUSTOMERS, NEEDS TO BE SUCCESSFUL AND IT IS THIS GLOBAL SCENARIO IN WHICH WE, THE SEMICONDUCTOR INDUSTRY, PLAY, I FEEL, A VERY IMPORTANT ROLE. THERE IS VERY LITTLE DOUBT THAT A SUCCESSFUL EUROPEAN INDUSTRY MUST HAVE ACCESS TO WORLD CLASS SEMICONDUCTOR TECHNOLOGY IN THE WIDEST SENSE AT THE LOWEST TOTAL COST AND HERE IS WHERE TRADITIONAL SERVICES ARE OF VITAL IMPORTANCE.

NATIONAL SEMICONDCUTOR, AS WELL AS SOME OTHER S.C. SUPPLIERS, HAVE DEVELOPED AND IMPLEMENTED STRONG SERVICE PROGRAMS, INVOLVING THE WHOLE ORGANISATION, WHICH ARE ABLE TO PROVIDE SERVICE ON A GLOBAL WORLDWIDE BASE.

MANY OF THE ELEMENTS HAVE BEEN DESCRIBED BY THE PREVIOUS SPEAKERS, SO I CAN KEEP THIS PART OF MY SPEECH BRIEF.

THE PROGRAM EVOLVED ALREADY DURING THE LATE 70'S WHEN THE INDUSTRY WAS CHARACTERISED BY MULTIPLE SOURCES, 100% INCOMING INSPECTIONS, REDUNDANT DEVICE QUALIFICATIONS AND AQL TYPE OF MEASUREMENTS.

THIS WAS FOLLOWED IN THE EARLY 80'S BY THE DRIVE TOWARDS ZERO DEFECTS WHICH EMERGED ALONG WITH JOINT CUSTOMER AND SUPPLIER PROGRAMS, QUALITY IMPROVEMENT TEAMS, STATISTICAL PROCESS CONTROLS AND SHIP TO STOCK PROGRAMS.

IN THE MID 80'S THE PRIORITY WAS ON IMPLEMENTING LONG TERM PARTNERSHIPS. CUSTOMERS HAVE MOVED AND CONTINUE TO MOVE TOWARDS FEWER SUPPLIERS HAVING SELF QUALIFICATION AND JUST-IN-TIME PROGRAMS.

THESE PROGRAMS DEVELOPED UNDER STRONG TOP MANAGEMENT DIRECTION INTO WHAT WE AT NATIONAL CALL THE "TOTAL COST PROGRAM" AND ALTHOUGH THE SUPPLY <u>AND USE</u> OF SEMICONDUCTORS HAS MATURED, IT IS MORE THAN EVER DRIVEN BY A PHENOMENAL FLOW OF TECHNOLOGICAL DEVELOPMENTS. THE NEED TO MANAGE AND APPLY THIS TECHNOLOGY COVERS ALL THE AREAS OF PRODUCT INVOLVEMENT, FROM DESIGN CONCEPT, THROUGH MANUFACTURING, TO THE DELIVERED SYSTEM.

TO SUCCESSFULLY ACHIEVE HIGH LEVELS OF INTEGRATION AND LEADING EDGE SYSTEMS SOLUTIONS, A CLOSE WORKING RELATIONSHIP IS REQUIRED BETWEEN CUSTOMERS AND VENDORS BASED ON TRUST, AN OPEN EXCHANGE OF INFORMATION AND AGREED COMMON GOALS. THIS SHOULD RESULT IN TOTAL COST PARTNERSHIPS, ALLOWING BOTH ORGANISATIONS TO FOCUS ON THE SKILLS AND EXPERTISE WHICH ADD REAL VALUE TO THEIR PRODUCTS AND BRING PROFIT, MOVING TO TOTAL COST PARTNERSHIPS WHERE OPEN COMMUNICATION AND FEEDBACK IS INHERENT AND ESSENTIAL TO MANAGE THE TOTAL COST OF MATERIALS.

EXPERIENCE HAS SHOWN THAT SAVINGS ON OPERATIONS VIA INDIRECT COSTS PROVE TO BE FAST AND INCUR LESS INVESTMENT THAN BY INCREASING AUTOMATION OR BY ERODING THE PRICE OF SUPPLIES. THIS IS BEING ACHIEVED WITHOUT COMPROMISING EITHER PARTIES QUALITY OF PRODUCT OR SERVICE. REASEARCH WITH OUR CUSTOMERS SHOW THAT THE OPPORTUNITIES TO REDUCE TOTAL COSTS ARE VERY REAL, YET FURTHER CHANGES IN OPERATING METHODS AND ATTITUDES ARE NEEDED TO ACHIEVE GENUINE BENEFITS.

I WOULD LIKE TO SHARE WITH YOU NOW THE PROGRAMS AT NATIONAL SEMICONDUCTOR WHICH INCREASE FURTHER THE SERVICE LEVELS AND REDUCE OVERALL COSTS AND INCREASE THE SUCCESSFACTORS OF OUR CUSTOMERS. OUR PROGRAMS ARE DESIGNED TO MEET CUSTOMER NEEDS AND ARE THE BUILDING BLOCKS OF A JUST-IN-TIME MANUFACTURING SUPPLY PROCESS. THE ELEMENTS OUTLINED COVER THE SPECTRUM FROM SYSTEM CONCEPTION TO PRODUCTION LOGISTICS, REDUCING CYCLE TIMES AND ALLOWING EACH PARTNER TO BECOME MORE RESPONSIVE TO MARKET NEEDS WHICH IS ONE OF THE PRIME OBJECTIVES OF NATIONAL SEMICONDUCTORS TOTAL QUALITY PROGRAM WHICH THE COMPANY EMBARKED ON IN 1989.

I BEGAN MY SPEECH WITH A REMARK ABOUT WINNING THE BATTLE AND RAISED THE QUESTION - ARE WE IN EUROPE IN DANGER OF LOSING THE WAR ?

I FEEL WE HAVE COME A LONG WAY IN TERMS OF SERVING OUR CUSTOMER BASE BUT STILL HAVE AN EVEN LONGER WAY TO GO. AS THE SERVICES ARE GOING TO BECOME MORE SOPHISTICATED, THE DEMAND OF SERVICES IS GOING TO CONSTANTLY CHANGE AND THE TOTAL QUALITY PROGRAM, CULTURE AND PHILOSOPHY IS GOING TO ADD A FURTHER DIMENSION. BUT, AS ALSO INDICATED AT THE BEGINNING, SERVICE IS ONLY ONE ELEMENT OF BUILDING A SUCCESSFUL ENTERPRISE.

AS SUCH SERVICES ARE A RESULT OF AN EFFORT NOT THE EFFORT ITSELF AND WHILE SERVICES ARE AN IMPORTANT PART TO GIVE COMPETITIVE ADVANTAGE THE REAL SOURCES FOR SUCCESS ARE NUMEROUS AND I WOULD LIKE TO CLOSE MY REMARKS BY DRAWING YOUR ATTENTION TO WHAT I CONSIDER TO BE THE REAL NEXT BATTLEGROUND - WHICH IS TIME.

IT IS TIME WHICH, IN MY MIND, RAISES MANY QUESTIONS AND AS TIME DOES NOT ALLOW ME TO GO INTO DEPTH DURING MY SPEECH, I WOULD LIKE TO SHARE THEM WITH YOU AND MAYBE DEVELOP THIS SCENARIO FURTHER DURING THE PANEL DISCUSSION.

THIS FOIL SHOWS A SUMMARY OF WHAT THE TOP 1500 OF THE WORLDS MOST IMPORTANT MANUFACTURING COMPANIES BELIEVE TO BE THE MOST IMPORTANT COMPETITIVE PRIORITIES TAKING THEM THROUGH THE NEXT FIVE YEARS AND IS THE RESULT OF THE STUDIES PERFORMED BY INSEAD, THE FONTAINEBLEAU BASED BUSINESS SCHOOL, WASEDA UNIVERSITY IN TOKYO AND THE UNIVERSITY OF BOSTON.

IN THIS RESEARCH YOU HEAR A LOT OF WHAT HAS BEEN DISCUSSED TODAY IN TERMS OF TOTAL QUALITY MANAGEMENT, JUST-IN-TIME MANUFACTURING AND MANUFACTURING PLANNING.

THE MOST RELEVANT PART, HOWEVER, IS WHAT IT TELLS US ABOUT THE SUBTLE BUT IMPORTANT DIFFERENCES IN PRIORITIES THROUGHOUT THE INDUSTRIALISED WORLD.

THIS IS ESPECIALLY SO IN COMPARISON WITH JAPAN ON THE ONE HAND AND THE U.S. AND EUROPE ON THE OTHER.

AS INDICATED, THERE ARE QUITE A FEW SUBTLE DIFFERENCES BUT THE MOST RELEVANT IS CLEARLY THE FOCUS JAPANESE COMPANIES ARE PLACING ON THE ABILITY TO MAKE RAPID DESIGNS AND DESIGN CHANGES IN HIGHLY CUSTOMISED PRODUCTS.

THE JAPANESE WAY OF OPERATING, THEIR SUPPORT INFRASTRUCTURE INCLUDING DESIGN, AND THE JAPANESE FACTORY ARE TOTALLY FOCUSSED TOWARDS BUILDING AN EVER CHANGING STREAM OF NEW PRODUCTS.

THIS IS THE WAY THESE LEADING COMPANIES MANAGE TIME AS THE MOST VALUABLE SOURCE FOR COMPETITIVE ADVANTAGE - IN PRODUCTION, SALES AND DISTRIBUTION, DESIGN CHANGES AND NEW PRODUCT DEVELOPMENTS -

AND THIS IS THE POINT :

NEW PRODUCT DEVELOPMENT OUGHT TO BE OUR BIGGEST CONCERN !

LET ME TRY TO UNDERLINE THE ISSUE WITH THE NEXT CHART AND WHAT I SHOW HERE IS PURPOSELY DESIGNED TO COVER A WIDE VARIETY OF END EQUIPMENT TO ILLUSTRATE THE POINT I AM TRYING TO MAKE.

THE JAPANESE PRODUCERS CAN DEVELOP A T.V. SET IN ABOUT ONE THIRD OF THE TIME REQUIRED BY A EUROPEAN MANUFACTURER. THE SAME APPLIES TO OTHER BROWN GOODS INCLUDING CAR RADIOS.

FOR CARS, THE JAPANESE CAN DEVELOP NEW PRODUCTS IN LESS THAN HALF THE TIME NEEDED IN THE U.S. AND BY THEIR EUROPEAN COMPETITION AND THIS IN SPITE OF THE FACT THAT ALL DATA SUGGESTS THAT THE MANUFACTURING THROUGHPUT OF COMPARABLE GOODS, WHEN PUT INTO PRODUCTION, IS FOR JAPANESE, U.S. AND EUROPEAN COMPANIES TODAY AT THE SAME LEVEL. THIS UNDERLINES AGAIN WHERE I FEEL THE COMPETITIVE ADVANTAGE LIES.

A COMPANY THAT CAN BRING OUT NEW PRODUCTS UP TO THREE TIMES FASTER, CAN <u>OUT INNOVATE</u> ITS COMPETITORS AND ENJOYS A HUGE COMPETITIVE ADVANTAGE.

NOW IT IS ALSO WELL KNOWN IN EUROPE THAT TIME TO MARKET IS A VERY CRUCIAL FACTOR FOR SUCCESS AND MANY IMPROVEMENTS HAVE BEEN MADE, ESPECIALLY IN THE CO-OPERATION BETWEEN OUR INDUSTRY AND THE END EQUIPMENT MANUFACTURERS, TO GET INVOLVED AS EARLY AS POSSIBLE IN THE DESIGN CYCLE OF A NEW PIECE OF EQUIPMENT TO ENSURE THE RIGHT TRADE OFFS IN TERMS OF THE TECHNOLOGY AND RELATED IMPLICATIONS RESULTING IN JOINT PRODUCT DEVELOPMENT TEAMS, PARTNERSHIPS AND JOINT VENTURES.

I WOULD LIKE TO CLOSE BY GIVING ONE RECENT EXAMPLE OF HOW NATIONAL IN EUROPE HAS BEEN INTIMATELY INVOLVED IN THAT PROCESS.

A MAJOR EUROPEAN TELECOMMUNICATION COMPANY DID DECIDE TO MOVE INTO THE FAST GROWING FAX BUSINESS WHERE INNOVATION CYCLES ARE SHORT, SHORT DESIGN CYCLES ARE CRUCIAL AND THE PACE IS SET BY THE FAST MOVING JAPANESE COMPETITION.

BASED ON THE FACT THAT NATIONAL SEMICONDUCTOR SHARED THE SAME STRATEGIC INTENT, HAD THE CAPABILITIES AND TECHNOLOGY ROAD MAPS IN PLACE, A PARTNERSHIP, BENEFICIAL FOR BOTH COMPANIES, DEVELOPED.

THE RESULTS SO FAR SUGGEST THAT IT IS POSSIBLE TO TAKE ON THE CHALLENGE

-SEVERAL PATENTS HAVE BEEN FILED FROM BOTH SIDES- AND THE SYSTEMS PERFORMANCE AND CONCEPTIAL FLEXIBILITY IS CENTERED AROUND AN INDUSTRY FIRST,

-THE INTEGRATION OF A DIGITAL SIGNAL PROCESSOR AND A HIGH PERFORMANCE MICROPROCESSOR-

DESIGNED AND MANUFACTURED IN EUROPE, WHICH FOUND ITS WAY IN THE MEANTIME IN MANY OTHER APPLICATIONS.

THERE ARE MANY MORE EXAMPLES LIKE THIS ACROSS DIFFERENT INDUSTRY SEGMENTS AND CLEARLY THIS IS ONE WAY OF DEALING WITH THE CHALLENGE. BUT LOOKING AT IT ON A LARGER SCALE, THERE ARE STILL TOO FEW OF THEM AND FURTHER SIGNIFICANT EFFORT, CREATIVITY AND MANAGEMENT TIME IS REQUIRED IN THIS FIELD TO BROADEN THE BASE AND MAKE ACCESS TO SEMICONDUCTOR TECHNOLOGY EASIER FOR OUR EUROPEAN CUSTOMERS.

BEFORE I LEAVE NOW, I WOULD LIKE TO SHARE WITH YOU SOME OF THE ACTIONS WE AT NATIONAL ARE TAKING TO SUPPORT THIS EFFORT.

THEY REACH FROM RELATIVELY SIMPLE ONES LIKE ELECTRONIC DATA EXCHANGE, OVER AND ABOVE THE NORMAL EDI ACTIVITIES - ELECTRONIC DATA SHEETS -, TO VERY SOPHISTICATED DEVELOPMENTS LIKE INTRODUCING PRODUCTS INCLUDING THE DEVICE MODELS, ALLOWING DESCRIPTIONS OF PRODUCTS IN VERY HIGH LEVEL DEVICE LANGUAGES, SUITED FOR DIRECT USE IN SYSTEM SIMULATIONS. IT IS THIS FIELD WHICH ESPECIALLY REQUIRES MUCH MORE ATTENTION AS MORE DESIGN WORK WILL HAVE TO BE CARRIED OUT ON COMPUTERS AND HERE IS WHERE THE JAPANESE VERTICALLY INTEGRATED COMPANIES HAVE AN ADVANTAGE BECAUSE THEIR TOTAL DESIGN ENVIRONMENT IS DEDICATED, STARTING FROM THE SYSTEM LEVEL DOWN TO THE DEVICE SPECIFICATION AND TO THE DEVICE PARAMETERS.

I'D LIKE TO THANK YOU VERY MUCH FOR YOUR ATTENTION AND I HOPE I HAVE THROUGHOUT MY REMARKS TODAY UNDERLINED THE IMPORTANCE OF SERVICES, WHICH EVOLVED INTO A TOTAL QUALITY PROGRAM AT NATIONAL SEMICONDUCTOR.

I ALSO TRIED TO HIGHLIGHT A FURTHER FACET WHICH, I THINK, IS <u>CRUCIAL</u> FOR SUCCESS AND, WHERE I FEEL, A LOT MORE NEEDS AND COULD BE DONE.

SERVICES,

the next competitive

battleground

National Semiconductor

DATAQ01S/5.91

SERVICES,

the next competitive

battleground ?

National Semiconductor

DATAQ02S/5.91

Services,

the next competitive battleground

Are we winning the battle and losing the war ?

National Semiconductor

DATAQ03S/5.91

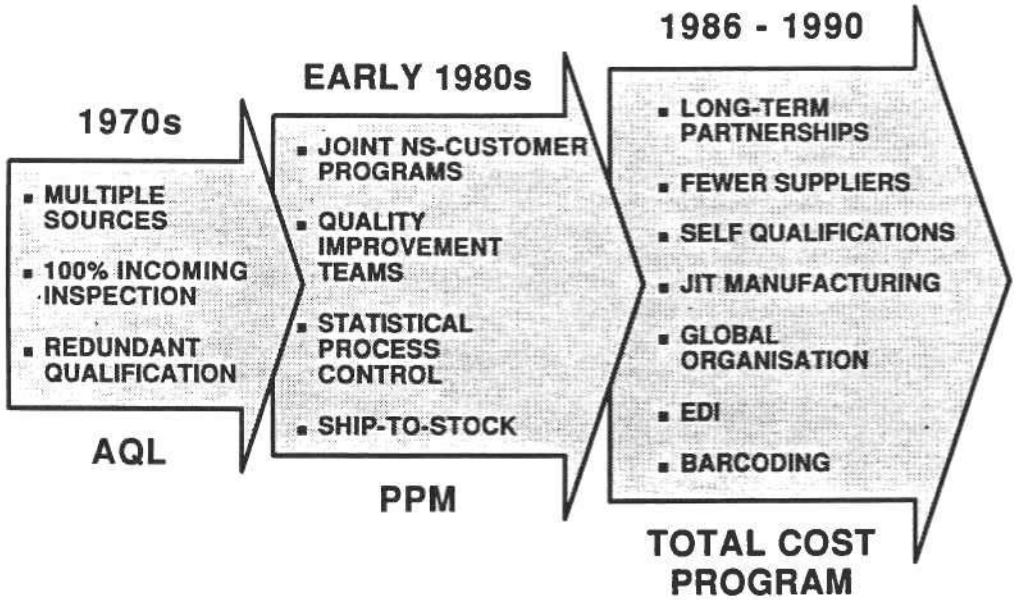
THE BATTLEFIELD - EUROPE
Billion $

	GNP	CAGR '90-'95 (%)	IC - TAM	CAGR '90-'95 (%)
USA	5200	1.5	15.70	14
JAPAN	2800	4.5	18.20	13
ROW	800	6	5.40	19
EUROPE	5500	4	7.60	17
	360 Mill Consumers			

National Semiconductor

DATAQ04S/5.91

Service Differentiation - Lowest Total Cost

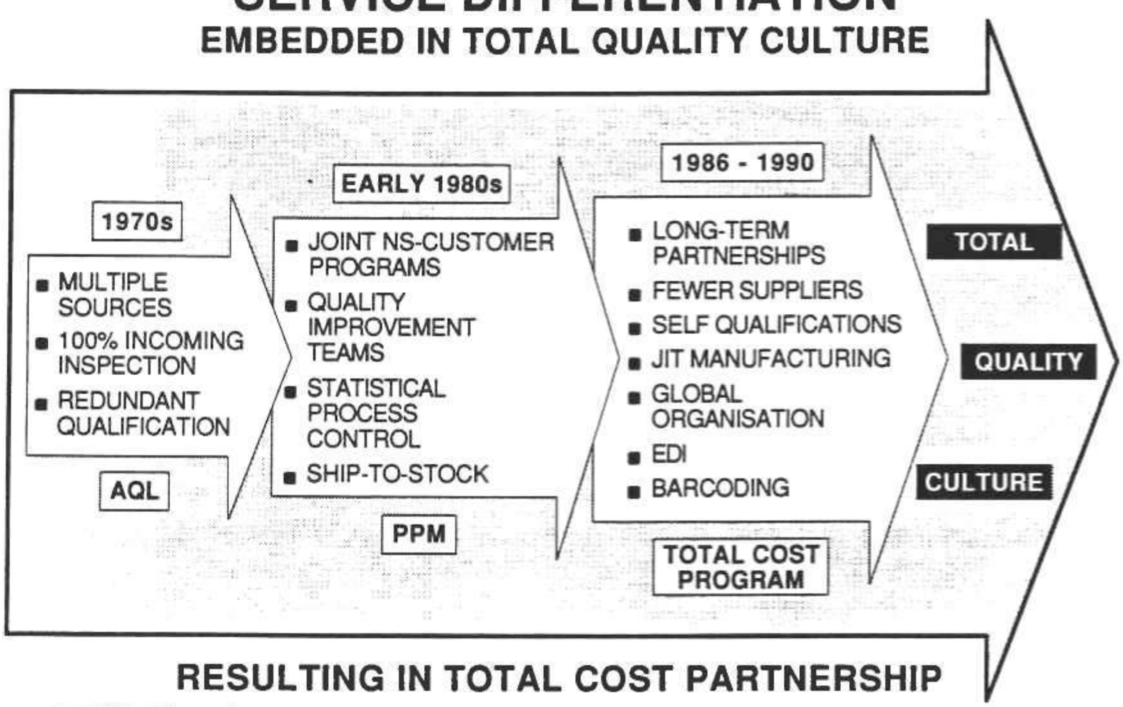


National Semiconductor

DATAQ05S/5.91

SERVICE DIFFERENTIATION

EMBEDDED IN TOTAL QUALITY CULTURE



RESULTING IN TOTAL COST PARTNERSHIP

National Semiconductor

DATAQ06S/5.91

National believes that significant system competitive advantage can be achieved by working together to reduce total costs in the areas of:

- SYSTEM - CONCEPTUAL DESIGN
- PRODUCT DESIGN
- QUALIFICATION
- QUALITY
- LOGISTICS
- PURCHASING
- FINANCE

RESULTING IN TOTAL COST PARTNERSHIP

National Semiconductor

DATA0075/5.81

TIME,

the next competitive

battleground

National Semiconductor

DATA0085/5.9

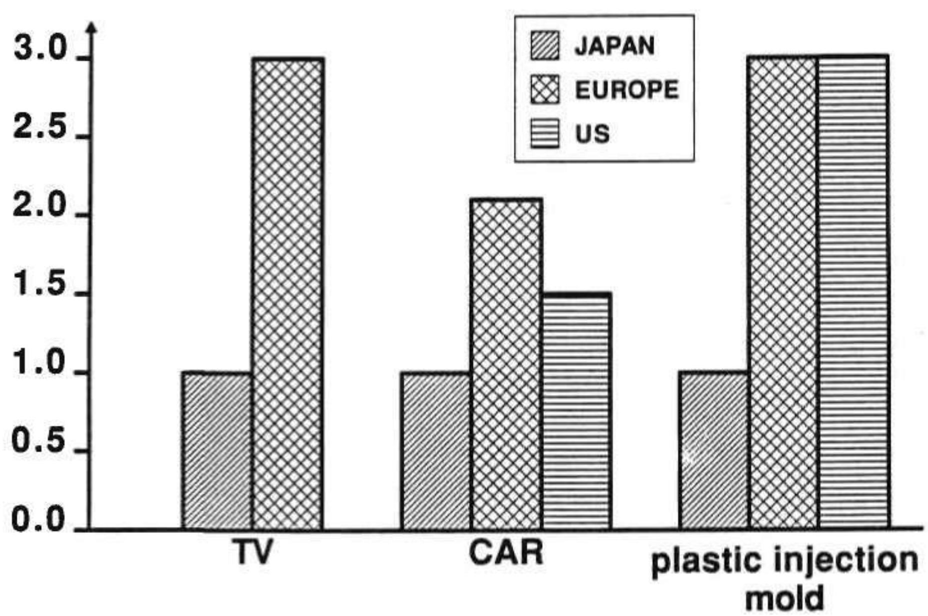
Competitive Priorities in the Next Five Years

JAPAN	UNITED STATES	EUROPE
Reliable products	Conformance quality	Conformance quality
Dependable delivery	Dependable delivery	Dependable delivery
Rapid design changes	Price competition	Fast delivery
Product customisation	High performance	High performance
Conformance quality	Reliable products	Reliable products

National Semiconductor

DATAQ09S/5.91

NEW PRODUCT DESIGN CYCLES



National Semiconductor

DATAQ10S/5.91

MAKING IT WORK

- Shared strategic intent
- Planning, positioning for partnerships
- Management commitment
- Product and technology roadmap
- Easier access to semiconductor technology

and

→ **Services** ←

resulting in

mutual benefits for the European Industry

Dataquest

a company of
The Dun & Bradstreet Corporation

SERVICES: THE NEXT COMPETITIVE BATTLEGROUND

Kazuo Kimbara
Executive Managing Director
and Group Executive
Electronic Devices Group
Hitachi, Ltd.

Mr. Kimbara is Executive Managing Director and Group Executive of the Electronic Devices Group of Hitachi, Ltd. Since joining Hitachi in 1951, he has held various manufacturing and management positions including Manager of the Takasaki and Musashi Works, Director of the Semiconductor and Integrated Circuits Division, Board Director, and Group Executive of the Electronic Devices Group. He was appointed to his present position in June 1989. Mr. Kimbara graduated from the Department of Electrical Engineering of Nagoya University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Dataquest

a company of
The Dun & Bradstreet Corporation

SERVICES: THE NEXT COMPETITIVE BATTLEGROUND

Barry Waite
Corporate Vice President
and General Manager
European Semiconductor Group
Motorola Inc.

Mr. Waite was appointed to his current position in January 1989, having been previously Assistant General Manager of the European Semiconductor Group of Motorola at the European headquarters in Geneva, Switzerland. He has been with Motorola since 1982, and was Manager at the East Kilbride, Scotland facility when it started Europe's first 6-inch wafer fabrication line and subsequent 1Mb DRAM manufacturing. Prior to this, he worked with Texas Instruments in Bedford, England and in Houston, Texas. Mr. Waite was educated in Britain and obtained his degree from the University of Sheffield.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Barry Waite,
Motorola Inc.

Dataquest, Marbella
30 May 91

SERVICES - THE NEXT COMPETITIVE BATTLEGROUND

Firstly, thank you to Dataquest for allowing me to join with several of my colleagues, in these vacation-style surroundings, to address this important subject of Services to our Customer.

As we can all see, the Panel is heavily weighted by the opinions of Semiconductor suppliers. With this important topic to discuss, it perhaps would have been more appropriate had our host invited a panel to represent the customer base rather than the supplier base. We must be careful we do not make a major discussion or debate on what our customers see as the next competitive battleground when in fact, those customers we serve in this audience would probably help us find that answer more quickly.

As we hand out our theories, strategies and opinions on the next focus area of competitive differentiation, we must do this with solid input from our customer. Total Customer Satisfaction is what we, as suppliers, will be striving to achieve. A customer's definition and expectancies of what it will take for its suppliers to meet these needs has been expanding across time and will, of course, continue to be expanded in the future.

We can reflect on these changing expectancies across time. Back in the 1970's, we could say the competitive need was heavily focused on pricing issues. Pricing was a key means of differentiating to secure a business award.

The customer's expectancies grew quickly beyond the pricing factor to include delivery performance - delivery performance here being measured in some loose definition, certainly by today's standards. Probably hitting a two-week delivery window was by many, at that time, regarded as acceptable.

The issue of quality and reliability then became more apparent, beginning with basic AQL standards. As we moved into the decade of the Eighties, the issue was found in Parts per Million defect level performance. The customer's expectancies now included Quality, Delivery and Pricing.

It was at this conference in 1990, that the then General Manager of Texas Instruments Europe, Mr. Jim Hubbard, spoke of the T.I. TQC roadmap towards Customer Satisfaction. He showed this roadmap to now require time-based focus for his customer's careabouts. These time-based focus items included "Just in time" Satisfaction, Delivery in plus or minus hours, Speed in meeting the customers' requirements.

Across the last two decades, we have seen the customer's expectancies ever-increasing, and we should, of course, expect to have to continue in this service improvement in the future.

So, what will our customers require in the future? What will our Semiconductor market require in the future? We must, of course, assess this market.

The Semiconductor market, as we progress through this decade, will continue to move in the trend of the last decade. This trend - as most in this room know - is further towards customised products and services at the expense of standard catalogue devices. In addition to the growth of the Semi custom and Micro computer sections of our market, we will also see customer specific needs increasing in the other market technologies.

Motorola is the customer of its vendors. In order to cross-check the future needs of our customers in this industry, I have assessed what the Motorola Semiconductor group, when it is a customer, is expecting from its suppliers. Our standards are embodied in the company's Six Sigma principles. In addition to cross training on company cultures, the forming of joint teams, we have experienced ever-increasing participation with suppliers in the development of state of the art equipment to meet the Motorola need. In fact, with more frequency than we have been able to practice, our vendors could be doing even more in areas such as base material specifications, definition of improved standards, newer features, systems improvements. etc.

There is, in fact, a true basis of partnership developing between the supplier and the customer.

Exciting new products have resulted from these joint design teams, and this has led to major business awards for some of our suppliers. Partnerships are bringing improved satisfaction for the customer along with increased business for the vendor. Air Products and Applied Materials are two such companies who are working with Motorola on a partnership basis, meeting Motorola's ever-increasing expectancies of its suppliers.

As we move forward in servicing our customers in the Semiconductor industry, we must recognise the need for joint design teams. The definition of Total Customer Satisfaction will include an expectancy of marrying the system's knowledge of the customer with a silicon technology of the Semiconductor corporation. These joint design teams must bring leadership silicon with leadership systems to make our customers successful in their market place.

In this world of shortening product life cycles, let me refer to a McKinsey and Co. study, which highlighted the importance of time to market. If a new product introduction and shipment is delayed six months in, let's say, a five year life cycle, the after tax profit for the life of the product is reduced by one-third. On the other hand, as a reference point, if the first quality shipments are on time but the development costs overran budget by 50%, the after tax profit effect was only 3.5%. This, of course, is not a recommendation for overruns in product development cost. However, it emphasises that quality design and time of introduction to market is a vitally important factor for both Total Customer Satisfaction and, of course, profit performance. The best of systems knowledge and silicon technology must be joined together to achieve this leadership excellence.

We are continuing in this industry on the road to full partnerships, Semiconductor supplier and systems specialist. Such partnerships will be essential for our customers to meet their ever-shortening time to market windows. Our customers will prefer to partner with those Semiconductor companies that can offer the silicon technology to make joint design teams successful. They will prefer to partner with Semiconductor companies who offer the services in responsiveness, EDI, fast reliability support, and of course, as always, delivery when the product is required at the quality required, offering a price-competitive solution for their system needs. All these things are important to our customer.

The battleground has been, is now, and will continue to be, that of Total Customer Satisfaction. Anticipating and executing on the needs of the customer to provide that Total Satisfaction will be the differentiator between Semiconductor suppliers.

Dataquest

a company of The Dun & Bradstreet Corporation

SERVICES: THE NEXT COMPETITIVE BATTLEGROUND

Robert A. Freischlag
President
Fujitsu Mikroelektronik GmbH

Mr. Freischlag is President of Fujitsu's Semiconductor Division in Europe based at the Company's European headquarters in Dreieich–Buchschlag near Frankfurt, Germany. Before coming to Europe, Mr. Freischlag was Senior Vice President and General Manager, Integrated Circuits Division of Fujitsu Microelectronics, Inc., USA. Having founded the IC Division of FMI in 1977, he was elected to the board of directors in 1982 and promoted to the position of General Manager in 1983. Prior to joining Fujitsu, Mr. Freischlag was Managing Director of Motorola Semiconductors Japan Ltd. and while at Motorola, he also held the position of Director of Marketing/Pacific. Mr. Freischlag attended San Diego State University obtaining his Bachelor degree in Physics there in 1966.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Service

– Make it easy for customers to do business

FUJITSU

1148-001

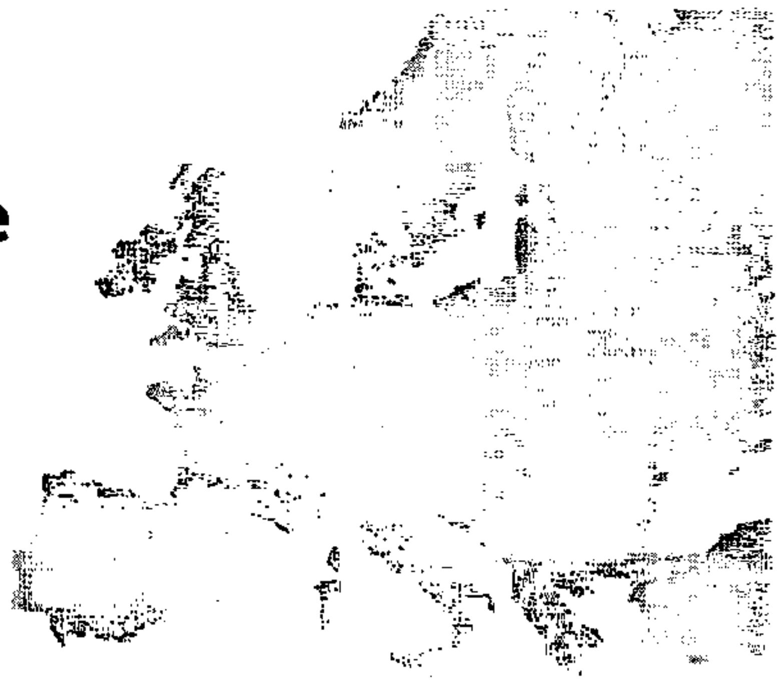
Service

- Integrated local support network
- Local R+D
- Just-in-time

FUJITSU

1148-002

Service



FUJITSU

Service

- Understand customer's strategic component needs
- Working together in pre-development and product definition stages
- Production Support → After Sales

FUJITSU

Service

The total relationship:

Semiconductor Manufacturer ⟷ Customer

↘ Total Service Commitment ↙

FUJITSU

1148-005

Service

- Long term investment strategy
- Organization

Customer's strategic component needs

FUJITSU

1148-006

Service

In place and functioning

- Local OEM Sales
- Distribution Network
- Design Centers ASIC/ASSP
- Assembly
- Fab

FUJITSU

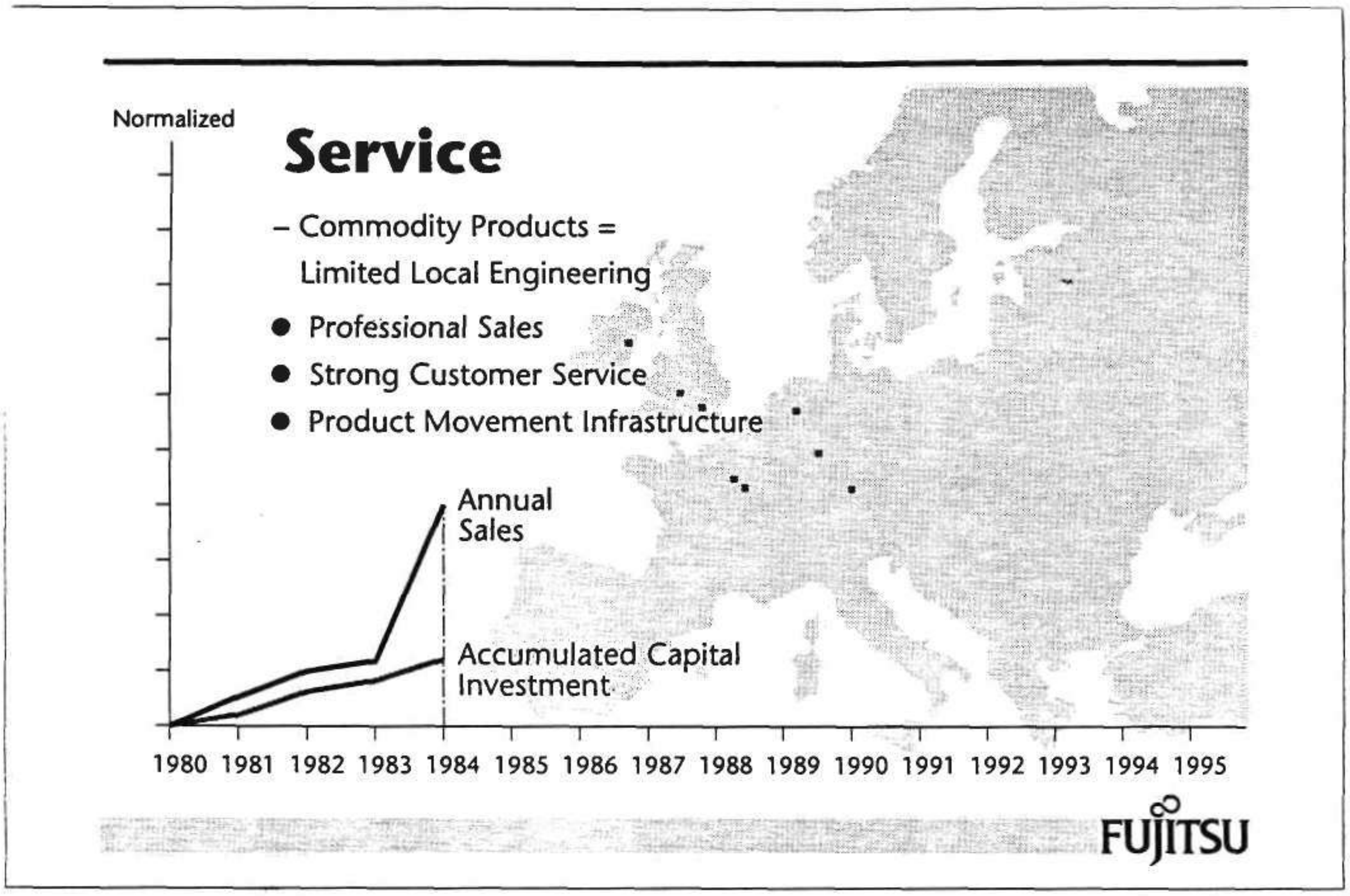
Service

Stage 1

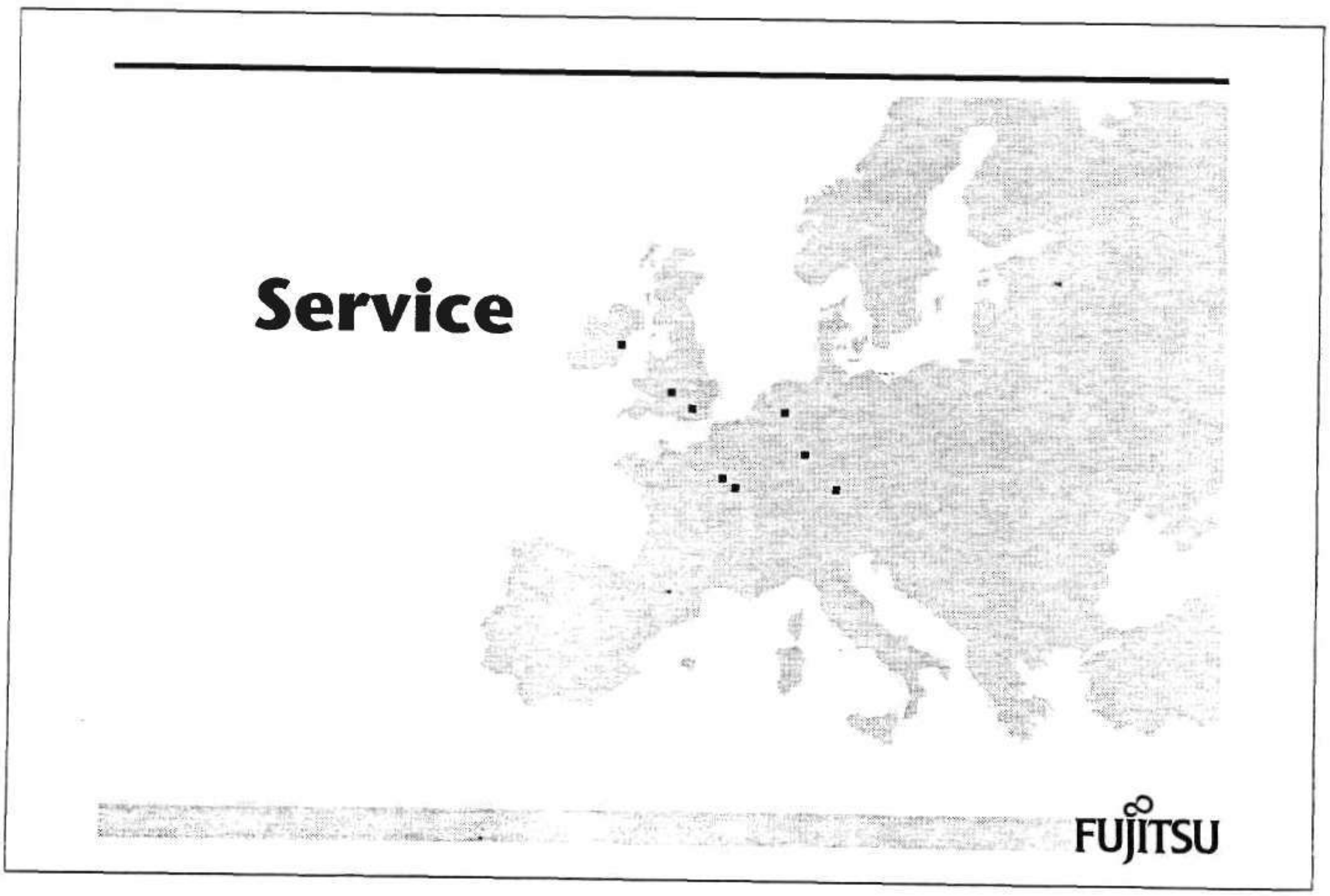
- Sales and Marketing HQ
- Local Sales offices
- Assembly and Test
- Distribution Network

Concentration on commodity memories

FUJITSU



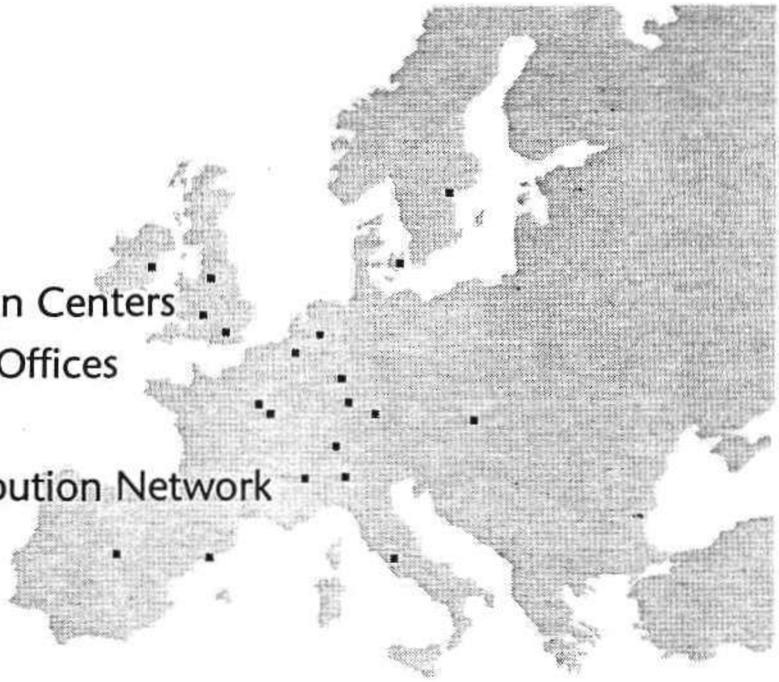
1148-009



1148-010

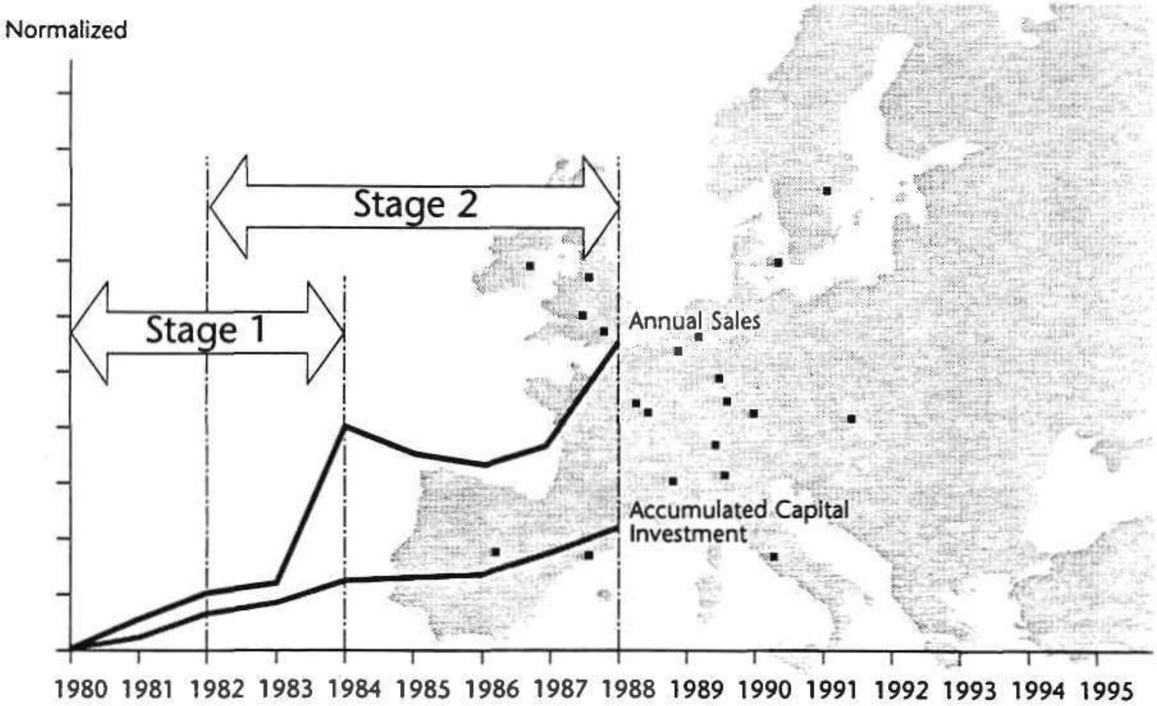
Stage 2

- Local ASIC Design Centers
- Additional Sales Offices
- ASIC HQ
- Expanded Distribution Network



FUJITSU

1148-011



FUJITSU

1148-012

Service

Stage 3

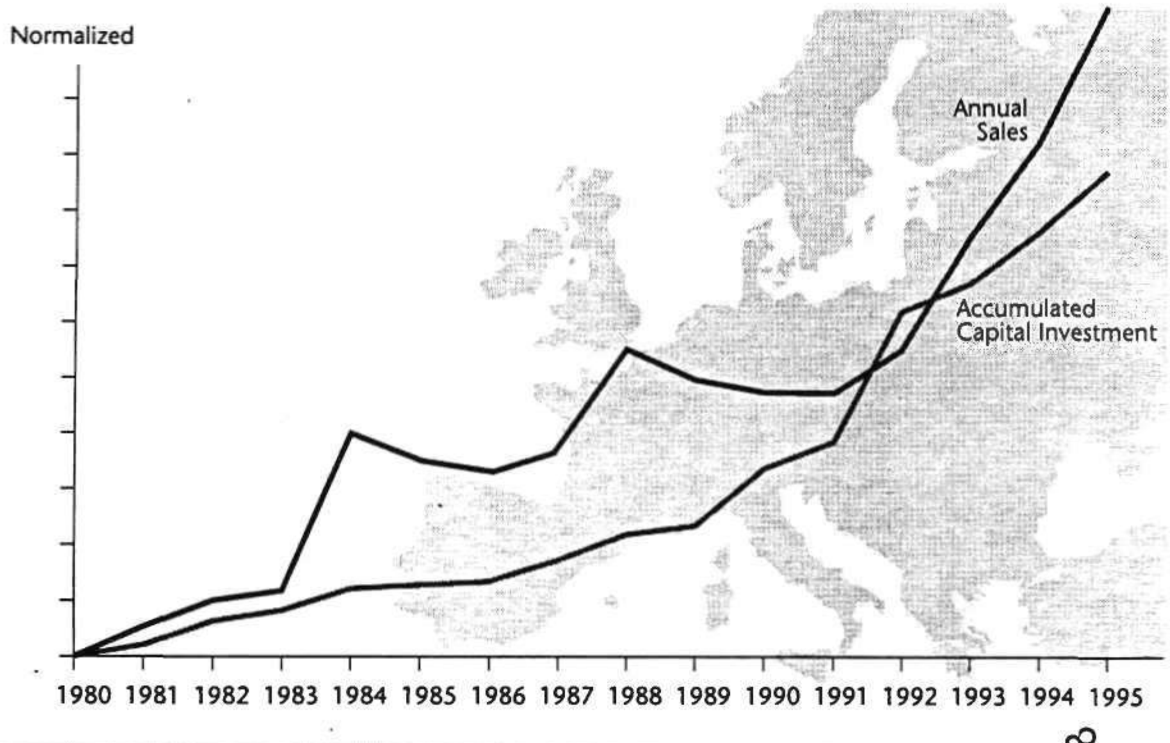
- 5 R+D Groups
- Projects include ISDN/DSP/GSM
- European Telecoms and Data Comms
- Future plans include R+D for Auto, HDTV, Video

Total Support Service Infrastructure

World Class Wafer Fab — Commodity Memories / Standard ASICs / ASSPs

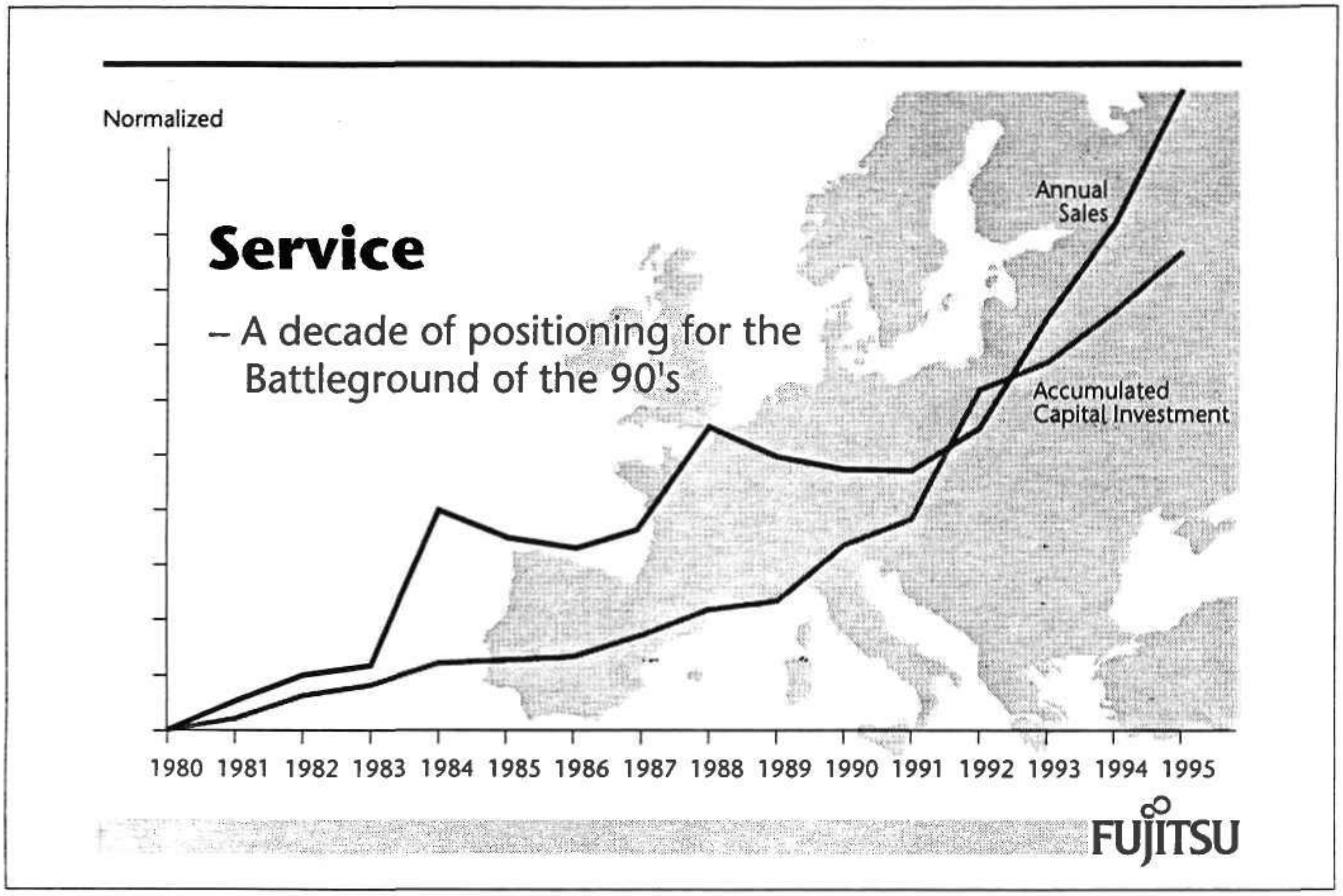
FUJITSU

1148-013



FUJITSU

1148-014


Normalized
Service
– A decade of positioning for the Battleground of the 90's
Annual Sales
Accumulated Capital Investment
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995
FUJITSU

1148-015

X

Profit Through the Silicon Cycle: The Next Ten Years

"GLOCALIZATION"

Pat Weber
Executive Vice President,
President Semiconductor Group
Texas Instruments

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

"GLOCALIZATION"

William Pat Weber
Executive Vice President
President, Semiconductor Group
Texas Instruments

As Texas Instrument's (TI) Executive Vice President and President of the company's semiconductor group, Mr. Weber is responsible for managing TI's worldwide semiconductor operations. Mr. Weber is also responsible for the materials and controls group, the consumer products division and international operations. He has been a member of the Board of Directors since 1984. Since joining TI in 1962, he has held a number of positions in manufacturing, project management, division/group management, defense electronics, digital systems, and semiconductor businesses; he has also undertaken corporate assignments. Mr. Weber also serves on the Board of Directors of the Semiconductor Industry Association, on the Development Board at the University of Texas, Dallas, and at the Better Business Bureau of Metropolitan Dallas, Inc. He is also a member of the US Philippine Business Council. Mr Weber holds a B.Sc. degree in Industrial Engineering from Lamar University and an M.Sc. degree in Engineering from Southern Methodist University.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

This presentation was not available

at the time of publication

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

AFTER THE MONOPOLY: A NEW ERA OF INNOVATION

Jerry Sanders
Chairman of the Board
and Chief Executive Officer
Advanced Micro Devices

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

This presentation was not available

at the time of publication

Profit Through the Silicon Cycle:
The Next Ten Years

CHANGES IN THE CHARACTERISTICS OF THE JAPANESE SEMICONDUCTOR MARKET AND USER NEEDS

Tatsuo Tanaka
Senior Executive Vice President
INSEC

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

CHANGES IN THE CHARACTERISTICS OF THE JAPANESE SEMICONDUCTOR MARKET AND USER NEEDS

Tatsuo Tanaka
Senior Executive Vice President
INSEC

Mr. Tanaka is Senior Executive Vice President of the International Semiconductor Cooperation Center (INSEC). This position is preceded by several years of senior executive posts in materials processing and semiconductor organizations, and most recently he was Executive Managing Director of the Photovoltaic Power Generation Technology of Research Association, a position he still holds in parallel with his responsibilities at INSEC. For 27 years Mr. Tanaka served with the Ministry of International Trade Industry (MITI), and spent 3 years in London as Vice President of the Japan External Trade Organization. Mr. Tanaka graduated from Tokyo Metropolitan University in Electrical Engineering.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

The Needs of the Japanese Market

(1) Today, I am pleased to have this opportunity to talk about the industries using integrated circuits in Japan.

First of all, I would like to review growth patterns of the Japanese IC markets, particularly how ICs are consumed by major industry groups on the basis of statistical data. Then, I would like to examine how Japanese IC users are evaluating foreign-made ICs and what problems they are seeing, based on results of the survey conducted by the INSEC. Finally, I would like to touch upon our ongoing program to promote the use of foreign-made ICs. Please note that I am using the word "ICs" throughout this presentation, which also mean LSIs and VLSIs for the sake of convenience.

(2) Now, let me start from IC demand trends in Japanese markets in the 1980s on the basis of production statistics prepared by the Ministry of International Trade and Industry (MITI), and imports and exports statistics by the Ministry of Finance (MOF). Assuming that the domestic IC demand can be estimated by subtracting exports from production and adding imports, the demand grew from ¥605 billion in 1981 to ¥2069 billion. On the U.S. dollar basis, this was the increase from $4.4 billion to $15.1 billion. As clearly seen in Figure 1, the domestic demand increased rapidly in

the later four years, suggesting accelerated growth of IC consumption by user industries. Note that the shaded area in the graph represents the value of imports, which reached ¥379 billion in 1990, accounting for slightly more than 18% of the estimated domestic demand. In addition, major foreign IC makers are operating 5 factories in Japan. If shipments from these facilities are added, a share of foreign-made ICs would be much larger than this 18.3%. As mentioned earlier, the Japanese IC market still continues rapid expansion, and to meet this strong demand, imports are fully integrated with production into the domestic IC supply system.

(3) Then, let us look into which industry sectors are using how many of such large amount of ICs. Japan does not have official statistics of IC demand excepting energy and a limited number of areas. However, IC consumption by major industrial sectors can be estimated from the input/output table of inter-industrial relations prepared by the MITI every five years. Needless to say, this table is designed to analyze inter-relations between industrial sectors through supply and procurement of products, thus figures listed in the table should not be treated as official statistics.

The latest input-output table available is the one prepared in 1987. Since that year, the MITI classified the IC industry as an independent industry and tabulated the value of ICs purchased by other industries. According to this 1987 input/output table, 48 out of 80 industries classified as the machinery industry were listed as IC users. Of 48 industries, Table 1 lists 22 which purchased more than ¥10 billion worth of ICs in 1987. It should be noted that there are various industries not in the list but which consumption was near ¥10 billion, including toy, industrial heavy electrical machinery, industrial robot, and textile machine. Table 1 also shows the total purchase of semiconductor devices, including ICs, by the same industries in the 1982 input/output table - the one before the 1987 table. Compared to the 1987 table, the 1982 table used different industrial classification and did not distinguish the IC industry. Nevertheless, I think it gives you some idea as to how IC consumption grew during the five-year period.

(4) Major findings from Table 1 are summarized as follows:

<1> While major IC users in 1982 were limited to a handful of industries led by computer and communications equipment, in 1987 a variety of industries emerged as substantial IC users.

<2> Many of large IC users in 1982 had their own IC

production operations and continued to be in a position to keep abreast of IC-related technological information which evolved year after year. These users can develop and design IC-based system products by using such technological information and are able to obtain assistance from their in-house IC production divisions, whenever needed.

<3> On the other hand, most of the new IC users do not have own IC production divisions and are able to obtain only information on ICs commercially available from time to time. Suppose these users develop system products based on that limited information on ICs - say, it takes about a few years to develop - then they may discover more advanced ICs available in the market. System makers in Japan and elsewhere are competing to develop more advanced products, and ICs hold the key to success. While ICs help produce high performance system products, there are some products which would not have been developed without ICs and have grown to a major market for ICs. A primary example is seen in Table 1. Magnetic video tape recorders, which accounted for meager 1.5% of the total semiconductor device demand in 1982, increased to more than 10% in 1987. This is because the use of ICs made it possible to commercialize video tape recorders for household use.

<4> Demand for ICs by Japanese industries have rapidly grown

in the recent years, and Japan has the sizable IC industry to serve the market. According to Dataquest's survey, among top ten IC suppliers in the world, six are Japanese companies. At the same time, however, it is important to recognize that Japanese companies using ICs are growing in numbers as well as increasingly diverse industry groups. Those companies want ICs for development of own products.

(5) Now let us move to the second point; what do Japanese IC users feel about foreign suppliers? INSEC's survey conducted in 1990 tells you some interesting facts. This survey was conducted by sending questionnaires to Japanese IC users, foreign suppliers and their distributors in Japan. We received responses from 79 users and 83 foreign suppliers and distributors, which were analyzed as follows.

(6) Figures 2-1 and 2-2 summarize percentages of companies in industrial and consumer equipment areas respectively, who reported the increase in purchase of foreign-made ICs in 1990 compared to the year before. Both in industrial and consumer areas, around 40% of respondents reported increase in purchase. when looking from user and supplier sides, a similar response pattern was observed. One exception is seen in the industrial equipment area, as shown in Fig.2-1, where the number of users who chose response "To incorporate as components" differed widely from suppliers. This is

because users in the questionnaire survey were mainly system makers, clearly reflected in a low percentage of response. A high percentage of response by suppliers indicates that foreign suppliers are carrying out marketing activities on a continuous basis to cover relatively a wide range of area.

Looking at types of ICs which sales reportedly increased, in the industrial equipment segment, the highest percentage of companies reported the increase in procurement of memories, followed by microprocessors, ASICs, application specific processors, and standard logic. In the consumer equipment area, analog ICs were reported the highest, then standard logic ICs, memories, and ASICs.

(7) Then, Fig.3 lists reasons for Japanese users to procure foreign-made ICs. Here, the number of responses to each item is proportionally indexed to the highest number of responses which is denoted as 100. First of all, a very interesting point in the table is, both users and suppliers chose "unique functions" as the most important reason for procurement. To incorporate ICs having unique functions into system products, participation of suppliers from the system design stage is required; suggesting that design-in activities are underway. Japanese users increase purchase of foreign-made ICs to replace Japanese products or to cope with the increase in consumption due to startup in volume

production of newly developed products. In the latter case, the increase has been driven by increasing adoption of design-in activities from the beginning. In the former, few foreign-made ICs can work on system products by simply replacing Japanese products; in reality, additional works and costs are required for re-designing. Thus, most of cases seem to be done without much economic justification. This may be reflected in Fig.3, where relatively a high percentage of foreign IC suppliers cited "similar functions" as one of major reasons for procurement, whereas Japanese users tended to emphasize "cooperation in international harmonization policy".

(8) To turn our attention to design centers - one of key elements of design-in activity, 97% of Japanese users wanted foreign suppliers to establish or upgrade design centers in Japan. However, only 40% of Japanese subsidiaries of foreign IC suppliers and distributors had design centers. Furthermore, many of the existing design centers serve as a liaison office to communicate requests of users to their headquarters - still a long way to meet needs of Japanese users.

(9) The next problem is the delay in product delivery by foreign suppliers and its impacts on production plans of users. As mentioned earlier, Japanese users are fiercely

competing in domestic and international markets, and any delay in product development and production plans may become fatal. In particular, the production plan is directly affected by the delayed delivery of components. According to the survey, 64% of users reported that their production was significantly affected by delay in delivery of foreign-made ICs, and 50% of them pointed out that the delay occurred more than three times during the same period. At the same time, foreign suppliers and distributors gave similar responses. In this sense, users and suppliers shared the recognition. As estimated from official statistics published by the Japanese government, nearly 20% of IC demand in Japan depends upon foreign sources. While business opportunity for foreign IC suppliers is expected to increase with further expansion of Japanese industries, the delay in product delivery, if repeatedly causing trouble, may make Japanese users distrustful of foreign suppliers. To avoid such situation, concerted efforts are required from the both sides.

(10) In addition, the results of case study on reports submitted by 10 Japanese users and 4 foreign suppliers, who are INSEC's board members, also pointed to (1) foreign suppliers have lower technical support capability than Japanese competitors, and in particular, the period required

for failure analysis is about twice that by Japanese suppliers, and (2) the frequency of repeated defects due to variance in the process or other causes is higher than Japanese suppliers. It should be noted, however, that user industries as a whole are beginning to see these problems as the matter of difference in ability and attitude between individual suppliers, rather than that between Japanese and foreign suppliers. Furthermore, in the questionnaire survey, a majority of Japanese users recognized that more and more authorities were delegated to Japanese subsidiaries of foreign IC suppliers from their headquarters, concerning technical supports, troubleshooting, and other business-related items requiring decision making at the management level, and that Japanese users could increasingly obtain a quick response. All in all, we are seeing that they are moving toward better and more productive relationship.

(11) Now, let us turn our eyes to an issue of Japanese business practice, a different view of contract in particular, raised by foreign suppliers. While most of Japanese users maintain their own standards and rules related to evaluation of reliability and quality, etc. required for qualification of suppliers, it is pointed out that they fail to specify standards and rules applicable to each procurement contract, but they bring them out only

after any trouble or dispute arises. Foreign suppliers argue that all countries but Japan settle any difference or dispute according to provisions in the agreement, resulting in a wide perception gap. The Japanese may argue that business relationship in Japan lasts for quite a long period or time once it is established, and a long history of such relationship has fostered the business practice not entirely relying on the written contract. Nevertheless, I personally believe that, as Japanese industries need and will continue to need foreign IC suppliers, they should make efforts to create international harmonization in business practice.

(12) Clearly, the use of ICs has rapidly been expanding into a wide range of Japanese industries, and which increases business opportunity for foreign suppliers in Japan. Today Japanese users are eager to obtain information on ICs. Under these circumstances, one thing that I am concerned is that there is a difference in view on sales activities of foreign IC suppliers between Japanese users and foreign suppliers. As noted in the results of the questionnaire survey, while most of foreign suppliers said that they stepped up sales activities in Japan, 58% of Japanese users saw no change. Also, there is a slight difference in opinion between them, concerning evaluation of information provided to users as part of sales activities. Fig.4

compares evaluations by users and suppliers on usefulness of information furnished by suppliers. This indicates that Japanese users see exhibitions, technical seminars, provision of product samples, technical materials, catalogues, and information on compatibility as important means of collecting information on compatibility as important means of collecting information on ICs. On the other hand, foreign suppliers give a low weight on exhibitions, technical seminars, and information on compatibility. Again, it is important to focus on sales activities by providing information which Japanese users need to select ICs.

(13) We have examined what Japanese users expect from foreign IC suppliers, on the basis of INSEC's three survey reports. these reports are part of INSEC's activities to create environment which helps improve the access for foreign-made ICs to Japanese markets. In essence, INSEC provides Japanese users with foreign-made ICs through publication and distribution of directories of foreign IC suppliers, catalogs, technical documents on promoted products, and various survey and research reports; organization and arrangement of technical seminars and exhibitions on foreign-made ICs; and planning and sponsoring of industrial tours to visit Japanese user industries.

In addition to INSEC, concerted efforts are being made by the government and industry to increase purchase of foreign-made ICs. The MITI encourages Japanese users to invite foreign IC suppliers to participate in the design-in process. Some users hold procurement meetings for foreign suppliers and the user industries send procurement missions. As a result, the access for foreign IC suppliers to the Japanese market has significantly improved. Thus, I would say it is all yours to grab the opportunity. I sincerely hope that you will make a success in Japanese markets and grow with Japanese users on a mutually beneficial basis. Thank you.

	Procurement in Value (Billions of Yen)			Contribution (%)		
	1982	1987		1982	1987	
	Total Semiconductor	Total Semiconductor	Total ICs	Total Semiconductor	Total Semiconductor	Total ICs
Office Equipment	141.0	129.0	96.0	8.4	6.1	5.7
Service Equipment	2.1	18.1	10.1	0.1	0.9	0.6
Audio Electronics Equipment		82.0	67.1		3.9	4.0
Parts for Audio Electronics Equipment	211.9	117.1	77.9	12.6	5.5	4.6
Radio & TV Receivers	165.2	52.1	31.7	9.8	2.5	1.9
Magnetic Video Record/Playback Equipment	25.9	229.0	172.3	1.5	10.8	10.2
Other Consumer Electronics Equipment		54.8	30.7		2.6	1.8
Digital Computers	294.2	273.8	253.0	17.5	12.9	15.0
Computer Peripherals		336.3	315.5		16.6	18.7
Wire Communication Eqipment		146.3	116.9		6.9	6.9
Radio Communication Equipment	419.4	46.6	27.0	24.9	2.2	2.0
Other Electronic Communication Equipment		4.2	0.2		0.2	*
Applied Electronics Equipment	239.5	144.6	135.6	14.2	6.8	8.0
Switch Controllers & Parts	1.6	33.8	29.3	0.1	1.6	1.7
Electronic Measuring Instruments	26.8	45.8	39.5	1.6	2.2	2.3
Other Parts for Electronics & Communication Equipment		90.5	34.6	-	4.3	2.0
Automobile		24.8	17.3		1.2	1.0
Truck & Bus		9.2	2.7		0.4	0.2
Internal-Combution Engine for Automobile	1.8	18.2	18.2	0.1	0.9	1.1
Automobile Parts		36.0	28.1		1.7	1.7
Cameras	1.0	28.5	24.4	0.1	1.3	1.4
Watches & Clocks	11.0	42.0	33.4	0.7	2.0	2.0
Analizers & Experiment Equipment	0.2	36.6	29.4	*	1.7	1.7
Musical Instrument	1.0	13.6	13.0	0.1	0.6	0.8
Total of All Segments	1,683.6	2,120.1	1,690.2	100.0	100.0	100.0

Source Input-Output Table of Inter-Industial Relations : MITI

Figuer 2-1 Procurement/Sales of Non-Japanese ICs by Products - Industrial Equipment

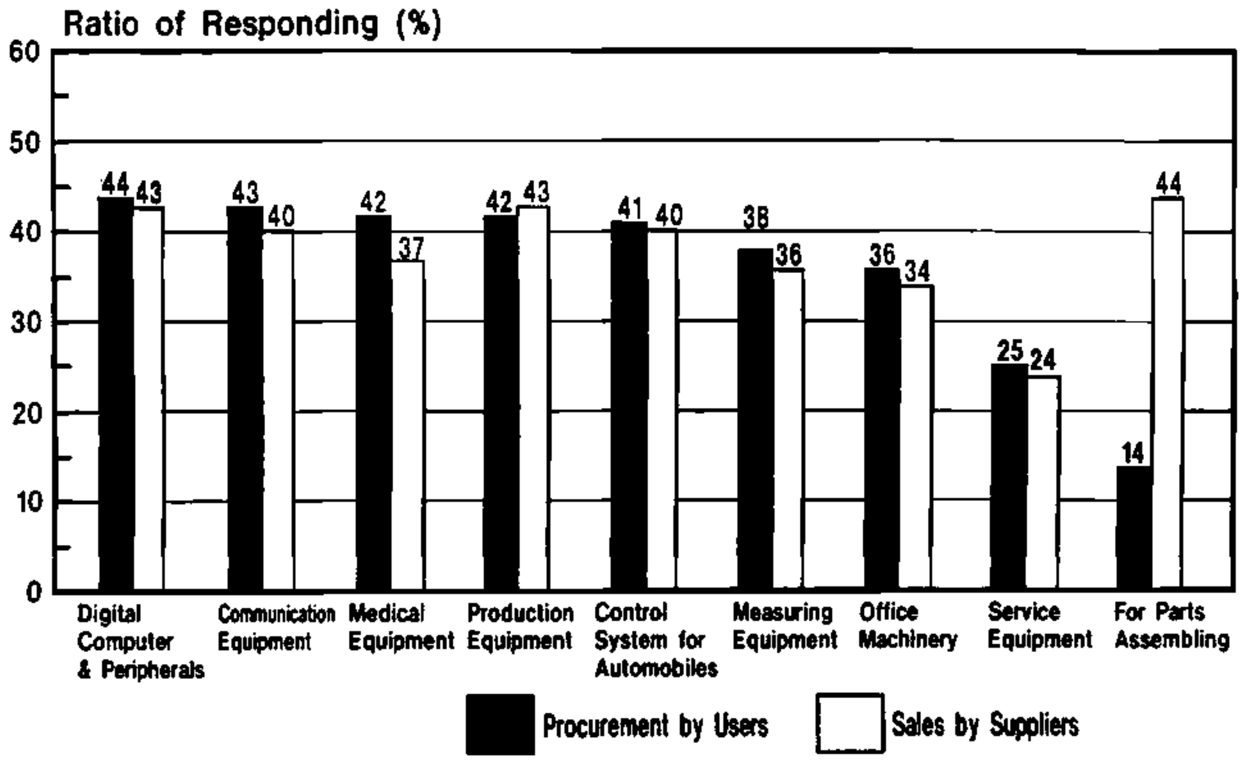


Figure 1 Historical Change of Japanese IC Demands in 80's

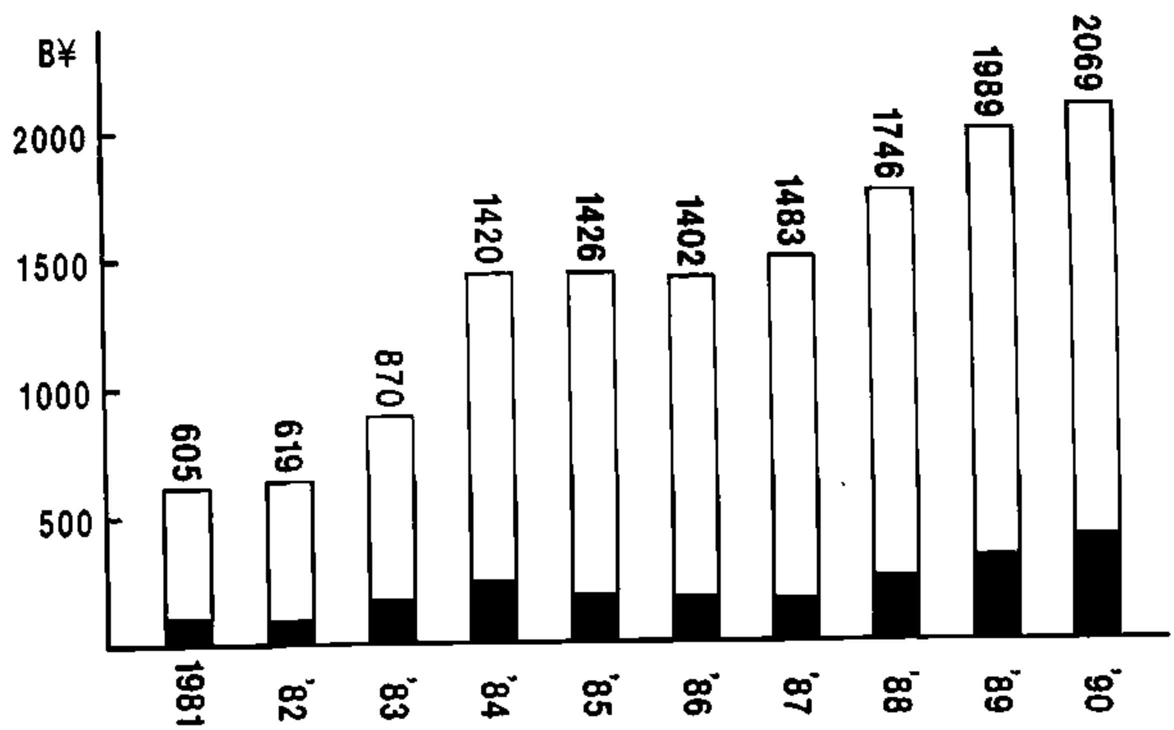


Figure 2-2 Procurement/Sales of Non-Japanese ICs by Application Consumer Equipment

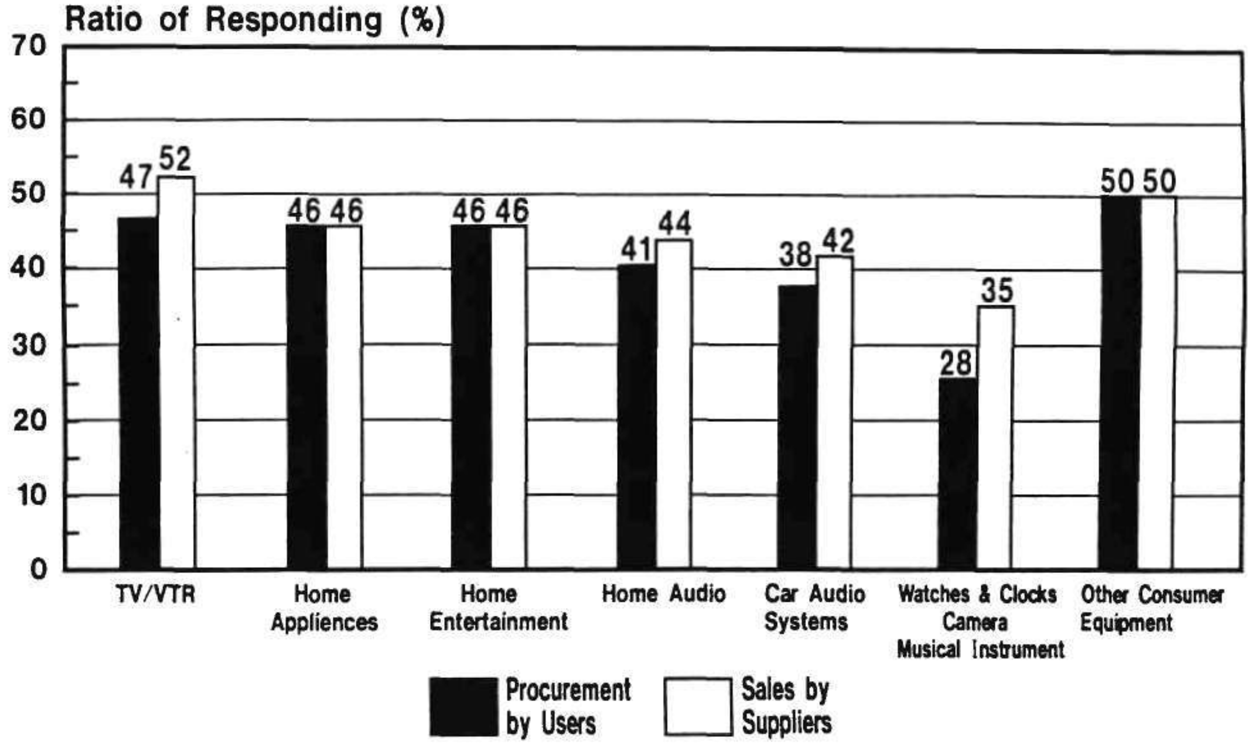
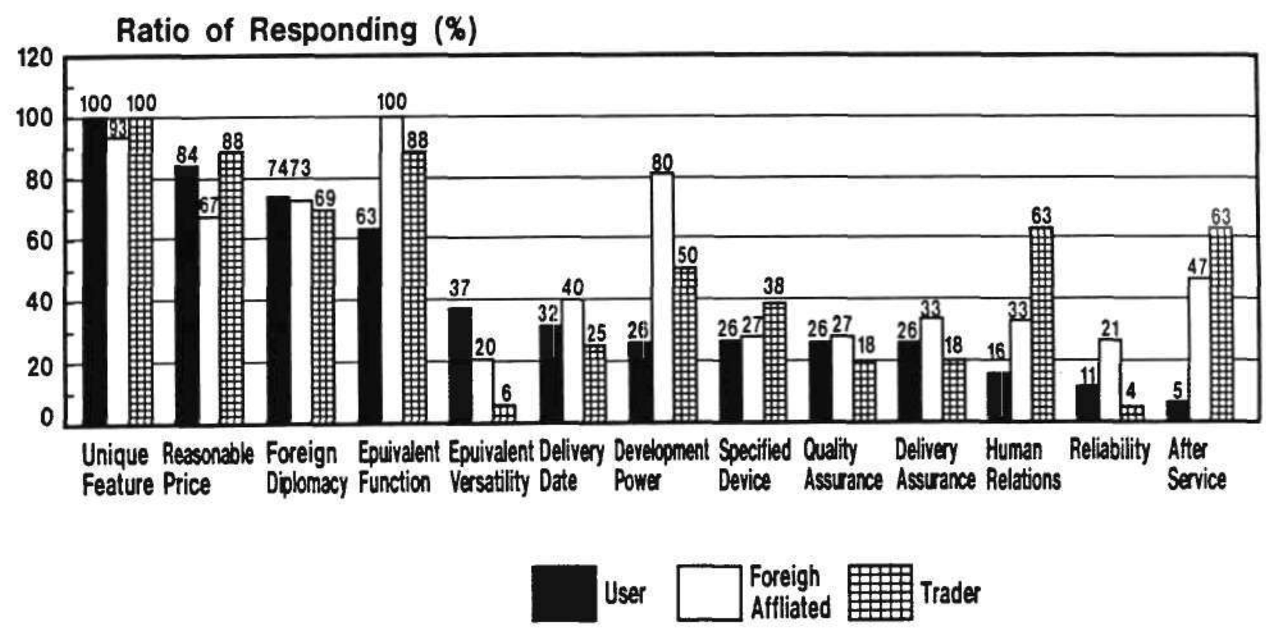


Figure 3 Reason of Adoption for Imported Semiconductor by Japanese User



Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

NEW PRODUCTS FOR HOME AND OFFICE

Peter Draheim
Director
Product Division Semiconductors
Philips International B.V.

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

NEW PRODUCTS FOR HOME AND OFFICE

Peter Draheim
Director
Product Division Semiconductors
Philips International B.V.

Dr. Draheim is General Manager of Philips' Product Group Industrial ICs and Director of the Semiconductor Product Division. The scope of the Industrial ICs product group is microcontrollers, ASICs, application-specific catalogue ICs for industrial applications such as telecom, EDP and automotive, and standard logic ICs. Before this he was Marketing and Sales Director of Philips ICs in Germany. He started his career at Philips in 1974 as development engineer at Valvo Röhren und Halbleiter Werke Hamburg for integrated circuits. Prior to joining Philips he worked at the Technical University of Braunschweig. He received a Dr.-Ing. degree at the Technical University of Braunschweig on semiconductor effects, his earlier studies being orientated on semiconductor physics.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

NEW PRODUCTS FOR HOME AND OFFICE

- Evolution of the electronic markets
- New multimedia applications
- Multimedia market trends

P. Draheim
Philips Semiconductors
Product Group Industrial ICs
Dataquest - 1991

Evolution of the electronic markets

Two trends are driving the evolution:

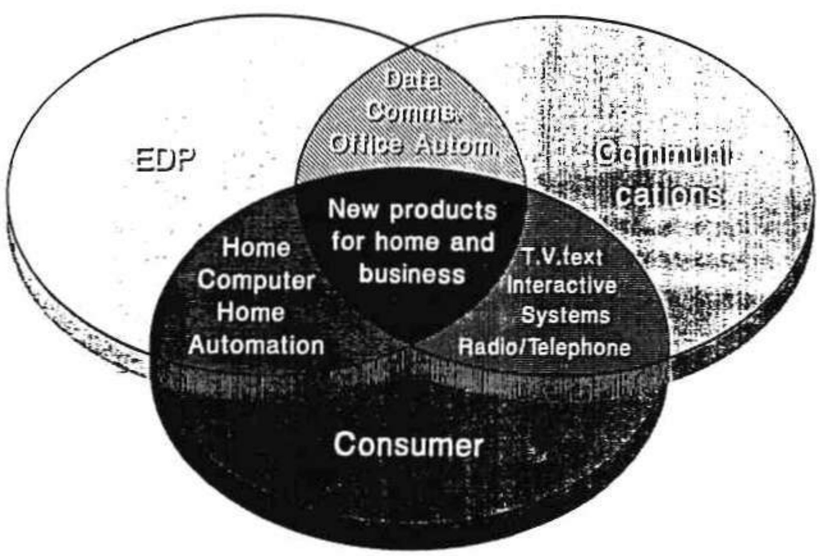
- Merge of applications
- Portability

What forced the merge of applications?

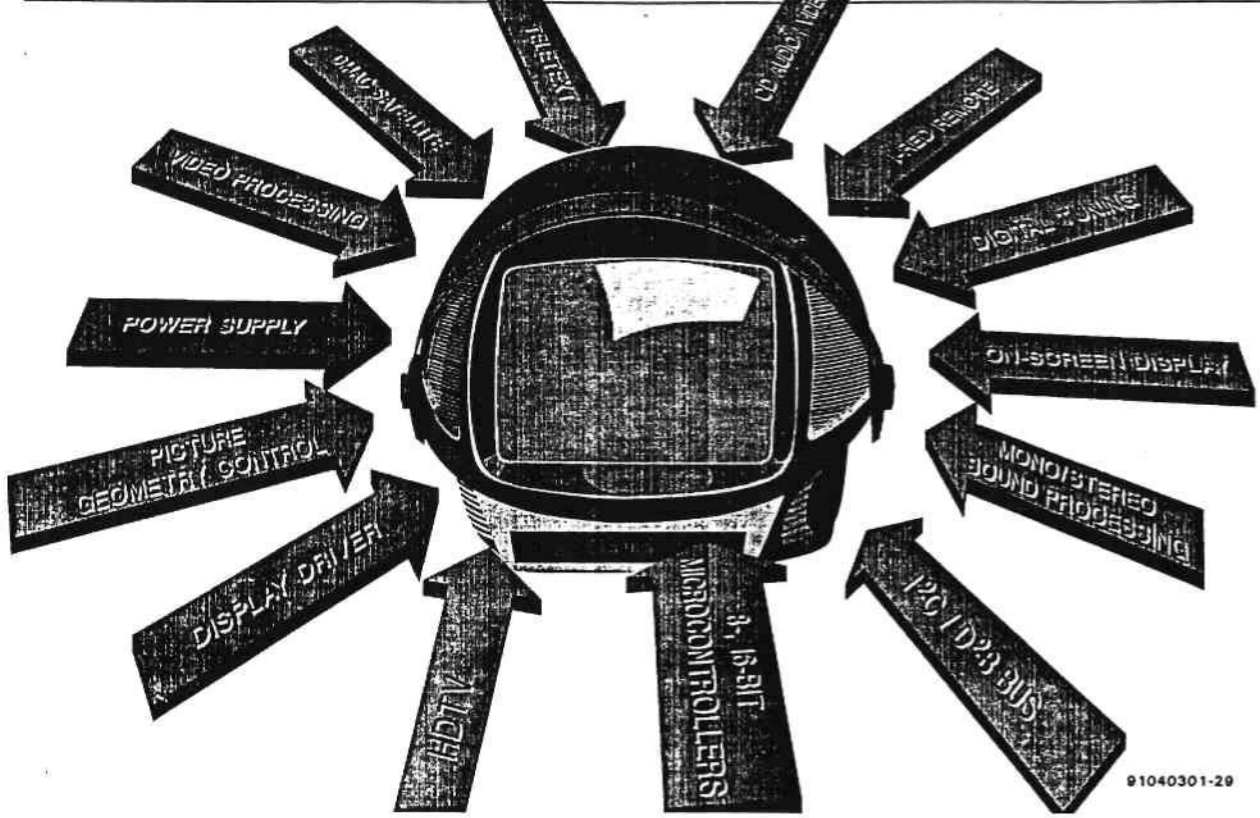
- Digital Audiosignal Processing
- Digital Videosignal Processing
- Digital Data Processing
- Digital Information and Data Exchange

➡ High speed real time processing on Silicon

Market Evolution of the 90's

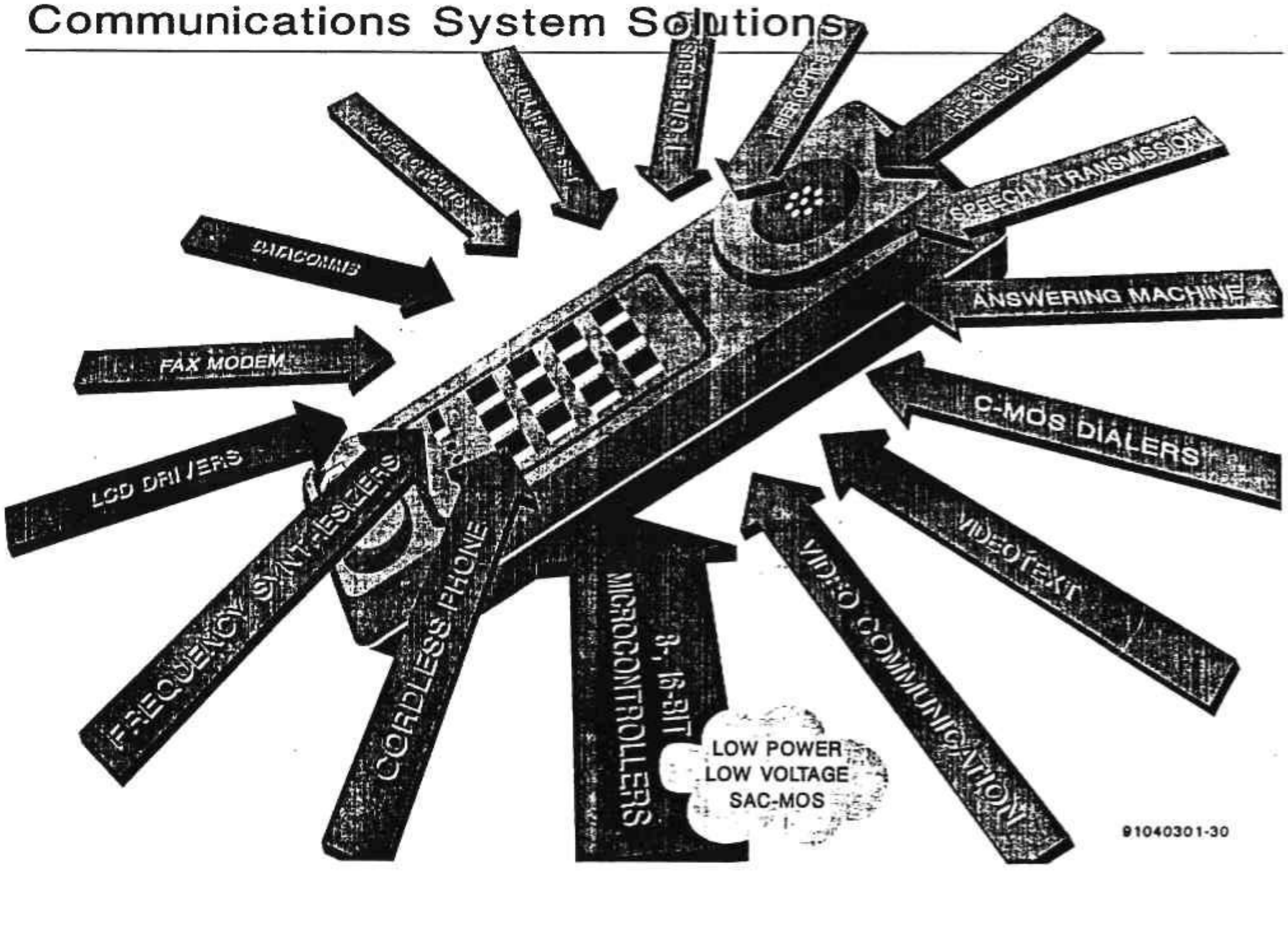


Consumer System Solutions



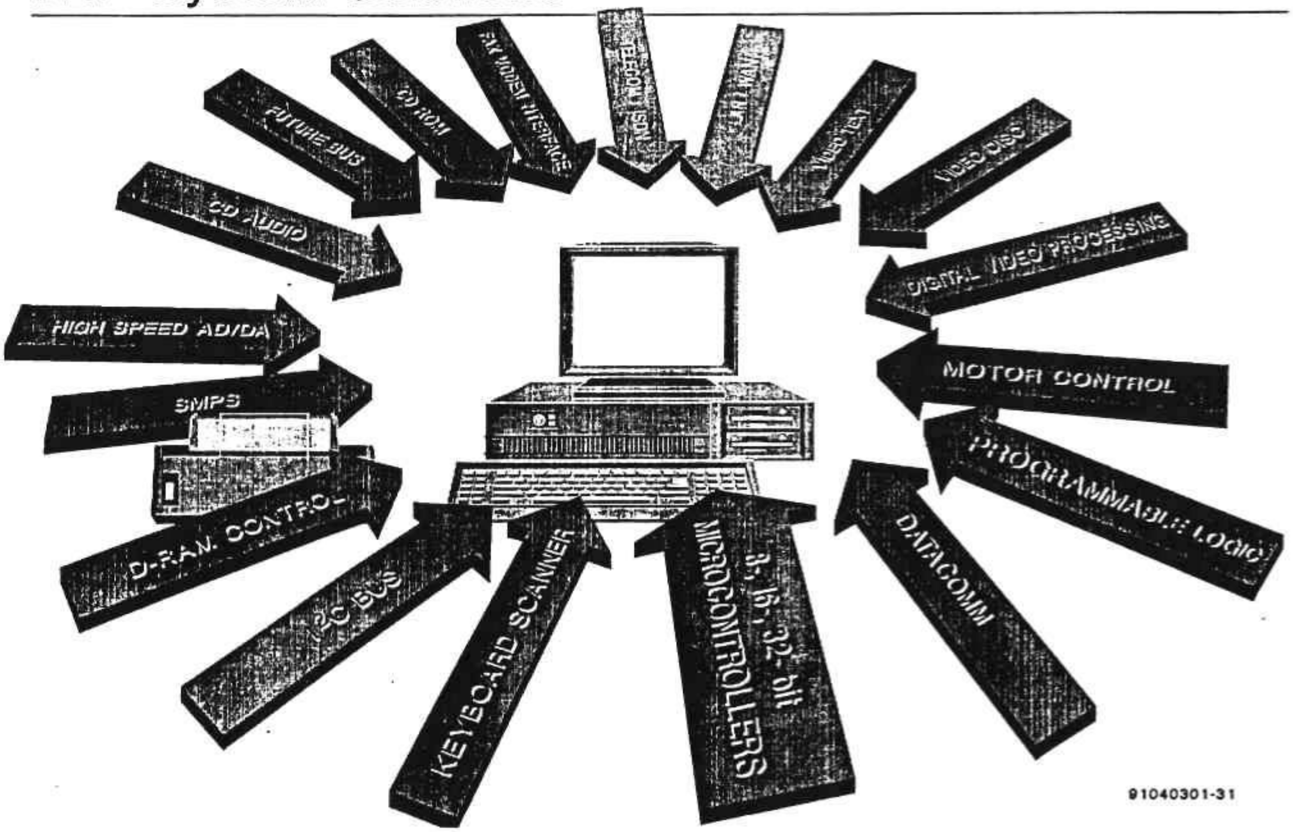
91040301-29

Communications System Solutions



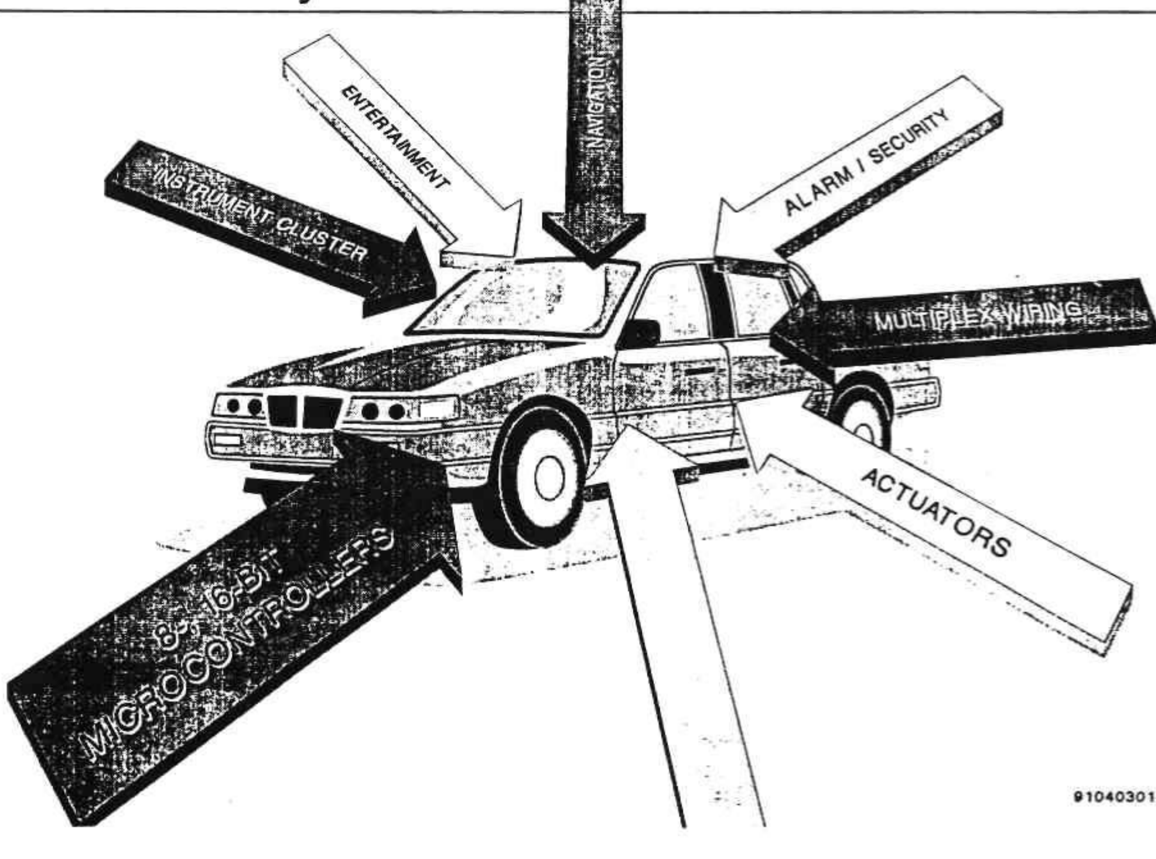
91040301-30

EDP System Solutions



91040301-31

Automotive System Solutions



91040301-32

Examples on merging applications

Consumer → DESK TOP VIDEO ← Data Processing

Telecommunication → TELETEXT ← Consumer

CORDLESS
TELEPHONY

PORTABILITY

Long up time is the key issue for personal products. This means :

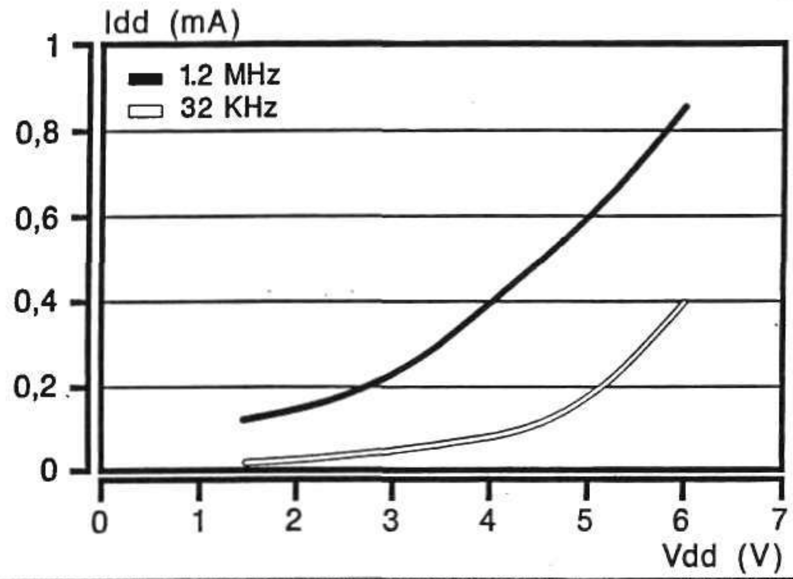
LOW VOLTAGE	LOW POWER
↓	↓
FEW BATTERIES	SMALL BATTERIES

= = > Operating Voltages for ICs <u>below</u> 2V becomes essential

Typical product :
P83CL410 Microcontroller

Operating current P83CL410

(typical values, low frequencies)

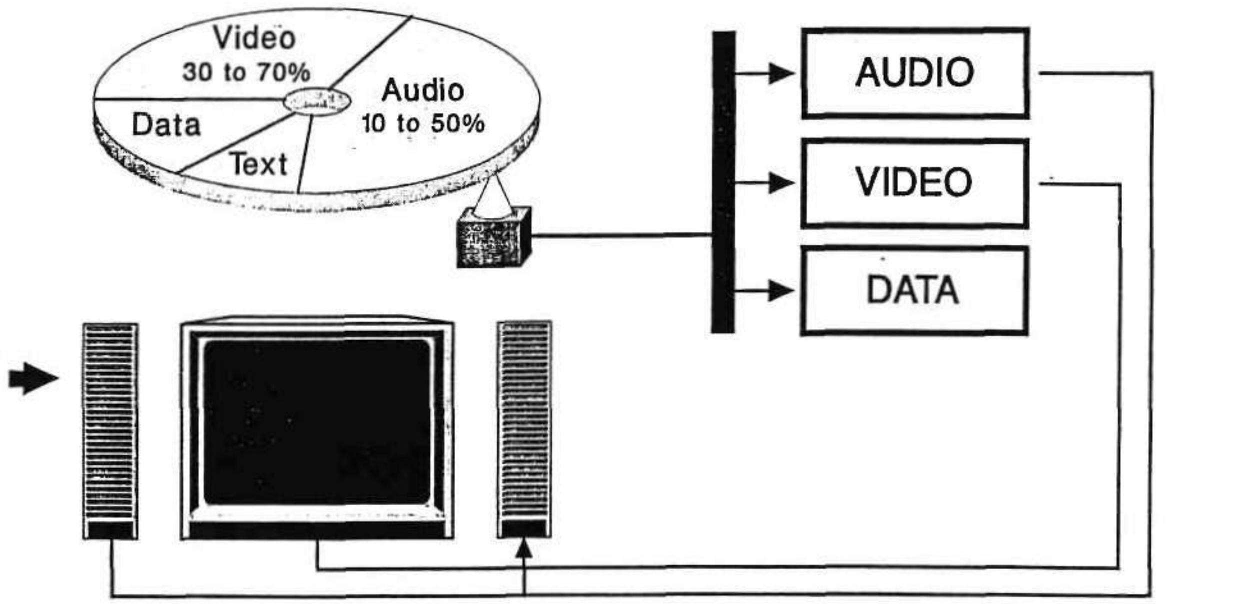


New multimedia applications

- CD - Interactive
- Desk Top Video

Video Audio Speech Telephony

Compact Disc - Interactive



Components for CD-I

- Data Processor → Highly integrated processor
- Video Processor → Intelligent image controllers
- Disc/Audio Processor → DSP
  Sound processor Filters, DACs
- Peripherals → Mouse controller
  Keyboard controller
  Non-Volatile memory

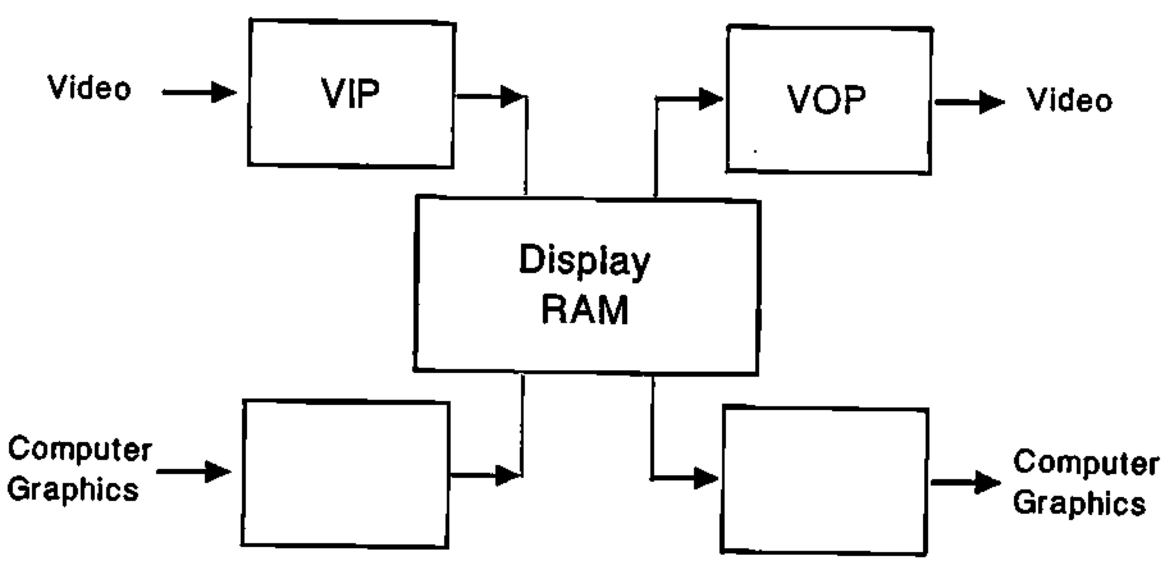
Desk Top Video - What is it?

- Today
  - Education
  - Training
  - Point-of-sale
  - Information kiosks
  - CAD
  - Industrial presentations
  - On-line TV
- Tomorrow

  Computer interface will evolve

  Text (e.g. MS-DOS) ➡ Graphical (e.g. Mac) ➡ Multimedia Environment

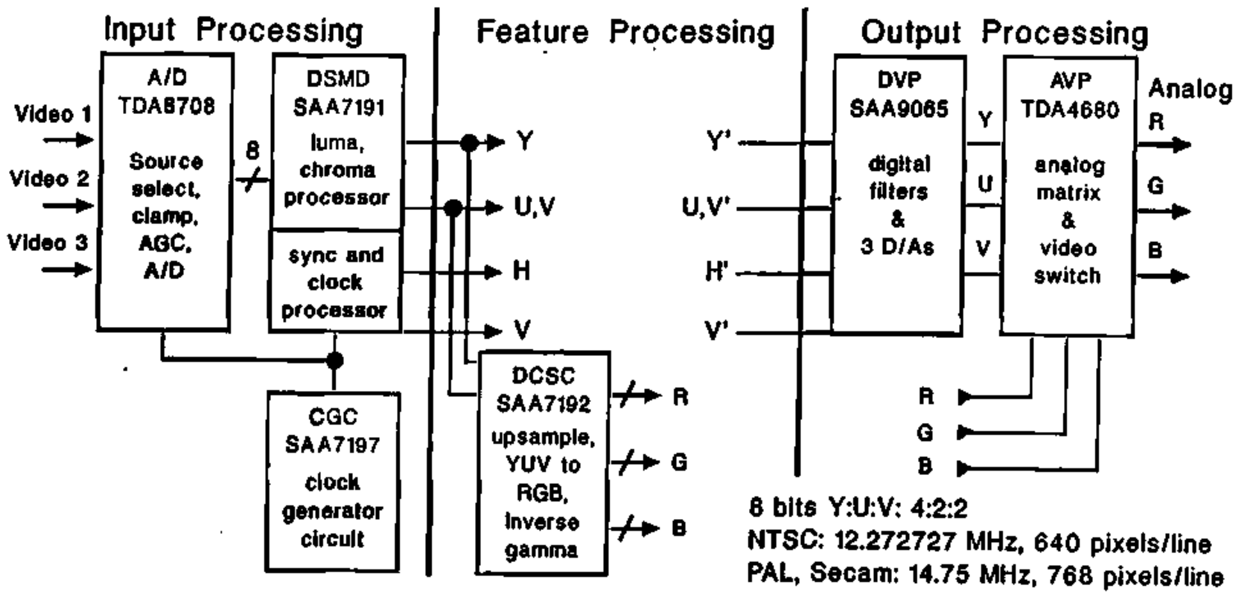
Desk Top Video



- Line-Locked Clock
- Feature Oriented Architecture
- Support for Standards
  NTSC, PAL, SECAM, S-VHS, CCIR601, and beyond
- Digital

Desk Top Video

Square Pixels



8 bits Y:U:V: 4:2:2
NTSC: 12.272727 MHz, 640 pixels/line
PAL, Secam: 14.75 MHz, 768 pixels/line

MULTIMEDIA MARKET TRENDS

How is the "Multimedia" hardware used nowadays :

32%	Industrial Presentations
28%	Desk Top Publishing
19%	Education, Training
11%	CAD
7%	Medical Imaging
3%	Remote Inspection, Quality Control

SUMMARY

- Digital signal processing and high speed realtime processing on silicon created new applications as

  Multimedia

- The attractiveness of the multimedia offer creates a fast growing market

- The key markets are : United States
  Japan and
  Asia Pacific

Profit Through the Silicon Cycle: The Next Ten Years

CONSISTENCY, PREDICTABILITY AND COMMITMENT—THE KEYS TO PROFITABILITY

John F. Gifford
President and Chief Executive Officer
Maxim Integrated Products, Inc.

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

**CONSISTENCY, PREDICTABILITY AND COMMITMENT—
THE KEYS TO PROFITABILITY**

John F. (Jack) Gifford
President and Chief Executive Officer
Maxim Integrated Products, Inc.

Mr. Gifford is Chairman and CEO of Maxim Integrated Products, Inc. A founder of Maxim, he has served as Chairman the past year after serving as the company's President since its incorporation in April 1983. He served as Maxim's Chief Financial Officer between April and October 1983 and between March 1986 and October 1987. Mr. Gifford started his career in the semiconductor industry in 1964 with Fairchild Semiconductor where he later became the company's first Director of Analog Products. In 1968, Mr. Gifford co-founded Advanced Micro Devices and remained VP Marketing and Planning until 1974 when he left to become Senior VP, then President/CEO of Intersil, Inc. He is considered to be one of the "founding fathers" of the analog industry. Mr. Gifford's agricultural upbringing and avid interest in technology lead him into a variety of other business activities. He is founder and President of J. Leal Farms, founder and President of Enslie Industries, and founder and Director of Nortron, Inc. and Small Business Technology (SBT). Mr. Gifford was nominated for National Entrepreneur of the Year by Arthur Young in 1988. Mr. Gifford received a bachelor's degree in Electrical Engineering in 1963 from the University of California Los Angeles (UCLA). He attended UCLA on a baseball scholarship. In 1990 he was elected to the ULCA Baseball Hall of Fame—an honor which he considers a highlight of his career.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Reprinted from:

THE WALL STREET TRANSCRIPT

"The Information Center for Business and Finance"

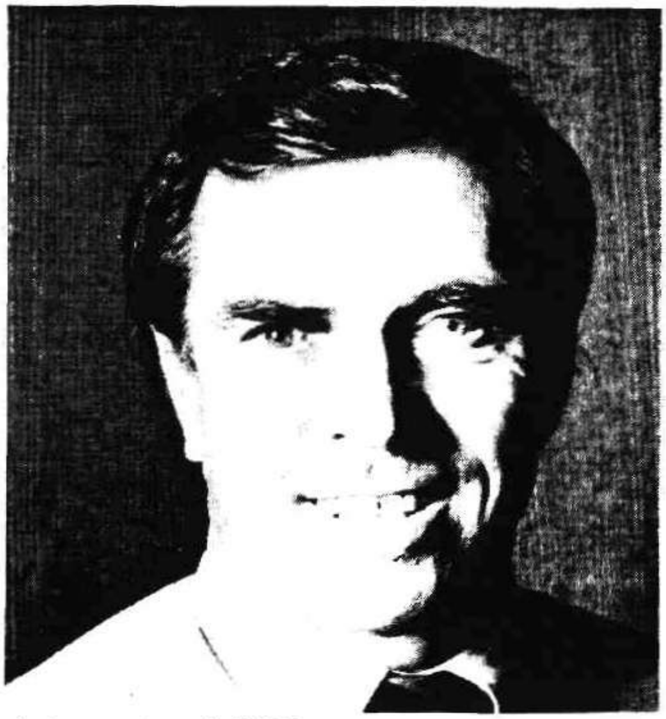
Volume CXI Number 13
Published Monday

99 Wall Street, New York, N.Y. 10005—(212) 747-9500; Voice (212) 952-7400; Fax (212) 668-9842
Second Class Postage Paid at New York, N.Y. (ISSN0043-0102)

FOR REPRINTS OR PHOTOCOPYING TWST
Reprints/Permission Department
THE WALL STREET TRANSCRIPT

April 1, 1991
Page 100,525-100,596
Single Issue $175.00

MAXIM INTEGRATED PRODUCTS, INC. (MXIM)



JOHN F. "JACK" GIFFORD is Chairman, President, and Chief Executive Officer of Maxim Integrated Products, Inc. A founder of Maxim, Gifford has served as Chairman the past year after serving as the company's President since its incorporation in April, 1983. He served as Maxim's Chief Financial Officer between April and October 1983 and between March 1986 and October 1987. Gifford received a Bachelors degree in Electrical Engineering in 1963 from the University of California Los Angeles (U.C.L.A.). He attended U.C.L.A. on a baseball scholarship. He started his career in the semiconductor industry in 1964 with Fairchild Semiconductor where he later became the company's first Director of Analog Products. In 1968, Gifford co-founded Advanced Micro Devices and remained V.P. Marketing & Planning until 1974 when he left to become Senior V.P., then President/CEO of Intersil, Inc. Gifford is considered to be one of the "founding fathers" of the analog industry. Gifford's agricultural upbringing and avid interest in technology lead him into a variety of other business activities. He is founder and President of J. Leal Farms, founder and President of Enslie Industries and is founder and Director of Nortron, Inc. and Small Business Technology (SBT). Gifford was nominated for National Entreprenuer of the Year by Arthur Young in 1988. In 1990, he was elected to the U.C.L.A. Baseball Hall of Fame. Other inductees include Jackie Robinson, Dr. Bobby Brown, Kerry Washington, Tim Leary and Jack "Moose" Myers. He considers this honor a highlight of his career. Gifford is active in numerous scholastic and charitable activities and is a frequent alumni participant in U.C.L.A. baseball. Married 31 years, Gifford and his wife, Rhodine, have three daughters.

(RA622/00)(4079) John F. "Jack" Gifford is Chairman, President and CEO of Maxim Integrated Products, Inc. Based in Sunnyvale, California, the company manufactures a broad range of linear and mixed-signal integrated circuits known as analog circuits. Linear devices process signals representing real world phenomena such as temperature, pressure, sound or speed. Mixed-signal devices combine linear and digital functions.

From his perspective, Gifford discussed the overall environment in which he finds Maxim Integrated Products operating over the short and long term. "Over the short term, I don't believe our specific industry, the analog products industry, will change. In fact, I've mentioned several times over the last 1½ years that the analog industry, along with the integrated circuit industry, is growing five percent to ten percent per year. In general, industry has been relatively stable and with limited growth over the last two years. We don't see anything in the short term changing. I'm speaking about the industry, not Maxim specifically.

"The combination of the previous recognition of technical innovation, coupled with this recent award recognizing Maxim as a predictable and a good supplier from our customers' view is a very important statement regarding our future prospects for growth." --Gifford, Maxim Integrated Products, Inc.

"Over the long term, I believe that the integrated circuit industry will continue to grow at a rate of five to ten percent per year. I don't believe there are basic macroeconomic changes that are going to cause it to behave differently from the last two years. I don't believe we're going to explode out of presently slow business conditions unless interest rates can remain low for an extended period. I also don't believe a recession began 6 months ago. I think business conditions in the integrated circuit markets have been slow but stable for two years. It will be difficult to change this trend because the government cannot afford to buy our way out of this climate.

"I think it's important the government keep interest rates relatively high in the intermediate to the long term so that they're able to attract international debt financing. If that becomes the case, the government will have less funds available for buying our way, explosively, out of the current economic environment.

"A positive situation relative to Maxim and other companies in our business is that customer and supplier inventories are at all-time lows. Customer to sales inventory ratios are lower than they've ever been. They have stabilized at very low levels. Maxim, particularly, has lower than normal worldwide inventories. Any minor upticks in consumption will, I believe, cause inventory expansion. That obviously can cause growth.

"Secondly, our market is changing. Although we participate in a $8-$10 billion market that's growing relatively slowly, there are great undercurrents occurring within that $8-$10 billion. Specifically, that market primarily consists of old products using bipolar technology. Later in the interview I'm sure we'll get into the definition of CMOS technology, the driving force behind this market transition.

"Maxim is and has been one of the leaders in converting users from the older bipolar component technology to the more powerful CMOS mixed signal analog technology. This conversion is occurring at a rapid rate; far in excess of the 5-10 percent annual growth of the IC market described above. Most sources estimate that analog market growth due to conversion from bipolar to CMOS technology based products is in the neighborhood of 60-65 percent growth a year! As a percentage of an $8-$10 billion market, this presents a tremendous opportunity for Maxim.

"Analog products have historically been used in large volumes and are very valuable to military equipment, particularly missile systems, radars, land mines, smart bombs—these sorts of things. This and the next generation of weapon systems are basically analog electronics, as opposed to digital electronics. Given that there will be a resurgence of weapon production, I would expect the analog market to be a beneficiary of that. Probably more so than the digital market."

As far as some of the possible changes that will be taking place in this industry are concerned, Gifford stated, "I think the biggest change that is occurring, has been occurring and will continue for several years. It is the importance of CMOS mixed signal technology and analog products to the proliferation of the microprocessor. To be more specific and a little more clear, microprocessors, microcomputers, microchips, whichever you choose to call them, are being used literally in everything from washing machines to automobiles, to the most advanced computer work stations and missile guidance systems.

"What most people don't realize is that there are more microprocessors and microcomputers used in nondata processing applications than in data processing applications. They are used in what are called environmental control applications and they're called controllers. In these applications they require analog products, (A-D, D-A converters, amplifiers, products such as these) in order to acquire the basic data they process.

"We went public in February, 1988 at about \$5-5½ a share; the stock is selling in the \$14-\$16 area. So most have been rewarded by holding the stock long term. We believe that our ability to produce similar predictable growth over the next five years will improve."

--Gifford, Maxim Integrated Products, Inc.

"With the proliferation of the microprocessor, of course, there is more and more need for a larger variety of, and volumes of the product types we invent, as well as more demand put upon their performance, accuracy, speed and complexity. The mixed signal CMOS technology is ideal for leading this evolution and this has definitely been the growth factor of our business. It will continue to be an even more important growth factor in the coming ten years."

Asked about his appraisal of possible government action that might impact the industry, Gifford replied, "I think you are referring to some sort of Japanese trade agreement. If that is the direction of the question, the analog industry has operated effectively in a free market, etc. By that I mean that companies like ourselves, Analog Devices, do over 50 percent of our business outside of the U.S. We've been very effective in Japan. This is a product development intensive business. The Americans that are specialized in the analog business have been quite good at it and continue to be quite good at it.

"Also, the Japanese have been very aggressive and exploitative users of our products, meaning that they quickly recognize good ideas and then exploit them. They in turn develop equipment of higher performance allowing them to create new markets or gain market share.

"To make a long answer a little bit shorter, we are not enthusiastic or really in support of government intervention, government sanctions, or any involvement of the government in our business. It's a very effective, successful, free market situation. We believe very much in that."

Gifford described the areas he believes will provide the greatest growth for Maxim over the next three to five years. "I have to say that most of it is in traditional markets. We are not a business that has depended on radical market changes occurring nor do we in the future expect such changes. I have mentioned the one trend that is overwhelming--the proliferation of the microprocessor which is dragging along with it a tremendous value and importance to the kinds of products we make; specifically the mixed signal, high performance analog products. It's a trend that's unstoppable. We believe that we are very much in the middle of this current.

"What Maxim has done so well in the past, and we believe will continue to do, is to develop and invent new products. We have invented and developed more new analog products in the last 7½ years than any other company in the world in analog products. Almost 75 percent of our revenues come today from products we've invented.

"There are almost infinite ideas for products and we are enthusiastic about being able to continue to develop ideas on silicon that will have value to our customers in terms of improving the performance of their equipment and/or reducing their equipment costs. The trend to incorporate microprocessors in instruments and equipment and the need for our products to feed analog information to the microprocessor we feel is very, very powerful.

"A real benchmark and a milestone for Maxim is that in the last 1½ years we have been recognized as a major corporation. During the early years we were considered a small, innovative, high value added company, mostly product driven. In the last couple of years, we certainly have won our share of awards and high rankings regarding recognition as a technical innovator. In a recent study by Engineering Times Magazine, one of the most popular and best read in our industry, Maxim was ranked as the most innovative company in the analog business, in 1990, in the world. Over 100,000 design engineers were surveyed to answer that question. We've consistently been highly ranked regarding technical innovation.

"Two weeks ago we received another recognition which I think says it all as far as our potential for becoming a great company. Dataquest Corporation, a market research corporation, surveyed 250 purchasing directors throughout the world, employed by major corporations. These purchasing agents were asked to complete a questionnaire having to do with choosing the best company in three categories of size. We were in the smaller size category. The largest size category were companies over \$500 million. They asked purchasing people who did they consider to be the best in the world regarding price, delivery, customer service, technical support and value to the purchasing management. Maxim ranked first among all in its size group. This had nothing or little to do with technology. This had to do with being a good supplier and a good company.

"We are extremely proud of that and we think that the combination of the previous recognition of technical innovation, coupled with this recent award recognizing Maxim as a predictable and a good supplier from our customers' view is a very important statement regarding our future prospects for growth."

Filling us in on the reasons for Maxim's recognition for technical innovation and commitment to quality, Gifford continued, "What we've been doing to deserve it is not completely clear to me. We continuously criticize ourselves and are constantly frustrated by our inability to perform as well as we think we should. Customers do complain, and we do screw things up, on occasion. I think it might just be that we take that very seriously and very emotionally and it is very much a credo in our company to do the best we can. We really are frustrated by our mistakes. It might be that attitude alone that has caused us, on a relative basis, to be compared best of all among companies our size in the integrated circuit business. It's this intolerance to customer insensitivity that is the primary concept existing at Maxim that helps put us in this position.

"I want to be sure and tell you that we do not believe we are perfect by any stretch of our imagination. One of the measures that we take, and we measure this every week, is our performance to on-time delivery. In other words, how well do we deliver to our customers' original scheduling date. We're operating at about 91 percent on-time delivery. We've consistently been able to improve that and we're going to improve further.

"Another factor that I think could have affected this ranking, is product quality. I think purchasing people very much appreciate the improvements Maxim has contributed to analog quality. Prior to Maxim, very little was done to offer a higher quality product in the analog market. Maxim entered the business offering a military quality product to the commercial and industrial user at no additional cost. We interviewed major Japanese companies to understand how they thought about quality. We installed a system of quality that involves 100 percent product conditioning and strict adherence to conservative design rules which resulted in being able to guarantee and state a failure in time, called FIT, of less than five failures for a billion operating hours. This is significantly improved above competitive failure levels.

"We have been consistently improving quality over the last six years. Each manufacturing lot is qualified before it is shipped. Specific qualification data can be traced back on each device to the manufacturing lot from which it came. This data is available to all customers, free of charge (not only military customers). We take this quite seriously.

"Without any more detail, these concepts—commitment to quality; of personal frustration, and intolerance to mistakes--might be the reasons for recognition of Maxim by purchasing management."

Regarding any special niches Maxim is involved in, Gifford explained, "We are relatively a broad line company for our present size. We have over 4,000 line items and almost 500 basic products. We are specialists in ten market segments. You can call each of these segments a niche. They are product-tied segments. They are niches such as A/D converters, D/A converters, power supply circuits, filters, analog multiplexers, amplifiers, comparators, etc., interface circuits video products, and references. Some of these niches exceed $1 billion in size! Our business in the consumer markets is limited. These are markets that are to a large extent supplied by Japanese suppliers, Motorola, TI and National.

"In the military market we have less than five percent of our business today. There are good reasons to believe that we will grow significantly in the military market in the coming three years."

Turning to Maxim's market share for the next several years, Gifford indicated, "The major area, where the increases will come and I've already eluded to, is the result of the massive conversion from the older bipolar analog products to the mixed signal CMOS products. We were a market pioneer and today, one of the leaders in that business. If one uses a little imagination, you can envision significant growth potential for us. A significant percentage of this $8-$12 billion market will convert to CMOS technology over the next five years and Maxim should be somewhere in there.

"This conversion in technology I've described should make for an optimistic future and consistent and predictable growth potential. To counterpoint however, there will be limited growth if we are not able to continue to offer very creative and valuable solutions to customer problems within the described market niches."

Discussing Maxim's strategy when it comes to acquisitions or joint ventures, Gifford informed us, "I've been asked this question a number of times and the answer is not terribly satisfying. I've come to this conclusion—a quality company has very limited acquisition opportunities. Let me expand on that a little bit. A company such as Maxim with operating profits in excess of 21 percent, 23 percent return on equity, 50 percent plus gross margins and increasing earnings per share growth, can damage and dilute its quality if the acquisition is not of a similar quality. Some managers are of the school that you can take an existing management team and put them in a not-so-good company and they will improve the quality of that company so that it will reach your par. I don't subscribe to that.

"Maxim is one of the more predictable companies with minimum downside and better than average percentage growth prospects. We're a cash generator. We do not require more debt or equity. We're in a large market, and we are already an important player."
--Gifford, Maxim Integrated Products, Inc.

"I believe that Maxim is an excellent company because we are very expert at what we do. In fact, I believe we are one of the best in the world at what we do. What that also says is that we are probably not very good, or at most no better than average, at managing a different business. We don't believe we can make much of a contribution to a business where we are not expert. That means it is risky to Maxim shareholders for us to acquire a business that is different or of a lesser quality.

"Therefore, to minimize risk we must acquire companies that are at least of equal quality to Maxim. We would love to do that. The problem is those companies are very expensive. That's why Maxim is expensive. Our acquisition opportunities become limited. I think acquisition opportunities may exist primarily in the small, very specialized product line type companies that do not have the potential for size to become a public company but are of high quality within that small domain. I don't think that there will be major .hanges in Maxim's sales growth due to major acquisitions. .cquisition is both a risk and an opportunity we take seriously in terms of dilution of the quality of Maxim.

"As you might know, or your readers might know, we are a pioneer in using partners to manufacture our silicon wafers and only recently in the last 1½ years did we begin manufacturing approximately 50 percent of our own material. So we have manufacturing partnerships. We have two wafer foundry partnerships. The purpose of these is to spread our manufacturing risk. We have manufacturing partnerships both in wafer fabrication and also final assembly.

"Regarding joint ventures as far as product development, Maxim has participated in a few programs over the last four years but probably fewer than most companies. These have been product driven where we have partnered with a customer on a good product idea. We will then dedicate ourselves and work with him. He will assist in definition and we will direct the development.

"This type of joint venture or partnership we encourage and look forward to. We to date have not found either the opportunity or need to joint venture with other people that are in, or are tangential to, our business. We may in the future but I can't project why or when that would be."

In regard to the possibility of restructuring Maxim, Gifford advised, "We think the company is relatively streamlined. We produce in the neighborhood of $170,000 sales per employee if we exclude temporary employees. We are efficiently organized. We've been spartan with regard to administrative overhead."

In terms of where he expects Maxim to be five years down the road, Gifford told us, "We are constantly revising and updating our product plan, which is a three to five year plan. It's very detailed. We've been doing this for years now—7-8 years. We're good at it. We have a good picture of our future. We feel sure that this company, certainly within a reasonable timeframe, will exceed $200 million in sales. We believe we must continue to execute as we've been executing. There's a lot of hard work between here and there. We do not doubt that we will achieve this plan.

"Some of your readers familiar with Maxim realize that today's business (this year and next year) has almost entirely been determined by the products that were defined, developed and merchandised beginning three years ago. What we're working on today will begin to affect our revenues three to five years from now. Our revenues for the next couple of years are pretty much determined already by what we began three years ago.

"I think the most important change isn't new news to anybody. After our customers, people are clearly our most important asset. You can look at our balance sheet and determine shareholder equity and other assets. In my opinion, for technology companies, balance sheets are somewhat obsolete. It's our human resource that is our primary balance sheet asset. What we must continue to do is to train and grow people as we've done to date.

"We have lost seven professionals, less than 4 percent in the last eight years. It is a very important concept -- people are our company. I feel we have a responsibility to provide the security for these people and their families. We believe it's human nature that our people will reciprocate. We have a partnership with our people. Our employees actually have purchased or have options to purchase through stock options and other ways, more than 47 percent of the Maxim stock. Of this 47% more than 23% remains unvested for four years.

"Employees are important Maxim shareholders and we think that has, and will continue to be, very important to our growth and success. We believe that because of this, we will have fewer difficulties than others in terms of continuing to act and operate as a very efficient, very sensitive small company, even though we'll become much bigger. We appreciate our existence! The concept of attempting to survive is one we don't want to lose, even though we have achieved success. We believe that the minute we let up, something's going to get us!"

As to what may change in the area of human resources for Maxim, Gifford said, "Not much. We don't really look at the personnel department as having the primary responsibility for the well being of our employees. They are the administrator, but people who succeed in our management, at the lowest levels of management, must be excellent at taking care of their people. It is their responsibility to have the relationship with that individual and his family, understanding their needs, and being objective about that individual's performance, his weaknesses and aspirations. We have 75 personnel managers! They're held responsible for hiring; for terminating; and most importantly, taking care of their people."

Questioned about any new products or services that Maxim will be offering over the next few years, Gifford reported, "It will be more of the same. Maxim has introduced between 15-20 new products every quarter. We're going to continue to do that. New products are becoming more complex and more value added. It's almost a form of religion at Maxim. We know that this strategy is fundamental to past and future success. There will be no change.

"As we become more important to our customer and have more capability, which are both truisms regarding Maxim, our old customers and new customers begin to involve us in their development activity. Maxim has become a preferred and important supplier. Customers now involve us earlier on in their equipment designs and in more of their equipment. We will have more in-depth partnerships with our customers as a result. They involve us more and we'll have more responsibilities toward them than we've had in the past.

"Also, through the technology and through improvement in our ability, we're able to develop and provide more complex products today that have more customer value. We're better at offering solutions, better solutions, more accurate solutions, more complex solutions than in the past. In summary, we're becoming more important to our customer. He's involving us. Also, we're becoming better at what we do, both through having more resources and just more experience."

With reference to Maxim's future customer base, Gifford mentioned, "I hope it continues to change as it has. We would expect to have more military customers in the next three to four years than we have today. I do not expect us to enter the consumer market. I do expect a minor role for Maxim in the automotive market.

"I think our customer base in Europe and Asia will continue to grow as well as in the U.S. I can give you an interesting number. Three years ago, we did a census of our customers and we had a total of 13,000 customers we had sold to. We thought at the time that was a big number, and it was a big number. These companies were throughout the world. We recently completed that census and the total today is over 31,000 customers throughout the world. That is almost a three times growth in companies who have bought from us.

"That's an important trend because once someone has bought from you, if you're reasonable, he'll buy again from you and often times he'll buy more from you. We have also become important to many of the major corporations worldwide. This trend will continue.

"We'll have to make a natural change in our marketing approach. We will continue to provide broader service. We're going to be more available, more locations, more people, this sort of thing."

We wanted to know if geographic expansion is part of Maxim's three to five year strategic plan. Gifford remarked, "There's nothing dramatic that I can say in that regard. We are in all the major markets today and will continue to add people and resources in these markets. I would suggest that Eastern Europe is going to be a market of interest in the coming 5-10 years and some attention should be paid to Eastern Europe.

"We have maintained over the last several years a very consistent mix of approximately 42 percent of our business in the U.S. and 58 percent of our business in Asia, Europe and the rest of the world. We would expect and hope that this mix would continue. We believe that many industrialists and economists have an unrealistic picture of what is a proper mix of business internationally. This is based on the devastation brought about by World War II and its economic effect on the rest of the world.

"Every continent and country in the world with the exception of the North American and Australian continents were devastated and not able to produce after World War II. After World War II it was obvious that the U.S. was going to be supplying 80-90 percent of the world's goods and services. The fact that these countries and these continents are rebuilt nations through American assistance and are in the economic markets today is very natural.

"Maxim believes that we now have an equilibrium condition, in that approximately each of the major continents are approximately one third of the market, i.e. North American continent 30 percent, Asia 30 percent and Europe 30 percent. Maxim participates in a much more normal, natural mix of business than most other companies. To the contraary, we believe the 50's, 60's and 70's were unusual and today is much more normal. We feel our business is not unusual or exceptional--but normal."

Addressing the question of Maxim's capital budget for the next few years, Gifford noted, "I'm glad that you asked that question because it's one of the things we have been proud of in the last year and a half. Maxim has been and is proud of our new product development and quality culture, but we've been a little embarrassed about not being a terribly efficient company in terms of manufacturing.

"To give you an idea, the year before last we spent something like $9 million for capital equipment. For fiscal '91 I believe expenditure for actual capital equipment could be less than $4 million. This is a result of learning how to run a very complex business; of improved efficiency; and of course, volume increases.

"As we said in the past, we believe that the business we are in is not capital intensive; it is not like the digital integrated circuit business. We believe for every dollar of capital equipment we should be able to generate $4-$6 of sales and the equipment should be useful for seven-ten years. This is quite different than the digital business where one dollar of capital equipment generates one dollar in sales, and it may be obsolete in three to five years.

"We think that our capital requirements are going to be modest and we will continue to follow this formula of approximately one dollar of capital equipment expenditure for

$4-$5 in sales increase; and equipment life should exceed seven years. With improvement in manufacturing efficiency and improvement in inventory management, we're beginning to generate significant cash. We'll be able to grow our cash materially in the next three to 12 months. There will not be a need for additional debt or equity."

When asked if R&D expenditures will increase, Gifford confirmed, "Yes they will. They may not increase as a percentage but they'll increase in absolute dollars. We have many more product opportunities than we have been able to exploit. Maxim, similar to other small companies, has been limited by the profits available to reinvest in the development of product opportunities. Profit levels have and are increasing, allowing increased product development effort.

"We have an obligation to our shareholders to return acceptable earnings growth and return on their investment. This is the primary criteria when you set about to structure your performance for coming years. Our first priority is to report acceptable EPS. Surplus profitability will be invested to develop and grow our business. In the future, we'll have more money available, in the absolute sense, to spend on developing products. We believe that will benefit the shareholders tremendously in the coming five years."

About Maxim's margins, Gifford commented, "Gross margins are as good as they need to be. We have no real problem there. Operating margins could be improved, of course, by spending less money on R&D and marketing. We think that would be counter productive to shareholder growth objectives for Maxim."

Is an earnings increase of 15 percent each year over the next several years feasible for Maxim? Gifford thinks, "That's very conservative in our opinion. Our model requires higher earnings growth than that."

Queried about any internal problem areas for Maxim that he is grappling with as CEO, Gifford responded, "Not internally but I do see potential external problems. Whether I can be effective or not is another question. We are all concerned with what's going to happen regarding corporate taxation, and treatment of research and development credit and the capital gains issue. We think those are all very important to have in place in a favorable way, if companies such as Maxim are going to continue to attract the contributing employees that we need and to provide the kind of earnings growth we expect to be able to report.

"We believe very firmly that we can produce the results; we just hope that the government doesn't take them away from us. I don't know how much I can do about that other than make statements like this that might get read by people who can do something about it.

"Internally, we are a company of people and they are our most important resource. I consider it most important to make sure that they're OK. Not just OK from a security point of view, but for Maxim's shareholders I must make sure that we have the players in place, and the number of them, to fight and win whatever battles Maxim chooses to go into. I take that as a serious strategic challenge for us.

"The pothole is complacency. Success breeds complacency. People giving up the battle. People deciding that they've done well enough, that they don't want to work as hard. They don't want to work as many hours — not taking our competitors seriously. Not recognizing what our customers are telling us and saying that tomorrow is soon enough rather than yesterday. It's an attitude issue.

"That's the biggest problem in America. American business takes too much for granted. The pothole is complacency. Everybody has the right to retire and maybe even to be complacent. They do not have that right, with regard to Maxim shareholders, to do it at Maxim! We have to constantly be aware and make sure everybody has the moral fiber to decide that if they are not going to try as hard as they can, they get out of the way and let somebody else get the job done!"

Focusing on any conditions in the economy that might affect Maxim's prospects, Gifford pointed out, "If we were a bigger company, we would be more affected by macroeconomic trends. We're not big, we're relatively small. Even as a $200 million company we believe we could be somewhat immune to those trends. We believe we can buck most recessionary trends because there is so much change going on in our business. I'm not trying to sound invincible at all, nor ignorant either. It's just that we're a microcosm in the huge business that we're in.

"Let me tell you a little story. I was at a luncheon about 6-8 months ago. The speaker was the president of Nike shoes. He gave a very exciting presentation. He reviewed the new Nike commercials, with Bo Jackson and others of their stars. He was discussing their business; their market share; he described it as a $10 billion industry. Everybody was properly impressed as was I. I thought, 'My God, what a fascinating growth business. Wait a minute, our market is $10 billion'! It is! Why did his $10 billion dramatically register and ours didn't? We are in a huge market but so close to it that we sometimes forget its size.

"Our opportunities are many and significant. Maxim's current plan doesn't call for 20 percent of our market; or 10 percent of our market. Our challenge is to pick the right opportunities in this enormous ocean of opportunity. Maxim is not going to be market limited but we must avoid ignoring the right opportunity and picking the wrong ones. We are in control of our own destiny. We believe Maxim is positioned today to be either a great company or a mediocre company. It is not as dependent upon what happens in world economics as it is dependent upon our ability to select and execute on the correct opportunities, and to accurately serve our customer.

"Like I said, the drawbacks are the inability of our people to perform and stay motivated. The opportunity is that we've got an enormous playing field and a lot of opportunities to select from. The economy will have an affect but will not determine the outcome. Whether we select the right opportunities or not will deterime the excitement about Maxim."

Giving thought to the way Maxim has been treated by the stock market, Gifford declared, "I think that the followers of our stock are probably one of the most knowledgeable set of stock buyers. First of all, there are relatively few institutions buying our stock. I think 25-27 percent of our stock is held by institutions, which is a small percentage relative to other companies that are watched closely. Investors buying our stock are knowledgeable about Maxim and they, for the most part, have been rather long-term holders.

"The venture founders of our company in the last year and a half have pretty much sold or distributed their positions in the company, so there is now a large float of shares on the market, and it's more broadly held than in the past — which means that the stock can be bought now more easily than in the past. The market has treated Maxim very predictably. Our price has followed our earnings curves and in sell-offs it has not been sold off badly.

"So I'm very pleased with the knowledge and confidence that our investors have in Maxim, and I'm hopeful they're happy with the investment. We went public in February, 1988 at about \$5-5½ a share; the stock is selling in the \$14-\$16 area. So most have been rewarded by holding the stock long term. We believe that our ability to produce similar predictable growth over the next five years will improve."

Concerning any aspects of Maxim that the financial community could understand a bit better, Gifford said, "One aspect that I feel they need to understand better is that there are going to be few surprises and there are few secrets at Maxim. Don't try to figure something out that isn't there. Like I said, we believe our earnings trend is determined two-four years in advance. It's a company that we believe can produce a 25-30 percent earnings growth a year consistently.

"We think Maxim is a relatively safe investment because it has over 30,000 customers; over 4,000 line items to sell; no customer that's responsible for more than 1 percent of sales; and we think it's relatively well managed. It's in a market that's got a variety of growth opportunities over the long term and although it's hard to grow fast, good long-term growth potential is a reality.

"We believe Maxim is one of the better opportunities in the investment sphere for getting long-term, better than average returns. We don't think we are a speculative stock. We think there are better places to be speculating than with Maxim stock. We would discourage investors who are looking to exploit quarter-to-quarter swings in performance."

Gifford underscored some key points about Maxim for prospective investors to take into consideration. "Maxim is one of the more predictable companies with minimum downside and better than average percentage growth prospects. We're a cash generator. We do not require more debt or equity. We're in a large market, and we are already an important player. We have a great brand. We're not dependent upon any one product. This company has a very stable, sound, long-term growth future. It's not going to double in sales and profits annually like computer or software companies sometimes do, but it's going to be a very predictable company that's going to grow, we think, to an important size in the next five to ten years."

On a more personal note, Gifford talked about his favorite leisure-time activities. "Well, I used to ski, but I enjoy tennis too much — and didn't want to hurt my knees, so I stopped skiing, and I play a lot of tennis when I can.

"As I said before, I'm an ex-baseball player, and I'm involved with U.C.L.A.'s baseball program, and I really cherish the opportunity to get out and play in these alumni games with them. We have 15 or 20 guys in the major leagues now who I like to spend time with whenever I can. And they're in most of the cities I visit, so I get to see them with my travels.

"I enjoy my wife and three children very much. We've been married for 31 years and we're a very close family. In fact, one of the things at Maxim that I didn't comment on and your readers might find interesting is that we're very nepotistic; we believe in nepotism. We encourage people to employ their children, their wives and their relatives. It is their responsibility that they perform, and we have a very uncommon number of families working in our company -- including my family. I have two daughters working here. So it is very Japanese and Old World in that regard. We believe that people will not bring their kin or siblings into the company if they're going to embarrass them, and we've found that to be true.

"My interests are pretty much the same as everybody else's. What time I have I like to spend with my family, and I'm athletic and I like to get out and run and play ball."

Profit Through the Silicon Cycle:
The Next Ten Years

SEMICONDUCTOR MANUFACTURING STRATEGY AND CAPITAL INVESTMENT IN THE 1990s

Kazuo Kimbara
Executive Managing Director
and Group Executive
Electronic Devices Group
Hitachi, Ltd.

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

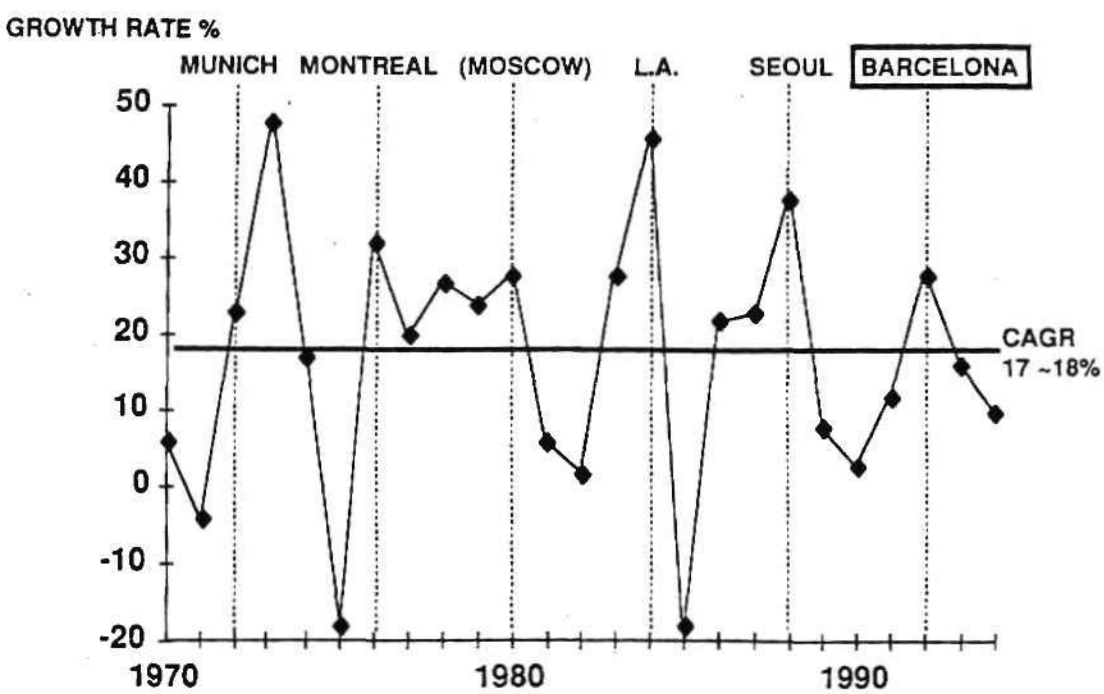
SEMICONDUCTOR MANUFACTURING STRATEGY AND CAPITAL INVESTMENT IN 1990s

KAZUO KIMBARA

Executive Managing Director and Group Executive
Electronic Devices Group
Hitachi, Ltd.

HITACHI

SILICON CYCLE



HITACHI

SEMICONDUCTOR INDUSTRY IN 1990s

- Increasing Usage of Semiconductor
- Continual Technology Evolution
  Micron → Sub - Micron
- Diversification of Market Needs
  Commodity Products → ASICs
- Swelling Investment in Equipment / R&D
- Shortage of Engineers
- Increasing Trade Conflicts
  Globalization / Alliance

→ [Cooperation and Competition]
[Harmonic Growth in Semiconductor Industry]

HITACHI

MARKET TREND IN 1990s

- Up Grade Equip. for Information / Communication
- Personal Equip. for Information
- New Consumer Equip.

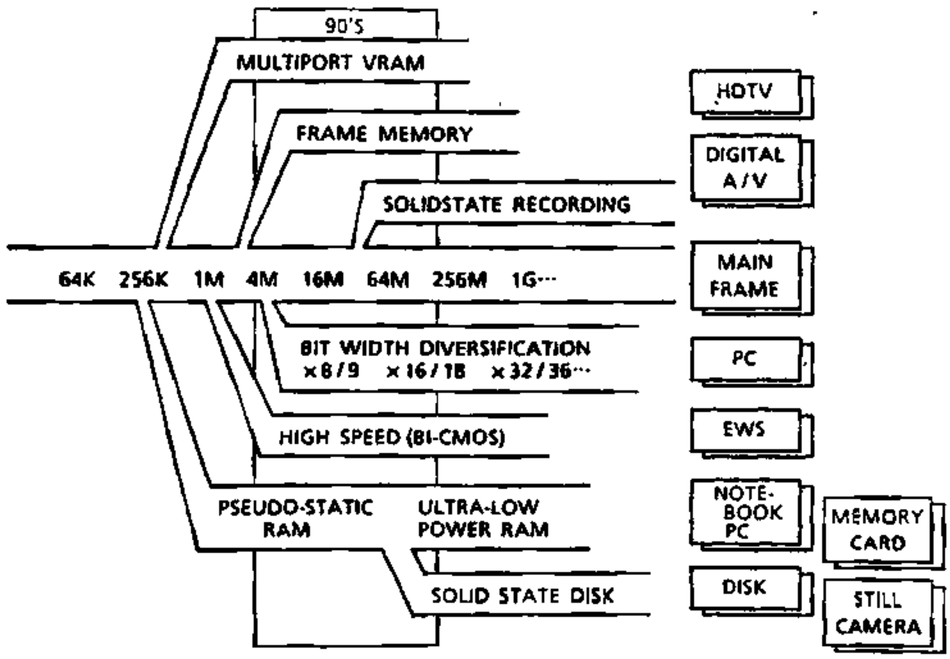
HITACHI

TECHNOLOGY TREND IN 1990s

- Finer Pattern and Larger Integration
- Diversification of Products
- Higher Performance
- Smaller, Thinner and More Pin Count Package

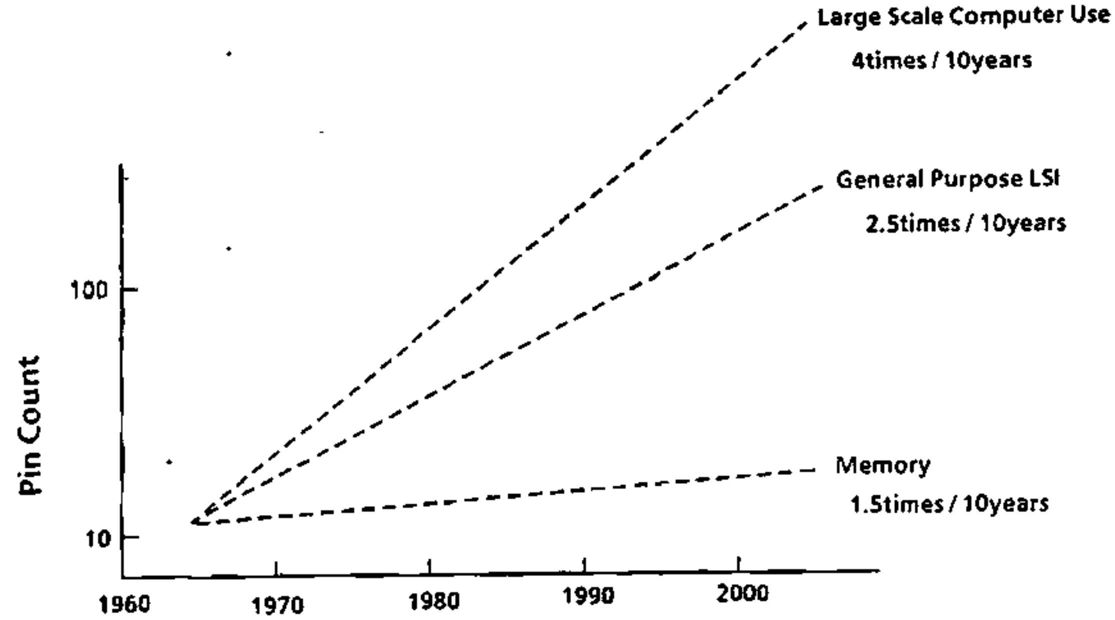
HITACHI

DIVERSIFICATION OF MEMORY



HITACHI

INCREASING PACKAGE PIN COUNT

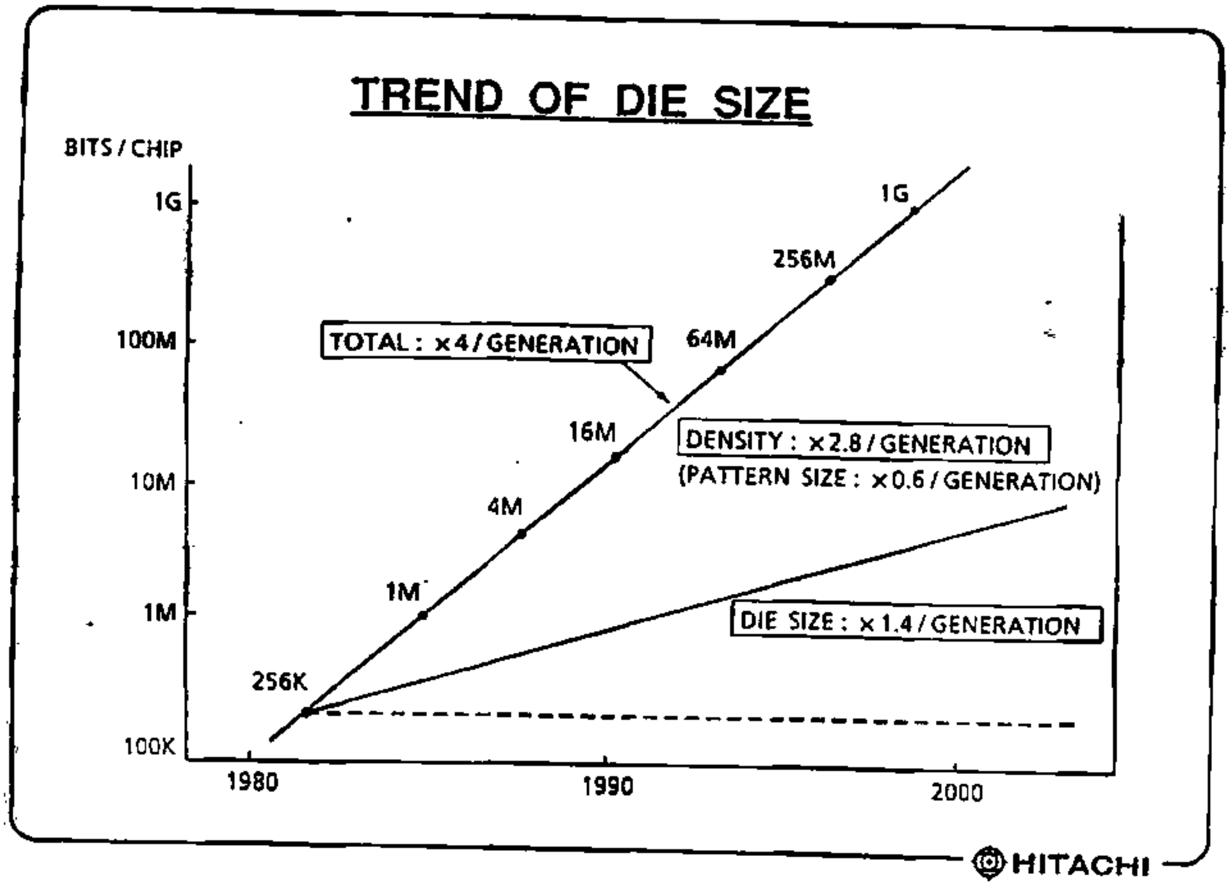


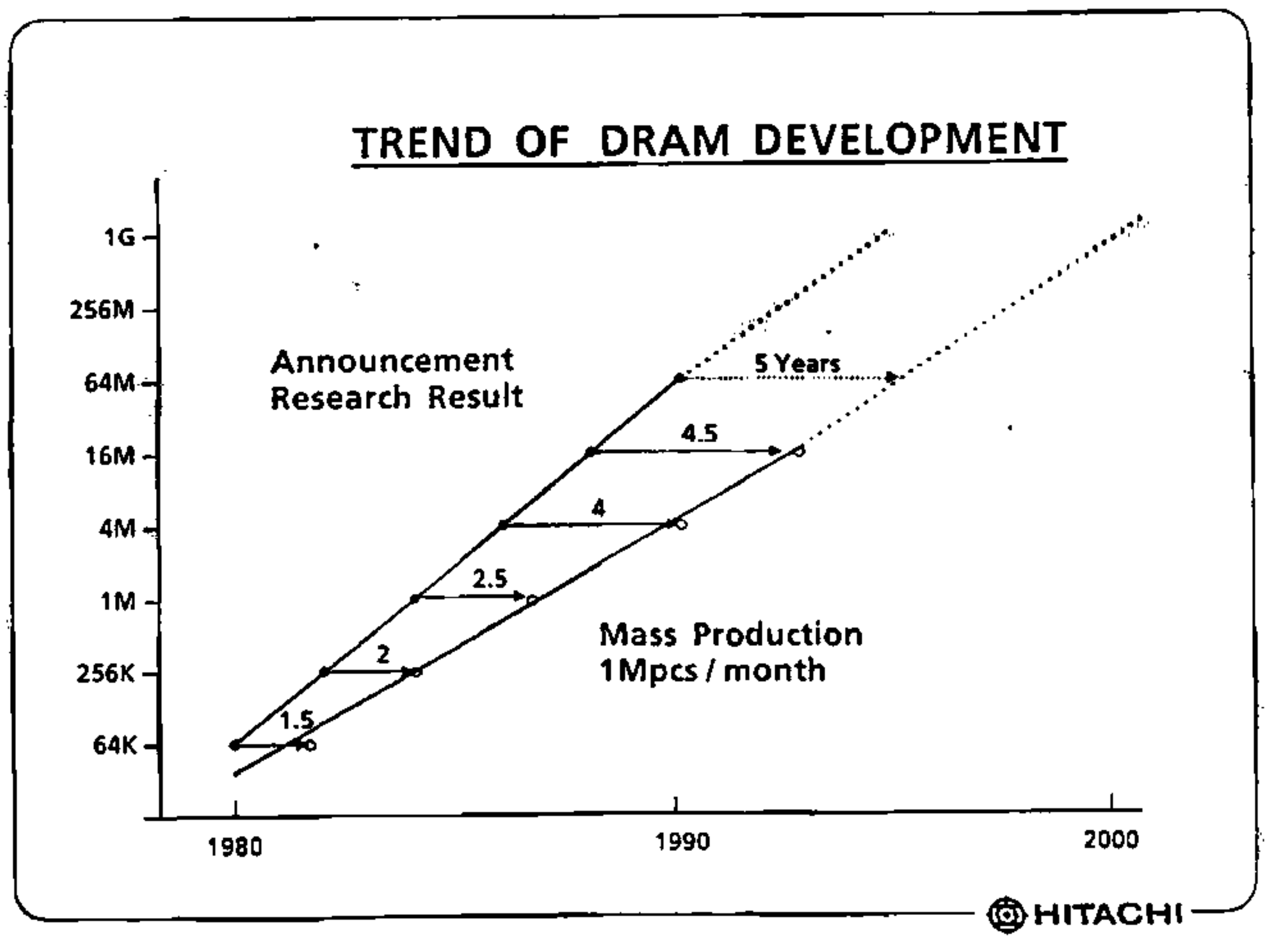
HITACHI

MANUFACTURING TREND IN 1990s

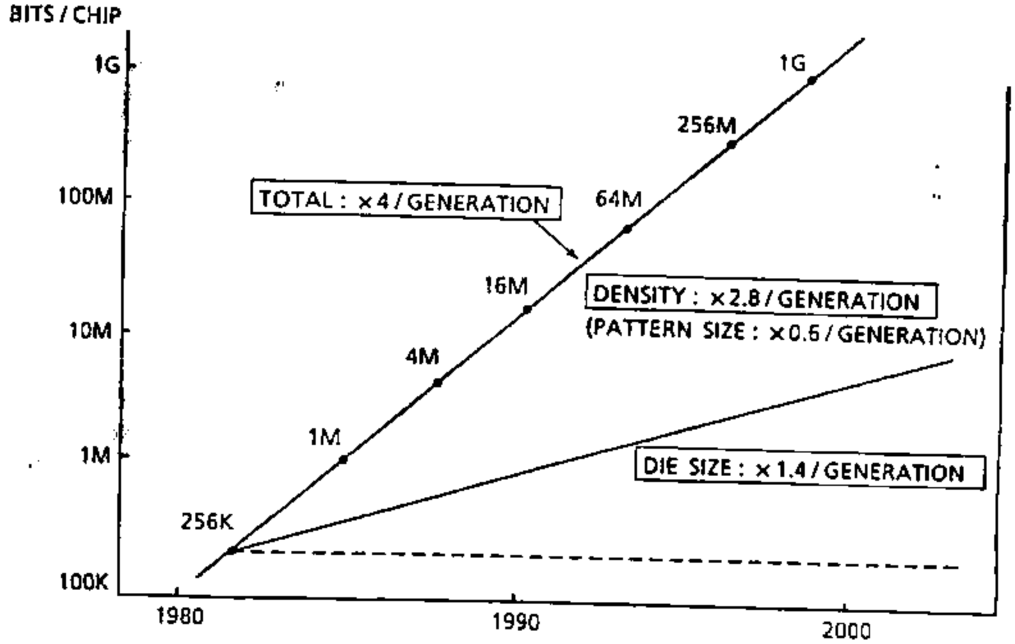
- Fine Processing Technology
- Difficulty in Testing
- Factory Automation

HITACHI


TREND OF DIE SIZE
BITS / CHIP
1G
100M
10M
1M
100K
1980
1990
2000
256K
1M
4M
16M
64M
256M
1G
TOTAL : ×4 / GENERATION
DENSITY : ×2.8 / GENERATION
(PATTERN SIZE : ×0.6 / GENERATION)
DIE SIZE : ×1.4 / GENERATION
HITACHI

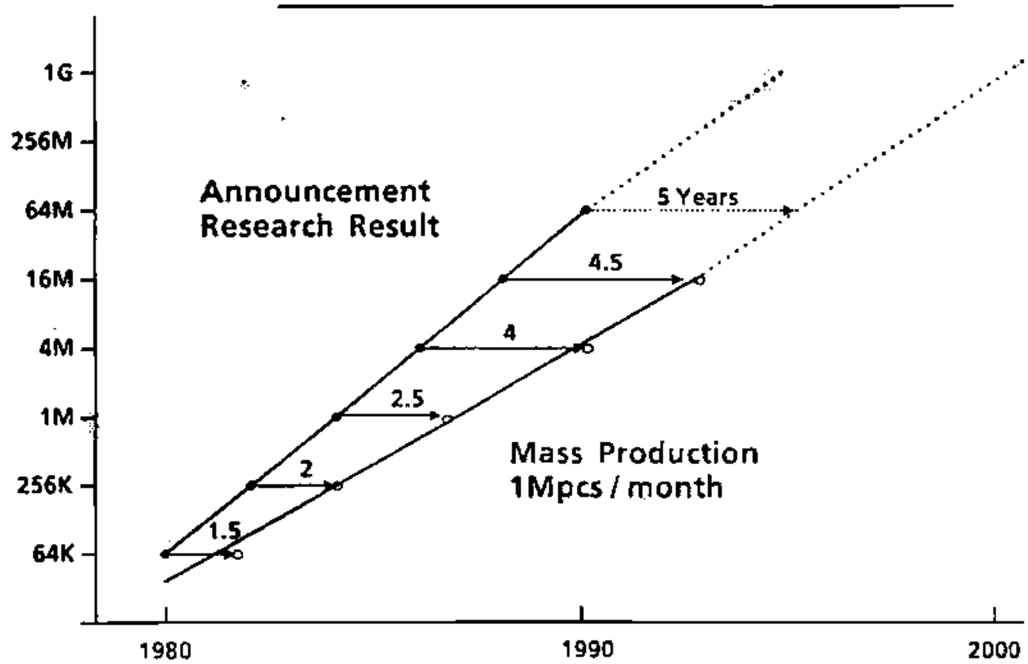

TREND OF DRAM DEVELOPMENT
1G
256M
64M
16M
4M
1M
256K
64K
1980
1990
2000
Announcement
Research Result
Mass Production
1Mpcs / month
1.5
2
2.5
4
4.5
5 Years
HITACHI

TREND OF DIE SIZE



HITACHI

TREND OF DRAM DEVELOPMENT



HITACHI

TESTING TECHNOLOGY

[DRAM's CASE]

As One Generation Evolves

Testing Time	3 times
Number of Devices Under Batch Test	2 times
Price of Testing Equipment	1.3 times
Throughput / Investment in Equipment	0.5 times

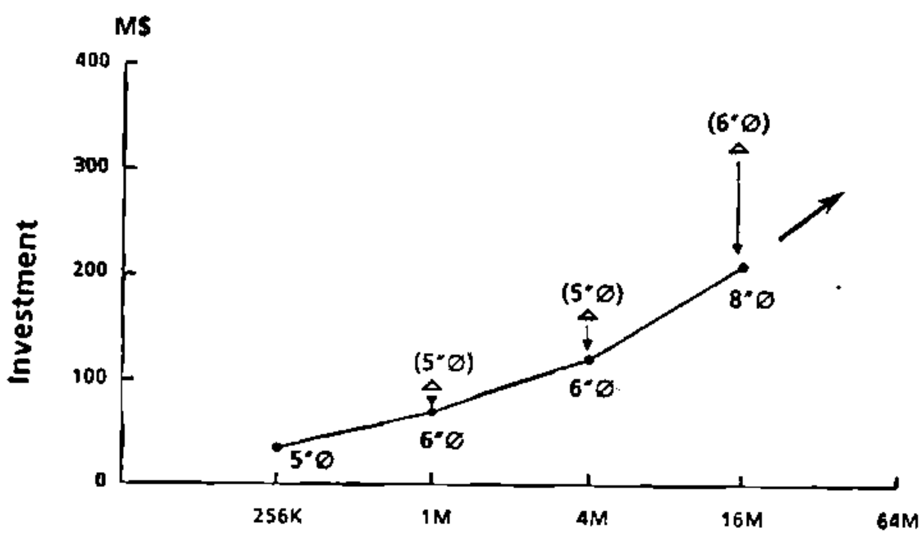
[Challenges to Testing]

- Tester — Higher rate of throughput
  Higher performance & Functionality
- Handler — FA, Flexibility

HITACHI

ENORMOUS INVESTMENT

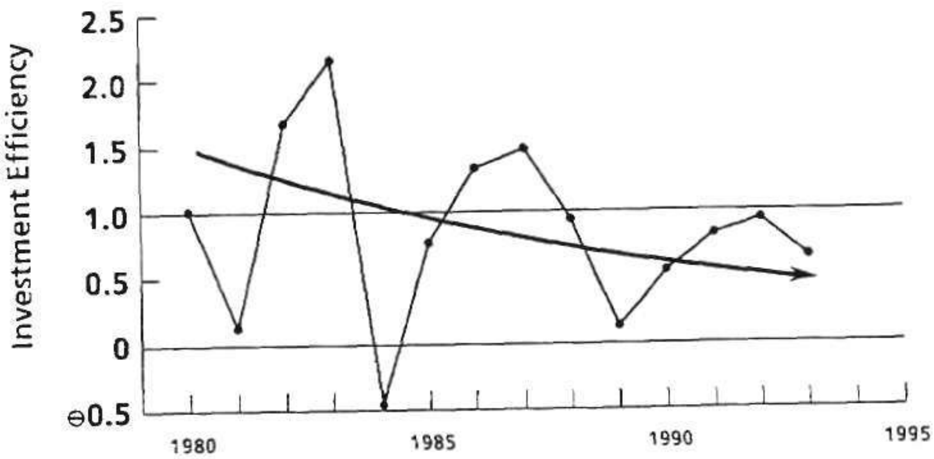
Investment / DRAM Production (1M pcs / month)



HITACHI

INVESTMENT EFFICIENCY

$$\text{Investment Efficiency}_{(n)} = \frac{\text{Increasing Shipment}\{(n+1)-(n)\}}{\text{Investment}_{(n)}}$$



HITACHI

TECHNOLOGY BARRIERS AND BREAK THROUGH

1. Micro Fabrication Technology

Limits of Photo-Lithography

(Resolution 0.3 μm, Chip Size□20mm)

→ Deep-UV Lithography (Excimer Laser KrF 248nm)

→ X-Ray(SOR) Lithography

→ E-Beam Lithography

→ FIB Lithography

HITACHI

TECHNOLOGY BARRIERS AND BREAK THROUGH

2. Testing Technology

More Complexity of Function, Diversification, More Pin Count

16Mbits or More/chip Memory LSI

1M gates or More/chip Logic LSI

➡ Testability at time of Design
(Self Test etc.)

➡ Redundancy Technology

HITACHI

TECHNOLOGY BARRIERS AND BREAK THROUGH

3. Increase of Investment for Development and Manufacturing, and Difficulty of Efficient Return

Wafer Enlargement (Diameter > 10 inches)

Fine Patterning (<0.5 μm)

Structure Complication

Variety and Thinning of Film Thickness

Increase of Process Steps (> 2 times of 64K DRAM)

➡ Super Clean Process

➡ Factory Automation

HITACHI

BUSINESS BARRIERS AND BREAK THROUGH

1. Enormous Investment in Equipment
   → Steady Investment in Equipment
   → Joint Ventures for Production
   → Foundry Business

2. Increase in R&D Investment
   → Technological Cooperation
   → Joint Development

3. Shortage of Engineers
   → Global R&D
   → Utilization of CAD

4. Increasing Trade Conflicts
   → Global Development of Production and R&D Bases
   → Joint Development and Production

HITACHI

CONCLUSION

1.Silicon Age Continuing through 1990s

2.Increase of Time Lag between R&D and Mass-production
  -More Difficulty of Applying Micro Fab. Technology to Manufacturing

3.Development of CAD Accelerated by Diversification of LSI (ASIC)

4.Post Photo - Lithography, most Important Issue in LSI Development in 1990s -- Limits of Photo-Lithography

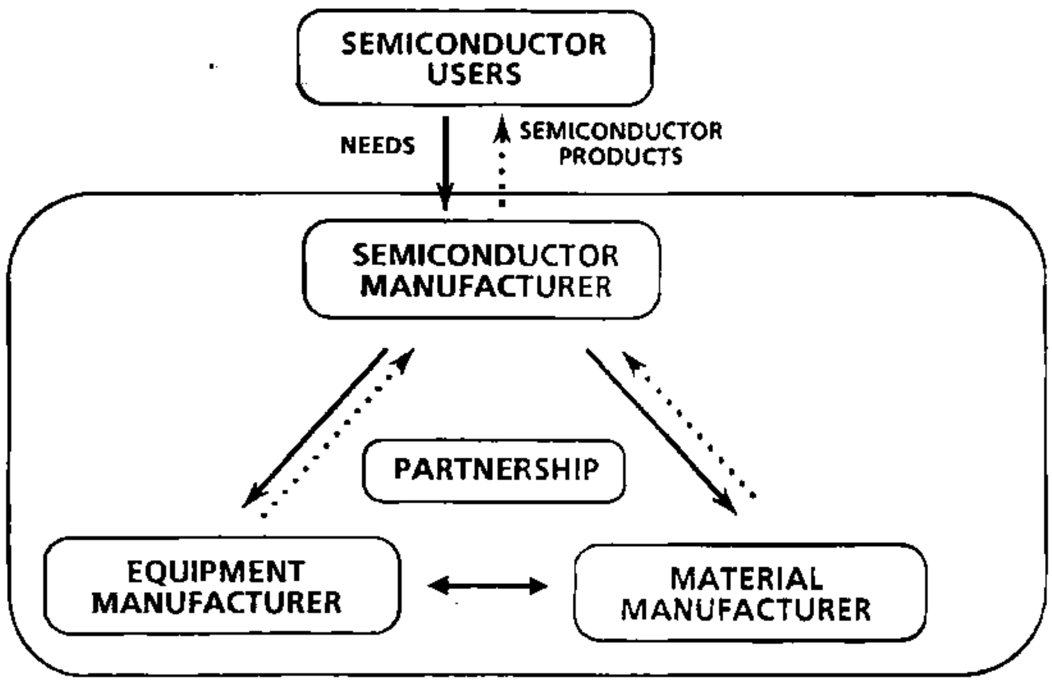
5.Diversification of LSI Resulted by Slowdown of shifting Higher Integration

6.Change of the Industry Structure, "How to Make"→"What to Make"

7.Enormous Investment and Fair Return, Critical Issue for Manufacturers
  Coordination Required among
  User, Semiconductor/Equipment/ Material Manufacturers

HITACHI

COMPLEMENTARY ACTIVITY



HITACHI

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

TBA

Steve Poole
European General Manager
Intel Corporation

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

TBA

Steve Poole
European General Manager
Intel Corporation

Mr. Poole is European General Manager with Intel Corporation and has been with the company for nine years. His previous positions were as European Assistant General Manager, which involved responsibility for all sales and marketing activities, and as Intel's UK Manager with responsibility for all sales and service activities within the United Kingdom. Prior to this he gained experience in semiconductor sales within American, European and Japanese organizations.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

Profit Through the Silicon Cycle: The Next Ten Years

PROFITS ARE POSSIBLE

Steve Poole
European General Manager
Intel Corporation

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

PROFITS ARE POSSIBLE

Steve Poole
European General Manager
Intel Corporation

Mr. Poole is European General Manager with Intel Corporation and has been with the company for nine years. His previous positions were as European Assistant General Manager, which involved responsibility for all sales and marketing activities, and as Intel's UK Manager with responsibility for all sales and service activities within the United Kingdom. Prior to this he gained experience in semiconductor sales within American, European and Japanese organizations.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

PROFITS ARE POSSIBLE

IMPLICATIONS OF THE GROWING TREND TOWARD SOLE-SOURCED INTEGRATED CIRCUITS

Steve Poole

Director and General Manager

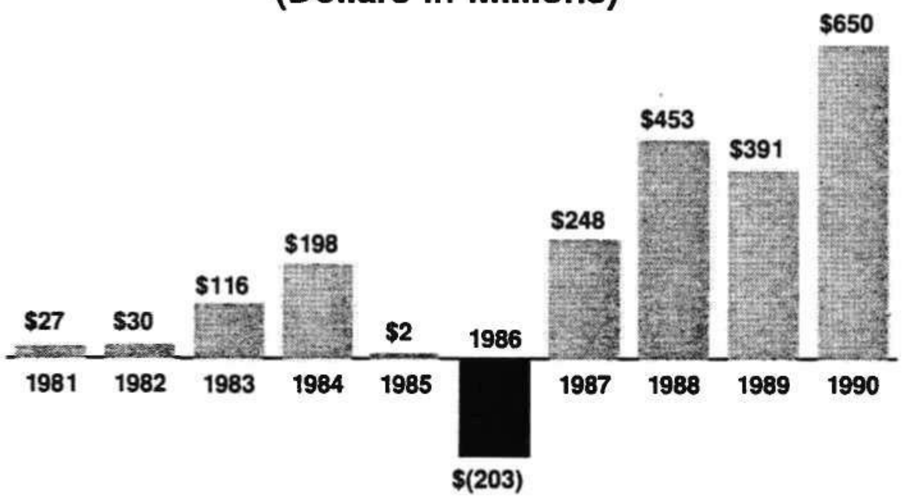
Intel Europe

Dataquest European Semiconductor Conference

May 31, 1991

INTEL NET INCOME

(Dollars in Millions)



WHY?

- Was it luck?
- Monopolist or Anti trust activities?
- Did Intel cheat it's customers?

WHAT THE CUSTOMER WANTS

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

CUSTOMER EXPECTATIONS

Past

16 Week Safety Stock

8 - 16 Week Leadtimes

DPM - 1% AQL

Price, Price, Price

Adversarial Relationship

Bottom Line: Many Sources

CUSTOMER EXPECTATIONS

Present

Minimal Inventory

Guaranteed Lead Times,

< 4 Weeks

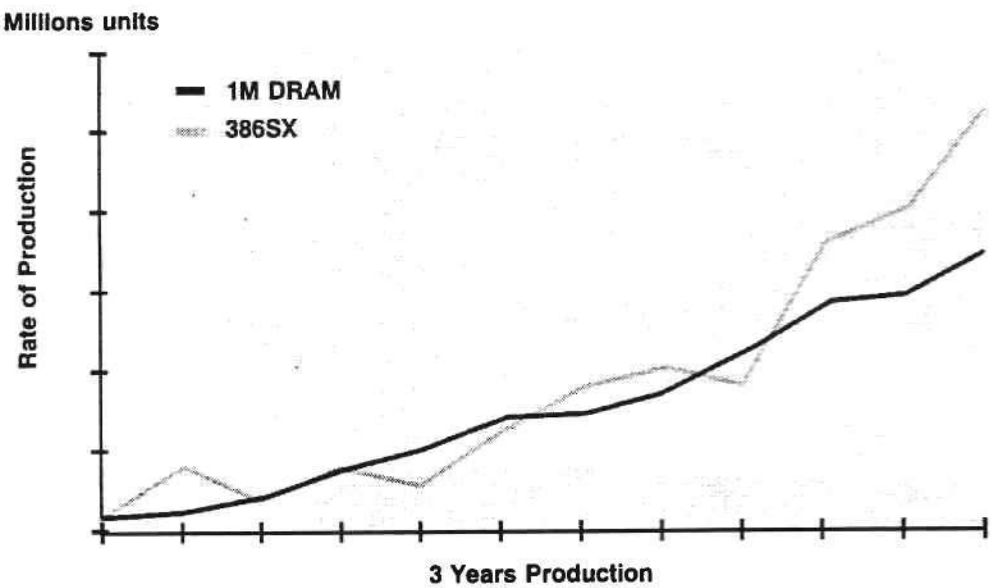
< 100 DPM

Total Cost, Value Analysis

Mutual Dependency, Partnership

Bottom Line: Reducing the Vendor Base

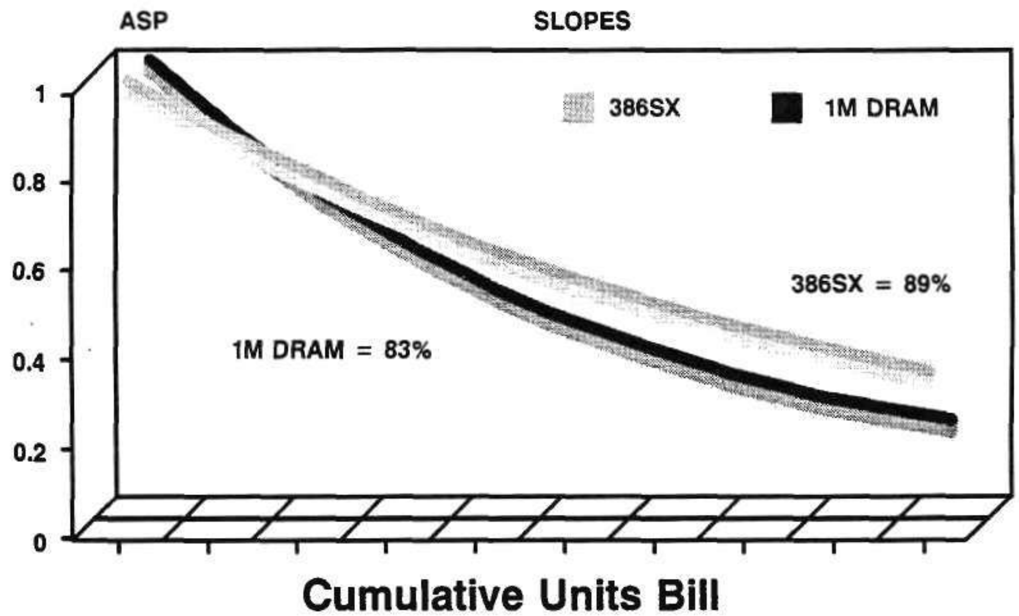
SOLE SOURCING - SECURITY OF SUPPLY?



Source: Dataquest, Intel

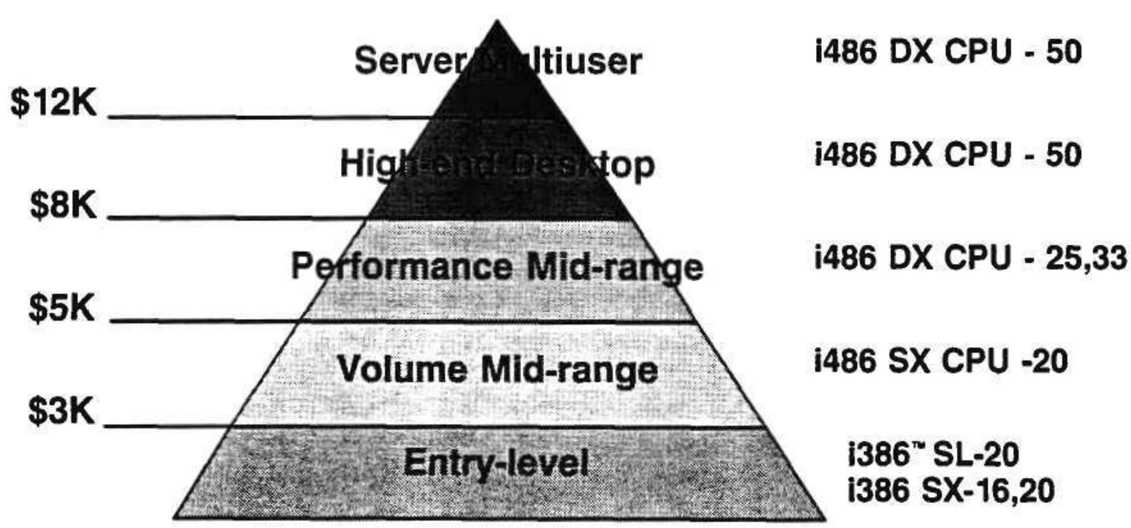
MULTISOURCING - GUARANTEES PRICE REDUCTIONS?

LEARNING CURVE

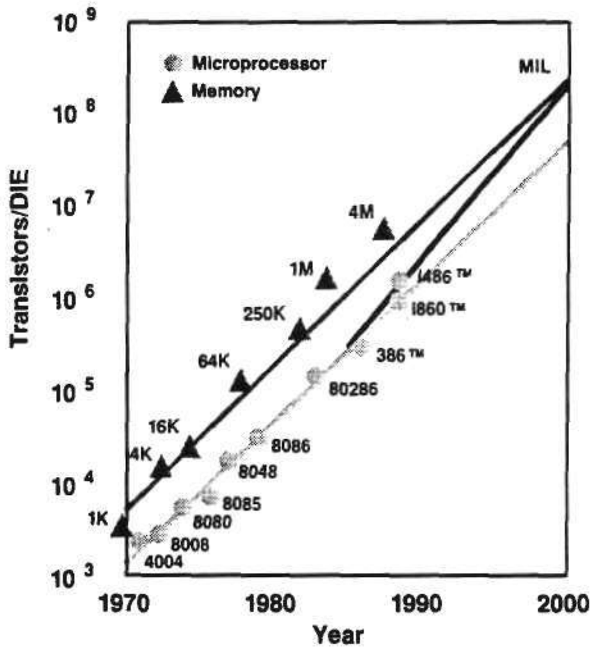


Source: Dataquest, Intel

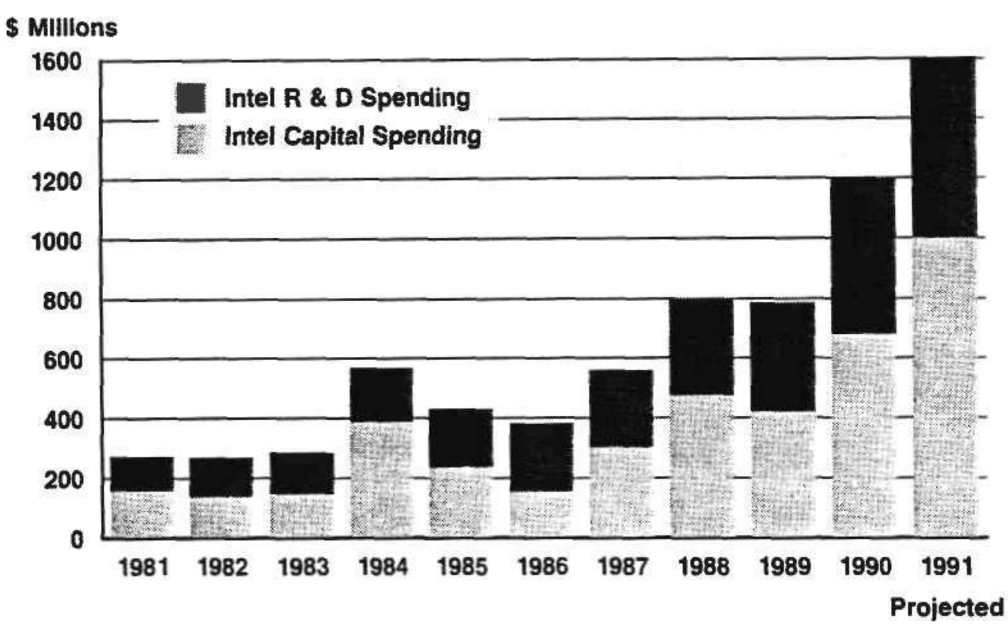
PRODUCT CONTINUITY/COMPATIBILITY WITH COMPETITIVE PERFORMANCE



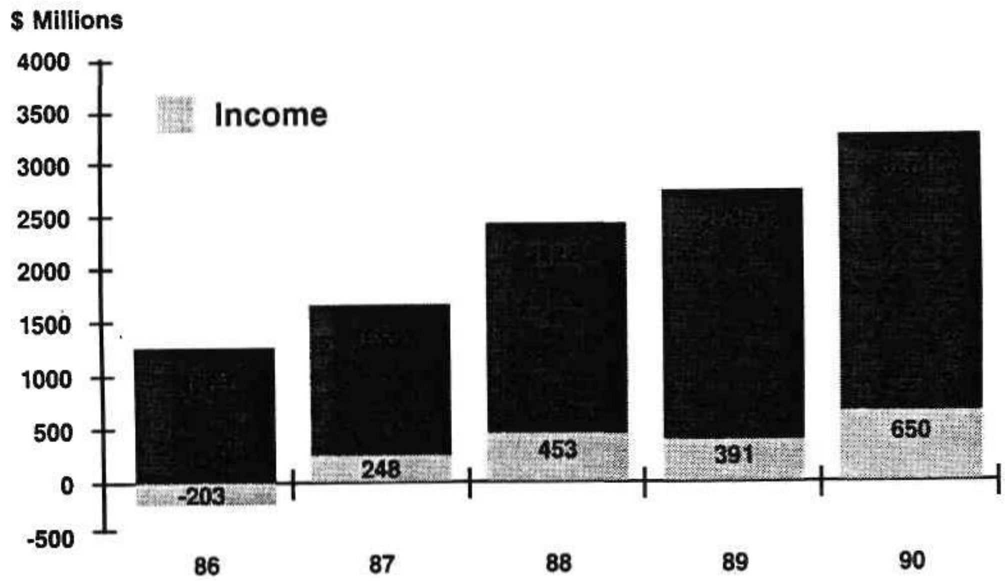
TECHNOLOGY TREADMILL



TECHNOLOGY INVESTMENTS



REVENUES



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

Profit Through the Silicon Cycle:
The Next Ten Years

COSTS AND RISKS IN THE NEXT TEN YEARS

Jürgen Knorr
Senior Vice President
and President of Semiconductor Group
Siemens Corporation

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

COSTS AND RISKS IN THE NEXT TEN YEARS

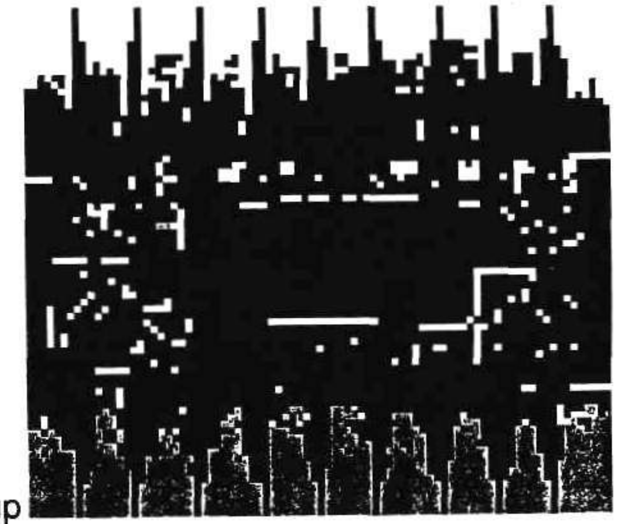
Jürgen Knorr
Senior Vice President
and President of Semiconductor Group
Siemens Corporation

Mr. Knorr is currently Senior Vice President and President of the Semiconductor Group for Siemens Corporation, and has held various management positions in the area of electronics and components with Siemens, having joined the Corporation in 1957. He is closely connected with and leads several component manufacturers' associations. Mr. Knorr gained his Dipl.-Ing. in Electrical and Mathematics Engineering at Technische Universität, Berlin.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

SIEMENS

Cost and risks in the next ten years



by
Jürgen Knorr,
Senior Vice President,
Siemens AG
Head of Semiconductor Group

Marbella, Spain May 1991

HL Ltg

SIEMENS

▶ The "TRIAD" represents circa 3/4 of the world electric/electronics market

31%		39%		30%	
U.S.A.	26%	Western Europe	29%	South East Asia	24%
		Incl. : FR of Germany	8%	Incl.: Japan	20%
Canada	2%	East European countries	9%	Rest of Asia	5%
Latin America	3%	Africa	1%	Australia/Newzealand	1%

Areas proportional to market volumes

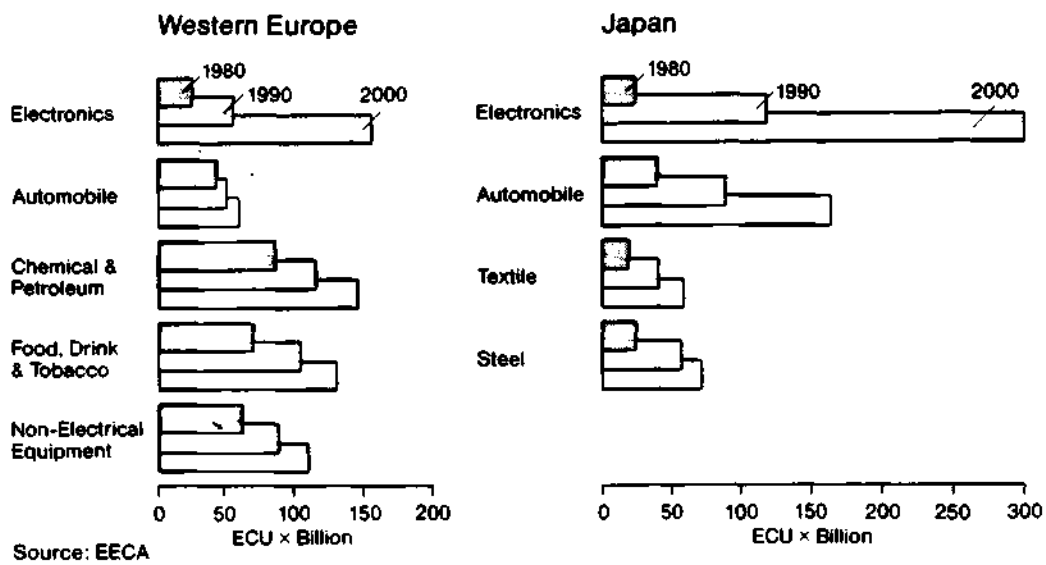
Source: Siemens

World electric/electronics market 90 by regions

HL Ltg

SIEMENS

- Electronic industries in Japan will dominate all other industries by 1990. It will take Europe longer to reach that situation.



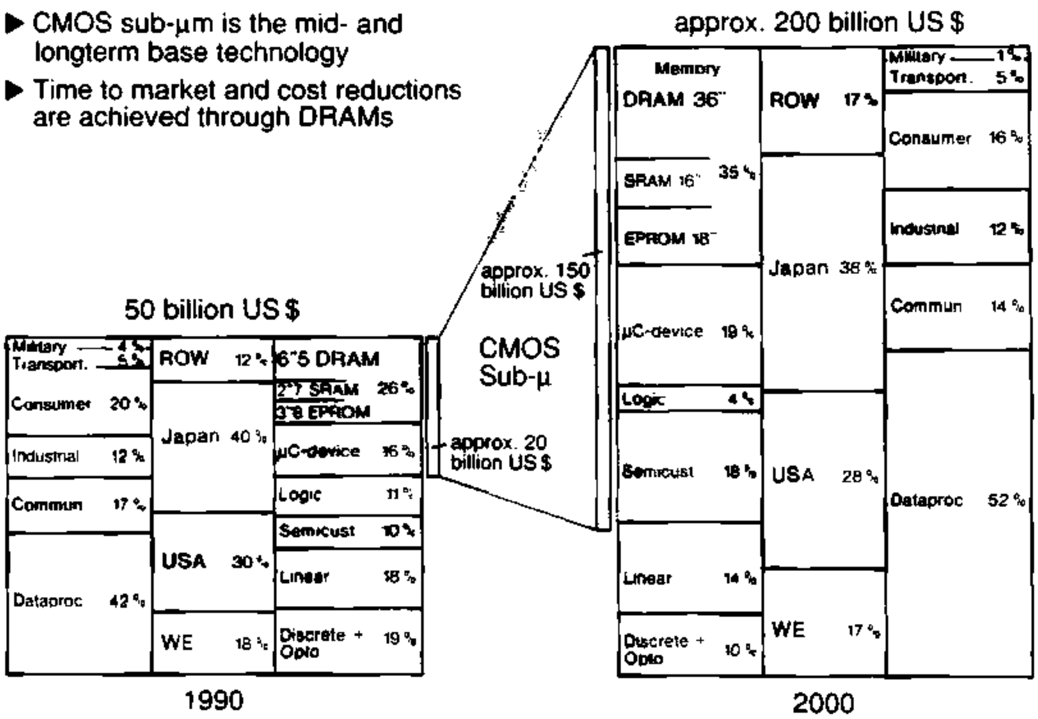
Source: EECA

European and Japanese production by branches

HL Lg

SIEMENS

- CMOS sub-µm is the mid- and longterm base technology
- Time to market and cost reductions are achieved through DRAMs



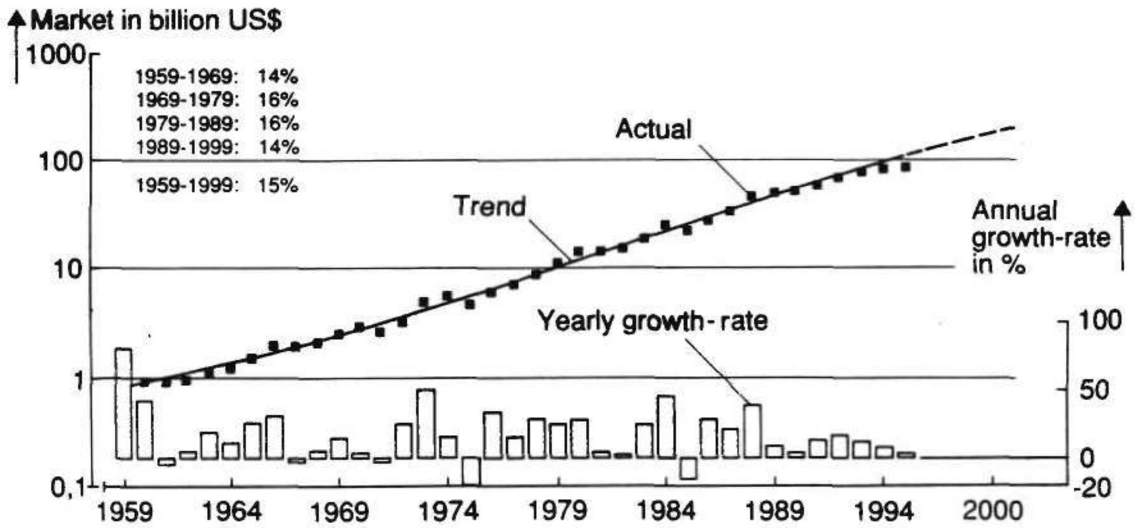
Source: Siemens, Dataquest

WE without Eastern-block nations

Semiconductor world market by segments, regions and products

HL Ltg

▶ The semiconductor world market exhibits a long-term growth rate of 15% p.a. ('59...'99)
... however the annual growth rate shows deep cyclical fluctuations



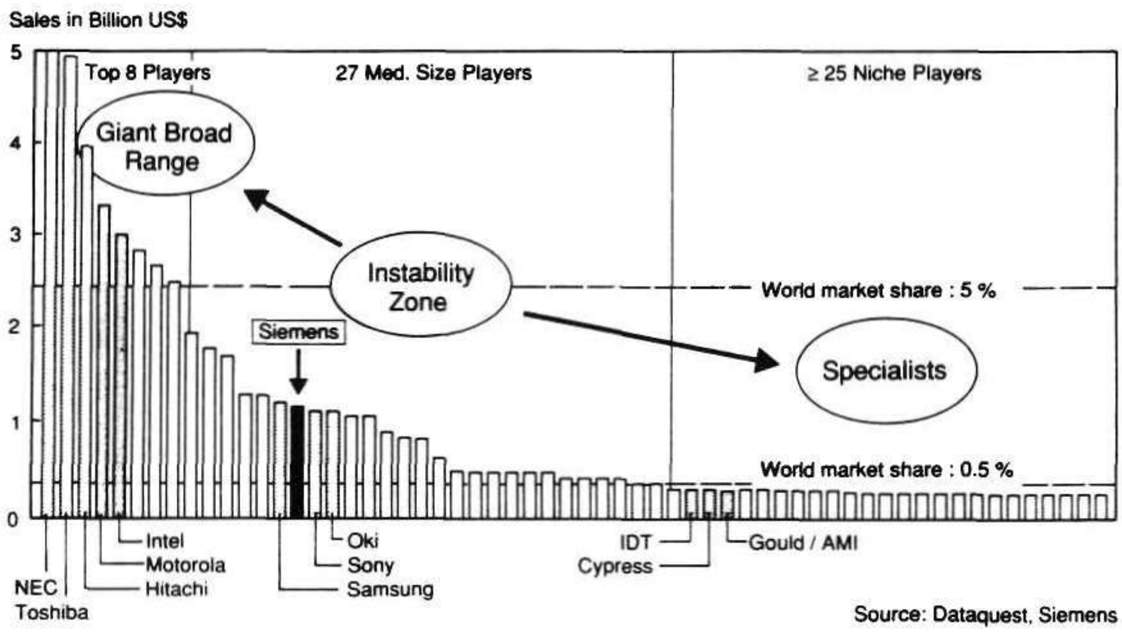
Source: Siemens

Semiconductor market growth

HL Ltg.

SIEMENS

▶ To survive, medium size manufacturers must become a top-player
or look for niches, which will be constantly attacked by the "big ones" ≡ top-players



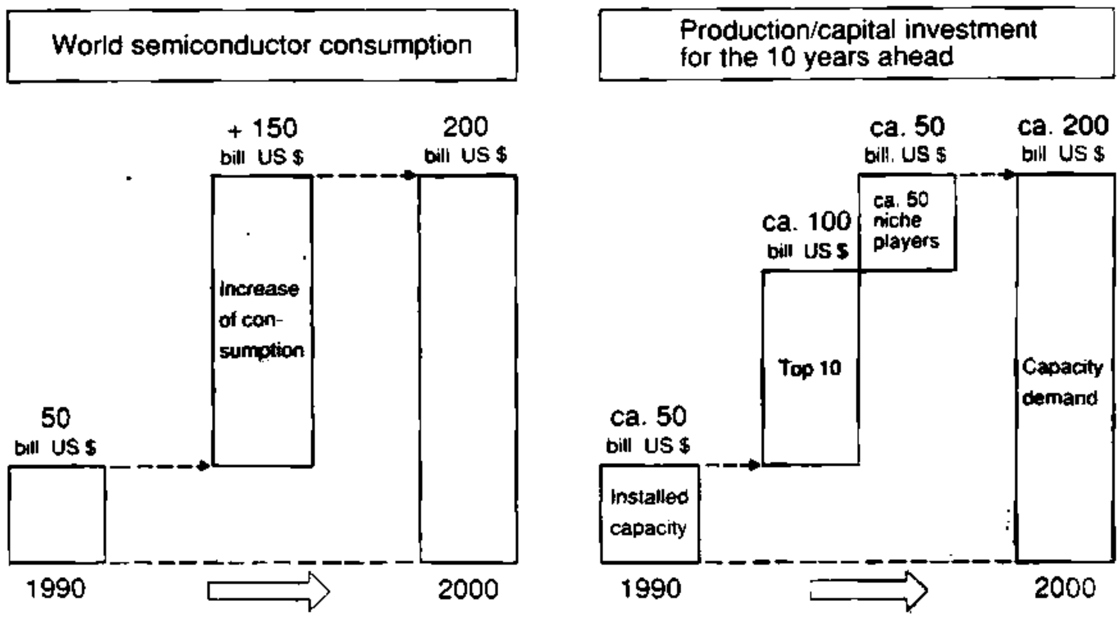
Source: Dataquest, Siemens

TOP 60 semiconductor companies in 89

HL Ltg

SIEMENS

▶ If the Top 10 semiconductor manufacturers will cover 2/3 of the market in 2000, each party will have to invest more than 10 bill. US$ over the next 10 years



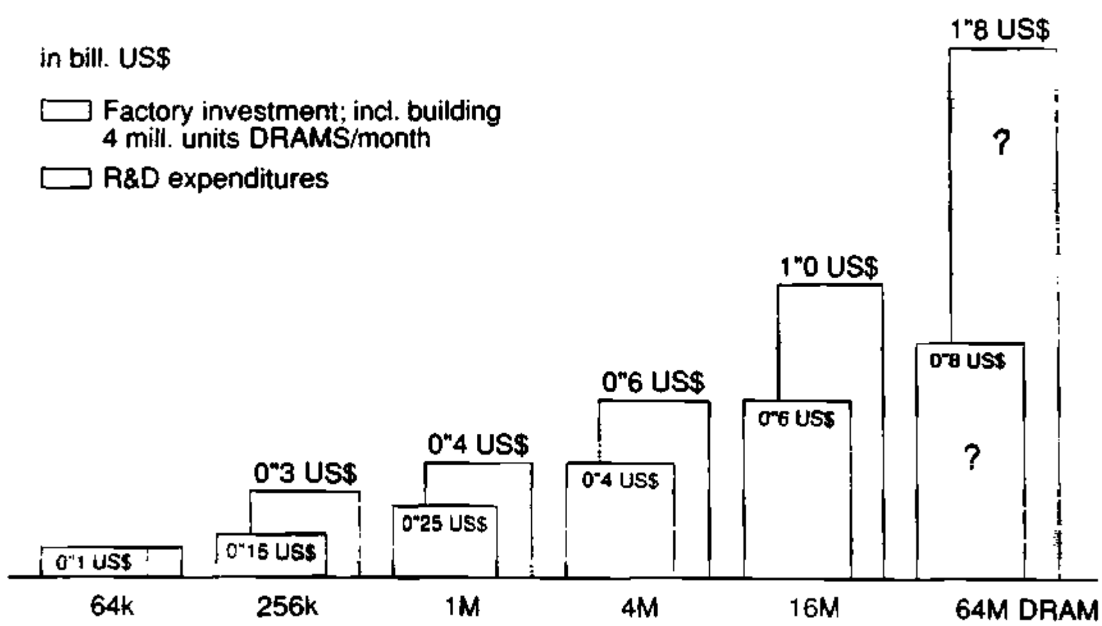
Source: Siemens

Worldwide semiconductor consumption

HL Lig

SIEMENS

▶ With each new generation of technology, R&D expenditures and factory investments continue to increase



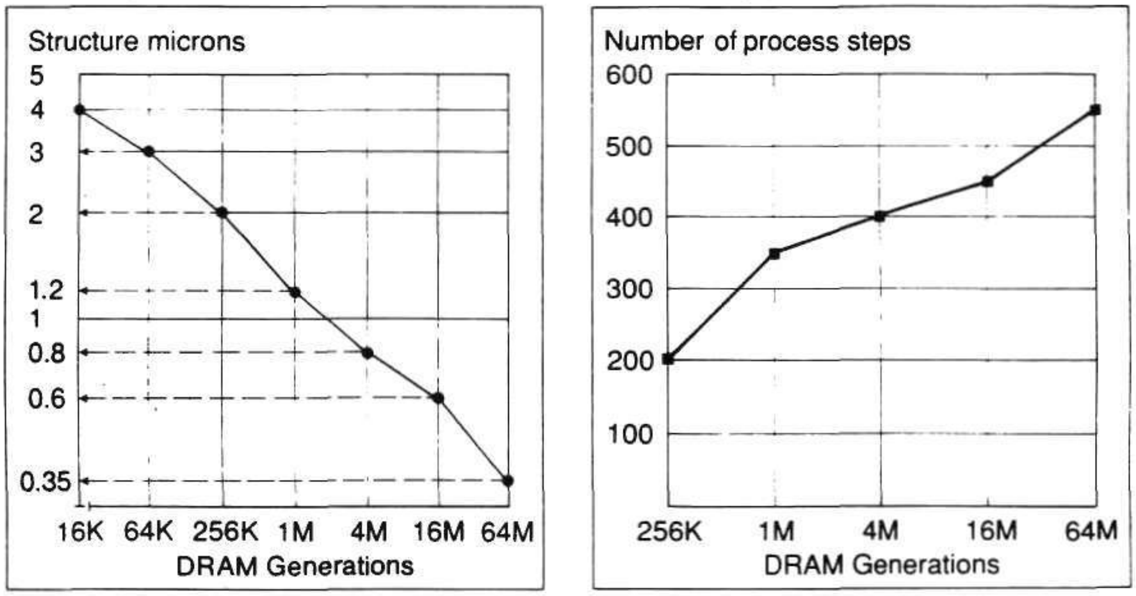
Source: Nikkei Microdevices 11, 1988, Prof. Ruge, TU & FhG Munich

DRAM generation: R&D expenditures and factory investment

HL Lig

SIEMENS

Decreasing structures... ... Increasing process complexity...



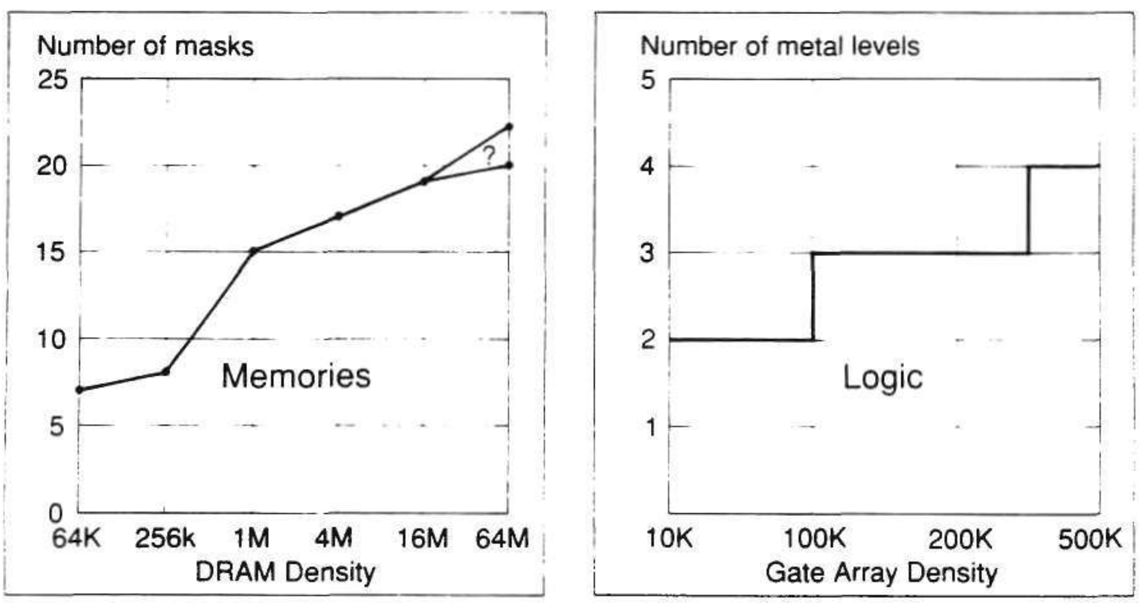
Source: Siemens

HL Ltg

Technology trends...
leading to increased capital investment (1)

SIEMENS

...Increasing number of masks... ...And an increasing number of metal levels



...Contribute to increasing capital investments, necessary to sustain a leading - edge semiconductor business

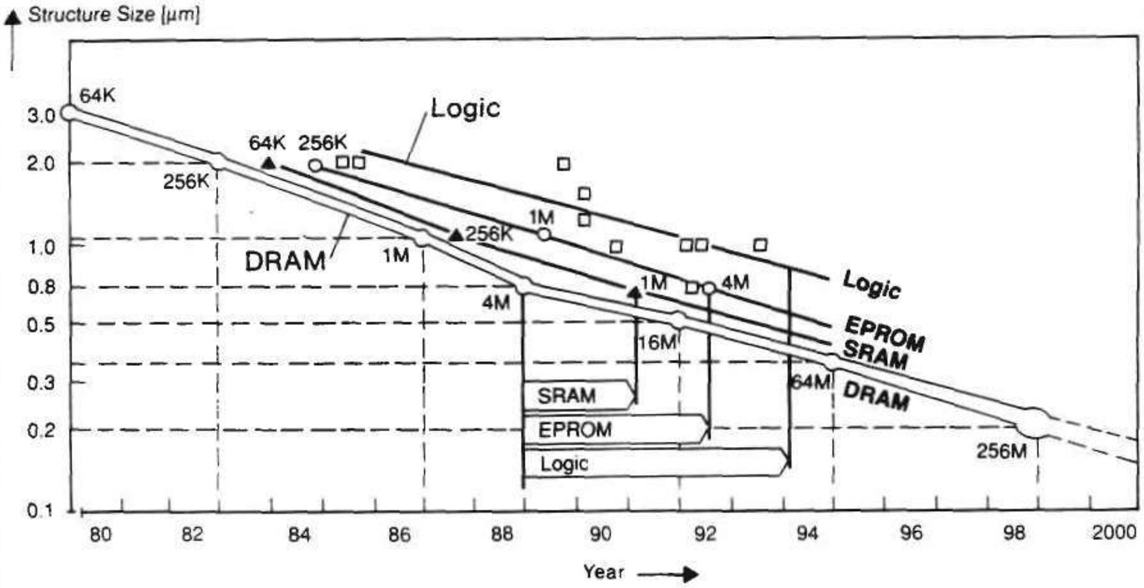
Source: Siemens

HL Ltg

Technology trends...
leading to increased capital investment (2)

SIEMENS

▶ DRAMs are <u>the</u> lead products for state of the art technology and -/equipment



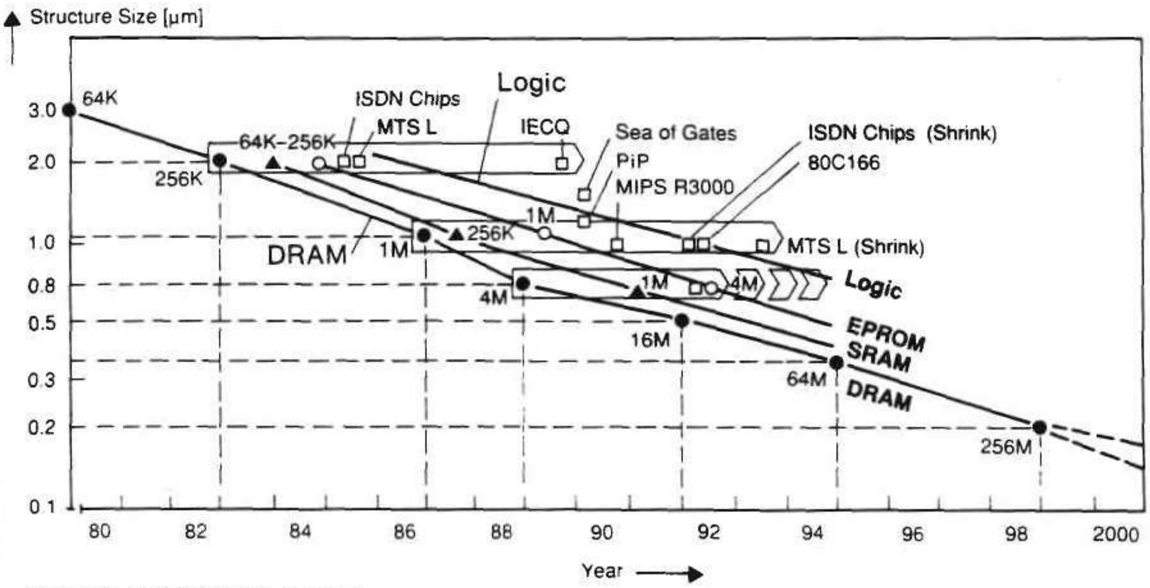
Source: In-Stat, Dataquest, Siemens

Market entrance of memory families and logic IC

HL Ltg

SIEMENS

▶ Logic ICs for advanced prototype systems reap the benefits of previous DRAM development... their volume production may trail DRAMs by 3...5 years



Source: In-Stat, Dataquest, Siemens

Market entrance of memory families and logic IC

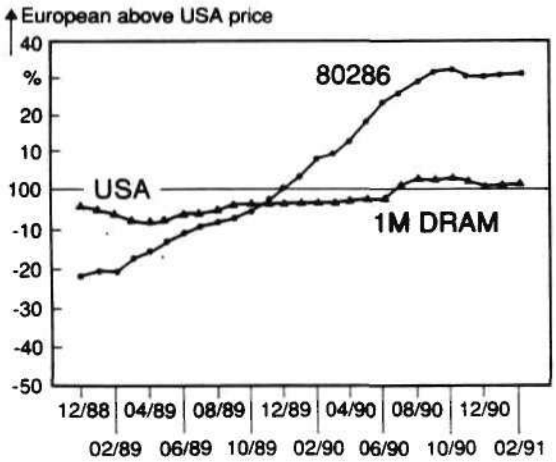
HL Ltg

SIEMENS

- Compared to the US, European ASPs for standard ICs appear to be higher...
- ... However, compared to Japan, European ASPs are clearly lower

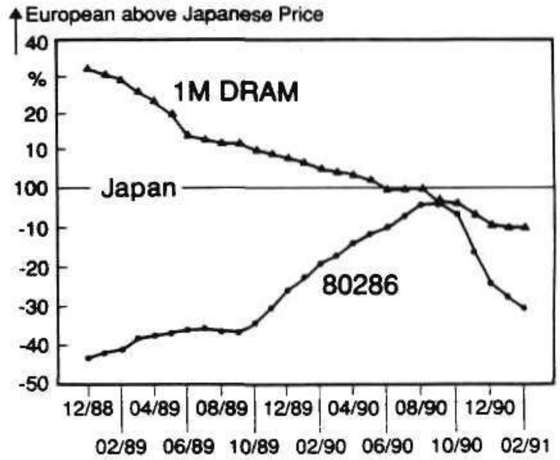
Europe vs. USA

12 Month Moving Average ($-based)
(> 20K units)



Europe vs. Japan

12 Month Moving Average ($-based)
(> 20K units)

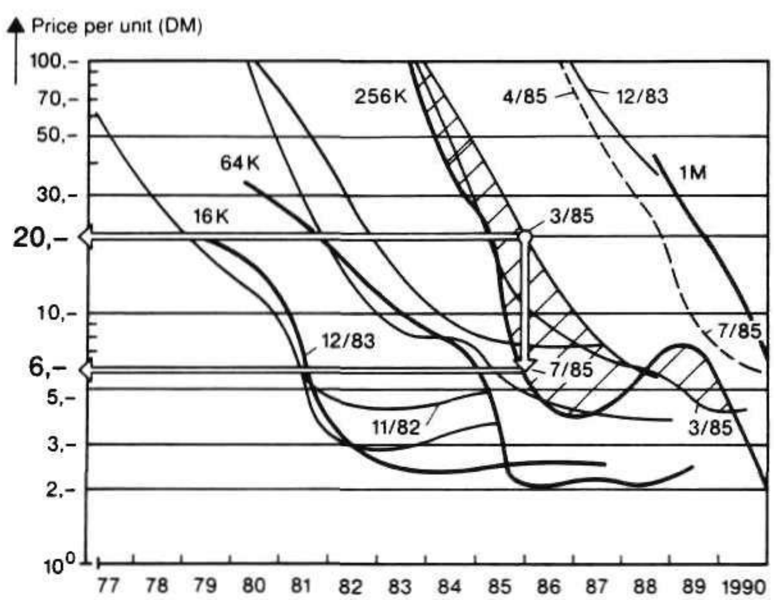


Source: Dataquest

Price trends of standard products: Europe vs. USA and Japan

HL Ltg.

SIEMENS



Example: 256K revenue difference

40 Mio. units p.a.
x 14 DM/unit
x 70% Fixed cost

= 400 Mio. DM/p.a.

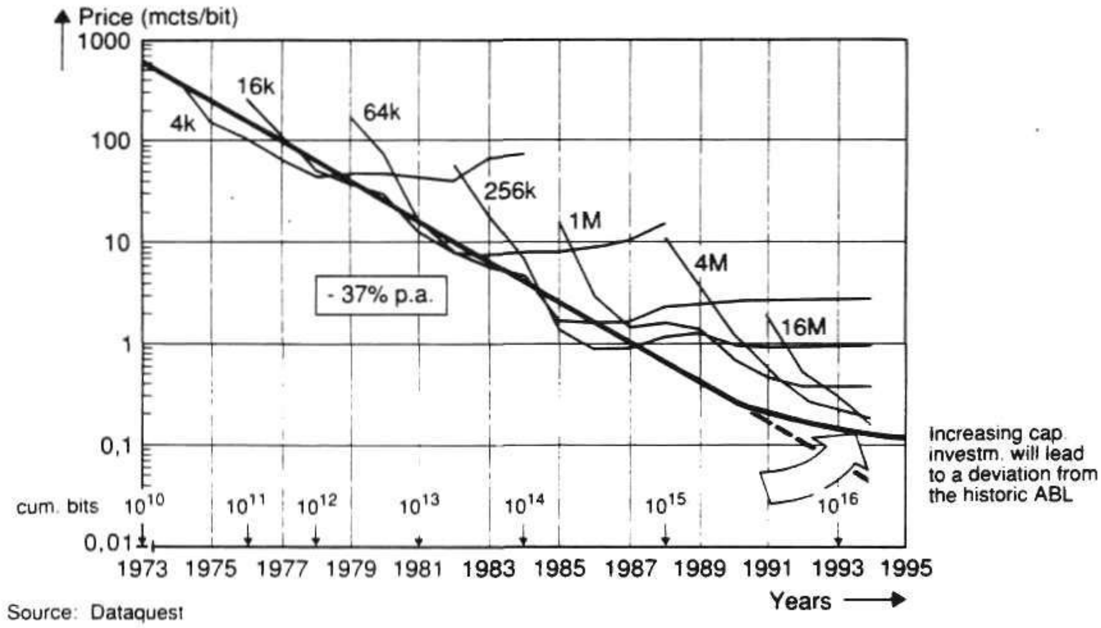
Source: Dataquest/Siemens

Peculiarities of DRAM price development

HL Ltg

SIEMENS

- In the past; the price per bit of each DRAM generation approached an envelope trend line representing the Average Bit-price-Line (ABL)
- The slope of this ABL suggested a continuous decrease of the average bit price: -37% p.a.

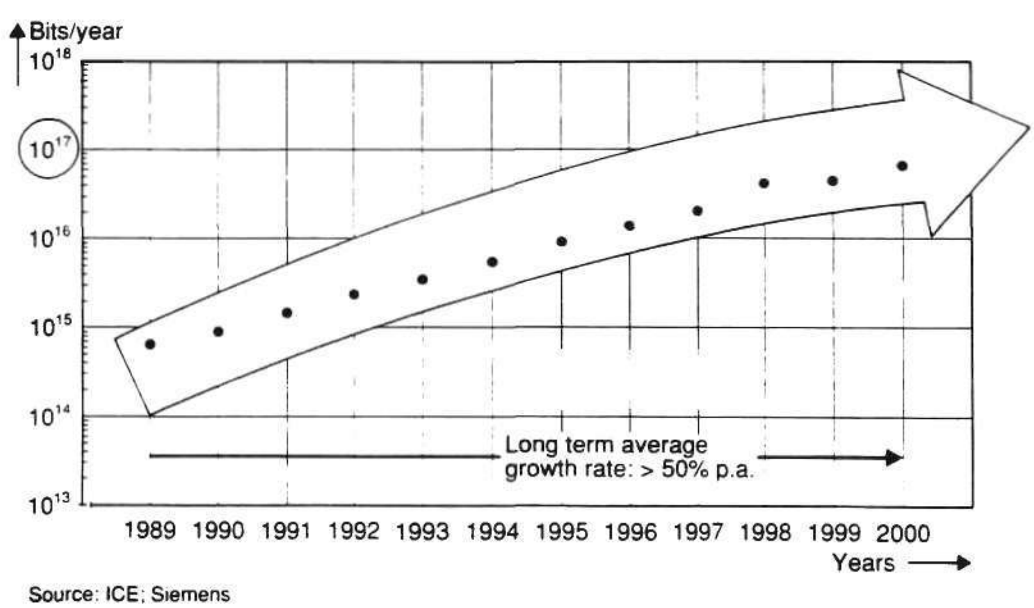


Average Bit-price Line (ABL): millicents/bit

HL Ltg

SIEMENS

- The worldwide DRAM bit consumption will come close to 10^{17} bits towards the end of this century ... based upon extrapolation ... growing approximately at a rate of 50% per annum

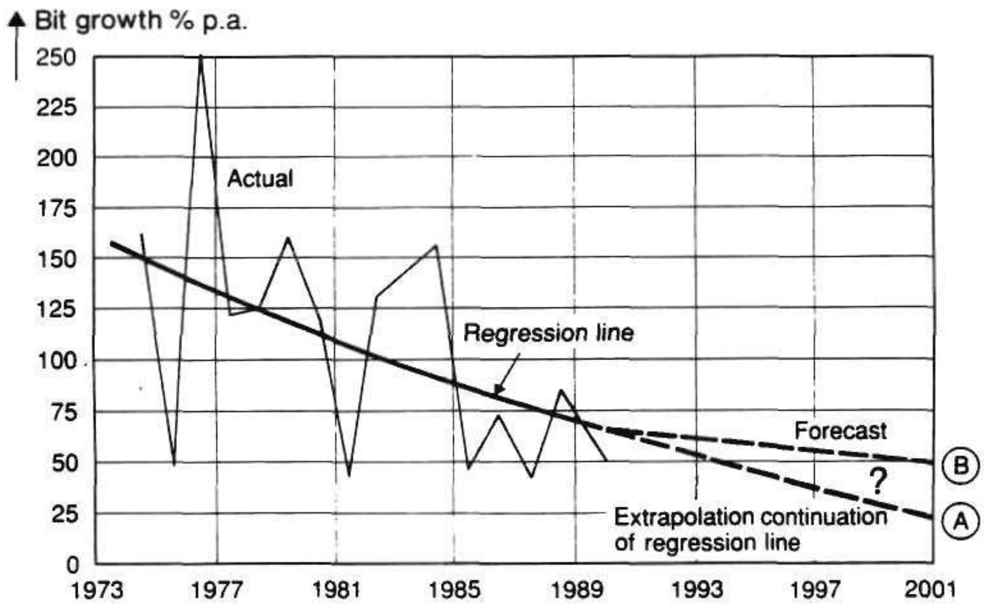


DRAM market development in bits/year

HL Ltg

SIEMENS

- The annual growth rate of worldwide bit consumption fluctuates considerably around a falling trend line



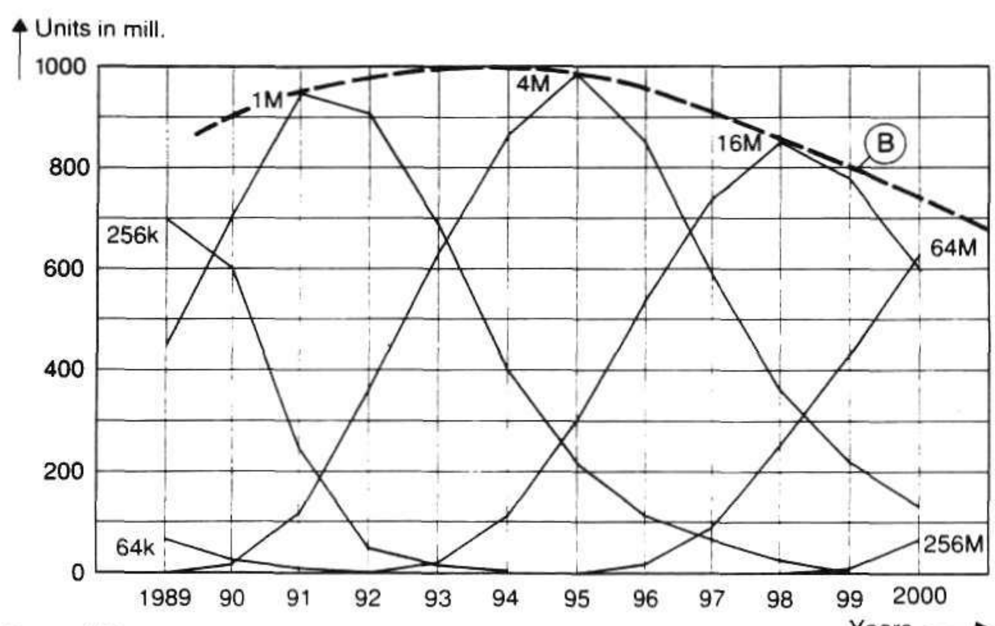
Source: Siemens

Annual growth rates of bit consumption

HL Ltg.

SIEMENS

- The DRAM-generations are forecast to appear following a 3 year cycle
- ... with peaks eventually decreasing



Source: ICE

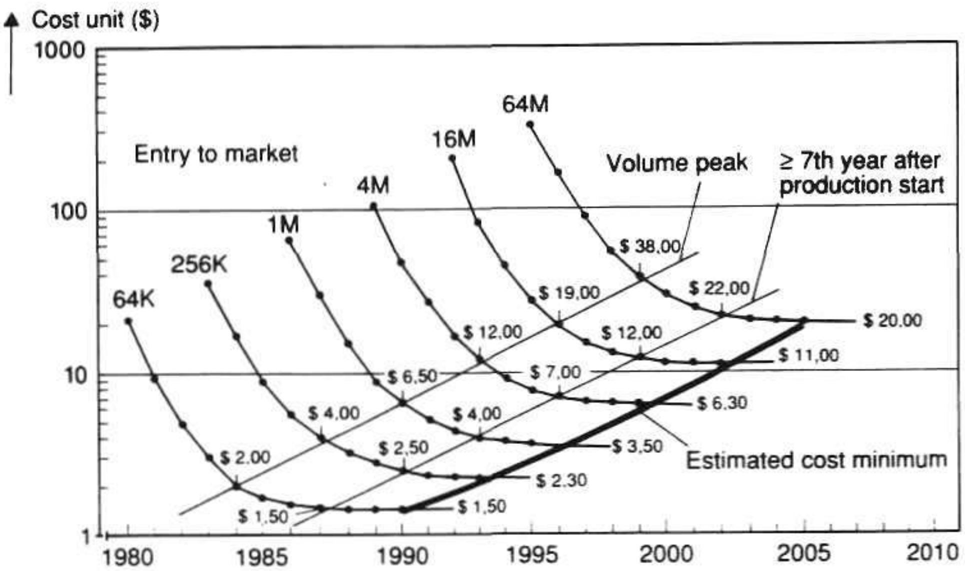
Forecast of the DRAM market (units, millions)

HL Ltg

SIEMENS

▶... Like hardly any other industry - semiconductors
- offer exponential performance improvements
- eat up exponentially more resources
- become increasingly expensive in production

... and yet sell at sharply decreasing price per function



DRAM: Estimated cost per unit per generation

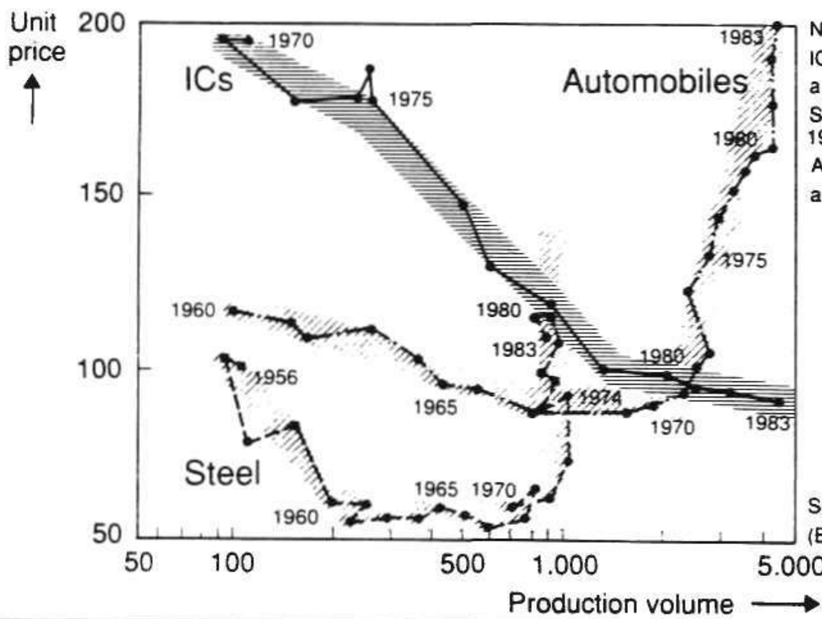
(4 mill. units/month)

HL Ltg.

SIEMENS

▶ Where as other industries like steel and automobiles succeded in rising their price-production curves...

... the semiconductor industry continues to offer steeply increasing functionality at steeply declining prices



Note:
ICs – 1970 volume = 100;
a unit price of ¥ 200 = 100;
Steel –
1956 volume and unit price = 100;
Automobiles – 1960 volume = 100;
a unit price of ¥ 500 = 100

Source: Nomura Research Institute (Based on MITI data); 1985

Changes in average IC production and unit price

HL Ltg

Profit Through the Silicon Cycle:
The Next Ten Years

SEMICONDUCTOR STRATEGIC ALLIANCES AND INVESTMENT TRENDS IN THE '90s

Hideharu Egawa
Senior Vice President and
Director of the Board
Toshiba Corporation

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

This presentation was not available

at the time of publication

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

Dataquest

a company of
The Dun & Bradstreet Corporation

Profit Through the Silicon Cycle: The Next Ten Years

THE '90s: PROGRESSING INTO THE MARKETING PHASE OF MICROELECTRONICS

Pasquale Pistorio
President and Chief Executive Officer
SGS-Thomson Microelectronics Group

Dataquest Europe Limited, a company of The Dun & Bradstreet Corporation
Roussel House, Broadwater Park, Denham, Uxbridge, Middx UB9 5HP / 0895 835050 / Tlx 266195 / Fax 0895 835260

THE '90s: PROGRESSING INTO THE MARKETING PHASE OF MICROELECTRONICS

Pasquale Pistorio
President and Chief Executive Officer
SGS-Thomson Microelectronics Group

Mr. Pistorio was appointed President and Chief Executive Officer of SGS-Thomson Microelectronics, the Semiconductor Group jointly formed by SGS and Thomson Semiconductors, in May 1987, having previously been President and CEO of the SGS group. Before returning to Italy for this position, he had served with Motorola in Italy, in Geneva and In Phoenix, Arizona, latterly as Director of World Marketing, responsible for marketing and sales activities worldwide. Mr. Pistorio's early career was in the sales and distribution of Motorola products. Mr. Pistorio graduated in Electrical Engineering from the Polytechnic of Turin was a master's degree in Electronics.

Dataquest Europe Limited
EUROPEAN SEMICONDUCTOR INDUSTRY CONFERENCE
May 29–31, 1991
Marbella, Spain

SGS-THOMSON
MICROELECTRONICS

THE '90s: PROGRESSING INTO THE MARKETING PHASE OF MICROELECTRONICS

presented by

PASQUALE PISTORIO

President and C.E.O.
SGS-THOMSON Microelectronics Group

at
Dataquest European Semiconductor Industry Conference
May 29-31 - Marbella, Spain

Ladies and gentlemen,

in 1982, one year after Dataquest began semiconductor market research in Europe, I spoke at the inauguration of a new design center in Grafing, Germany. At that time I said that I believed the technological and manufacturing science phases of our industry would be followed by a third phase, that of marketing where close customer/supplier relationships would be paramount.

Today with buzz words like "customers service", "total customer satisfaction", "customer driven design", etc, I don't think there can be any doubt that the third phase is in full swing and is certainly customer oriented.

What is more, from personal experience I can tell you that it works to the benefit of those companies willing to put themselves in a condition to take advantage of it.

It's not by chance that SGS-THOMSON has continued to grow faster than the market even though we chose not to be in the sector which, in this decade, has contributed most to growth -- that is to say DRAMS. What we have got, though, is a leading position in dedicated devices over the whole spectrum of semiconductor technologies and applications.

And just in case you are worried that this is going to be no more than a company presentation, I promise you here and now, that was the one and only time I'll mention my company's name.

In fact, to say what I want to say about Progressing Into the Marketing Phase of Microelectronics, I won't have time for any unnecessary diversions.

So let's start straight away by asking what will be so special about the marketing phase? We've all been marketing our products for as long as we can remember, haven't we?

Of course the answer is yes, we, as an industry, have been marketing our products, and I underline our products. That is to say the products we have made because we believe they are needed. And I must add that up to now we have done it very successfully.

Even if in doing so, particularly in the area of leading edge commodities, e.g. memories, we have created problems for ourselves that are becoming increasingly difficult to manage -- the high capital costs for manufacturing and the astronomical costs of R&D coupled with increasingly shorter recoupment times being some of the worst.

Compound these factors with the traditional boom/bust cycles of our industry and it starts to look like it may be time to change the way we have been working.

In the past our marketing could be described as technology driven commodity marketing. That is to say we all raced to develop a new technology. And then we raced to produce a new generation of commodity products and get them to market before our competition.

All this is fine, but the negative aspect of this sort of vicious cycle is it caters essentially to markets and not customers. That is to say that the exploitation of the very expensive technology is essentially aimed towards commodities and its full potential is not realized at the level of system integration where both our customers and ourselves could get maximum application benefits and economic pay-backs.

I certainly believe that technology will always remain a significant factor in the success of any semiconductor manufacturer. However I am certain that the overwhelming importance we placed on it in the past has to be balanced by other, equally important aspects.

I believe, in fact, that the evolution of the semiconductor industry has already seen two distinct phases. Firstly technology in which essentially basic silicon technology was the dominant factor, shaping the industry and determining the success or failure of a semiconductor company.

However already in the middle seventies a second phase was taking shape in as much as another aspect began to have more importance than technology. Technology was still essential but now it had become a condition to play since all the major players had technology. Now the industry was being shaped by those companies able to exploit their technologies with the right products, at the right price, at the right quality with the right timing. In other words those companies able to exploit their technologies with a world class manufacturing machine. It was in this second phase that the Japanese took the lead over the Americans and this second phase was dominant all through the eighties and is still very important.

Now I think we are already moving to a third phase in the evolution of the semiconductor industry's history in which technology will still be important, a condition without which one cannot play, manufacturing science a must without which one cannot play but what will shape-up the industry will be what I call the marketing phase.

If we look at our interaction with device users in the previous phase we see that, even if we have had a strong customer orientation, we have done no more than respond to immediate needs in as much as, in the main, we have aimed to get the commodity products that technology makes available onto the customers production line with the lowest possible cost of ownership.

That is to say the customer, by and large, has always had to build his application using the generic -- even if high-tech -- semiconductor devices that we make available.

While this has been acceptable in the past, as systems architectures become more complex so the cost and performance overheads of generic product solutions become more onerous.

To realize devices for these new and complex system architectures requires a completely new way of looking at the design of semiconductor devices.

It is no longer possible to meet the customer's needs simply by working in isolation to expand the bounds of technology.

In fact, the technologies we have today are capable of squeezing millions of transistors onto a single chip or integrating onto the same piece of silicon both small signal control and high power driving circuit. What is becoming more important is the rationality of the systems and architecture we integrate.

In other words we are looking not just at a whole new generation of products but also a whole new way of defining and designing them.

We, the semiconductor manufacturers are already having to increase our knowledge of application systems architectures and be prepared to create silicon architectures that become truly integral parts of the whole.

To realize these new architectures we are having to set up truly reciprocal interactions between the user and semiconductor industries.

What's more, as electronics moves into areas which have been traditionally electro-mechanical, they are encountering situations which just cannot be met through traditional standard commodity approaches.

And I think it is also worth mentioning that this includes areas other than pure silicon technology, like packaging techniques, where we have already seen significant advances through close interaction between the electronics application specialists and semiconductor engineers, to meet the specific demands of the user's environment.

So in reality we have a situation where to meet the current needs of our traditional customers we find ourselves more and more in the situation where we have to work in closer partnership. And the same applies to new and developing markets.

This need for close working relationships, I believe, is what will define the next phase of the industry. And it is exactly for this reason that I consider restrictive the definition of many people, including Dataquest in the promotional material for this conference, who define the coming phase as the customer service decade.

Of course customer service is important and any forward looking company, mine included, has "service" as one of its main strategies. But it is not enough.

It is certainly not enough from a purely competitive point of view.

Not least because as technology and manufacturing science mature so the advantages they give become equally available to everyone that has remained.

To remain in the game, the ability to reach six sigma quality capability will soon be seen as the norm. Manufacturers who cannot offer JIT and ship to stock will not just be second grade, they will be out of business. EDI will be common place, as is already total documentation support.

By the way, I don't want to say that all of these targets will be easy to reach, or that everyone will be able to reach them. It will require a tremendous amount of effort, a tremendous amount of cultural change in many western companies, a tremendous amount of investment in people and a tremendous amount of investment in equipment.

It is an enormous challenge that we are facing right now, and only those companies able to meet the challenge within the next couple of years will be able to remain in play as big broad range manufacturers. Only niche specialists that offer some peculiarity in technology or service can be forgiven for not reaching all the targets.

So therefore, when this new set of rules is established, the traditional concept of service from a business point of view is no longer a strategic differentiator, it is just part of the price you pay to play.

The next phase of the industry will be defined by our ability not just to give the customer the products we already have at the lowest price of ownership, with the very best of service, with all that implies but also by our ability to work with customers as partners and allies.

I used the words partners and allies here because I believe the next phase of the industry will have to go beyond the supplier/customer relationships that have been the norm up to now.

In the past, we in the semiconductor industry have been a lot like the old scribes. The poets of the electronics industry designed their electronic verse and we transcribed them into silicon.

The marketing phase will go beyond this. It will no longer be enough for a systems manufacturer to define that unique set of specifications he requires to meet his application needs and then pass them over to the semiconductor design engineer who, using whichever technology he has available, will turn them into integrated circuits.

This serial method of communication is not only slow, it is limiting in the amount of information it transmits and offers very little scope for cross- disciplinary pollination.

The successful products of the nineties will be marked equally by the efficiency in which the silicon is used to meet application needs and by the speed in which the idea is translated into readily available devices.

This need for better communication between the supplier and the customer and higher levels of trust, along with the obvious need for faster product development are the main driving forces towards the creation of alliances.

The very cornerstone of success and competitiveness is the reciprocal trust between the semiconductor manufacturer and the systems manufacturer.

Users have to be willing to say where they are heading for not just today but also tomorrow and the day after. And that same level of openness will be required from the semiconductor manufacturer towards the systems manufacturer. Obviously this is a tremendous article of faith and is only possible between companies who have built up special relationships over many years of close cooperation.

The design cycle, whether it is initiated by the systems or the semiconductor manufacturer will have to be a joint venture right from the very moment of inception with cooperative internal as well as external marketing determining the limits and potentials of the end product and the tools and technologies available to realize it.

Beyond this, however, the marketing phase will be characterized by its people content. True communication is not only between committees or design teams. True communication, in the final analysis, has got to be between people on a one to one basis. And this I believe is an important element which will contribute to the success of any alliance.

So, essentially, during the marketing phase of our industry the successful companies will be those who are able to create working alliances with the necessary high levels of trust, corporate dialogue and person-to-person communications.

In short the ones who are able to forge trusting partnerships and alliances with their intellectual, cultural, commercial and technological equals.

Whether this can be done on a global level by all of today's players is yet to be seen. That it has to be done is beyond doubt.

Japanese industry, by its very vertically integrated nature has long been experiencing a form of the marketing phase, though limited to their corporate structure. However the role requirements for interactions within a single culture, single corporate structure are very different from those required for multi-cultural, multi-corporate alliances.

To begin with there is the trust factor I mentioned previously -- how readily will a European or American computer peripheral manufacturer, for example, entrust his corporate plans to a semiconductor manufacturer who is an integral part of a group with other companies in direct competition to his own?

And even if there is not the question of conflict of interest, there is still the question of cultural differences. Today the Japanese industry has such a commanding presence simply because of the way they have exploited their cultural environment.

The Japanese work ethic and attitude to long term low cost capital are the very characteristics needed to put into place and maintain highly efficient production machines. But will they be able to find the flexibility to react to the needs of a less closely defined work environment which will, in all probability characterize the customer/user interface of the alliances we are talking about.

Furthermore, perhaps because of their vertically integrated nature, the Japanese semiconductor manufacturers have not put a great deal of effort into the establishment of design centers in either America or Europe, apart from the semicustom shops which are not really relevant in this context. And this in itself will prove to be a limiting factor -- at least to begin with -- in the establishment of the personal one-to-one engineering contacts needed to oil the wheels of smooth running alliances.

Finally there is the question of global reciprocity. Even if a Japanese semiconductor manufacturer is able to set up close working alliances with European or American electronics manufacturers, what are the chances that the flow of end products will be two-way, that is to say will the western end-products find the sort of market in Japan that Japanese systems could expect to find in the west? Unless there is this reciprocity then all we are talking about is yet another insidious form of industrial colonization -- and I believe many people here know my views on that!

Western manufacturers on the other hand have a lot of things going for them as we move into the marketing phase of the industry.

First and foremost, there is the fact that within the western market for electronic systems, which accounts for 70% of the world total, there are no major cultural differences. Of course we are not all the same but I don't think that the fact an English man insists on calling orange jam marmalade or that Americans insist on defining a legalized form of warfare as football, makes much difference when it comes to establishing good and easy working relationships.

Here our values, if not identical are close enough to be acceptable amongst us all.

Western manufacturers are also less constricted by vertical integration, although of course some semiconductor manufacturers are part of Japanese-like wide ranging, global corporations. What is more the trust factor has already to a large extent been addressed since western systems and semiconductor manufacturers have been working together for years -- even if at a level of supplier/customer rather than ally or partner.

When it comes to design centers, there is no doubt that the more forward looking western manufacturers have been committed to design centers for many years now.

Any western semiconductor manufacturer worth its salt has design centers not just in America and Europe but also in Asia.

This means that we have a good start when it comes to putting into place the infrastructures needed by the alliances that will characterize the industry in the coming decade.

Finally, I don't think there is any doubt that the western markets have a more open philosophy to imports of systems than those in Japan. Here in particular, national cultural characteristics are as important as governmental philosophies.

Western consumers are notably lacking in patriotic tendencies when it comes to the purchase of any sort of equipment -- be it electronic, photographic or mechanical. If it is the right product then it doesn't matter if it comes from Tokyo or Timbuktu.

So alliances between western semiconductor manufacturers and systems manufacturers from anywhere in the world can be built not just on the sharing of know-how and resources, but also on truly reciprocal trade opportunities.

Up to now I have talked about Japan and the west, obviously for many people here there is a more specific area of interest -- Europe. In particular, I am sure that it would be interesting to examine how Europe can profit from the opportunities offered by the opening of the marketing phase.

And let me say that probably the most important opportunity offered by the opening of the next phase in our industry's development will be that the balance of power in the electronics and semiconductor industries could be, to some extent redistributed.

The new phase as I have already said will encourage more partnerships and strategic alliances rather than short term supplier/customer agreements.

And this in itself has certain implications which will push Europe's industry further towards the consolidation I have mentioned so many times in the past.

If companies are to work as allies and partners it is necessary for both players to be of sufficient size to have the inherent command of resources -- in terms of know-how, manpower, finances and markets -- needed to contribute significantly to the common goal.

Small specialist companies will simply not have the spread of resources and talents needed to withstand the investments or meet the various cross disciplinary challenges. Of course I am not saying that small companies will not survive, indeed in my scenario there will be a mass of small companies serving niche markets and these companies will have their part to play in the marketing phase.

However I believe they will be expected to play a more passive role probably as preferred suppliers rather than allies, offering very specific services and talents and picking up at the same time the relatively small but still significant and satisfying benefits.

This means, from Europe's point of view, if we are not to be condemned to a subservient role, that we have to do everything possible to ensure we have an indigenous semiconductor presence of sufficient scale to be attractive to global players in the electronics market.

This means Europe needs to create at least one "national" champion -- and by "national" I mean European, in the field of semiconductors with the dimensions required to be a profitable, solid top ten world player. And we all know that none of today's big three Europeans have a suitable dimension of scale.

But fortunately they have the technological, manufacturing and marketing capabilities from which to spring to the desired dimension of scale through a combination of corporate industrial actions and of European sponsored cooperative programs, of which JESSI is a good example.

The opening of the marketing phase, the changed awareness of semiconductor users, the understanding of strategic needs by European Public Authorities and, last but not least, the progress made in the past five years by the European semiconductor industry, all represent a favorable set of circumstances that, if properly exploited, can open up new perspectives for the entire European electronics sector.

To conclude, let me repeat again briefly the key points of this address.

1) The semiconductor industry has seen three distinct phases: the technology phase, the manufacturing phase and now it is progressing into the marketing phase.

2) The technology phase was dominated by the Americans because this phase was consistent with the socio-economical environment of the US. The manufacturing phase, from the mid seventies to today, has been dominated by the Japanese because this phase was consistent with the socio-economic environment of Japan. The new marketing phase opens up many new opportunities to western manufacturers, and Europe in particular, because of its new requirements.

3) All aspects of the previous two phases will remain eminently present in the third phase. What I mean is that even today, technology remains as an essential entry stake as is manufacturing science. However either alone or together, they will not be enough to win during the marketing phase.

4) The marketing phase will be characterized not only by superior customer service which already will pose a dramatic challenge in the requirements for zero defect products and zero problem services but also will require very critical forms of strategic alliances between user and makers.

5) Europe can hope to profit from this phase, redistributing the balance of electronics and microelectronics in the world. A precondition to the success of this, however, is that at least one world class semiconductors manufacturer with sufficient dimensions of scale is created in Europe. None of the present three big players have this dimension, even if each one of us has the essential characteristics in technology, marketing and manufacturing to be the starting point.

Europe needs a strong microelectronics industry if it is to succeed in the entire electronics sector and even to survive as an industrial world force. With the opening of the marketing phase we are being given an opportunity to re-conquer our former position on the world market.

Ladies and gentlemen, thank you.

Dataquest

a company of
The Dun & Bradstreet Corporation