Asian Semiconductor and Electronics Technology Industry Conference

December 7, 1987
Asiaworld Plaza Hotel
Taipei, Taiwan, ROC

Dataquest

a company of
The Dun & Bradstreet Corporation

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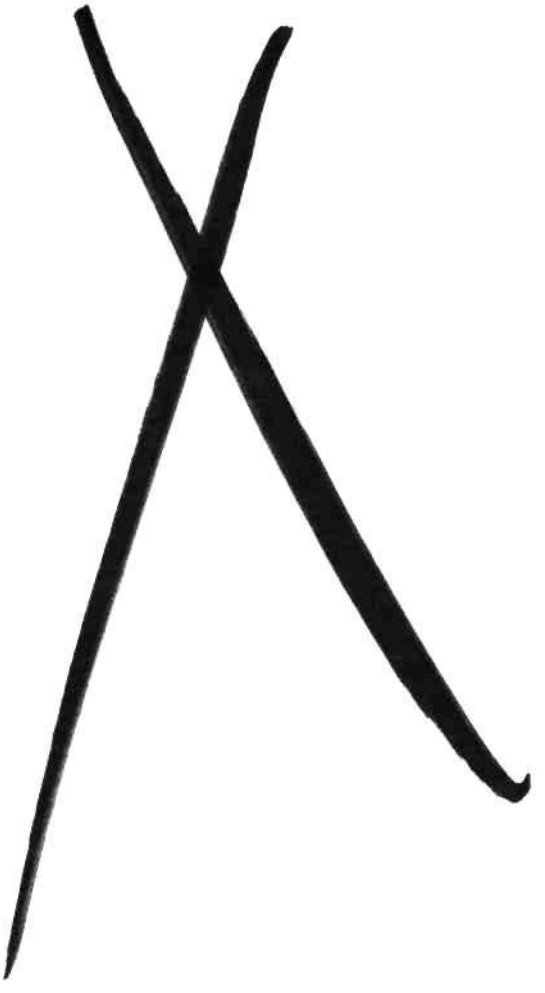

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1987 ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY INDUSTRY CONFERENCE

The Three Asian Ty's: Responsibility, Opportunity, and Compatibility

December 7, 1987

SUNDAY, December 6

4:00 p.m.	**Registration**
6:00 p.m. to 8:00 p.m.	**Cocktail Reception**

MONDAY, December 7

7:00 a.m.	**Registration Continues**
8:45 a.m.	**Welcome** Jim Riley Senior Vice President Dataquest Incorporated
9:00 a.m.	**The Three Asian Ty's** Tom Wang Associate Director Asian Semiconductor and Electronics Technology Service Dataquest Incorporated
9:15 a.m.	**World Semiconductor Outlook** Gene Norrett Corporate Vice President and Division General Manager Components Division Dataquest Incorporated
9:45 a.m.	**Asian Semiconductor and Electronics Status** Tom Wang Dataquest Incorporated
10:15 a.m.	**Coffee Break**
10:30 a.m.	**Korean Semiconductor Prospects for the 1990s** Dr. Y.S. Kim Vice President Samsung Semiconductor and Telecommunications Co., Ltd.
11:00 a.m.	**Entering the Asia/Pacific VLSI World** Robert H.C. Tsao President United Microelectronics Corporation
11:30 a.m.	**Asia/Pacific Influence on the 1990s Electronics Industry** Chung-Ding Tam Vice President and General Manager Motorola Inc.
12:15 p.m.	**Lunch**
1:00 p.m.	**Luncheon Speaker** Dr. K.T. Li Minister without Portfolio ROC
2:00 p.m.	**The Development of the Electronics Industry in ROC** W.S. Lin President Tatung Co.

(over)

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2:30 p.m.	**Telecommunications—The Emerging Market in Asia** Dr. P. June Min Senior Managing Director R&D and Business Development Group GoldStar Semiconductor, Ltd.
3:00 p.m.	**32-Bit PC Opens a New Era in Asia** Stan Shih President Multitech Industrial Corp.
3:30 p.m.	**Coffee Break**
4:00 p.m.	**Twenty Years Experience in Asia Pacific** Antony Watts Director of Strategic Planning—Asia Pacific SGS Semiconductor (Pte) Ltd.
4:30 p.m.	**Catching the Asian Electronics Wave** Jim Healy President Trillium/LTX Co.
4:30 p.m.	**The Need to Protect Intellectual Property and Patent Rights** Roger D. Severance Director, Pacific Basin Office International Trade Administration United States Department of Commerce
5:00 p.m.	**Closing Remarks** Tom Wang Dataquest Incorporated
5:30 p.m.	**Cocktails**
6:30 p.m.	**Gala Farewell Dinner and Entertainment**
8:30 p.m.	**Adjourn**

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ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY INDUSTRY CONFERENCE EVALUATION QUESTIONNAIRE

Taipei, Taiwan, ROC
December 7, 1987

Thank you for attending our Asian Semiconductor and Electronics Technology 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)
Riley, Welcome			
Wang, The Three Asian Ty's			
Norrett, World Semiconductor Outlook			
Wang, Asian Semiconductor and Electronics Status			
Kim, Korean Semiconductor Prospects for the 1990s			
Tsao, Entering the Asia/Pacific VLSI World			
Tam, Asia/Pacific Influence on the 1990s Electronics Industry			
Lin, The Development of the Electronics Industry in ROC			
Min, Telecommunications—The Emerging Market in Asia			
Shih, 32-Bit PC Opens a New Era in Asia			
Watts, Twenty Years Experience in Asia/Pacific			
Healy, Catching the Asian Electronics Wave			
Severance, The Need to Protect Intellectual Property and Patent Rights			

2. At our next conference, would you prefer to hear more, less, or the same of the following types of speakers:

	More	Less	The Same
Dataquest Speakers			
Speakers from large semiconductor/electronics companies			
Speakers from small semiconductor/electronics companies			
Speakers from semiconductor users			
Speakers from distributors			

3. Please suggest other types of speakers you might like to hear: _____

4. How would you rate the conference facilities (1 to 10)?

Location _____ Guest Rooms _____ Meals _____ Meeting Rooms _____

(over)

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5. Topics that would be of interest to you for the next ASETS conference: _____

_____

_____

_____

6. Comments: _____

_____

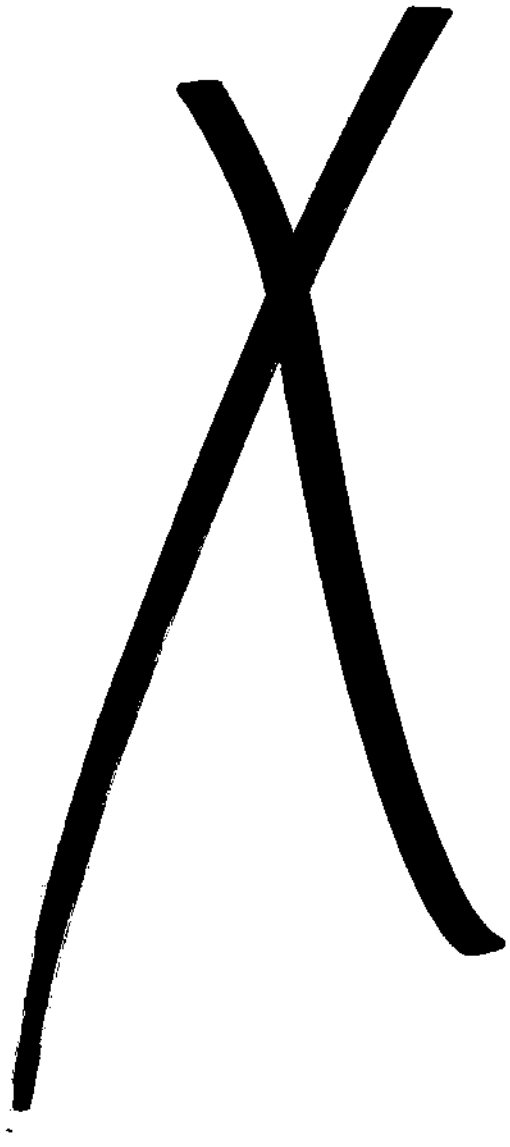
_____

_____

7. Your primary interest in the semiconductor industry is as a:

Manufacturer: _____ User: _____ Other _____
(Please specify)

_____
Name and Company (Optional)



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ASIAN SEMICONDUCTOR & ELECTRONICS TECHNOLOGY INDUSTRY CONFERENCE
December 06 through 07, 1987
Taipei, Taiwan, ROC

Final List of Attendees

Jamie Bai	IBM Taiwan
Mike Ballard	Advanced Micro Devices, Inc.
Tzek-Yaa Bin	ERSO
Peter Chan	NCR Corporation
Tim Chan	LTX Corporation
Andy Chang	United Microelectronics Corporation
C. H. Chang	ERSO
H. J. Chang	Daewoo
Lung-Chung Chang	ERSO
Ming-Chein Chang	ERSO
Rebecca R. Chang	AT&T
S. S. Chang	Proton Semiconductor
Scott Chang	LTX Corporation
Wade Chang	Industrial Technology Research Institute
Benson Chao	Industrial Technology Research Institute
Arthur Chen	Motorola, Inc.
C. H. Chen	ERSO
Debbie Chen	World Journal
H. H. Chen	Commonwealth
J. B. Chen	Taiwan Semiconductor Mfg. Co.
Robin Chen	Industrial Technology Research Institute
S. H. Chen	Hitachi Elect. Components (Asia) Ltd.
S. J. Chen	ERSO

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S. M. Chen	Taiwan Semiconductor Mfg. Co.
Swan Chen	United Microelectronics Corporation
Tony Chen	NEC Corporation
Y. S. Chen	ERSO
David Cheng	Orient
Jin-Her Cheng	ERSO
Sha-Li Chi	Dataquest Incorporated
L. W. Chian	ERSO
Richard Chiang	VLSI Technology, Inc.
Gary Chien	ICI Taiwan Ltd.
Chia-Chi Chin	ERSO
C. H. Chiu	Bank of Communication
Chun Chiu	Integrated Device Technology, Inc.
Tom Chiu	LTX Corporation
Sung Yoll Choe	Samsung Semiconductor & Tele. Co., Ltd.
Robert Christensen	Asian Sources
Bi-Shu Chu	ERSO
Richard Chuang	Tsar & Tsai
Wei-Hsiung Chuang	ERSO
Roger Chung	United Microelectronics Corporation
Jim Currier	NCR Corporation
Bau-Tong Dai	ERSO
James E. Dykes	Taiwan Semiconductor Mfg. Co.
Peter Fan	Super King
K. C. Goh	LTX Corporation

Bob Goldsmith	Motorola, Inc.
Jan Lucas N. Hagreis	Philips Components (Philippine), Inc.
Steven Hanley	Wilson, Sonsini, Goodrich & Rosati
Jim Healy	Trillium
C. S. Ho	Mitac, Inc.
Chun Ho	Vitelic Corporation
Dr. Irving T. Ho	Institute for Information Industry
Richard Hong	Melco Taiwan Co., Ltd.
Dave Housego	The Financial Times
Stanley Hsu	San Fu
John Hsuan	United Microelectronics Corporation
Yean-Shan Hu	ERSO
David Huang	AIT
Hyley Huang	United Microelectronics Corporation
Miss Huang	Hot Line
Steve Huang	Harris Far East Ltd.
C. B. Hwang	Melco Taiwan Co., Ltd.
K. Igarashi	Kawasaki Steel Corporation
K. Ishii	Kawasaki Steel Corporation
Mei-Li Jen	Executive Yuan
Charles Jeng	Mitac, Inc.
Der-Ye John	ERSO
Borje Junestrand	Ericsson Telecom
Cecilia C. Kamman	Dataquest Incorporated
Richard W. Kamman	Dataquest Incorporated
Taik H. Kim	Hyundai Electronics America

Hirose Kotonao	Unizon Technology Pie Ltd.
Peter Ku	GI
Eric Kuo	National Semiconductor Corporation
Macro Kuo	Talent
E. Kurakazu	Melco Taiwan Co., Ltd.
Ed Lai	NCR Corporation
Henry Lai	NCR Corporation
Steven Lau	National Semiconductor Corporation
J. O. Lee	Daewoo
J. S. Lee	LTX Corporation
Tih-Ming Lee	ERSO
Philip Leung	Advanced Micro Devices, Inc.
Kenneth E. Leymeister	Dow Chemical Japan Limited
Choh H. Li	SIPA
Shiu-Yuang Liang	ERSO
Alex Liaw	Texas Instruments, Inc.
Patrick Lim	NCR Corporation
Ben Lin	NDC
C. L. Lin	Taipeitop
Chun-Liang Lin	Bank of Communication
Clement Lin	Mitac, Inc.
David Lin	Infopro
Jing-Ming Lin	ERSO
John Lin	San Fu
K. T. Lin	ERSO

Mrs. W. S. Lin	Tatung Company
Peter Lin	LTX Corporation
Shy-Ming Lin	ERSO
Tsung-Hsiang Lin	ERSO
W. S. Lin	Tatung Company
Craig A. Lindahl	NCR Corporation
Ing-Dar Liu	United Microelectronics Corporation
Philip Liu	CENS
T. H. Liu	ERSO
Miss Lo	Hot Line
Rong-Weng Lo	ERSO
Andrew Lu	IBM Taiwan
Teddy Lu	Multitech Industrial Corporation
C. L. Lue	ERSO
W. H. Lue	ERSO
Joe Lung	Dataquest Incorporated
Jerry Lynch	Advanced Micro Devices, Inc.
Chris Marut	AIT
Jim McGregor	Asian Wall Street Journal
P. June Min	GoldStar Semiconductor, Ltd.
Coe-Yen Nee	MRL
Gene Norrett	Dataquest Incorporated
Robert W. Osborn	Eaton Corporation
Peggy Pan	Information & Computer
Jim Riley	Dataquest Incorporated

Tadahiko Sakata	Kavasho
Michinori Sawai	Hitachi Research Institute
Roger D. Severance	U.S. Department of Commerce
Carol Sheen	Super King
Yeou-Taur Shen	ERSO
Jiin-Ming Shieh	ERSO
Albert Shih	Motorola, Inc.
Chintay Shih	ERSO
Stan Shih	Multitech Industrial Corporation
Hitoshi Shirai	Hitachi Research Institute
Peter Solomon	RAMAX Limited
J. H. Son	Dataquest Incorporated
Li-Ping Su	MOS Electronic Taiwan Inc.
Vincent Sung	ERSO
K. Takitani	Kawasaki Steel Corporation
Chung-Ding Tam	Motorola, Inc.
Y. S. Tang	Tatung Company
Alan G. Tapley	Victorian Investment Corporation
Hiroshi Tatejima	Dataquest Japan, Ltd.
Steve Terng	Uniform Industries
C. C. Tsai	Taiwan Semiconductor Mfg. Co.
H. L. Tsai	San Fu
Ming-Kai Tsai	United Microelectronics Corporation
Robert H.C. Tsao	United Microelectronics Corporation
Long-Haur Tsay	ERSO

B. L. Wang	Business Times
C. Wallace Wang	Hughes Aircraft Company
Fu-Ching Wang	ERSO
Shirley Wang	AIT
Steve Wang	United Microelectronics Corporation
Tom Wang	Dataquest Incorporated
Antony Watts	SGS Semiconductor (PTE), Ltd.
Eric Wei	SIPA
Jeff Winters	VLSI Technology, Inc.
James Wu	Super King
Max Wu	Sertek International Inc.
Tai-Kang Wu	ERSO
Tung-Hsiung Wu	Mitac, Inc.
Masahiro Yamane	Mitsubishi Electric Corporation
K. C. Yang	ERSO
Der-Chang Yeh	Executive Yuan
Sheridan S. Yen	Matrix Integrated Systems, Inc.
H. Yoshizawa	Melco Taiwan Co., Ltd.
Even Yu	Texas Instruments, Inc.
Miss Yu	Hot Line

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ASIAN SEMICONDUCTOR & ELECTRONICS TECHNOLOGY INDUSTRY CONFERENCE
December 06 through 07, 1987
Taipei, Taiwan, ROC

Final List of Attendees

AIT	David Huang Chris Marut Shirley Wang
AT&T	Rebecca R. Chang, Vice President
Advanced Micro Devices, Inc.	Mike Ballard, Director, Sales SE Asia Philip Leung Jerry Lynch, Director, SE Asia Sales
Asian Sources	Robert Christensen
Asian Wall Street Journal	Jim McGregor
Bank of Communication	C. H. Chiu, Banking Officer Chun-Liang Lin, Investment Department
Business Times	B. L. Wang
CENS	Philip Liu
Commonvealth	H. H. Chen
Daewoo	H. J. Chang, Executive Managing Director J. O. Lee, Assistant Manager
Dataquest Incorporated	Cecilia C. Kamman Richard W. Kamman Joe Lung Gene Norrett, Vice President & Director, SIG

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Dataquest Incorporated	Jim Riley, Senior Vice President J. H. Son, Manager, ASETS Tom Wang, Associate Director, ASETS Sha-Li Chi
Dataquest Japan, Ltd.	Hiroshi Tatejima, Marketing Manager
Dov Chemical Japan Limited	Kenneth E. Leymeister, Group Leader
ERSO	Tzek-Yaa Bin, Deputy Engineer C. H. Chang, Engineer Lung-Chung Chang, Engineer Ming-Chein Chang, Deputy Engineer C. H. Chen, Super Engineer S. J. Chen, Assistant Engineer Y. S. Chen, Vice Engineer Jin-Her Cheng, Engineer L. W. Chian, Vice Engineer Chia-Chi Chin, Deputy General Director Bi-Shu Chu, Assistant Engineer Wei-Hsiung Chuang, Deputy Engineer Bau-Tong Dai, Engineer Yean-Shan Hu, Deputy Engineer Der-Ye John, Deputy Engineer Tih-Ming Lee, Engineer Shiu-Yuang Liang, Deputy Engineer Jing-Ming Lin, Deputy Engineer K. T. Lin, Vice Engineer Shy-Ming Lin, Director Tsung-Hsiang Lin, Engineer T. H. Liu, Vice Engineer Rong-Weng Lo, Engineer C. L. Lue, Vice Engineer W. H. Lue, Vice Manager Yeou-Taur Shen, Deputy Engineer Jiin-Ming Shieh, Engineer Chintay Shih, Vice President & General Director Vincent Sung, Assistant Engineer Long-Haur Tsay, Assistant Engineer Fu-Ching Wang, Engineer Tai-Kang Wu, Engineer K. C. Yang, Vice Engineer
Eaton Corporation	Robert W. Osborn, Asia Pacific Manager

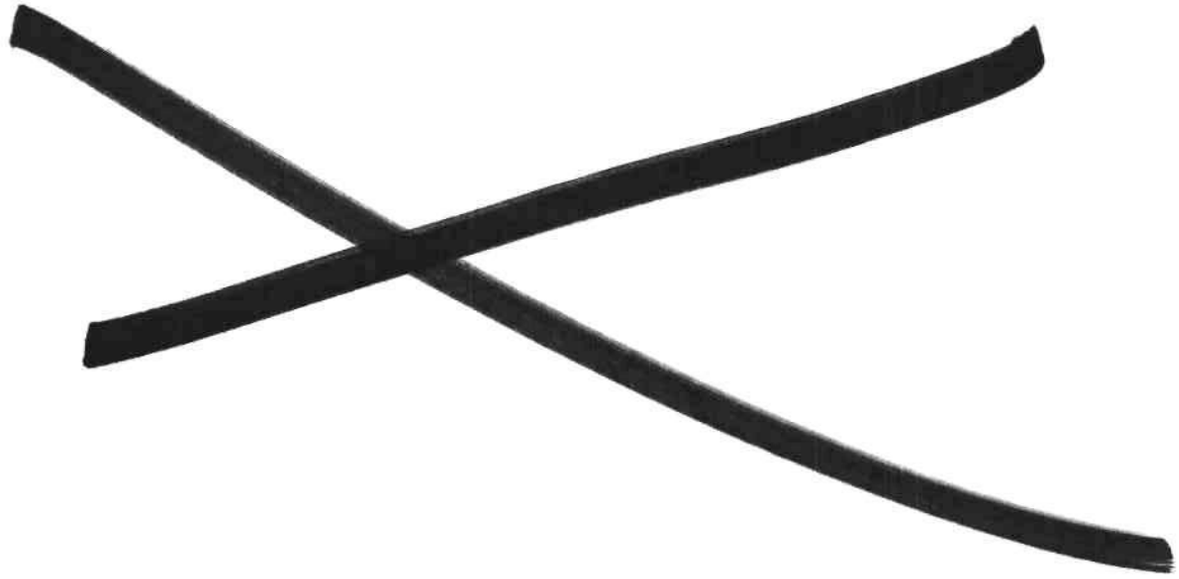
Ericsson Telecom	Borje Junestrand, Purchasing Manager, Electronic Components
Executive Yuan	Mei-Li Jen, Director Der-Chang Yeh, Researcher
GI	Peter Ku, Test Engineer Manager
GoldStar Semiconductor, Ltd.	P. June Min, Senior Managing Director
Harris Far East Ltd.	Steve Huang, Manager
Hitachi Elect. Components (Asia) Ltd.	S. H. Chen, Assistant General Manager
Hitachi Research Institute	Michinori Sawai Hitoshi Shirai, Researcher
Hot Line	Miss Huang Miss Lo Miss Yu
Hughes Aircraft Company	C. Wallace Wang, Manager, Equipment Engineering
Hyundai Electronics America	Taik H. Kim, Senior Vice President
IBM Taiwan	Jamie Bai Andrew Lu
ICI Taiwan Ltd.	Gary Chien, Business Development Specialist
Industrial Technology Research Institute	Wade Chang Benson Chao, Director Robin Chen, Associate Researcher
Infopro	David Lin

Information & Computer	Peggy Pan
Institute for Information Industry	Dr. Irving T. Ho, President
Integrated Device Technology, Inc.	Chun Chiu, Director, Far East Business Development
Kawasaki Steel Corporation	K. Igarashi, General Manager K. Ishii, Manager K. Takitani, Manager
Kawasho	Tadahiko Sakata
LTX Corporation	Tim Chan, General Manager, Asia-Pacific Scott Chang, Regional Sales Manager, Taiwan Tom Chiu, Product Manager, Hong Kong K. C. Goh, Regional Sales Manager, Singapore J. S. Lee, Regional Sales Manager, Korea Peter Lin, Applications Manager, Taiwan
MOS Electronic Taiwan Inc.	Li-Ping Su, President
MRL	Coe-Yen Nee, Assistant, General Dr.
Matrix Integrated Systems, Inc.	Sheridan S. Yen, Asian Marketing Manager
Melco Taiwan Co., Ltd.	Richard Hong, Assistant Manager C. B. Hwang, Assistant Manager E. Kurakazu, Manager H. Yoshizava, Vice President
Mitac, Inc.	C. S. Ho, President Charles Jeng, Special Assistant Clement Lin, Product Manager Tung-Hsiung Wu
Mitsubishi Electric Corporation	Masahiro Yamane, Deputy Manager, Marketing & Product Planning Department

Motorola, Inc.	Arthur Chen, Regional Marketing Manager Bob Goldsmith, Marketing Director Albert Shih, Manager Chung-Ding Tam, Vice President & General Manager
Multitech Industrial Corporation	Teddy Lu, Assistant Vice President Stan Shih, President
NCR Corporation	Peter Chan, Manager Jim Currier, Director, Corporate Purchasing Ed Lai, Manager, Taiwan Supply Office Henry Lai Patrick Lim Craig A. Lindahl, Market Research Manager
NDC	Ben Lin
NEC Corporation	Tony Chen, Manager
National Semiconductor Corporation	Eric Kuo, Industry Marketing Director Steven Lau, Regional Technical Manager
Orient	David Cheng
Philips Components (Philippine), Inc.	Jan Lucas N. Hagreis, International Marketing Manager
Proton Semiconductor	S. S. Chang
RAMAX Limited	Peter Solomon, Executive Director
SGS Semiconductor (PTE), Ltd.	Antony Watts, Director, Strategic Planning

SIPA	Choh H. Li, Director General Eric Wei, Director
Samsung Semiconductor & Tele. Co., Ltd.	Sung Yoll Choe, Director
San Fu	Stanley Hsu, Director John Lin, Manager H. L. Tsai
Sertek International Inc.	Max Wu
Super King	Peter Pan, Deputy Manager Carol Sheen, Special Assistant James Wu, Deputy Manager
Taipeitop	C. L. Lin, President
Taiwan Semiconductor Mfg. Co.	J. B. Chen, Deputy Manager S. M. Chen, Manager James E. Dykes, President & Chief Executive Officer C. C. Tsai, Marketing Manager
Talent	Macro Kuo, Executive Vice President
Tatung Company	W. S. Lin, President Mrs. W. S. Lin Y. S. Tang, Professor
Texas Instruments, Inc.	Alex Liaw Even Yu, System Marketing Specialist
The Financial Times	Dave Housego, Editor
Trillium	Jim Healy, President
Tsar & Tsai	Richard Chuang

U.S. Department of Commerce	Roger D. Severance, Director, Pacific Basin
Uniform Industries	Steve Terng, Manager
United Microelectronics Corporation	Andy Chang, Strategic Marketing Manager Swan Chen, Marketing Planning Manager Roger Chung, Computer Product Manager John Hsuan, Vice President Hyley Huang, Plant Director Ing-Dar Liu, Vice President Ming-Kai Tsai, R&D Director Robert H.C. Tsao, President Steve Wang, Marketing Director
Unizon Technology Pie Ltd.	Hirose Kotonao, Managing Director
VLSI Technology, Inc.	Richard Chiang Jeff Winters, Managing Director, Far East
Victorian Investment Corporation	Alan G. Tapley, Managing Director
Vitelic Corporation	Chun Ho, Vice President & General Manager of Taiwan
Wilson, Sonsini, Goodrich & Rosati	Steven Hanley
World Journal	Debbie Chen



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THE THREE ASIAN TY'S

Tom Wang
Associate Director
Asian Semiconductor and Electronics Technology Service
Dataquest Incorporated

Mr. Wang is Associate Director of Dataquest's Asian Semiconductor and Electronics Technology Service. He is responsible for strategic research of the semiconductor and electronics industries of Korea, Taiwan, Hong Kong, Singapore, China, India, and other parts of Asia. Prior to joining Dataquest, Mr. Wang was employed at National Semiconductor as Applications Manager and Market Research Manager. Earlier, he worked as a Project Leader designing multibus controller boards, I/O processor boards, and computer architecture at several systems houses. He also taught graduate courses at San Jose State University. Mr. Wang received B.S.E.E. and M.S.E.E. degrees from National Cheng Kung University in Taiwan, an M.S.E.E. degree from San Jose State University, and an M.B.A. degree from Golden Gate University in San Francisco. He has also completed courses toward a Ph.D. at the University of California at Berkeley. In addition, he has published a textbook and 26 technical papers and is fluent in Mandarin, Cantonese, and Taiwanese.

Dataquest Incorporated
ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY SERVICE
December 7, 1987
Taipei, Taiwan, ROC

The Three Asian Ty's: Responsibility, Opportunity, and Compatibility

Asian Semiconductor and Electronics Technology Industry Conference

TOM WANG

Associate Director

Asian Semiconductor and Electronics Industry Service

Dataquest Incorporated

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THE THREE ASIAN TY's

- Responsibility
- Opportunity
- Compatibility

RESPONSIBILITY

Emergence and Growth
of Offshore Assembly Plants

- Product sharing for labor-intensive, "back-end" production
- Minimal transportation costs
- Import duty on offshore value-added only
- Hedge risk of nationalization or natural disaster

RESPONSIBILITY

Emergence and Growth
of Indigenous Electronics Industry

- Years of experience in operating U.S. subsidiaries
- Enlightened curricula in scientific and engineering disciplines
- Foreign-educated engineers return to Asian homelands
- In situ plant and equipment

RESPONSIBILITY

Speakers

- ***Korean Semiconductor Prospects for the 1990s***
  Dr. Y.S. Kim
  Vice President
  Samsung Semiconductor and Telecommunications Co., Ltd.
- ***Entering the Asia/Pacific VLSI World***
  Robert H.C. Tsao
  President
  United Microelectronics Corporation
- ***32-Bit PC Opens a New Era in Asia***
  Stan Shih
  President
  Multitech Industrial Corp.

OPPORTUNITY

Economic Growth
Real GDP Growth Rates (%)

	1986	1987(E)	1988(E)
Taiwan	11.0	10.1	7.3
South Korea	12.4	11.1	8.0
Hong Kong	11.0	12.6	8.9
Singapore	1.9	6.9	5.5
China	8.0	9.7	9.1
Japan	2.4	2.5	3.0
United States	2.2	3.1	2.8
Europe	2.5	2.2	2.0

(E) indicates estimate

Source: Dataquest

OPPORTUNITY

High-Technology Business Opportunities

- Semiconductor manufacturing
- Semiconductor equipment and materials manufacturing
- Systems manufacturing
- Financial opportunities

OPPORTUNITY

Speakers

- ***Asia/Pacific Influence on the 1990s Electronics Industry***
  Chung-Ding Tam
  Vice President and General Manager, Asia Pacific
  Semiconductor Products Division
  Motorola Inc.
- ***Luncheon speaker***
  Dr. K.T. Li
  Minister without Portfolio
  ROC
- ***The Development of the Electronics Industry in ROC***
  W.S. Lin
  President
  Tatung Co.
- ***Telecommunications - The Emerging Market in Asia***
  Dr. P. June Min
  Senior Managing Director, R&D and Business Development Group
  Computer and Communications Sector
  GoldStar, Ltd.

COMPATIBILITY

Strategic and Technological
Alliances: Win-Win Situations

- Accelerates indigenous semiconductor industry growth
- Market access in the Pacific Rim
- Low-priced product fabrication, manufacturing, and assembly
- Billions of dollars in growth capital

COMPATIBILITY

Mutually Beneficial Trade Conduct

- Tariff reductions
- Protection of intellectual property
- Fair product pricing

COMPATIBILITY

Speakers

- ***Twenty Years Experience in Asia/Pacific***
  Antony Watts
  Director of Strategic Planning – Asia/Pacific
  SGS Semiconductor (Pte) Ltd.
- ***Catching the Asian Electronics Wave***
  Jim Healy
  President
  Trillium/LTX Co.
- ***The Need to Protect Intellectual Property and Patent Rights***
  Roger D. Severance
  Director, Pacific Basin Office
  International Trade Administration
  U.S. Department of Commerce

CONCLUSION

The three Ty's to guarantee the continuous growth of the Asian high-tech industry:

- Take responsibility
- Provide opportunity
- Enhance compatibility

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WORLD SEMICONDUCTOR OUTLOOK

Gene Norrett
Vice President
Director, Components Group
Dataquest Incorporated

Mr. Norrett is a Vice President of Dataquest and Director of its Components Group. In this capacity, he has direct responsibility for all U.S. research in that area and coordinates research based in Europe and Japan. Prior to becoming Components Group director, he founded Dataquest's Japanese Semiconductor Industry Service and was Acting Managing Director of Dataquest Japan K.K. Before joining Dataquest, Mr. Norrett spent 14 years with the Motorola Semiconductor Product Sector, serving in various marketing and management positions. He has traveled extensively in Japan, Taiwan, Korea, China, and Europe. Mr. Norrett's educational background includes a B.A. degree in Mathematics from Temple University and an M.S. degree in Applied Statistics from Villanova University. He has also taken graduate courses in Marketing at Arizona State University.

Dataqeust Incorporated
ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY SERVICE
December 7, 1987
Taipei, Taiwan, ROC

The Three Asian Ty's: Responsibility, Opportunity, and Compatibility

WORLD SEMICONDUCTOR OUTLOOK

GENE NORRETT
Corporate Vice President and Division General Manager
Components Division
Dataquest Incorporated

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CHIP INDUSTRY

- Same game
  - An overview of the current economic situation
- Different rules
  - An assessment of the changes that are affecting your business
- Looking ahead

SAME GAME - ECONOMICS

Estimated Revenue, Billions of Dollars

	1987	1990
World Manufacturing	$2,600.0	$2,800.0
World Electronic Equipment	$ 470.0	$ 600.0
World Semiconductor (incl. IBM, AT&T)	$ 42.5	$ 60.0
World Semiconductor Manufacturing Equipment	$ 5.8	$ 9.5

Source: Dataquest

SAME GAME - COMPETITION

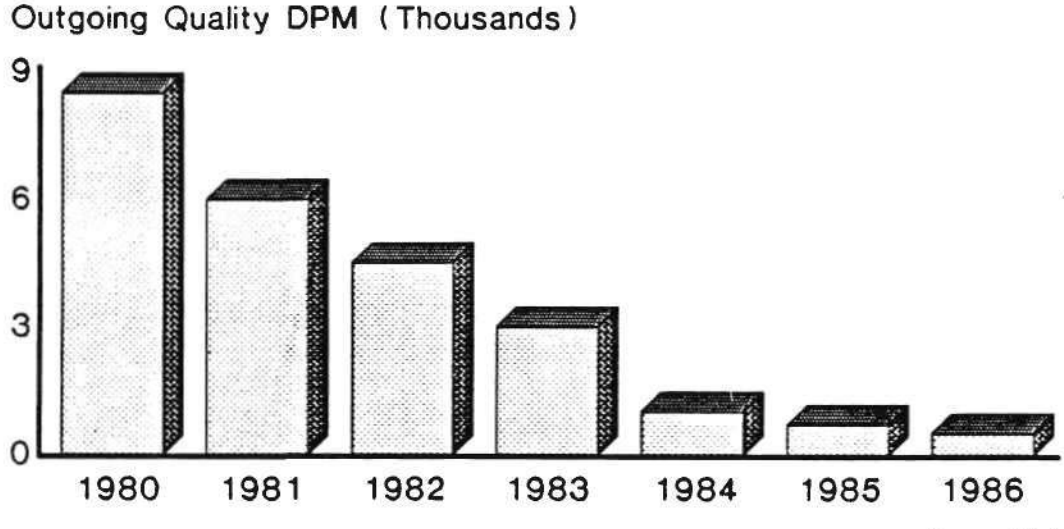
Worldwide Semiconductor Market Shares
(Millions of Dollars)

1986 Rank	1985 Rank		1985	1986	Percent Change
1	1	NEC	1,984	2,638	33.0%
2	4	Hitachi	1,671	2,305	37.9%
3	5	Toshiba	1,468	2,276	55.0%
4	2	Motorola	1,830	2,025	10.7%
5	3	Texas Instruments	1,742	1,781	2.2%
6	6	National/Fairchild	1,417	1,485	4.8%
7	7	Philips-Signetics	1,065	1,361	27.8%
8	9	Fujitsu	1,019	1,309	28.5%
9	10	Matsushita	906	1,204	32.9%
10	12	Mitsubishi	662	1,140	72.2%
11	8	Intel	1,020	991	(2.8%)
12	11	AMD/MMI	787	838	6.5%

Source: Dataquest

SAME GAME - QUALITY

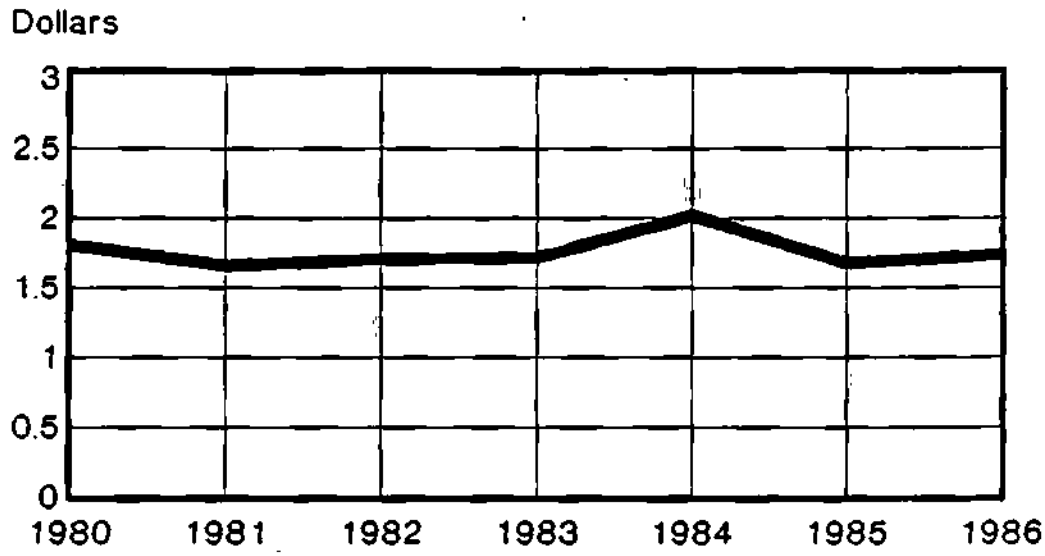
Component DPM Levels
(Customer Perceptions)



Source: Intel

SAME GAME - PRICES

Total MOS ASPs



Source: Dataquest

SAME GAME - APPLICATIONS

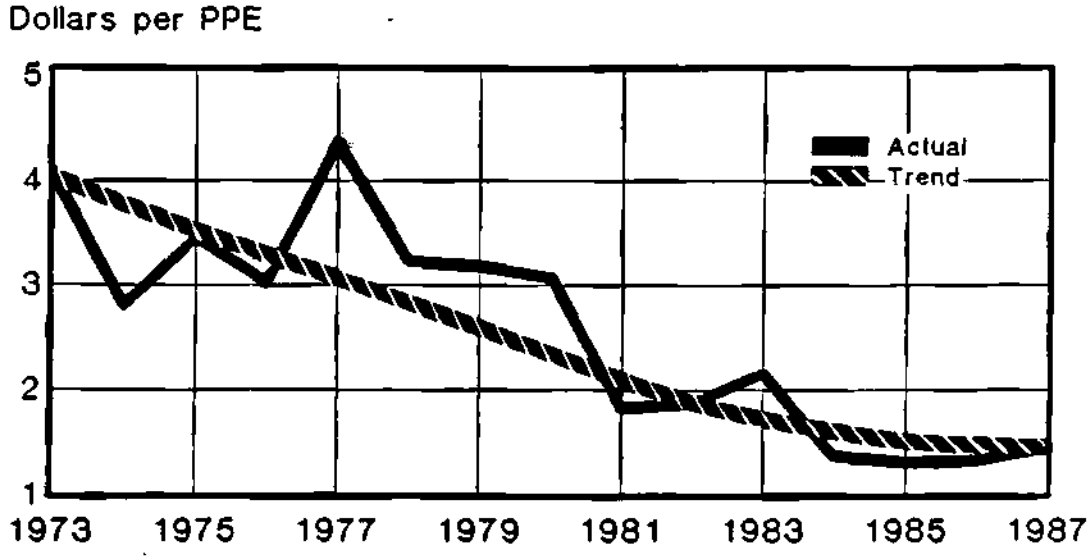
Percent of Region
1986

	Japan	U.S.	Europe	ROW
Data Processing	33.2	37.4	22.7	41.0
Communications	13.6	13.7	26.5	9.0
Industrial	11.2	20.9	16.8	2.0
Consumer	40.3	13.7	8.2	46.0
Military	0	8.3	16.3	0
Transportation	1.7	6.0	9.5	2.0
Total	100.0	100.0	100.0	100.0

Source: Dataquest

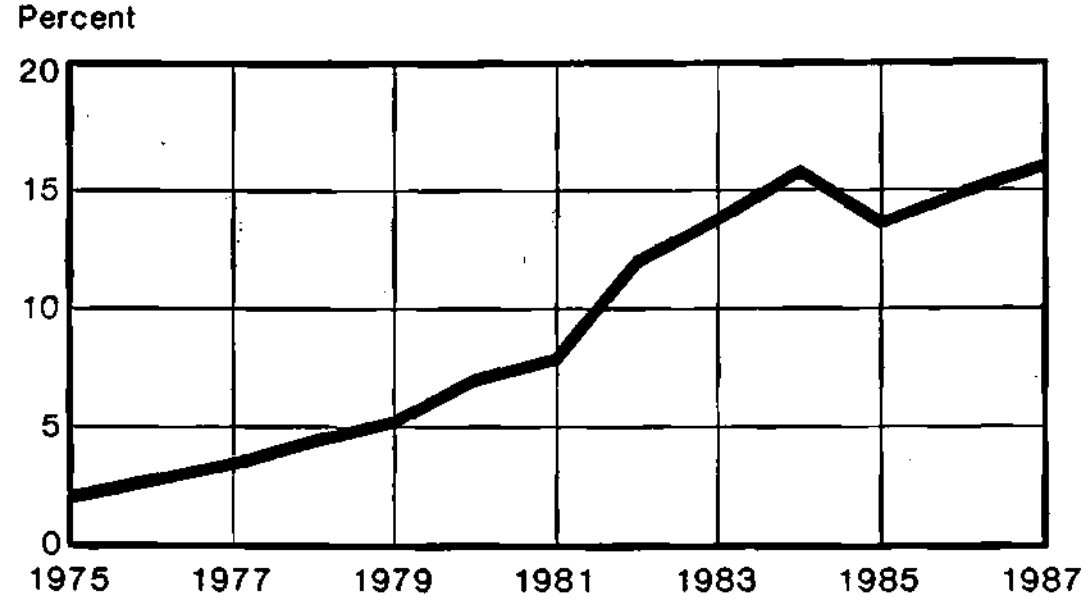
SAME GAME - RETURN OF CAPITAL

Revenue (T+1)/PPE



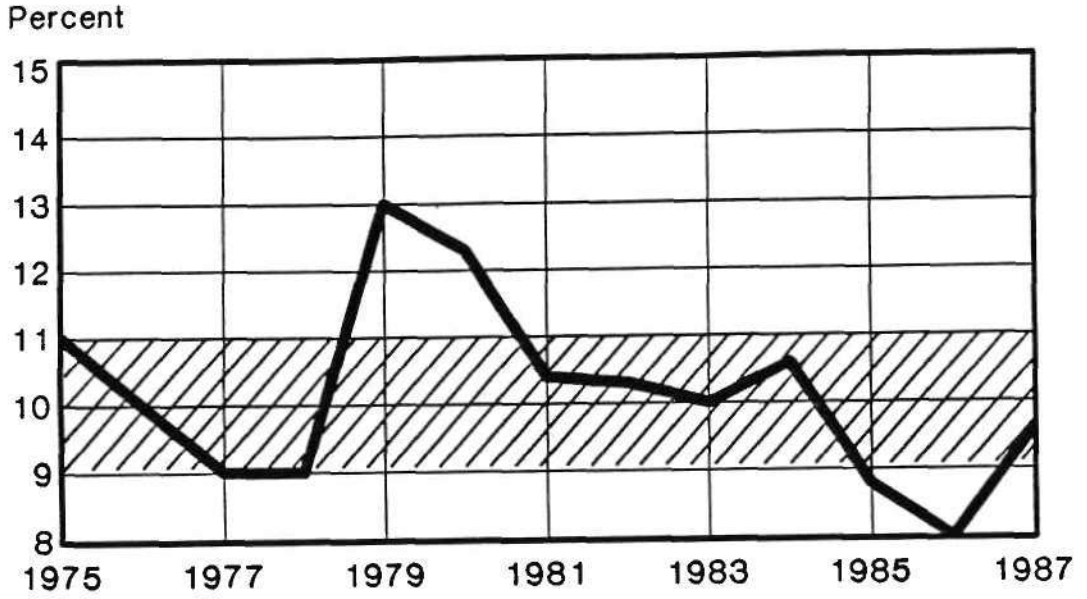
Source: Dataquest

JAPANESE SHARE OF U.S. MARKET

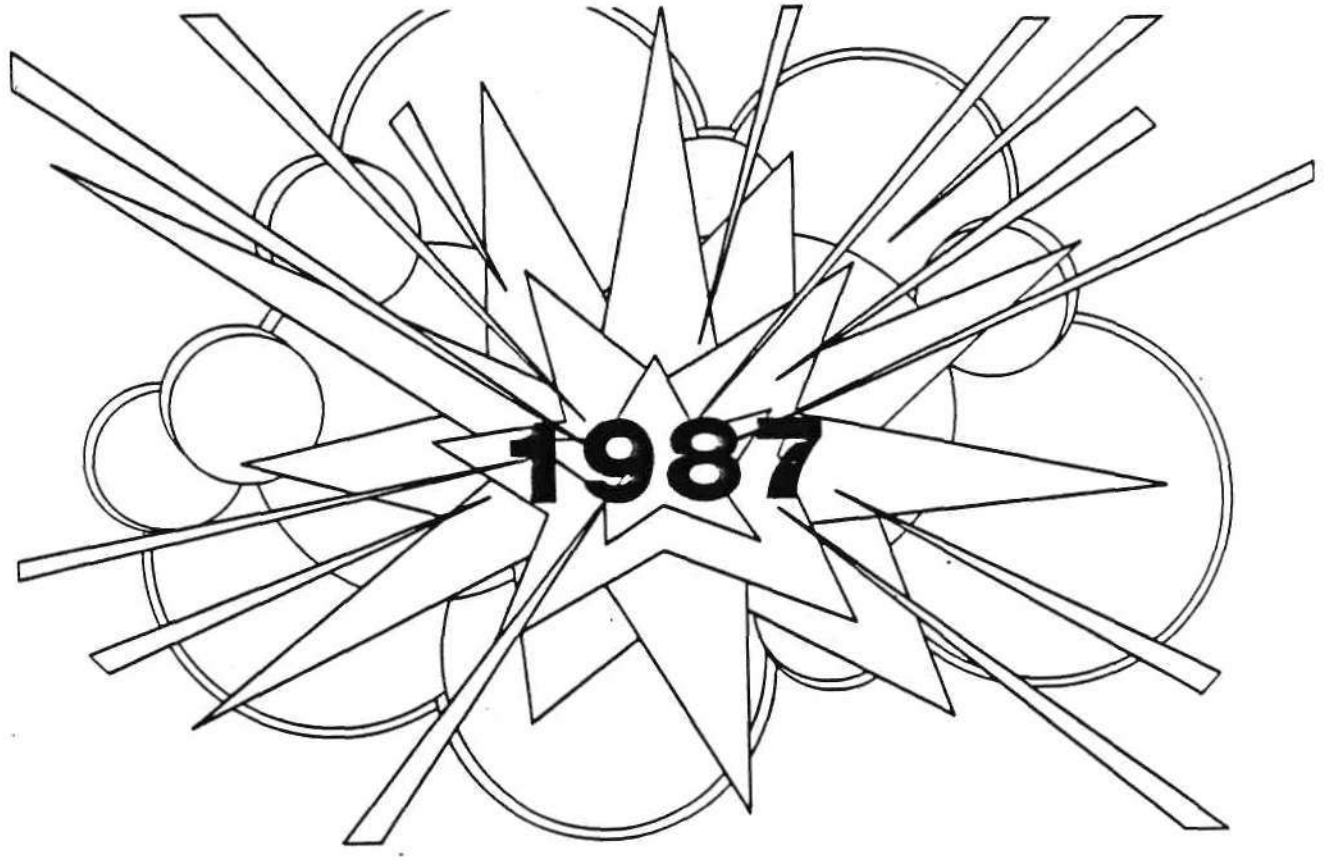


Source: Dataquest

U.S. SHARE OF JAPANESE MARKET

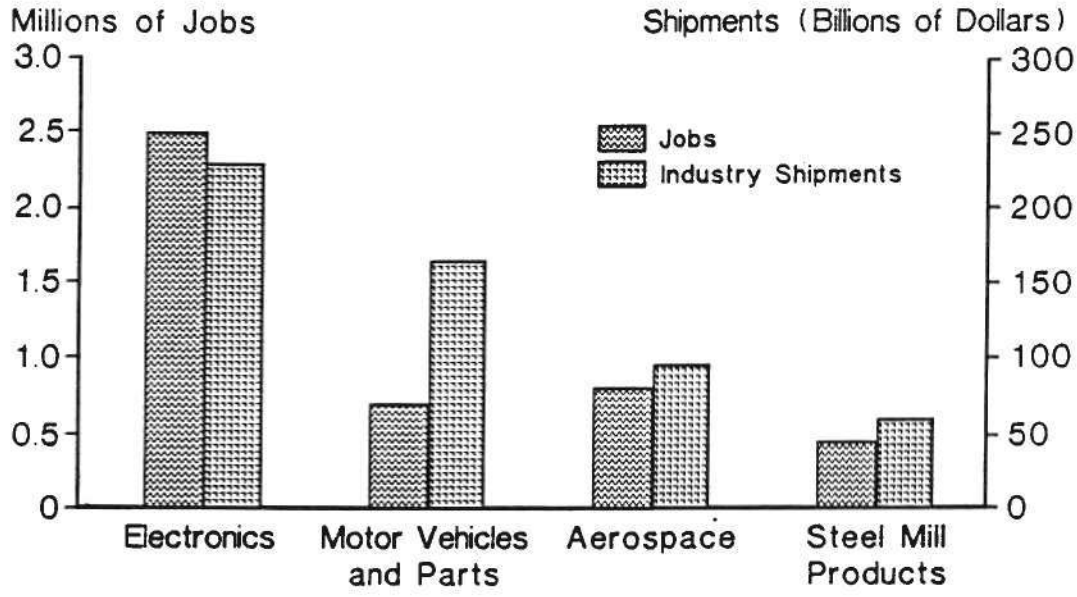


Source: Dataquest



DIFFERENT RULES - ELECTRONICS

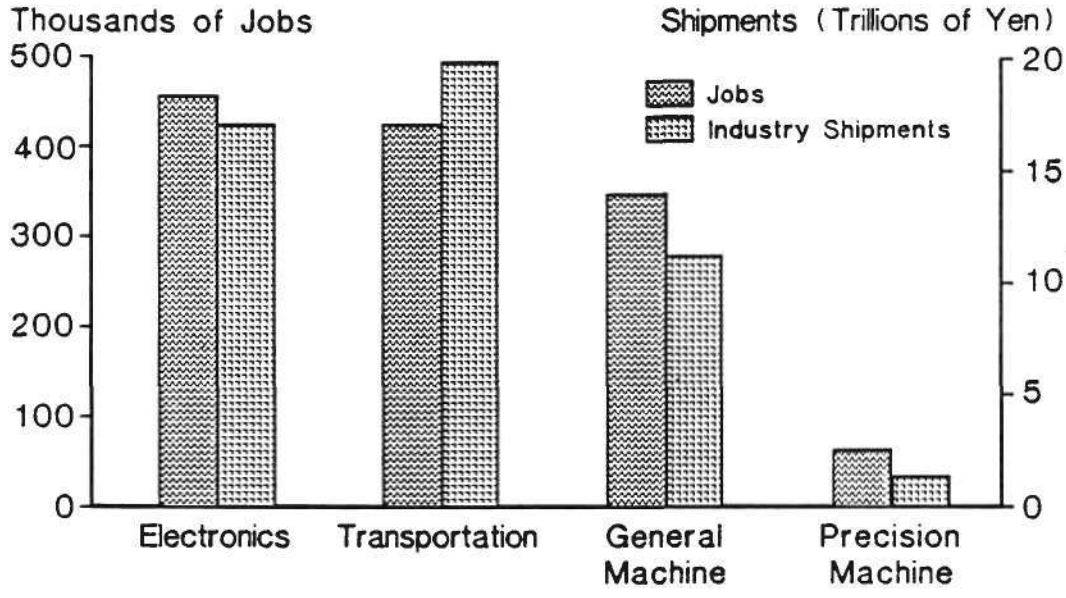
Electronics is America's Largest Industry



Source: National Semiconductor

DIFFERENT RULES - ELECTRONICS

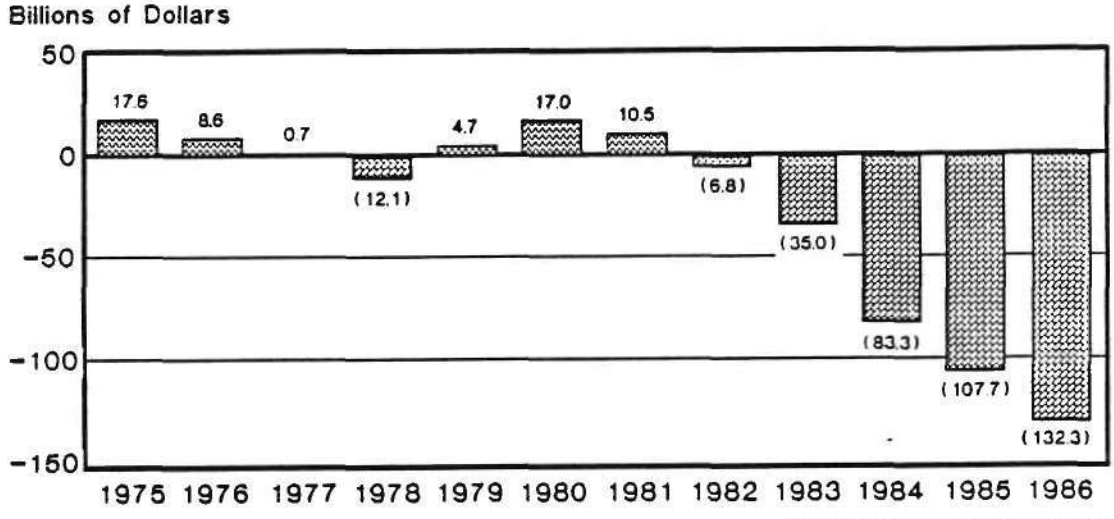
Electronics is Japan's Largest Industry



Source: MITI

DIFFERENT RULES - TRADE IMBALANCE

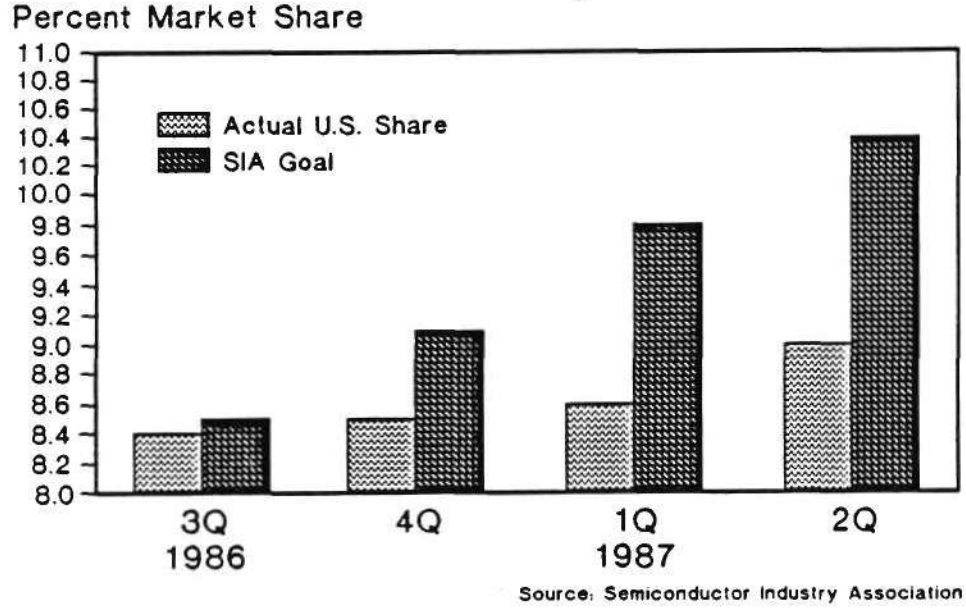
U.S. Manufacturing Trade Balance
1975 through 1986 (Est.)



Source: National Semiconductor

DIFFERENT RULES - TRADE AGREEMENT

Estimated Japanese Semiconductor Market Share



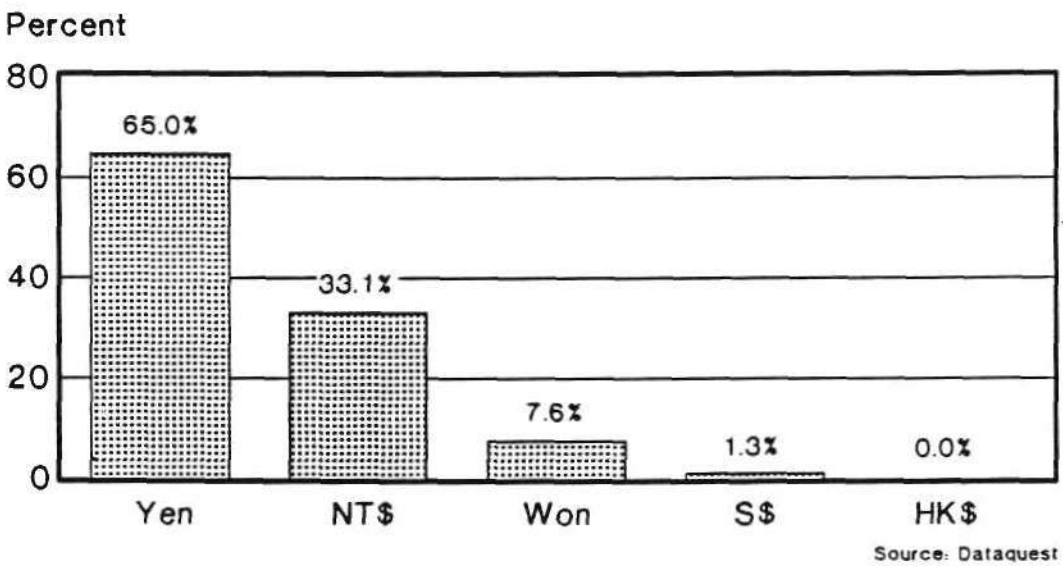
Source: Semiconductor Industry Association

DIFFERENT RULES - TARGETING SEMICONDUCTORS

- United States
  - Sematech
- Japan
  - VLSI projects
- Korea
  - VLSI projects
- Europe
  - Mega project
- Taiwan
  - ERSO

DIFFERENT RULES - CURRENCY

Appreciation against U.S. Dollar - 1985 to Present



Source: Dataquest

DIFFERENT RULES - IMPORTANCE OF ASIA

Estimated Semiconductor Market Growth
(Percent)

	1986	1987	1988
Korea	56	60	50
Taiwan	40	60	35
Hong Kong	43	65	40
Singapore	45	65	40
United States	6	20	23
Europe	17	17	19
Japan	44	14	21

Source: Dataquest

DIFFERENT RULES - MILESTONE LAWSUITS

Apple vs. Franklin
Whelan vs. Jaslow

Lotus vs. Paperback Software
MMI vs. Lattice/Altera
NEC vs. Intel
TI vs. Japanese chip makers
Intel vs. AMD

ROM software
Structural similarities in software
"Look and feel"
Patent infringement
Microcode copyright
DRAM patents
286/386 MPU

DIFFERENT RULES - PRODUCT SHIFT (ASICs)

Estimated Share of Total IC

	1986	1987	1990
Standard ICs	79%	78%	74%
ASICs	21	22	26
Total ICs	100%	100%	100%
Total (Billions of Dollars)	$23.6	$29.0	$41.0

Source: Dataquest

DIFFERENT RULES - NEW APPLICATIONS

- Minisuper PCs with voice recognition and 3D graphics
- Personal, satellite, and mobile communications
- Home control and entertainment system
- Biometric security systems
- 16-bit MPUs for engine management
- Integrated printers, facsimile, copier, data processing, and modems

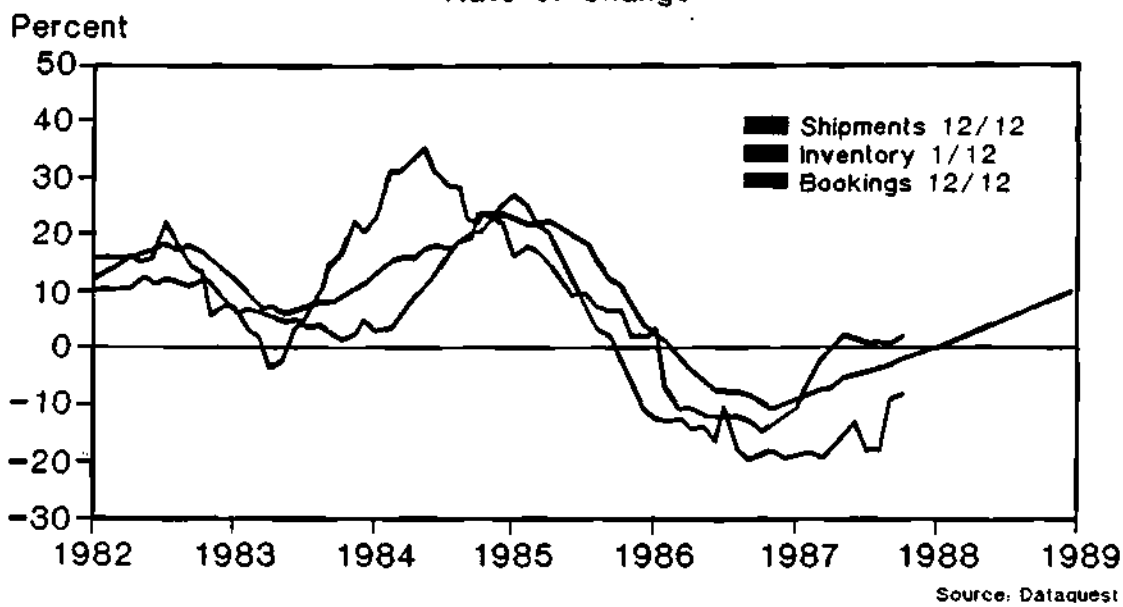
LOOKING AHEAD - ECONOMICS

	1987	1988
United States		
Real GDP	2.7%	2.8%
Industrial Production	3.1%	2.8%
Japan		
Real GDP	2.5%	3.0%
Industrial Production	2.5%	3.0%
Europe		
Real GDP	2.2%	2.0%
Industrial Production	2.8%	2.0%

Source: Dataquest Estimates

LOOKING AHEAD - ELECTRONICS

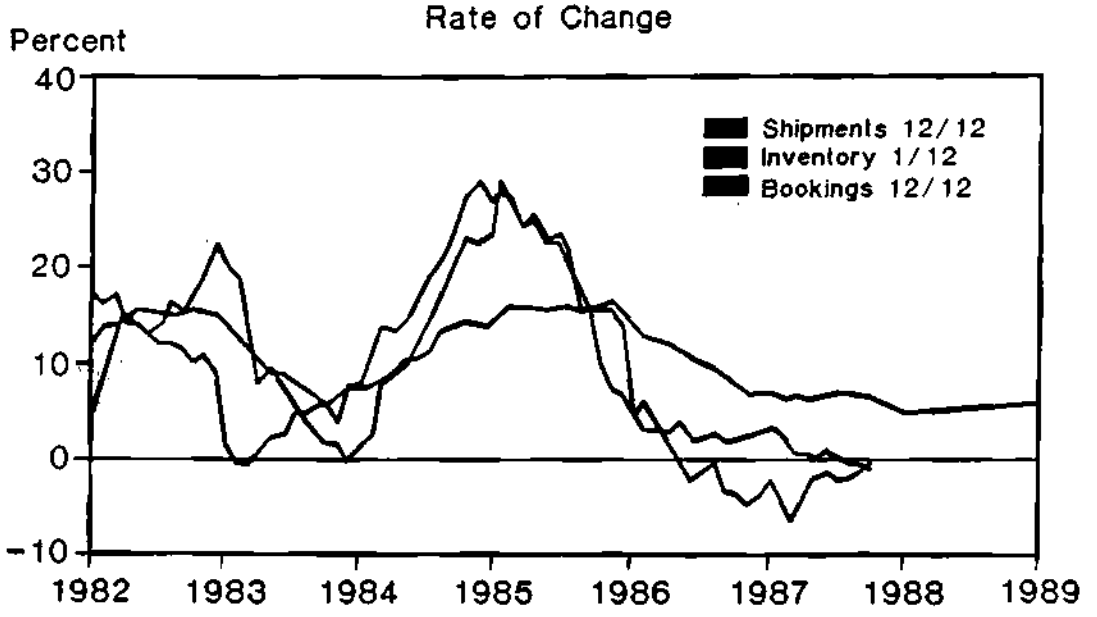
U.S. Computers and Office Equipment
Rate of Change



Source: Dataquest

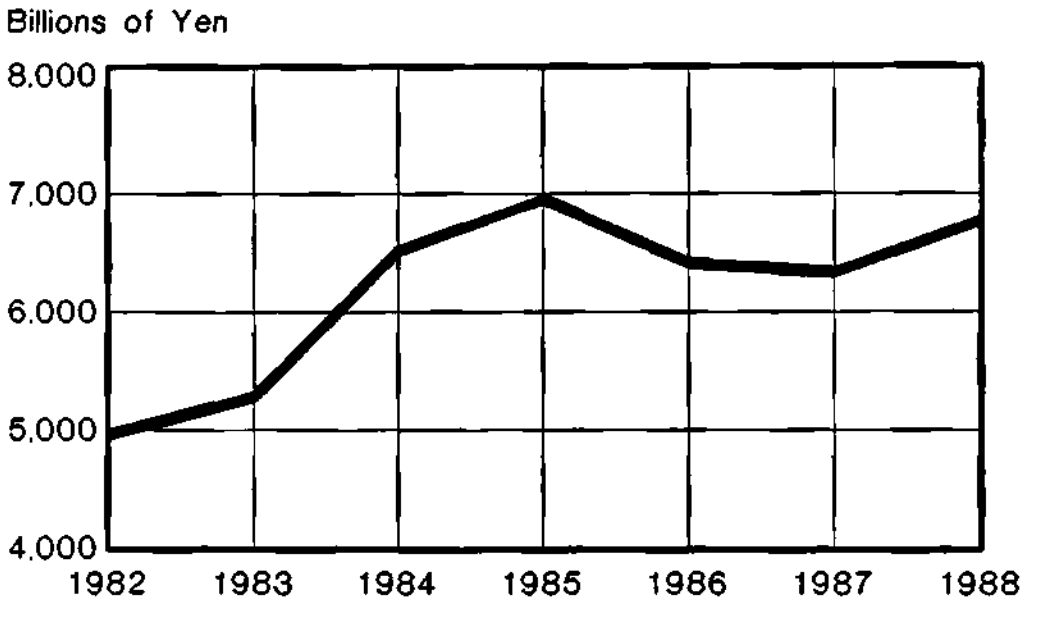
LOOKING AHEAD - ELECTRONICS

U.S. Communications Equipment
Rate of Change



Source: Dataquest

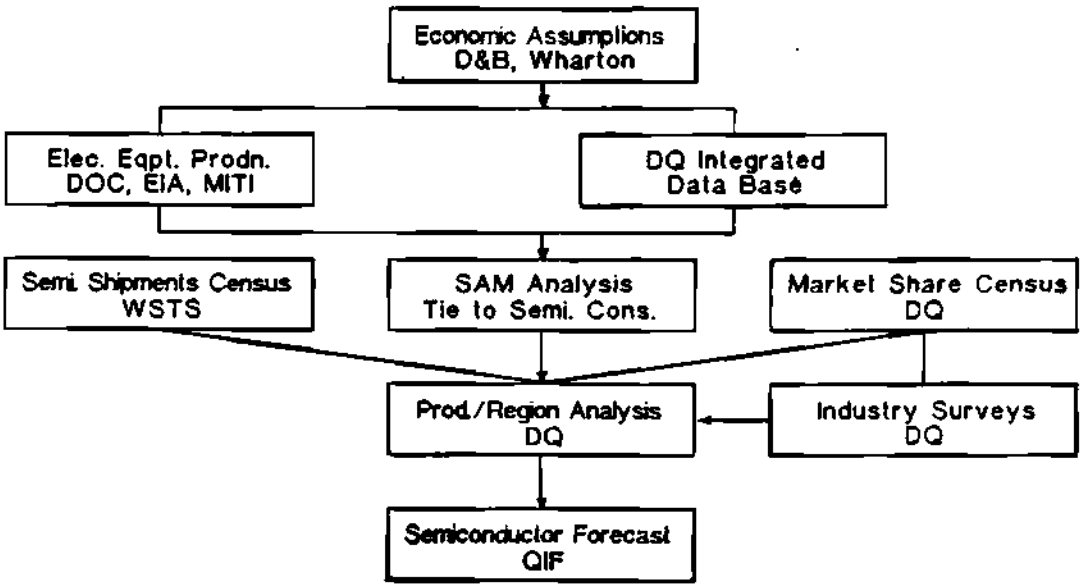
LOOKING AHEAD - ELECTRONICS



Source: Dataquest

LOOKING AHEAD - SEMICONDUCTORS

Semiconductor Forecasting
QIF System



LOOKING AHEAD - SEMICONDUCTORS

Percent Change, U.S. Dollars

	1987 (Preliminary)				
	Q1	Q2	Q3	Q4	Year
North America	4.3%	11.7%	9.0%	2.0%	22.6%
Japan	(2.8%)	14.1%	5.4%	7.4%	17.8%
Europe	11.9%	9.9%	(1.8%)	5.3%	22.6%
ROW	16.0%	25.9%	10.7%	4.3%	68.2%
Total	4.0%	13.9%	5.9%	4.9%	25.0%

Source: Dataquest

LOOKING AHEAD - SEMICONDUCTORS

Percent Change, U.S. Dollars

	1988 (Preliminary)				
	Q1	Q2	Q3	Q4	Year
North America	5.0%	7.1%	3.1%	2.5%	23.0%
Japan	2.5%	5.8%	6.4%	3.9%	20.5%
Europe	5.1%	5.9%	3.1%	5.1%	19.0%
ROW	8.7%	11.1%	8.1%	4.7%	41.4%
Total	4.6%	7.0%	5.0%	3.8%	23.7%

Source: Dataquest

LOOKING AHEAD - SEMICONDUCTORS

High-Growth Semiconductor Products

Product	Estimated CAGR 1986-1991
Cell-Based ICs	32.8%
Specialty Memories	38.2%
DSP Chips	27.9%
Graphics Chips	42.0%
32-Bit MPUs	46.3%
8-Bit MCUs (Smart Cards)	50.0%
1Mb DRAMs	57.0%

Source: Dataquest

SUMMARY

- Same game
- Different rules
- Looking ahead

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KOREAN SEMICONDUCTOR PROSPECTS FOR THE 1990S

Sung Vol Choi
Director, Strategic Planning
Samsung Semiconductor and Telecommunications Co., Ltd.

Mr. Choi is the Director of Strategic Planning for Samsung Semiconductor and Telecommunications Co., Ltd. Prior to this position, he was Director of Business Development for Samsung Semiconductor Inc. in the United States. Mr. Choi holds a B.A. degree in Mechanical Engineering from Seoul National University and an M.B.A. degree from Korea University.

Dataquest Incorporated
ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY SERVICE
December 7, 1987
Taipei, Taiwan, ROC

KOREAN SEMICONDUCTOR PROSPECT

Presented at the 1st
ASIAN Semiconductor and Electronics Technology Industry Conference

Taipei, Taiwan

Dec. 7, 1987

Samsung Semiconductor & Telecommunications Co., Ltd.

INTRODUCTION TO KOREA (1986)

	KOREA	TAIWAN	JAPAN	U.S.A
AREA(km²)	98,477	36,002	377,748	9,363,400
POPULATION (MILLION)	41.4	19.5	121.5	241.6
POPULATION DENSITY(PERSONS/km²)	420.6	541.5	321.8	25.8
G N P(BB)	95.1	72.5	1,982.7	4,208.1
PER CAPITA GNP($)	2,298	3,719	16,155	17,400

(1987 MAJOR STATISTICS OF ECONOMY, NATIONAL BUREAU OF STATISTICS ECONOMIC PLANNING BOARD)

HISTORICAL REVIEW OF KOREAN SEMICONDUCTOR INDUSTRY

1960s : - TR ASSEMBLY	BY KEIHIN INC, 1965.
- IC ASSEMBLY	BY KOREAN SUBSIDIARIES OF FAIRCHILD, MOTOROLA, LATE 1960s.
1970s : - TR FABRICATION	BY KOREA SEMICONDUCTOR INC, 1974 (PRESENTLY SAMSUNG'S BUCHEON PLANT)
- L-IC FABRICATION	BY SAMSUNG, GOLDSTAR, LATE 1970s.
1st HALF OF 1980s	MEMORY-ORIENTED VLSI PRODUCTION BY SAMSUNG AND HYUNDAI. (64K DRAM)
2nd HALF OF 1980s	VOLUME PRODUCTION OF MEMORY PRODUCTS (256K DRAM, 1M DRAM)
	PRODUCT DIVERSIFICATION

KOREAN SEMICONDUCTOR COMPANIES (1986)

	WAFER FAB	ASSEMBLY	TOTAL
FOREIGN SUBSIDIARIES	-	8	8
JOINT VENTURE	1	5	6
DOMESTIC	4	8	12
TOTAL	* 5	21	26

* WAFER FAB : SAMSUNG, HYUNDAI, GOLD STAR, DAEWOO, KOREA ELECTRONICS.

MARKET DEMAND VS SUPPLY (PRODUCTION) (1986)

(IN U.S. $100M)

	KOREA	U.S.A.	JAPAN	OTHERS	TOTAL W
DEMAND	8	102	120	75	305
PRODUCTION $ (% OF W)	3.5 (1.1)	120 (39.3)	145 (47.5)	36.5 (12.1)	305 (100)

$ EXCLUDING ASSEMBLY WORK

KOREAN SEMICONDUCTOR EXPORT

ASSEMBLY VS WAFER FABRICATION

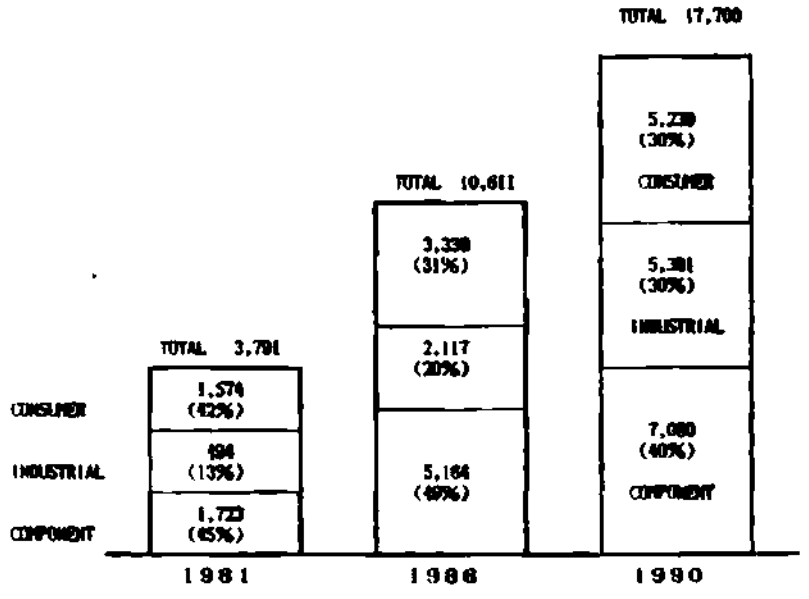
(IN US $M)

	1984	1985	1986
ASSEMBLY	1,186	860	1,179
WAFER FABICATION	72	112	205
TOTAL	1,258	972	1,383

PROS & CONS OF KOREAN SEMICONDUCTOR INDUSTRY

PROS	CONS
• COST EFECTIVE MANUFACTURING - LOW LABOR COST - HIGH PRODUCTIVITY • POTENTIAL GROWTH OF DOMESTIC MARKET HIGH GROWTH RATE OF ELECTRONIC INDUSTRY AND GNP - CAPTIVE MARKET(SAMSUNG, GOLDSTAR) • FINANCIAL STRENGTH OF DOMESTIC COMPANIES - UNDER UMBRELLA OF CONGLOMERATE PARENTS • POTENTIAL R&D CAPABILITY - HIGHLY EDUCATED MAN-POWER	• SHORT VLSI HISTORY • LACK OF SUPPORTING INDUSTRIES - EQUIPMENT, MATERIAL • LACK OF EXPERIENCED R&D MAN-POWER

KOREAN ELECTRONIC INDUSTRY PRODUCTION FORECAST (IN US $M)



CAGR ('81 ~'90)

CONSUMER	14.2%
INDUSTRIAL	30.3%
COMPONENT	17.0%
TOTAL	18.7%

(SOURCE: EIAK)

KOREAN SEMICONDUCTOR DEMAND FORECAST

(US $M)

	1988	1990	1995	CAGR ('88-'95)
DEMAND	816	1,338	3,610	18.0
MOS IC	205	482	1,930	28.3
BIPOLAR-LIC	341	453	1,030	13.1
DISCRETE	180	255	430	10.2
OTHERS	90	148	220	10.4
$ IMPORT RATIO (%)	82.4	77.9	65.0	

SOURCE : KIAK, SAMSUNG

$ IMPORT RATIO : IMPORT/DEMAND

KOREA'S SEMICONDUCTOR TECHNOLOGY PROSPECT

		1987	1990	1995
DESIGN		· MEMORY(DRAMs) : APPROACHING LEADING EDGE OTHERS : INFANT STAGE	· MEMORY : LEADING EDGE OTHERS : LEARNING PERIOD	· DESIGN CAPABILITY IN MOST AREAS
PROCESS		· DEVELOP DRAM TECHNOLOGIES (TECHNOLOGY DRIVER)	· DIVERSIFY TECHNOLOGIES BASED UPON DRAM TECHNOLOGIES	· LEADING EDGE POSITION
DESIGN RULE		1u ~ 2u	0.5u ~ 1u	0.2u ~ 0.5u
PRODUCT	· MEMORY	· 256K DRAM	· 1M DRAM	· 64M DRAM
	· MICRO	· 4BIT MCU	· 8BIT, 16BIT MCU · 16BIT, MPU(2nd-Source)	· 32BIT MCU · MICRO CORE DESIGN
	· ASIC	· 6,000 GATE ARRAY	· 10,000~12,000 GATE ARRAY · STANDARD CELL	· MULTI-FUNCTION GATE ARRAY

SAMSUNG' S GOAL

- TO BE A MAJOR WORLDWIDE SUPPLIER WITH
  - COST EFFICIENT MANUFACTURING CAPABILITIES
  - HIGH QUALITY / RELIABILITY
  - GOOD CUSTOMER SERVICE

-- REQUIREMENTS -

- DIVERSIFICATION OF PRODUCT PORTFOLIO WITH R&D CONCENTRATION ON HIGH-END PRODUCTS
- BROADEN OUR CUSTOMER BASE
- GOOD BUSINESS RELATIONSHIP WITH FOREIGN COMPETITORS
- ESTABLISH DOMESTIC SEMICONDUCTOR SUPPORT INDUSTRIES

SAMSUNG' S PRODUCT MIX

(%)

	1988	1990	1995
MOS MEMORY	45	43	40
MOS MICRO AND LOGIC	25	27	32
BIPOLAR-LIC	11	13	15
DISCRETE AND OTHERS	19	17	13
	100	100	100

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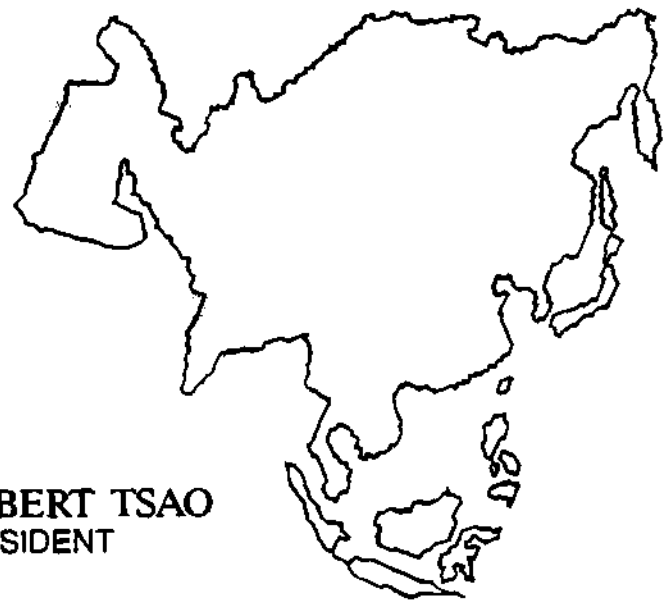
ENTERING THE ASIA/PACIFIC VLSI WORLD

Robert H.C. Tsao
President
United Microelectronics Corporation

Mr. Tsao is President of United Microelectronics Corporation (UMC) and Chairman of the Board of Unicorn Microelectronics. Prior to joining UMC, he was Manager of Operations Support and Deputy Director at the Electronic Research Service Organization (ERSO). Earlier, he was an Associate Researcher at the Industrial Technical Research Institute (ITRI), after assisting with its formation. Mr. Tsao has a degree in Electrical Engineering from Taiwan University and a master's degree in Management Science from Chiao Tung University.

Dataquest Incorporated
ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY SERVICE
December 7, 1987
Taipei, Taiwan, ROC

ENTERING THE VLSI WORLD
AN ASIAN PERSPECTIVE



ROBERT TSAO
PRESIDENT

UNITED MICROELECTRONICS CORPORATION

WORLDWIDE SEMICONDUCTOR CONSUMPTION
(Percent Change, U.S. Dollars)

Yearly Growth	1986	1987	1988
North America	6.5%	12.7%	23.4%
Japan ($)	44.9%	14.0%	19.0%
Japan (yen)	1.9%	9.0%	19.9%
Europe	17.2%	10.0%	19.9%
ROW	55.6%	38.1%	28.2%
Worldwide	25.6%	15.1%	21.6%

Source: Dataquest

WORLDWIDE SEMICONDUCTOR CONSUMPTION COMPOUND ANNUAL GROWTH RATE

(1987-1992 Forecast)

	1987-1992	1992-1997
Total Semi.	14.0%	13.4%
Total IC	15.6%	14.5%
ROW Semi.	17.2%	17.3%
ROW IC	20.0%	19.3%

Source: Dataquest

WORLDWIDE SEMICONDUCTOR CONSUMPTION

(Percent Change, U.S. Dollars)

Market Share	1986	1987	1988
North America	32.8%	32.1%	32.6%
Japan ($)	40.0%	39.6%	38.7%
Europe	17.7%	16.9%	16.7%
ROW	9.5%	11.4%	12.0%

Source: Dataquest

ASIA vs. WORLDWIDE
in
SEMICONDUCTOR CONSUMPTION
(1986)

Unit: US$ M

	Worldwide	Asia	Asia in World
Data Processing	9,870	1,063.5	10.8%
Consumer Elec.	8,833	1,193.2	13.5%
Telecomm.	4,523	233.5	5.2%
Others	7,783	103.8	1.3%
Total	31,009	2,594.0	8.4%

Source: Dataquest

WORLDWIDE SEMICONDUCTOR PRODUCTION
vs.
T./K./H.K. CONSUMPTION

Unit: US$ B

		1983	1984	1985	1986	1983-1986 CAGR
World-wide	Value	22.2	32.9	29	31	11.8%
	G.R.(%)	25	48	−12	7	
Taiwan	Value	0.48	0.75	0.65	1.09	31.4%
	G.R.(%)	30	56	−13	68	
Korea	Value	0.23	0.43	0.41	0.66	42.1%
	G.R.(%)	44	87	−5	61	
H.K.	Value	0.38	0.55	0.4	0.51	10.3%
	G.R.(%)	52	45	−27	28	

Source: Local Government/Dataquest

TAIWAN vs. WORLDWIDE
in
SEMICONDUCTOR CONSUMPTION
(1986)

Unit: US$ M

	Worldwide	Taiwan	TWN in World
Data Processing	9.870	474.7	3.2%
Consumer Elec.	8,833	174.9	2.0%
Telecomm.	4,523	30.5	0.7%
Others	7,783	13.9	0.2%
Total	31,009	694.0	2.2%

TAIWAN vs. ASIA
in
SEMICONDUCTOR CONSUMPTION

Unit: US$ M

	Asia	Taiwan	TWN in Asia
Data Processing	1,063.5	474.7	44.6%
Consumer Elec.	1,193.2	174.9	14.7%
Telecomm.	233.5	30.5	13.1%
Others	103.8	13.9	13.4%
Total	2,594.0	694.0	26.8%

Source: Dataquest

WORLDWIDE ELECTRONIC EQUIPMENT SALES
vs.
T./K./H.K. PRODUCTION VALUES

Unit: US$ B

		1983	1984	1985	1986	1983-1986 CAGR
World-wide	Value	220	233	254	288	9.4%
	G.R.(%)	10	6	9	13	
Taiwan	Value	5.5	7.3	6.4	10.3	23.3%
	G.R.(%)	28	33	−12	61	
Korea	Value	5.6	7.2	7.3	10.6	23.7%
	G.R.(%)	40	29	1	45	
H.K.	Value	3.0	3.9	3.4	4.2	11.9%
	G.R.(%)	42	30	−12	23	

Source: Local Government

WORLDWIDE SALES
vs.
T./K./H.K. PRODUCTION
(Datamation Products)

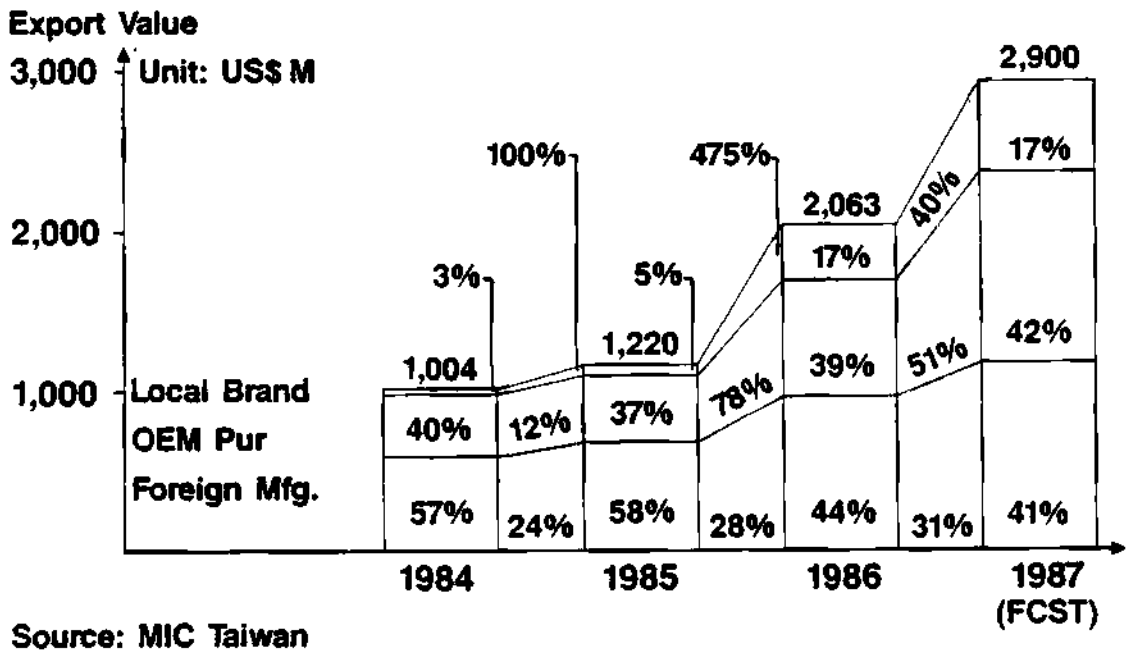
Unit: US$ B

		1983	1984	1985	1986	1983-1986 CAGR
World-wide	Value	96.8	112.3	126.9	142.3	13.7%
	G.R.(%)	14	16	13	12	
* Taiwan	Value	0.29	0.89	1.11	1.6	76.7%
	G.R.(%)	383	207	25	44	
* Korea	Value	0.21	0.43	0.52	0.88	61.2%
	G.R.(%)	320	105	21	69	
* H.K.	Value	0.08	0.19	0.11	0.17	28.6%
	G.R.(%)	300	138	−42	55	

* Excluding Components

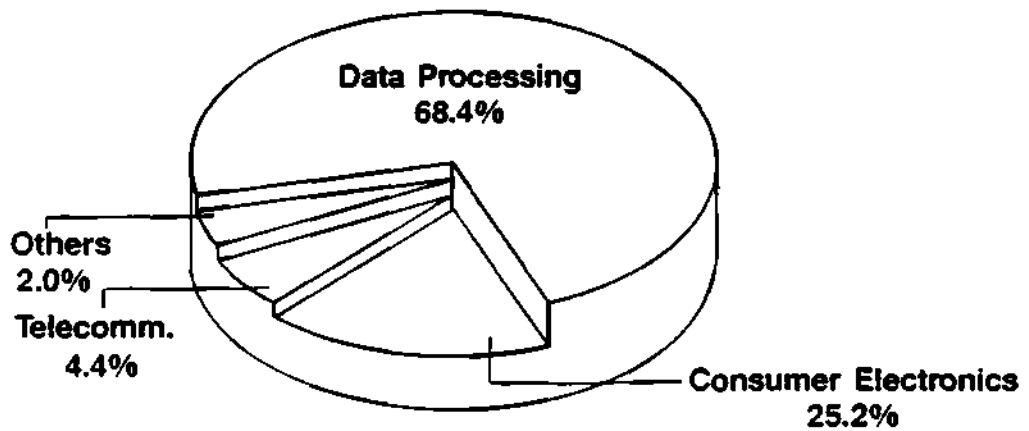
Source: Local Government Report ICE

R.O.C. INFORMATION PRODUCTS
EXPORT DISTRIBUTION MIGRATION



Source: MIC Taiwan

1986 SEMICONDUCTOR CONSUMPTION
IN TAIWAN
by APPLICATION FIELD



Total Semi. Consumption: US$ 694.0 Million

Source: Dataquest

ASIAN SEMICONDUCTOR PRODUCTION

Unit: US$ M

	1982	1983	1984	1985	1986	CAGR 1982-1986
South Korea	$648	$850	$1,259	$994	$1,292	18.8%
Taiwan	$456	$471	$659	$522	$689	10.8%
Hong Kong	$99	$125	$142	$136	$169	14.2%
Singapore	$800	$1,049	$1,306	$1,031	$1,177	10.1%
China	$50	$67	$89	$120	$160	33.7%
Japan	$4,682	$6,667	$11,058	$10,180	$13,821	31.1%

Source: Dataquest

WAFER FABRICATION — ASIA

Unit: US$ M

	1985	1986	1987*
Samsung	$95	$170	$250
UMC	$33	$70	$100
Hyundai	$5	$20	$35
Gold Star	$33	$59	$85

* Estimated

Source: Dataquest

R.O.C. SEMICONDUCTOR PRODUCTS IMPORT & EXPORT

Unit: NT$ M

	1H1986	1H1987	% Change
Import	16,096	23,794	+47.8%
Export	12,620	15,331	+21.5%

R.O.C. SEMICONDUCTOR PRODUCTS IMPORT & EXPORT

Unit: US$ M

	1H1986	1H1987	% Change
Import	423.58	793.13	+87.24%
Export	332.10	511.03	+53.88%

WAFER FAB CAPACITY IN TAIWAN
EXISTING AND PLANNED

(Kpcs/Month)

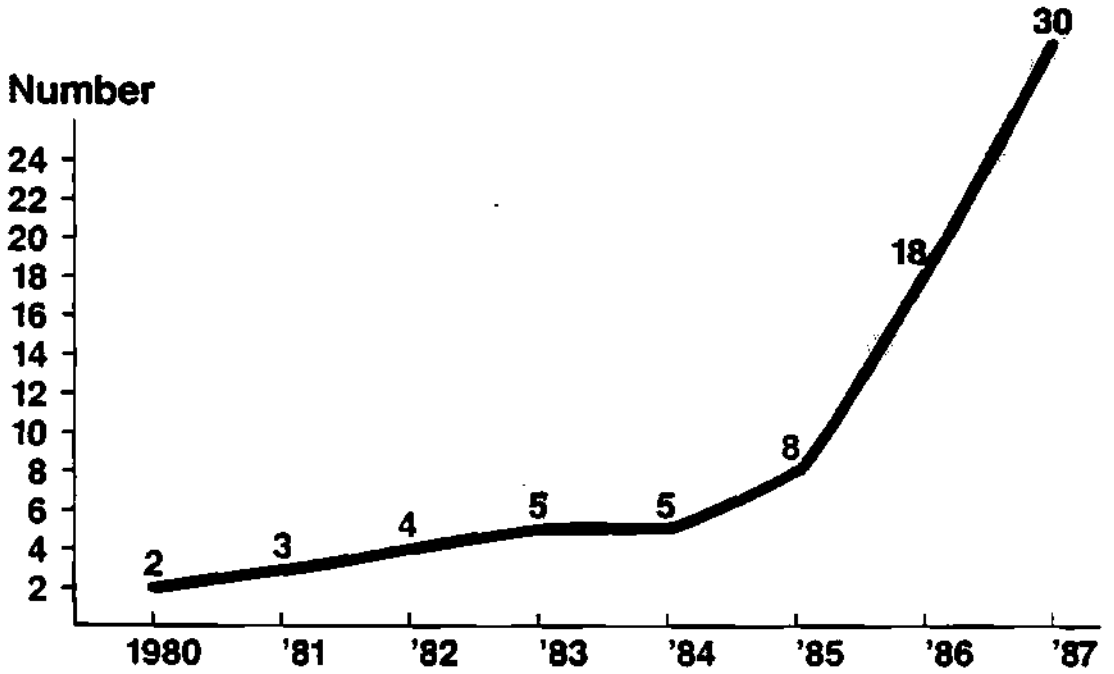
Companies	Existing Capacity	Expansion Capacity	Available Time
UMC	40 (4")	10 (6")	Q4, 1988
		20 (6")	Q4, 1990
ERSO	16 (4")	1 (6")	Q4, 1986
TSMC	-	10 (6")	Q4, 1987
		30 (6")	Q4, 1989

WAFER FAB CAPACITY IN TAIWAN
EXISTING AND PLANNED

(Kpcs/Month)

Companies	Existing Capacity	Expansion Capacity	Available Time
QUASEL	4 (4")		
HMC	-	20 (5")	Q2, 1988
		20 (5")	Q1, 1989
Wintech	-	10 (5")	Q4, 1989
UTIC	-	5 (4")	Q4, 1988

NUMBER OF IC DESIGN HOUSES IN TAIWAN



I.C. DESIGN HOUSES IN TAIWAN

Companies	Started	Designers	Gate Array	Standard Cell	Full Custom	Silicon Compiler
* Local						
UMC	1980	60	x	x	x	x
ERSO	1976	70	x	x	x	x
HOLTEK	1983	40	x		x	
SYNTEK	1982	40	x	x	x	x

I.C. DESIGN HOUSES IN TAIWAN

Companies	Started	Designers	Gate Array	Standard Cell	Full Custom	Silicon Compiler
* Local (Continued)						
PROTON	1986	40	x		x	
PRINCETON	1987	50			x	
SERTEK	1986	20	x	x	x	
REALTEK	1986	20	x	x	x	

I.C. DESIGN HOUSES IN TAIWAN

Companies	Started	Designers	Gate Array	Standard Cell	Full Custom	Silicon Compiler
* Local (Continued)						
SIS	1986	10	x		x	
ALPHATEK	1986	40	x	x	x	
ASLIC	1986	20	x		x	
MICRON	1987	7			x	

I.C. DESIGN HOUSES IN TAIWAN

Companies	Started	Designers	Gate Array	Standard Cell	Full Custom	Silicon Compiler
* Foreign						
MOTOROLA	1981	20	x	x	x	
FAIRCHILD	1986	10	x	x		
FERRANTI	1985	10	x	x		
HITACHI	1985	10	x	x	x	
SGS	1986	10	x	x		
PHILIPS	1985	20	x	x	x	

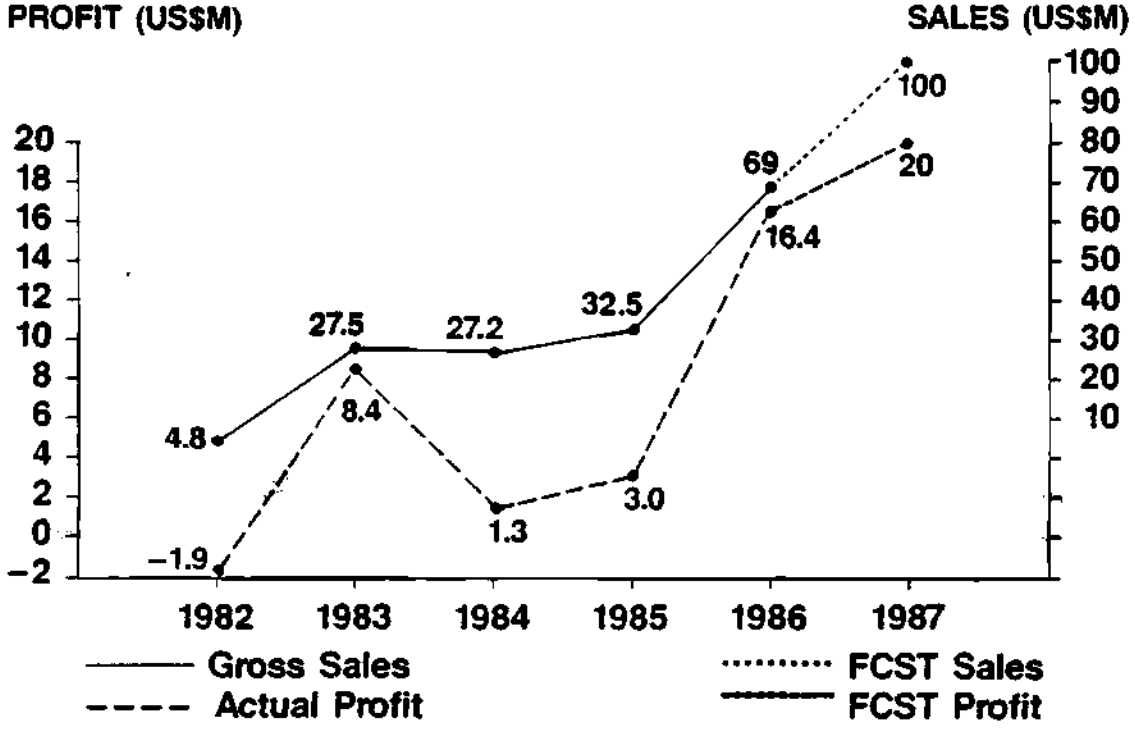
IC ASSEMBLY HOUSES IN TAIWAN

Company	Capital (US$M)	Started	Bonders	Packages
* Local				
CET	7.5	1984	25	PDIP,PLCC,SO
SILICONWARE	2.5	1983	15	PDIP,COB,F/P
TALENT	2.0	1983	21	PDIP
ASE	10.0		70	PDIP,COB,F/P,SO
LINGSEN	3.0	1973	37	PDIP,PLCC,SO,COB
ORIENT	10.0	1972	55	PDIP,CDIP,S/B,F/P
FINE PRODUCTS	N/A	1969	20	CDIP,S/B

IC ASSEMBLY HOUSES IN TAIWAN

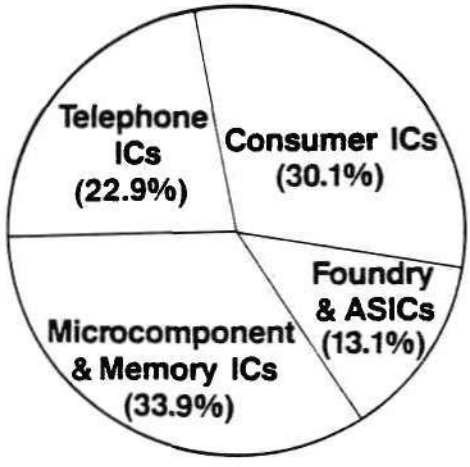
Company	Capital (US$M)	Started	Bonders	Packages
* Foreign				
RCA	N/A	1969	79	PDIP,CDIP,S/B
GI	N/A	1967	60	PDIP
GTE	1.5	1981	35	CDIP,S/B,PGA
PHILIPS	N/A	1969	150	PDIP,CDIP,SO,PGA
TI	N/A	1969	200	PDIP,CDIP,SO,PLCC

UMC SALES AND PROFIT

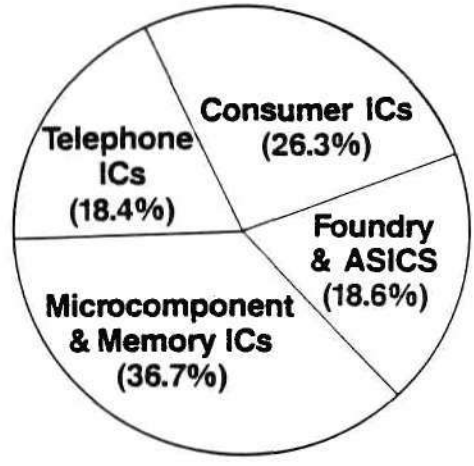


UMC SALES DISTRIBUTED BY PRODUCT LINE

(1986 Actual vs. 1987 Forecast)



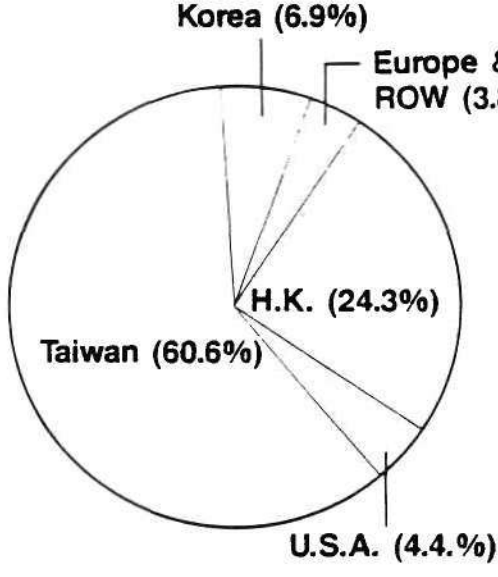
1986
TTL Amt $69M



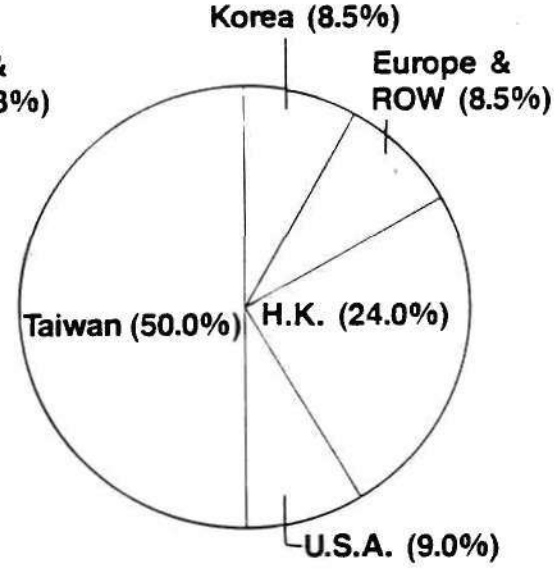
1987
TTL Amt $100M

UMC SALES DISTRIBUTION BY REGION

(1986 Actual vs. 1987 Forecast)



1986
TTL Amt $69M



1987
TTL Amt $100M

UMC PRODUCT LINE GROWTH

	1984	1985	1986	1H '87
Telephone IC	10	13	18	32
Melody IC	8	10	16	16
Timekeeping IC	3	5	8	8
Calculator IC	0	2	3	1
Memory IC	2	8	12	14
Microcomputer IC	4	20	30	38
Custom-design IC	3	5	20	22
Total	30	63	107	131

UMC PROCESS DEVELOPMENT

FEB. 1982 - 7.5 μm Metal Gate CMOS
APR. 1983 - 3.5 μm Si-Gate NMOS
DEC. 1983 - 2.5 μm Si-Gate CMOS
OCT. 1984 - 2.0 μm Si-Gate CMOS
APR. 1985 - 2.0 μm CMOS EPROM
APR. 1985 - 1.5 μm CMOS DRAM
DEC. 1985 - 1.25 μm D/M Si-Gate CMOS
SEP. 1986 - 5.0 μm High Voltage P-Well CMOS
AUG. 1987 - 3.0 μm Analog P-Well CMOS
AUG. 1987 - 1.25 μm LDD 2-Metal CMOS

ASIA/PACIFIC INFLUENCE

ON THE 1990'S

ELECTRONICS INDUSTRY

C. D. Tam
Vice President & General Manager
Asia/Pacific Semiconductor Products Division
Motorola Inc.

December 8, 1987.

ASIA/PACIFIC INFLUENCE

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December 8, 1987.

1. PREFACE

Mr. Chairman, ladies and gentlemen:

January 1, 2000 will not only be the dawn of a new year, a new decade, and a new century, but also the beginning of a new millennium. On the other hand, it will also be just a day in the passage of time between the day before and the day after. It is an exciting date in the history of the International Calendar and yet it is otherwise just an ordinary day. How will the world then look? How will Asia/Pacific "4 Dragons" fare and where will our electronic industry stand on that day? Are we the observers or are we the participants? This seems a choice for the individual, but I do believe that all of us present here are, by our very existence and profession, already participants. Like it or not, we cannot escape the responsibility of being participants in shaping the electronics industry in Asia/pacific. It is what we do, and do not do, that will combine to shape the future.

2. The rapid growth of the Asia/Pacific industry

The electronic industry is diverse thus making comparison of market segments such as computer vs consumer electronics difficult. However, recognising that semiconductor is the crude oil of the electronics industry, semiconductor consumption (TAM) gives a good dynamic overview of the

electronics industry. Analysis of the mix of product families in the TAM model gives a good idea of the composite of the industry - for example, a heavy consumption of 32 bit MPU will indicate strong production of advanced P.C., EWS, robotics, advanced telecom.....etc.

In early 1986 during Dataquest Symposium in Hakone, Japan, I presented a paper titled Asia/Pacific electronics, an industry in transition. Looking at the established infrastructure, accumulated strength, cultural ethics and the continued transfer of electronic equipment manufacturing into Asia/Pacific region, our conclusion is that the semiconductor consumption market (a measure of electronic end equipment production) will catch up with Europe before 1993. This conclusion was important as it recognised the shift of center of gravity of global electronics. I am glad to see that the recent Research Newsletter of Dataquest in October officially forecasting that the ROW semiconductor market (predominantly due to A/P), is projected to become 17% of the world-wide market by 1992, matching Europe. The momentum of this region, with a semiconductor consumption growth in excess of 60% in '87, is closing the gap even faster than my projection made 2 years ago.

Forty years ago in the Western world, three Bell laboratory scientists invented the point contact transistor, and the semiconductor industry was born. However, it only took Asia/Pacific about 20 years to grow from a rudimental semiconductor base to the size of Western Europe in another few more years. The people here are notably hard working, creative and adaptable, and the education systems are getting better all the time. It is interesting to note that 3 of the 4 dragons, Hong Kong, Singapore and R.O.C. are Chinese-based cultures and even Korea has been heavily influenced by the Chinese or Confucius culture. No doubt many of us can look back with pride on such accomplishment.

However it is the future that we must look forward to. We must realistically recognise the strength and weakness of the Asia/Pacific Electronics Industry, and the threats to its future growth.

3. Strength and Weakness

Electronic industry thrives on new products, which come about in the following cycle: research - innovation - application. The more recent innovations that have had the greatest impact on modern life have, in fact, been drawn from the crucible of basic research. Digital computation, semiconductor electronics, lasers all grew out of basic research. Very

soon we would expect similar thing from the very exciting and fast moving field of high temperature superconductors.

But, important as they are, innovations - the imaginative fruits of research - are not all there is to achieving competitiveness in global markets. Other factors are equally essential.

The transformation of innovation into products, processes and services which create markets requires a development environment which is open and receptive to new ideas and which is simultaneously sensitive to the needs and desires of consumers. That transformation requires systems of design and manufacturing which are efficient, flexible and swift.

Also the effective transformation of innovation into the marketplace requires a work force which is well educated, effectively managed and highly motivated. A work force which identifies its future success with the future of the company and which can act to improve products, enhance reliability and reduce costs is a much greater asset to a corporation than a work force which is regarded as the passive objective of time and motion studies of industrial engineers. Lastly, competitiveness requires the availability of intelligently applied capital - both to nurture the innovations that have potential and to improve the manufacturing process.

Comments on development in A/P electronic industry:

Basic research - it is unlikely that the A/P countries will have major contribution till the 21st century. However, the process of continuously accumulating experience must continue.

Innovation - highly dependent on creative people and environment, where venture capital exists or government is supportive. The intellectual bases are there in the A/P countries so there are rooms for much evolution in the future.

Applications - The four important factors are design, manufacturing, a motivated work force and capital. The strongest competitive advantage (both real and perceived) of the A/P NIC is low cost manufacturing. The dedication of the work force is good and on the average can score over that of U.S. and Europe, however not yet reaching that of Japan. Capital availability is adequate for most purposes, except in very capital-intensive area like semiconductor wafer fabrication where government needs to give a direct or indirect hand to local

companies to make the venture feasible. Design is still the weakest link in the chain. Utilization of new and affordable CAD systems as short-cuts to increase design efficiency is only beginning to be understood by some companies in A/P.

Thus even though we can catch Europe based on raw manufacturing power as a global manufacturing center, the electronic industry must master design in order to go further in the 90's.

4. Threats to future growth

The A/P countries have to face increased protectionism sentiment and enforcement of intellectual property rights. The electronic industries must now learn to live with these new sets of condition and become responsible and cooperative global citizens.

a) Protectionism sentiment in the U.S.

The whole issue centers around the hugh U.S. deficit. The electronic industries in A/P NIC run a big surplus with U.S., and run a major deficit with Japan. For years the markets for electronics in U.S. are wide open, and for many products there are GSP incentives. On the other

hand, the Japan market is basically closed. Being human beings, we obviously all choose the path of least resistance in doing business. It is not an accident that U.S. becomes the No.1 export market for A/P NIC's electronic products.

On the other hand when it comes to purchasing of material and equipment by NIC companies, the close proximity of Japan, the aggressive export mentality of Japanese companies, the closer cultural matching and the right product portfolio give Japan advantages in the NIC countries. With much purchase but little export, all the NIC countries run a big deficit in trade with Japan.

This imbalance in trade is the hottest button for the region. Since all the participants here today are people that shape the electronic industries, we must be aware of the seriousness of the situation now that the sleeping giant, U.S.A., has been awaken to this major imbalance. When an A/P electronic company builds a new factory to expand his production for sales in U.S.A., has the management thought of using as much U.S. equipment and material? Most individual considers it somebody else, or the government's responsibility to find a mean to solve this imbalance. Government, of course, has little jurisdiction over individual company's decision. The issue is so big now that all of us present here, as

leaders in our fields, must take personal interests in remeding such macroscopic issue at microscopic level if protectionism feeling in the U.S. is to be reduced so that confrontation can be avoided.

U.S. companies, subsidaries of U.S. companies in A/P, must be much more active in supporting the A/P region and take up an active and aggressive role in pursuing business. U.S.A. has always been a resource rich country and very self-sufficient. The U.S. domestic market has always taken a higher priority than international market. Most U.S. companies therefore have never really developed the "EXPORT OR STARVE" mentality that propells the A/P companies forward in the struggle for survival. The hugh deficit finally awakes the U.S. survival instincts. It is fortunate that more and more U.S. companies now recognise they must have world-class organization and infrastructure outside U.S.A. to service customers to become strong global players. They are doing something about it so that American products, or products with optimized American and Asian content can be sold. It is clear that A/P success is influencing the U.S. corporate culture. I hope more and more American companies will rise to this challenge as God only helps those who help themselves.

MARKET ACCESS - THE NEW BATTLE CRY FROM AND AGAINST A/P NIC.

In the face of increasing trade pressure from U.S.A on A/P, the 4 dragons have to find other market to export to rather than depending on export to U.S.A. as major means of growth. The trade imbalance with Japan will become hotly debated topic at government level. We look forward to Japan performing their role of super economic power and make their market more accessible to A/P electronics products. In many cases A/P countries are making electronic products that are similar or same as Japan and can be sold in the Japan market. Considering the high yen exchange rate, surely a win-win situation can exist for both parties.

For many years, both Korea and Taiwan have been protecting the development of the local market, while at the same time focusing on export. This practice has been increasing under attack from U.S. We must recognise that the U.S. is now insisting on FAIR trade, rather than free trade. It is fortunately most of the electronic industries have passed the infancy stage and as teenagers we should have the confidence to be on our own two feet. This will help towards avoiding trade sanctions.

b) Protection of Intellectual Property and Patents Rights. Since a speaker from the United States Department of Commerce is to speak on this, I would not elaborate on this. Suffice to say one of the reason that design ability in A/P was not well developed because most companies want to manufacture what others have designed. Copying is wide-spread in the past.

The trend in the future has to move towards reverse engineering and original design, respecting others patent right through licensing. The final outcome may be more beneficial to A/P in the long run - the creation of new products coupled with manufacturing strength, opening up more opportunity.

The A/P electronic industry in the 90's will, therefore, be different from that of the 80's. The future is still full of opportunities with our newly found strength, but we must be willing to be compatible and cooperative with the world, utilizing the win-win mentality from our deep rooted Chinese culture.

* * * * * * * * * * *

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THE DEVELOPMENT OF THE ELECTRONICS INDUSTRY IN ROC

W.S. Lin
President
Tatung Company

Mr. Lin is the President of Tatung Company. His educational background includes a B.S. degree in Electrical Engineering from Tatung Institute of Technology and an M.B.A. degree from Washington University in St. Louis, Missouri, in the United States.

Dataquest Incorporated
ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY SERVICE
December 7, 1987
Taipei, Taiwan, ROC

The Development of the Electronics Industry in the Republic of China

Ladies and gentlemen:

It is a great pleasure and honor for me to be invited to speak at the Conference sponsored by the prestigious Dataquest Company.

The electronics industry in Taiwan originally belonged to the Taiwan Electric Appliance Manufacturers Association including consumer electronics, industrial electronics, telecommunications electronics, and electronics components. After incorporating the information electronics, the electric appliance industry has greatly increased its production and export value.

In 1981 the ROC Nationwide Economic Conference included the information and electronics industry in the ROC strategic industries which have enjoyed the government's incentives. Specifically, the incentives are applicable to the six categories of products, namely, consumer electronics, industrial electronics, telecommunications, computer systems, information software, and electronics components and materials.

The development of the electronics industry in Taiwan dates back to 1961 when Tatung Company began to import parts and components to assemble transistor radios. Since then the industry has made outstanding achievements, eventually positioning itself as ROC's No. 1 foreign exchange earner since 1984.

The primary products at the four developing phases of the ROC electronics industry are as follows:

At the first phase in 1960's, we assembled radios, B/W TVs, telephone sets, mechanic switchboards, semiconductors, etc.

At the second phase in 1970's, we made electronic matches, electronic switchboards, color TVs, calculators, electronic capacitors, electronic transformers, etc.

At the third phase in the first half of 1980's, we produced video cassette recorders, microwave ovens, computers and computer peripherals, tuners, magnet heads, etc.

At the fourth phase since mid-1980's, we have successfully designed digital TVs, digital sound equipment, 16/32 bit computers, medium- and high- resolution picture tubes, and the like.

The fast growth of the ROC electronic industry can be attributed to three significant factors:

The first has been the vision and hard work of ROC entrepreneurs in the private sector. Tatung Company took the initiative in producing transistor radios, B/W TVs, color TVs, telephone sets, video cassette recorders, picture tubes, tuners, computer and computer peripherals, microwave ovens, etc. Tatung's success in developing those products have made a remarkable contribution to the prosperity of the electronics industry in the ROC. In addition, the active involvement of other 3000 manufacturing members of the Electric Appliance Industry Association has played an important role in the electronic industry.

Secondly, the ROC government has implemented a number of important measures to inspire the development of the electronics industry.

In 1966 Kaohsiung Export Processing Zone was established to induce the investment of foreigners.

In 1975 The Electronics Research and Service Organization (ERSO) of the Industrial Technology Research Institute (ITRI) was formed to concentrate its efforts on the R&D of IC and computer-related products. When a product is successfully designed, the ITRI will transfer the achievement to the private enterprise for production.

In 1980 the government founded the Hsinchu Science-based Industrial Park, with a mission to upgrade the standards of high technology. At present it has 66 manufacturers, with a total workforce of more than eight thousand. The production value for 1986 amounted to US$450 million. Compared with US$3.6 million in production value for 1980, it increased 150 times. According to the "10-Year Project for Developing the Industrial Park" drawn up by the National Science Association of the Executive Yuan, there will be 200 manufacturers in 1997, with US$215 billion in annual revenues, which is estimated to be 10% of the nationwide revenues. Meanwhile, the R&D spending will account for 27% of the total national R&D spending in 1997.

As I have indicated, the Nationwide Economic Conference in 1981 resolved to best the electronics industry as one of strategic industries, of which the manufacturers have received the government's incentives.

To promote the two-way trade, investment, and technological cooperation in electronics products between the United States and the Republic of China, the Taiwan Electric Appliance Manufacturers' Association signed a cooperative agreement with U.S. Electronics Industry Association in 1986. In addition, the Association has approached the U.K. economic authorities concerned for getting more export quotas to the U.K.

The third factor which has expedited the development of the electronics industry in Taiwan is that many renowned foreign corporations have invested in erecting factories to build high-tech products for exporting worldwide.

In 1964 U.S. General Instruments Corporation founded the Taiwan electronics Company, the name of which has been changed as the Taiwan General Instruments Company. The Company produces television components for exports. And the RCA, Zenith, AOC, Motorola, TDK, Philips and the like have come to set up plants for manufacturing electronics components for sale at home and abroad. The trend has contributed much to the rapid growth of the electronics industry in Taiwan.

The electronics products have played an increasingly significant role in the manufacturing industry in Taiwan. The electronics products accounted for 11.2% of the total production value of the manufacturing industry in 1986, compared with 8.9% in 1980.

Meanwhile, the exports of the electronics industry have increased over the years. The exporting value of the electronics products represented 18.76% of the ROC total exporting value in the first eight months of 1987, compared with 16.92% in 1983. However, the sale to the United States has decreased over the years. The exports of the electronics products to the U.S. accounted for 49% of the ROC total exports in the first eight months of 1987, compared with 60.6% in 1983.

During the past three years, The United States has been the ROC's No. 1 importer of its electronics products, and Japan, next only to Hong Kong, has been the third. However, over the past three years Japan has been No. 1 supplier of its electronics products to the ROC; the U.S. has been the second and Singapore, coming before Hong Kong, has been the third.

To promote the competitiveness of the ROC's electronics products in the world market in the years ahead, both the government and the private sector have to step up their efforts at the following areas:

* To expedite a combination of computer and communication, leading to the nationwide integrated system of digital net.

* To set up large-size factories for manufacturing essential electronics parts and components.

* To develop semiconductor-related parts and components, as well as complete technology in specially applied IC and VLSI.

* To develop materials industry.

* To form an interdisciplinary approach information center.

* To establish testing and quality standards.

* To strengthen the development of hardware and software.

* To step up efforts at automation, systems, diversification, high value-added, and the like.

Thank you.

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TELECOMMUNICATIONS--THE EMERGING MARKET IN ASIA

P. June Min
Senior Managing Director
R&D and Business Development Group
GoldStar Company, Ltd.

Dr. Min is Senior Managing Director of the R&D and Business Development Group, Computer and Communications Sector, at GoldStar Company, Ltd. Previously, he was Senior Managing Director for Communications Systems, Semiconductors, and Computer Systems at GoldStar Semiconductor, Ltd. Before that, he was Executive Director of Information and Communication Systems at GoldStar Tele-Electric Co. Before joining GoldStar, Dr. Min was Program Manager, Office Systems Products, at Xerox Corporation and Senior Manager of the Service Support System at IBM Corporation. He has also worked as a researcher for the Information Systems Lab and Remote Sensing Lab at Purdue University and as an Engineering Manager at Tong Young Electric Company of Korea. Dr. Min holds a B.S.E.E. degree from Yonsei University of Korea and an M.S.E.E. degree and a Ph.D. in Computer Science from Purdue University. He received five IBM Contribution Awards, is the author of numerous technical publications, and has taught computer science and engineering at IBM and at various universities.

Dataquest Incorporated
ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY SERVICE
December 7, 1987
Taipei, Taiwan, ROC

TELECOMMUNICATIONS –

THE EMERGING MARKET IN ASIA

DEC. 1987

P. JUNE MIN

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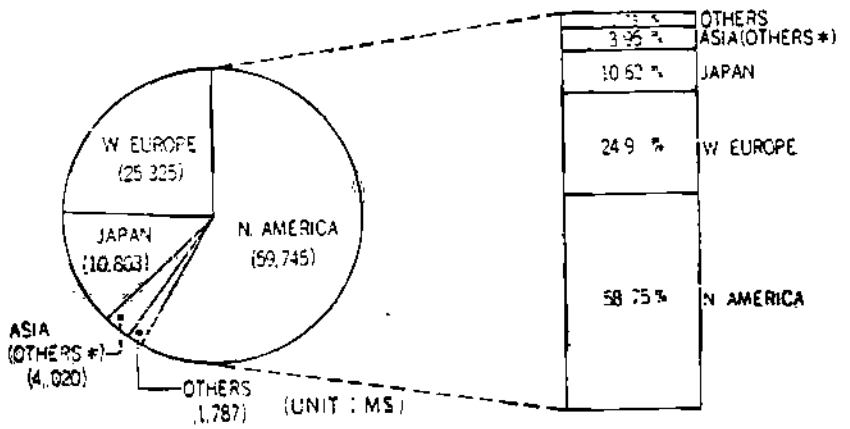
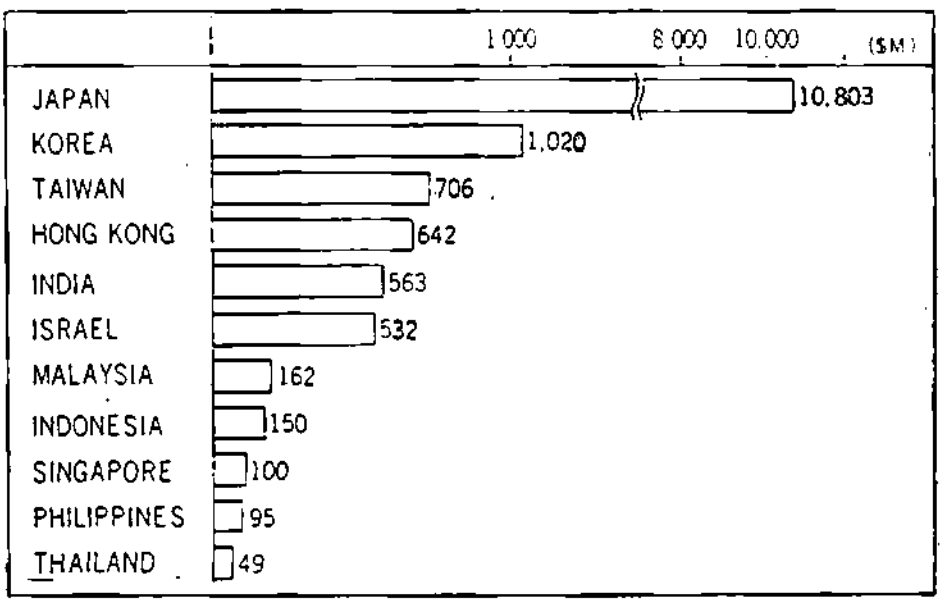
WORLDWIDE MFG STATUS IN 1986

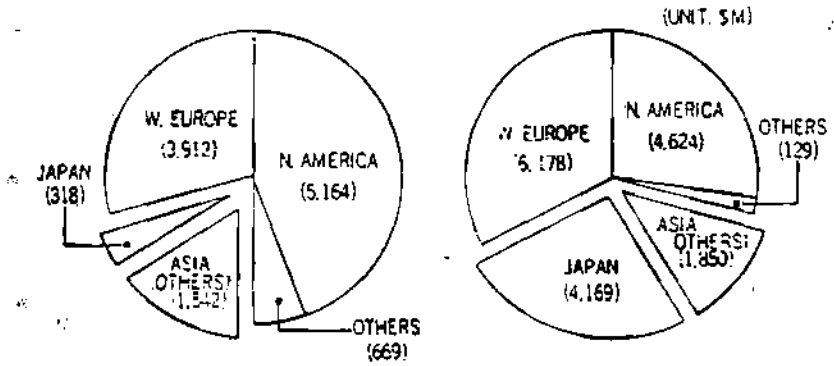


REMARK ASIA-OTHERS*) : HONG KONG, INDIA, INDONESIA, ISRAEL, KOREA, MALAYSIA, PHILIPPINES, SINGAPORE, TAIWAN, THAILAND

ASIAN MFG STATUS IN 1986

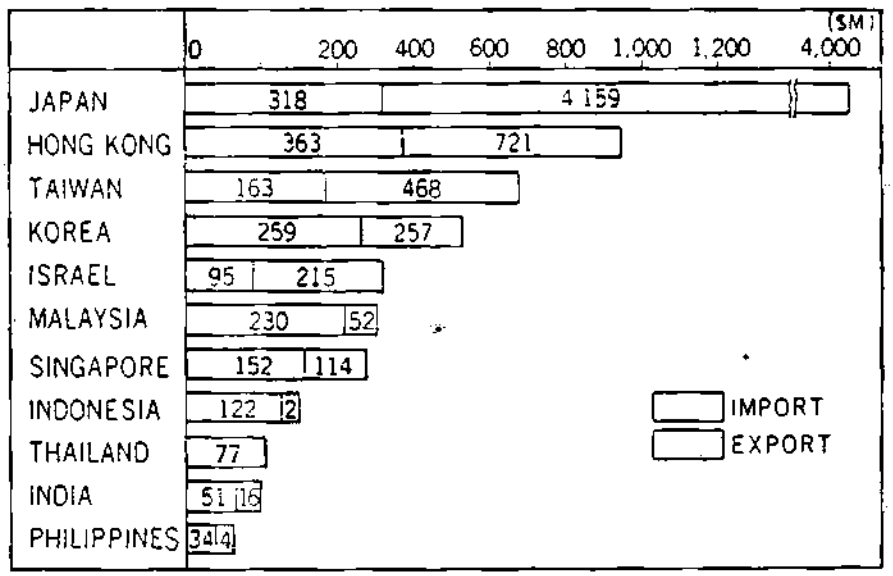


WORLDWIDE IMPORT/EXPORT STATUS IN 1985

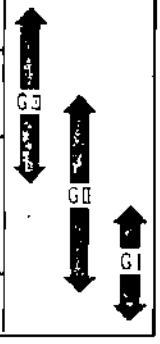


1985 IMPORT (11,605) 1985 EXPORT (16,940)

ASIAN IMPORT/EXPORT STATUS IN 1985



THE PROGRESS OF TELECOM.

PROGRESS	STAGE
1. DEMAND FOR BASIC SERVICES TO BE SATISFIED • ELIMINATING THE TELEPHONE SUBCRIPTION WATING LIST	
2. THE DEVELOPMENT OF THE TELECOM. INFRASTRUCTURE • "BACK-BONE" TRANSMISSION SYSTEM TO EXTEND SERVICE TO A REMOTE AREA	
3. THE NEED FOR IMPROVING THE QUALITY OF SERVICE IN THE NATIONAL NETWORKS • DIGITALIZATION OF THE TELECOM. NETWORKS • SINGLE NETWORK TO HANDLE VOICE AND TELEX/DATA NETWORK FOR MESSAGE AND DATA TRANSMISSION	
4. THE IMPLEMENTATION OF THE NETWORK EVOLUTION TO ISDN • DEMANDS FOR VARIOUS VOICE AND NON-VOICE SERVICES	

*REMARK : GROUP I (GI) : EXPORT > IMPORT EXCESSIVELY
GROUP II (GII) : OVERPASSING THE IMPORT STAGE
GROUP III (GIII) : THE POOR EXPORT POWER

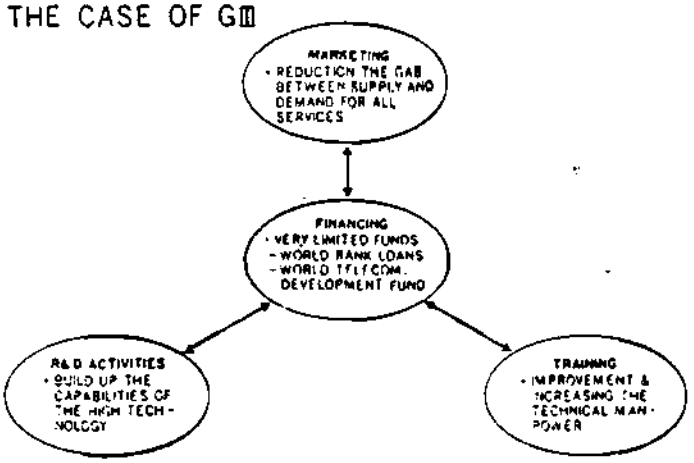
THE SITUATION OF THE ASIAN TELECOM. INDUSTRY

- LONG TERM TELECOM. PROGRAM AS A PART OF THE NATIONAL ECONOMIC DEVELOPMENT PLAN.

1. A LONG INTEGRATED PROJECT
   - JOINT VENTURE
   - TECHNOLOGY TRANSFER PROGRAM
2. R&D ACTIVITIES
   - BUILD-UP THE CAPABILITY FOR ABSORPTION OF NEW AND HIGHLY CHANGING TECHNOLOGY
   - REDUCTION THE HEAVY DEPENDENCE OF THE NATIONAL COMMUNICATIONS ON THE FOREIGN MARKET FOR THE TELECOM. EQUIPMENT AND MATERIALS
3. COMMUNICATION STANDARD
   - COMMUNICATION NETWORKS TO ACCOMODATE THE STANDARD RECOMMENDATIONS SUCH AS CCITT TO KEEP IN DEPENDENCE OF EQUIPMENT AND MATERIALS

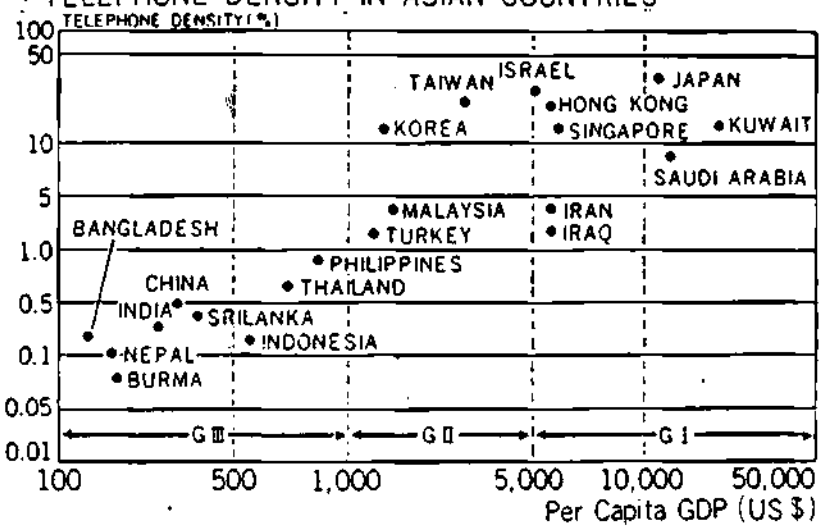
SPEED UP THE DEVELOPMENT OF THE NATIONAL TELECOM. INFRASTRUCTURE

– THE CASE OF GⅢ



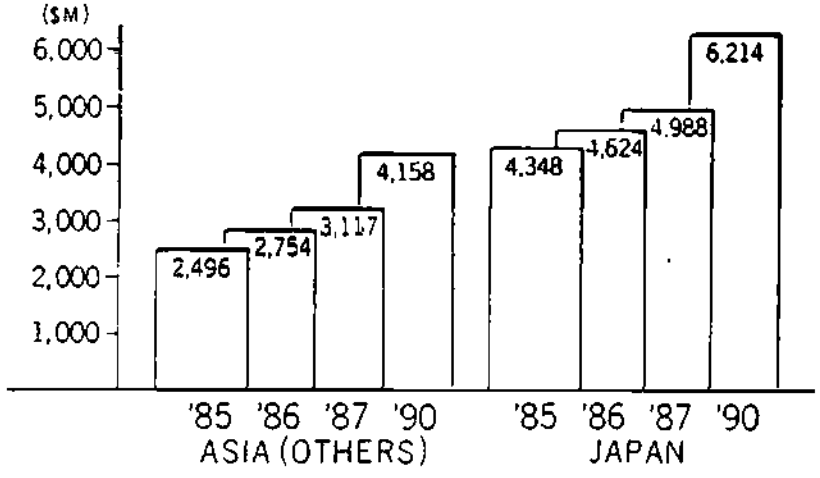
ASIAN MARKET FORECAST

• TELEPHONE DENSITY IN ASIAN COUNTRIES

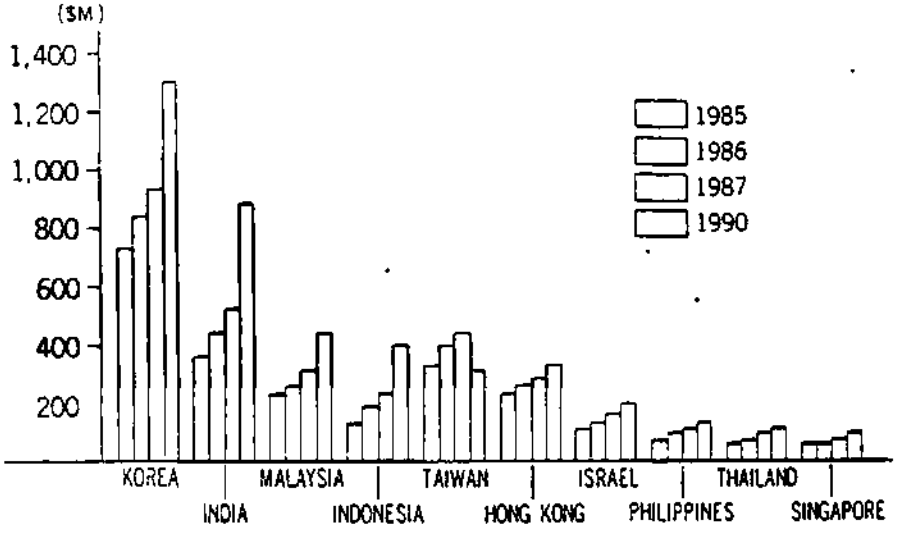


MAIN TELEPHONES PER 100 POPULATIONS IN 1983

ASIAN MARKET FORECAST (I)

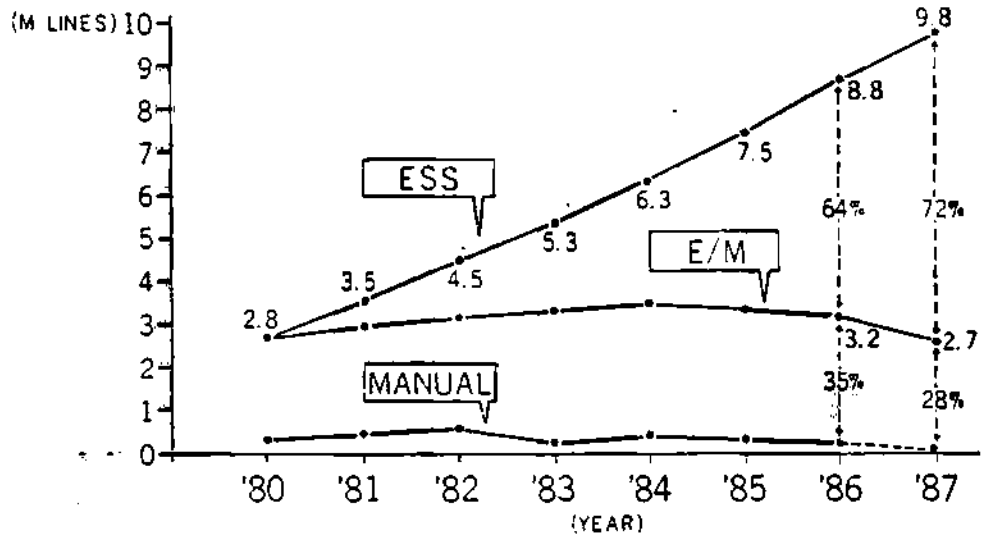


ASIAN MARKET FORECAST (II)



TELECOM. MARKET IN KOREA

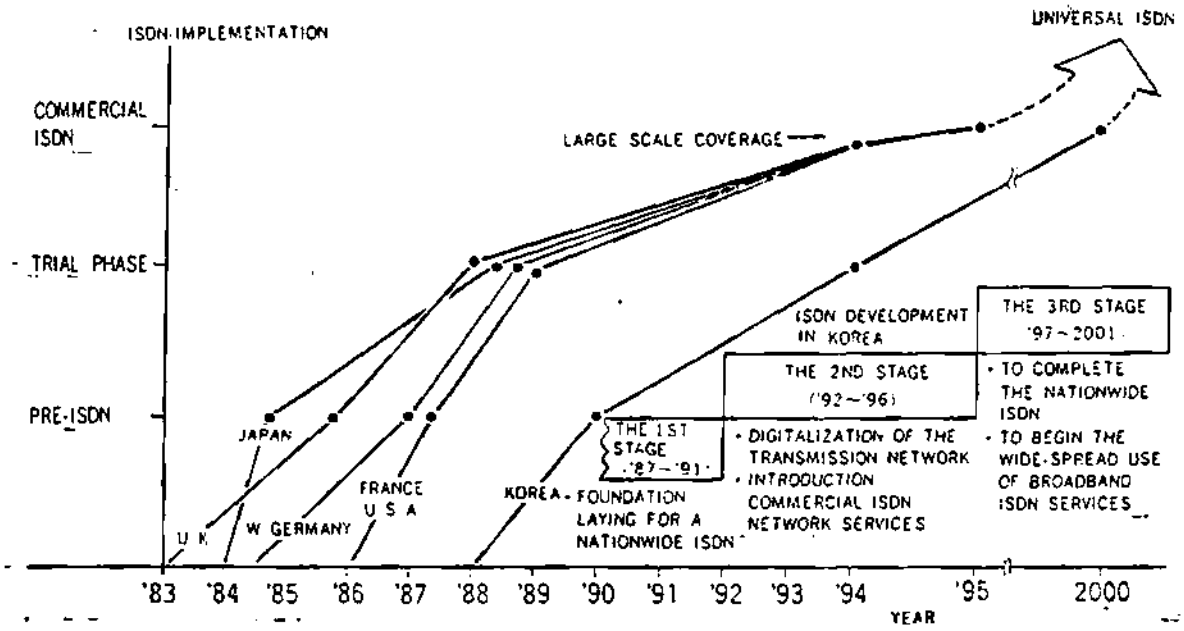
– AUTOMATION OF THE SWITCHING SYSTEMS IN KOREA



–THE TELECOM. PROGRESS DURING THE RECENT YEARS IN KOREA

	1981	1986
• TELEPHONE SUBSCRIBERS PER 100 POPULATION	8.4	18.0
• AUTOMATION OF THE SWITCHING SYSTEM		
LOCAL EXCHANGE	8 %	65.3 %
TOLL EXCHANGE	0 %	100 %
• DIGITALIZATION OF THE NETWORK		
LOCAL TRANSMISSION	12.0 %	47.8 %
"BACK-BONE" TRANSMISSION	18.8 %	51.1 %
• BUDGET (BILLION WON)	1,752	2,491

ISDN TECHNOLOGY STATUS & FORECAST



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32-BIT PC OPENS A NEW ERA IN ASIA

Stan Shih
President
Multitech Industrial Corp.

Mr. Shih is President of Multitech Industrial Corp., a large Taiwan computer company. Multitech is part of the MSC Group, which includes Sertek International Inc., Continental Systems Inc., Multiventure Investments Inc., The Third Wave Publishing Corp., Sertek Labs Inc., and Acer Corporation. Prior to joining Multitech, Mr. Shih was Vice President of Qualitron Industrial Corp., where he was involved in the development of a wide range of calculators and design of the first pen watch. Earlier, he was Deputy Director of Unitron Industrial Corp., where he designed, developed, and commercialized Taiwan's first desktop calculator. Mr. Shih received B.S.E.E. and M.S.E.E. degrees from the National Chiao Tong University. In 1983, the International Jaycees named him one of the 10 most outstanding young persons in the world, based on his contributions to computer technology in Taiwan.

Dataquest Incorporated
ASIAN SEMICONDUCTOR AND ELECTRONICS TECHNOLOGY SERVICE
December 7, 1987
Taipei, Taiwan, ROC

32-BIT PC OPENS A NEW ERA IN ASIA

Stan Shih
President
Multitech Industrial Corp.

PC EVOLUTION IN ASIA

Processor	8-bit	8/16-bit	16-bit	32-bit
Technology	6502	8088	80286	80386
PC Product	APPLE II	PC/XT	PC/AT	386/AT
Company	APPLE	IBM	IBM	COMPAQ
Date Introduced	1978	1981	1984	1986
1st Asia Follower	1982	1984	1985	1986
Time Lag (year)	4	3	1	0

TRADITIONAL STRATEGY OF ASIAN PC MAKERS

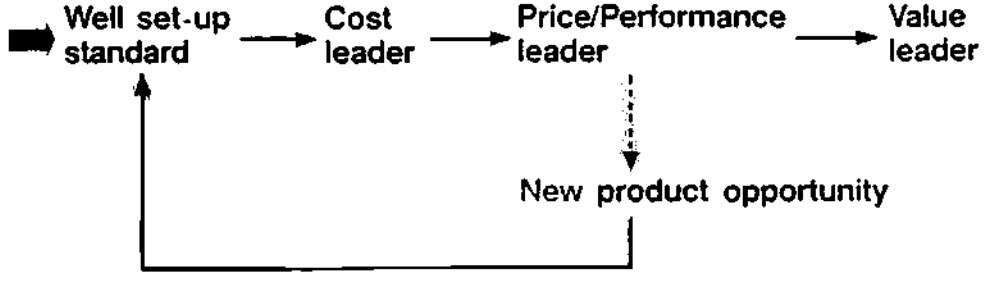
- Follows the market leader
- Follows the de facto standard
- Provide best price competition
- OEM oriented marketing

With 6 years' development Asian PC makers have grown to become leading technology competitors and product providers in the worldwide PC market.

KEY SUCCESS FACTORS IN THE EVOLUTION

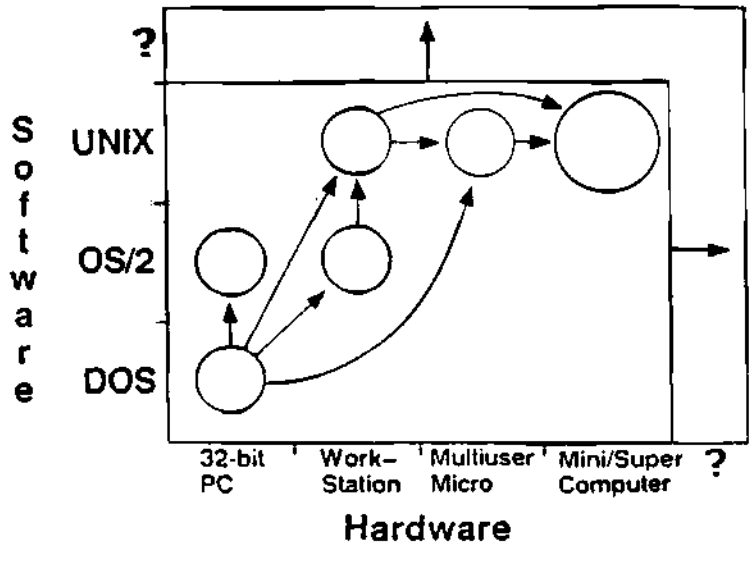
- Accumulated experiences of well-trained engineers
- Frequent communications with leading technology sources — Silicon Valley
  - Short geographic distance
  - Native Asian engineers
- Open technology transfer from USA
  - ASIC
  - Software
  - Design Tool
  - And more

STRATEGIC MODEL FOR EVOLUTION



SO, WHAT IS THE FUTURE FOR ASIAN PC MAKERS?

FUTURE EVOLUTION FOR 32-BIT PC



THE NEW AREA FOR ASIAN COMPUTER MAKER

- Workstation
- Multiuser micro
- Minicomputer
- Supercomputer

→ Traditional minicomputer system market

- UNIX OS
- New hardware: ambiguous standard
- 32-bit microprocessor

ASIAN COMPUTER MAKER TO ENTER MINICOMPUTER BUSINESS :

THE STRENGTH

- Cost effective engineering
- Flexible/low cost manufacturing
- Affordable technology
- Close link-up with leading technology source
- Emerging product standard

ASIAN COMPUTER MAKER TO ENTER MINICOMPUTER BUSINESS:

THE CHALLENGE

- Lack of set-up to support high end products
- Need to upgrade the software capability
- Need to overcome the poor image in system market
- Need to provide connectivity solution

THE MINICOMPUTER MARKET

- A totally different arena with PC business
- Not all PC (even 32-bit PC) makers are well equipped for this business

WHAT IS THE SOLUTION?

Short term: OEM

- Create OEM relationship with leading companies
  - Sub-contracting
  - OEM black box supplying
  - Joint projects with OEMs
  - Shorten the learning curve

WHAT IS THE SOLUTION?

Mid-term: Get ready for the future

- Improve technology depth and width
  - migrate from PC growth path

    DOS PC ⟶ OS/2 PC
    ⟶ UNIX workstation
    ⟶ UNIX multiuser

- Set up total system know-how
  - Simple CPU speed upgrading ⟶ System Architecture upgrading
  - Connectivity: computer and communications

WHAT IS THE SOLUTION?

Long term: Strategic alliance with

- Software house for system and application software
- Technology/know-how source for new technology injection
- ASIC house for upstream integration
- Third party VAR for add-on hardware and software

CONCLUSION:

32-bit PC opens tremendous opportunity for Asian computer makers in the high end product market

→ A total system challenge, not a traditional box business

- More R&D efforts
- More marketing efforts

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TWENTY YEARS EXPERIENCE IN ASIA

Antony Watts
Director of Strategic Planning--Asia Pacific
SGS Semiconductor (Pte) Ltd.

Mr. Watts is Director of Strategic Planning--Asia Pacific for SGS Semiconductor. In this capacity, he is responsible for strategy and planning, including business planning and partnership development. For the last six years, he has worked in both product and strategic marketing in the Asia/Pacific area. Prior to moving to SGS in Asia, Mr. Watts held a variety of positions at SGS in the United Kingdom and at the company's headquarters in Milan, Italy. These have included product marketing, publicity, and microprocessor marketing. Mr. Watts graduated from Kings College in London and did research in Solid-State Physics at Kings College and Oxford University.

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20 YEARS EXPERIENCE IN ASIA PACIFIC

1. The first industrial revolution created modern industrial societies by harnessing and putting to the service of man huge amounts of mechanical energy, mainly obtained from fossil fuels - coal and oil.

- The second industrial revolution - the electronics one - is giving birth to a knowledge society by accummulating and putting to the service of mankind an endless amount of information. It is multiplying the intellectual ability of man and, even if we don't yet know how to perfect it, is opening up areas of artificial intelligence which will change entirely the world we know.

- This Industrial revolution is accelerating today. It is a revolution based on technology (semiconductors) and creativity. It has it's own values entirely different from those of the 1st revolution and often difficult to grasp, for example ideas rather than physical capacity. Is an idea free, or must it be paid for?

- Semiconductor devices were invented (or is it discovered) in 1948. These first transistors, made of germanium and later silicon, gradually replaced electron tubes in most applications. In 1958, just 10 years later, came the next step forward - the integrated circuit. The problem of building complex systems was effectively solved, now it was the age not of "How to build the system" but "What system to build", it was the conception of the age of knowledge.

- The production of semiconductors and the availability of this technology to a nation or society has resulted in dramatic changes, It has also resulted in a new crop of "have's" and "have nots". Societies changed in ways which would have been unthinkable 40 years ago (communications, entertainment, computing).

- The benefit of the semiconductor was accelerated by the dramatic cost reductions achieved.

    - The electron tube cost 1$ in the 50's and was replaced by a transistor costing 10 cents.

    - A modern IC with 100K to 1M transistors can cost as low as 5$. This means a transistor at a basement sale price of 0.005 cents.

- Overall a function cost reduction of 20,000 times in 20 years, and the IC's operate 1 million times faster.

To match this performance the automobile industry would have to sell cars at 2$, and Concorde supersonic plane would be competitive if it carried 2 million people and flew at 30 million km/hour!

No wonder then that the semiconductor industry is controlling the innovation and progress of the whole electronic industry, no wonder either that companies and even countries regard the technology as of strategic importance. The prize for the winner who dominates the industry is control of the Electronics Industry which is a market ten to fifteen times larger than semiconductors alone. This winner could also control the overall standards of modern industrial society. Japan understands this and USA is working up to it now, Europe lost this race, but is starting to fight back.

SGS-THOMSON synthesises this concept as:

"No advanced industrial society can exist without controlled access to an advanced electronic industry which in turn cannot exist without controlled access to an advanced semiconductor industry".

This is our mission in the countries in which we operate.

ASIA PACIFIC

2. Turning to Asia Pacific, SGS-Fairchild (as we were then) took a very early decision to move out of Europe. Along with a few other pioneers, we saw that the countries of the Region were developing political stability and a dynamic approach to growth for their people. In turn the expectations of salaries were very low, but so was the local technical expertise.

We started in Singapore with our assembly factory in 1969 following a decade of impressive growth in the industry in which we had already taken European national motivations into account and opened factories in France, UK, Germany and Sweden (only France remains today).

The motivation for choosing Singapore at this time was the need for low labour cost. Singapore unemployment was rising to 10% and swelling with fresh school leavers from the post war baby boom.

The Singapore government recognised the need to move from being an entrepot port to an industrialised nation and offered strategic location, political stability and financial incentive. Through a continuous program of training and investment we have

seen this plant rise from manufacturing epoxy transistors at 1 to 3m/mth up to complex IC's at over 30m/mth. The plant now manufactures over 500 product lines in a clean room environment.

Just a few examples of its achievements since 1980. Productivity in DIP14 has risen 840%. Automation has allowed an operator who could bond 80 pcs/hr to now supervise robots producing 4000 pcs/hr. The ratio of engineers to operators has moved from 40/1 up to 15/1 and the plant cycle time has been cut from 24 to 6 days, less than twice the theoretical process time.

In addition to this successful partnership SGS has established a similar plant in Malaysia giving us a total AP annual production capacity of 1.2Billion units and a second location in Singapore, a 5" wafer fab for epitaxial power transistors and power linear ICs with a capacity of over 500k wafer/year. A total investment of over 165M$.

In the period 1970 - 1987, the two Asia Pacific plants were given huge amounts of technology. We made great efforts to train local engineers and managers, transfering both management skills and 'brain power'. In return we got low labour cost manufacturing. The balance was forming even in the early period between the benefits enjoyed by the Asian people and the benefits to our company. It was not however, clear at this time whether it was an equal balance... as I shall discuss later... sufficient to say now that it seemed a good idea at the time to use low labour cost in Asia to balance R&D or creativity costs in Europe. It appeared to satisfy the aspirations of both peoples.

1980 is a reference year for SGS, and to a certain extent for the industry as a whole. It was a year of important changes. The most significant for us was the emergence of the socio-political situation in Europe, especially our base in Italy, from the dark ages when profit was a sin and productivity was a bad word among the majority of workers. On the world scene it was becoming clear that the Japanese strategy of manufacturing dominance was being effective, certainly they were winning a larger and larger share of the USA market - they already dominated their own and still do.

SGS set ourselves a new mission with new objectives - Economic, Technological and Social.

"To be a broadrange semiconductor manufacturer with control of technologies needed for LSI, operating on a multinational basis and aiming to be a stable member of the top group of world suppliers within a decade".

The Economic is a global objective (ie profit), the Technological is an objective mostly coming from the west, in our case Europe, but partly USA; the Social objective applies globally but has, I feel, a special relevance in Asia.

It says "we want to contribute .. share... social and technical development in every country where we operate." We aim for high quality of employment and generation of wealth for the Company, the employees and the country.

In the period 1980 to today, both our sales and our manufacturing have thrived on these objectives in Asia.

Our Asia Pacific SGS sales have risen from 10.5M$ in 1980 to 100M$ this year. Since we have now combined with Thomson, our SGS-Thomson sales and market penetration in Asia Pacific has gone from 21M$, 1.9% in 1982 up to a forecast of 145M$, 5.1% for 1987.

WORLD TRADE

3. But to get back to the issues of balance and benefit which I want to look at, let me recount an article that was in the Opinion page of the Herald Tribune for November 9th 1987.

Forty years ago, the industrial "west" was trading freely with the , mainly agricultural, Rest-of-World. The West believed that the work ethic they had and the productivity achieved was near the best that man could achieve. Free trade was the norm, and it favoured everyone for it clearly expanded the whole world economy and helped everyone to upgrade their structure.

Country A, for example Europe or USA, was making machinery and cars, then radio and TV and other consumer products. Country B, for example Asia or Japan, was making textiles and the ROW made nothing. Progress was easy. Country A could move up to computers, B to cars and C could take over textiles. All would benefit and free trade would benefit all.

Of course, in this process there is the underlying implication that Know-How to make the next generation is passing down the chain, either by free handout, licence or piracy, to enable B and C progress, while A is relying on its citizens creating more and moving into new manufacturing industries the others can't aspire to.

- But a few factors upset this symbiosis.

  - the accelerating pace of progress which makes R&D costs in A rise faster and faster and which are not paid for by B & C either by licence/royalty, consumption of goods or other means.

  - productivity in B, and maybe C, rises to more than A as they concentrate on manufacturing science and exercise, in the case of Japan, a national strategy of dominance.

  - maybe other factors, for example the confucian ethic of hard work, diligence, education has been quoted.

- The result of this upset which seems to fit the current state of our industry is that B overtakes A in manufacturing - cars, computers, TV etc. C continues to make textiles and A ends up making nothing - for example USA in TV/VCR.

- When this is seen to happen, our democratically elected friends the politicians immediately look for platforms on which to take a stand. Trade barriers are the first, "Japan has cultural and structural barriers that prevent USA penetration", says USA. "We don't" says Japan. Taiwan and Korea, fearing an attack on their exchange rates, make an effort to remove import duties and restrictions. The overall effect is small.

- An attack is made on the Yen/$ exchange rate - Oh how I wish I had bought Yen at 257 so I could now sell at 134... But still the effect is small, USA consumers still want to buy VCR's and these are not made in USA.

- No, the issues underlying the imbalance of the Electronics Industry and therefore the semiconductor market are

  - manufacturing science, and productivity

  - strategic market dominance, and early product life protection

  - imbalance of contribution for new creativity, or lack of payment for ideas.

- This last point is a hot subject. Most major companies today are looking over their portfolio of patents and checking which competitor is using the idea without a licence. Many, very expensive - 100's of millions of dollar - claims are now in the pipeline or being settled. Countries have been forced to enact

new laws to protect "intellectual property rights" including patents, copyright, chip layout, microcode etc.

The result is that the west will protect what they have - designs, creativity, technology (especially process and CAD). Protection is inevitable unless a path of socio-economic partnership is taken.

If there is partnership, it is not sufficient to balance creativity, design, ideas on one side and productivity on the other. Simplistically you might say this benefits the West by having low cost products - in reality the West loses by giving freely its newest ideas and gaining only unemployment. The ROW may claim that ideas are free, or free to be taken, or that they themselves are still unequal since their GNP/Capita is lower, but actually they are rewarded more by the phenomenal growth and development of their countries, leaving the West with a growing feeling of frustration and otner social reactions.

PARTNERSHIP

4. So to come back to SGS-Thomson, we believe that fewer and fewer large corporations will share the semiconductor industry and that they will form closer cooperative links to users.

This is brought about for two reasons, first the maturity of the industry and second the increasing level of competive edge needed to succeed, at a systems level rather than a circuit level.

With a trend torwards:

- o giving controlled access to technology, at a cost, to enable partners to better compete,
- o extending partnerships for a positive contribution to progress in profit, share or leadership in advance and new systems.

The target is clear. We are in the business in this age of knowledge to properly market our creative skills, tools, processes in exchange for new creativity and new market share. We want to profit from using technology to achieve goals for ourselves and our partners.

This means results in real economic benefits in a wide sense for both partners, with no one dominating the other by strategic or national policies of buying market share.

This means partnerships where the contribution is balanced in

system, technology of manufacturing and/or sales. It does not mean a simple transfer of technology.

- This means satisfying the aspirations of people, companies and countries in an on-going way. It does not mean discontent and enmity.

- Partnership is our European approach to share progress.

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CATCHING THE ASIAN ELECTRONICS WAVE

James T. Healy
Senior Vice President, LTX Corporation
President, Trillium Test Systems

Mr. Healy is a Senior Vice President of LTX Corporation and a founder and President of Trillium Test Systems, a division of LTX Corporation. Trillium manufactures digital VLSI test systems and networks. Prior to joining Trillium, Mr. Healy held management positions at GenRad and Trio-Tech International. Earlier, during the 13 years he spent at Fairchild Test Systems, Mr. Healy developed markets for Fairchild's products in Asia and Europe. Mr. Healy has an M.S. degree and has authored numerous articles and two textbooks: one on automatic test equipment and the other on the marketing of high-technology products. He is also a former teacher at Golden Gate University.

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CATCHING THE ASIAN ELECTRONIC WAVE

Dataquest Conference
December 7, 1987
Taipai, Taiwan

James T. Healy
Sr. Vice President
LTX Corporation
Trillium Division

Good afternoon ladies and gentlemen.

THE AMERICAN WAY

Two things Americans are known for are: marketing and innovation. Americans, at least in recent years, have not been known for their manufacturing expertise. In a 1984 ballad, Bob Dylan, a famous American poet wrote,

> "When it costs too much to build at home
> You just build it cheaper someplace else."

Last week at a speach at De Anza College in California Andy Grove, the President of Intel, said, "Manufacturing abroad is causing terrible long term damage to our economy." But he stopped short of saying that eventually he would bring Intel's plants back to the USA.

Recently, Andy Rooney of the American television show "60 Minutes" said, "I find I am disappointed in my country. I think we sell things better than we make them."

In the 1960's, Chicago was the thriving center of the consumer electronic industry. Today, the American consumer electronics industry has become nearly extinct. There is not a single American company which manufactures a videocassette recorder or compact disk. Foreign competition in the U.S. is very evident in other industries, such as ship building, steel, automobiles, textiles, shoes, and especially semiconductors.

As for innovation, America has given the world many inventions but has not done a good job of balancing innovation with manufacturing. The DRAM market will top $2 billon this year and Intel, who introduced the DRAM to the world and once enjoyed 100% market share, has zero share today. Ironically, Intel plans to reenter the DRAM market by reselling DRAM's made by Korea's Samsung Electronics.

The philosophy of building it cheaper someplace else is one of the factors that has led to the emergence of the Four Tigers: Korea, Taiwan, Singapore and Hong Kong. I find the Four Tigers a positive reference, and an apt description of the tenacity and strength of these nations.

THE FOUR TIGERS

The Four Tigers are seen by Americans as being in the front ranks of the global economic powers. Their average annual economic growth rates in most cases approach 10%. Collectively, the Four Tigers together with the Pacific Rim countries of Japan and Thailand, have surpassed every other region in the world in economic performance. The engine of their growth is world trade, and much of the fuel for this engine is the gigantic open domestic market of the United States. On the other hand, the Pacific Rim markets are looking more and more attractive to

American companies. Many companies are mapping out their strategies for moving decisively into the Pacific Rim markets, not just for the next few years, but for the next few decades. For example, we at LTX have sales and support centers for our equipment in Singapore, Taiwan and Korea as well as Japan. Some of these centers are not economically justified, if based on the short term business alone, but are our way of saying to our current and potential Asian customers that we are here for the long term.

Americans for the most part have been unused to or uninterested in learning the intricacies of foreign languages and cultures. That is changing. U.S. imports continue to rise and our trade deficit is enormous, but with the slide of the dollar, the global industrial battle is now being fought on more even terms. Plans to increase American exports are progressing. Apple has a computer that programs in the Japanese language. Both General Motors and Ford are designing cars for export to the Japanese market, if you can believe that. It is like taking tea to China.

We Americans are finding ourselves compelled by foreign competition to change our attitudes. High technology will sell itself no doubt, but the Pacific Rim countries are demanding more of our intellectual and cultural resources than ever before.

AMERICA'S PACIFIC DESTINY

American business leaders of today, like our political leaders over the past 70 years, have already grasped the extraordinary opportunity and significance of America's role in the Pacific Rim. Even before the 1911 Revolution in China, led by Sun Yat-sen, American Pacific presence had been accepted as a beneficial phenomenon.

In 1906, President Theodore Roosevelt became the first American to be awarded the Nobel Peace Prize for acting as the intermediary in the peaceful conclusion of the Russo-Japanese War. In fact, it was American-originated ideas of democracy, national independance and popular welfare that inspired Sun Yat-sen to lead the Republican revolution that overthrew the Qing regime. He had learned many of these ideas at a mission school in Hawaii.

Historically, America has at least attempted to act in the noble traditions of national idealism. Even the difficult experience of the Vietnam War had unanticipated benefits. It bought time for much of the region, especially the ASEAN countries, to build up their economies and societies while the Communist Forces were kept busy.

As for the American business leaders, their investment today in the Four Tigers, not to mention the two way trade volume with these countries as well as Japan and even the China mainland, reflects the acknowledgement that relatively cheap labor alone is no longer the attracting force. As the smallar American companies sense the marketing opportunity of the Pacific Rim, those with flexibility, originality of ideas, and energy to move quickly will do so, quickly.

The growth of the the semiconductor industry worldwide is a good example. Pegging the dollar at the January 1987 value, then Europe and Japan's real growth was about 2% each. The United States grew by 20% while the Rest of the World, specifically the Four Tigers, grew by a phenomenal 68%. The issue of currency and location of factories are indicative of just how global the semiconductor industry has become and just how interconnected we all are.

PROTECTIONISM

Unfortunately, a war is looming on the horizon. Not a war of guns, but an economic war which could, in some respects, be a more tragic way of undermining the growing strength of the Pacific Rim community than a real war. American Semiconductor companies believe they cannot compete with governments, especially the Japanese Government. The U. S. government sees it as a national issue, with implications for the national defense and economy. Hence, the decision of the United States government to disallow the purchase of Fairchild by Fujitsu.

About a year ago, an historic semiconductor trade pact between the U.S. and Japan was signed. Apparently, the Japanese did not live up to their side of the bargan, forcing the U.S. to impose trade sanctions. But the results are not promising. The U. S. semiconductor manufacturers still feel the Japanese are manipulating prices and supplies by centrally controlling semiconductor production. In addition, U. S. companies still have a very low share of the Japanese marketplace. We all need to reflect on this.

Recently, in a speech in San Francisco, the Assistant Treasury Secretary, David Mulford, referred to tigers as a shrinking population. He said, "To survive, tigers must adapt and adaptation will require cooperation, not predatory behavior." What Secretary Mulford specifically wants is for the Four Tigers to revalue their currency. He went on to say that policies which promote overvalued exchange rates play a central role in the recent rise of the Four Tigers as trading powers.

In the opinion of journalist David Aikman, it is not the exchange rates, but the controls imposed by governments on capital flow, that distorts things. It is also high tariffs, subsidies and other government controls that kowtow to domestic political interests, while reducing the living standards of the working public, that upsets the U. S. and leads to protectionism.

Punitive trade discrimination, or protectionism, as a response to a trade imbalance tends to spread the disease rather than cure it. Protectionist measures have a tendency to multiply and encompass other countries far beyond the circle of countries at which they were originally aimed, and would certainly include Europe. A worldwide trade war could also be devastating to the Four Tigers.

In fact, it is not the overvalued exchange rates but the policies of the Four Tigers that give their citizens incentives to work, save and invest, that are the main cause of the rise of the newly industrializing countries as trading partners of the U.S. and other countries. This policy, incidently, is called capitalism, and the Four Tigers are practicing it. It would be foolish for the U.S. to attempt to sanction those who are prospering by practicing what the U.S. preaches: free trade and economic liberty. Yet it is incumbent upon the Four Tigers to insure the trade is fair.

On the other hand, the Japanese, just like France and Germany, are masters at enjoying the open markets of the U.S. while sheltering their own. They are the serious offenders. It was on this day in 1941 that Admiral Yamamoto said to the ship's captian, "I think we have awakened a sleeping giant !" He had. We responded. It was less than 30 years ago that the Russians put a satelite into oribit. In response we Americans walked on the moon.

We can and will rise to the occasion. We view the trade imbalance as a chrisis somewhere between the bombing of Pearl Harbor and Sputnik. We will respond again but it would be better if we could respond together. Possibly, the Four Tigers, who also suffer from restrictive Japanese import tendencies, should join forces with the U.S. to exert pressure on Tokyo to relax both tariff and nontariff barriers.

THE CHANGING SEMICONDUCTOR INDUSTRY

In any event, it is the Four Tigers who are clearly, as this conference atests, taking responsibility for their own future, especially in high tech. They are expanding opportunities for producers of semiconductors, consumer electronics, and computer product markets, and they are looking forward to a bright future of cooperation and compatability. And within the semiconductor industry, this change is welcome because the industry is changing.

A few years ago there were two camps each with it's own unique set of marketing characteristics. The capitives such as IBM, Honeywell, and ATT produced semiconductors for their own use, while the merchants, like Intel, AMD and TI, produced standard products for worldwide consumption.

Today, the massive change that is taking place is both profound and dramatic. New technology is buffeting the industry. Sweeping adjustments are taking place in the economics of chip making. The political forces are also changing. The customers, as pointed out in a recent Electronics magazine article by Mr. Park and Mr. Yoon, are shifting their focus from a product orientation to a quality and service expectation.

A completely different way of doing business is emerging; it is characterized by especially close customer relationships and high levels of service and support. The focus is changing from market share and distribution, to market development, market creation and education. From advertising to development of the infrastructure including the financial and technical communities. With the advent of powerful design tools for application-specific integrated circuits (ASIC) and other semicustom products, the design prerogative, which was firmly in the hands of the chip maker, is shifting to the system designers. Service, support, and turnaround time are more important than the ability to turn out millions of low cost chips.

NICHE SPECIALISTS

As a result of this shift from a product mentality to a service mentality, the standard IC makers, or merchants, are being challenged by the vertically integrated companies which included all the Japanese and Korean producers as well as companies like Philips and Siemens. To cope with the change, the standard IC makers must learn to react quickly to target chips for niches, while the vertically integrated companies must move faster in more directions if they are to beat the nimble niche specialists.

In addition to the two classic camps of semiconductor manufacturers, "semi-semiconductor" houses specializing in specific niches are emerging. The design houses, of which there are many in Taiwan, have no wafer fabrication operations and focus all their resources on design and test for chips such as high speed A/D's, graphic subsystems, and mathematic accelerators.

Process specialists make chips like high speed memories and logic for niche markets on1.2 microcron line. Process specialists and design houses, like Proton here in Taiwan, give the customer exactly what they want in a very short time period.

Semicustom houses such as LSI Logic, who specialize in gate arrays, emphasize quick turn around while others emphasize flexibility with custom and semicustom designs based on standard cells. These custom and semicustom houses have two major challenges facing them. They must keep their design tools abreast of the capabilities of process technology, and keep their own process technology on the leading edge. Not easy to do and expensive.

But when it is all said and done, they all have one common objective: to ship as quickly as possible the highest quality parts at the lowest possible cost. And this is where the right test strategy is invaluable.

TIME TO MARKET

In the past, the semiconductor focus was on reducing manufacturing costs. Although it is still necessary to keep manufacturing costs low, the focus has shifted to reducing both new silicon debug and programming costs as well as handling costs. The longer it takes to debug a new test program and the silicon, the greater the cost. The ASIC people are willing to devote an hour or two to device and program debug. In the case of standard products, such as new microprocessor and peripheral chips, the goals are debug times of less than 24 hours.

Achieving these debug times requires a tester with a solid CAE interface which uses a workstation to create an environment for the device designer at the tester similar to the one he used when designing the chip. This is especially important for the new silicon compiler generated chips, where the chips are designed direct from the customer's specification.

SET-UP TIMES

High speed automatic handler prober set-up and changeover times, on the order of two to five minutes, also reduces the time to market figures. To accomplish this, the interface should be self-aligning and use proximity indicators and quick release mechanisms for removing and installing hardware. This type of interface is extremely effective on the test floor where a device lot may consist of as little as 100 devices. If it takes 30 minutes to set up the prober, then just 4 minutes to test the 100 parts, the economics of fast changeover becomes obvious. Test floor throughput can easily be doubled for this reason alone. This results in lower testing costs.

ENHANCED YIELD AFTER TEST

As for yield, to understand the potential cost savings it is first necessary to understand the cost base of new devices. The three cost factors are the silicon itself, the cost of packaging, and the cost of testing. If one can reduce tester guardbands by increasing tester accuracies, less good silicon will be rejected, resulting in an effective reduction in the cost of the silicon. Therefore, cost per device tested is not only a function of throughput, but of tester accuracy as well.

If stringent tests, such as dynamic time parameters, can be performed at probe, the wafer can be presorted and bad die will not be packaged, effectively reducing the cost of packaging. Finally, if all tests can be performed by the tester in a single pass through the test program, and if tester overhead stays below about 10 percent, the real cost per device tested will be reduced significantly.

MODULALITY AND COMPATIBILITY IN TESTER DESIGN

If a line of testers is available whereby the user can purchase the required capability needed, with the assurance the equipment can be field upgraded at a later date with more capability, such as test channels or pins, higher data rates, larger memories and the like, there is no need to pay now for capability that will not be required until sometime in the future.

Additionally, if the upgraded equipment or other models of the tester are software compatable, then the investment in application software as well as in training and spare parts is protected. Therefore, true modularity and software compatability are key considerations when selecting a tester.

THE LTX CORPORATION

Time to market, accuracy, modularity and compatinbility are the guiding principles of the LTX Corporation. Trillium, the digital division of LTX, has experienced high growth similar to high growth experienced by the Four Tigers. We shipped our first LSI/VLSI test system in August of 1985. Today, in just a little over 2 years, we have passed the $100 million mark in bookings, with shipments of over $80 million world wide. As for the Linear Division of LTX, we have shipped over $550 million in linear test systems since 1977, and command over 40% market share worldwide.

We believe our success is directly linked to our customer's success. Therefore, we have a true realization of the meaning of the the Dataquest theme: Responsibility, Opportunity and Compatability. For us, in a word, it means Partnership.

PARTNERSHIP

Through a partnership with our customers we focus on two objectives: low cost of ownership and low cost per device tested. Cost per device tested, as mentioned earlier, is a function of three factors; time to market, that is, how fast you can turn around the prototype, test throughput and yield after test. Cost of ownership, on the other hand, is a function of product reliability and servicing costs.

The best measure of reliability is uptime, defined as the time the test system is available for use, as distinct from scheduled and unscheduled downtime. From this measure comes a ratio of true uptime to maximum obtainable uptime. LTX then guarantees a specific uptime, and the user has the obligation to record all events that enter into the tester uptime performance. This logging of activity helps eliminate disputes and becomes an invaluable source of factual operating data.

THE MODEL

As part of the LTX partnership arrangement, a model, similar to the one developed by Wilhelm Maris, of Philips Alcoma is developed to describe the cost of ownership and the cost per device tested in terms of the user's environment. It starts with the required production rate over a specific time period, taking into account all of the relevant parameters, including the actual cost of the test system over the relevant period. Using the model, we compute the projected testing costs using a specific test system. The cost of one test system may be compared to any other test system from any manufacturer. The results are in terms of cost per good device produced during the expected life of the equipment.

There are two other important benefits obtained from this model which help manage the decision making process. First, in the selection of new testers, the results of the computations are invaluable in reconciling differences between the technical and purchasing specialists. The engineer may want the latest capability, while the purchasing agent is driving for the lowest cost. Because most new testers are so technically sophisticated and the capital costs are so high, such decisions must result from a concensus. As Dr. Maris says, "Where individual personnal preferences of those who have to make the decisions are fundamantally at odds, the cost model can cast the deciding vote."

He goes on to say the second benefit is that it quickly becomes obvious it is the cost of testing (the combination of the cost per device tested and the cost of ownership) not the initial price of the tester, that is the only sound investment criterion.

CONCLUSION

In conclusion, the new reality, the wind of the rapidly increasing world competition, is blowing across all businesses and governments. They in turn, are beginning to seriously acknowledge it. It is a world of growing interdependencies, in which responsibility, opportunity and compatability mean partnerships. The international corporation, in addition to considering corporate profits and national development, must foster international partnerships, not only as a way to progress, but as the means to survive.

If I may quote Bob Dylan again,

"The answer my friend is blowing in the wind."

Thank You.

References:

"The New Intel: Moore mature, More Competitive", Electronic Business, November 15, 1987

"Manufacturers and Suppliers: Forging Tighter Links.", Ir. Wilhelm Maris, Keynote Address, Semiconductor Industry Forecast Conference, London, England, June 14, 1987.

"The Almighty Won", Wall Streat Journal, November, 1987.

"Management in the Third Wave", H. Allen Raymond, Scott, Foresman and Company, 1986.

"Pacific Rim", David Aikman, Little Brown and Company, 1986.

"Going International", Lennie Copeland and Lewis Griggs, New American Library, 1986.

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THE NEED TO PROTECT INTELLECTUAL PROPERTY AND PATENT RIGHTS

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Mr. Severance is the Director of the Office of Pacific Basin for the United States Department of Commerce International Trade Administration and is responsible for all Asian countries other than Japan and China. He has led missions of U.S. experts on intellectual property protection to Korea, Taiwan, and Singapore and has taken an active role in bringing about better protection for foreign intellectual property in the Asian countries. He has also had responsibility for Commerce Department programs and activities in Eastern Europe, the Soviet Union, and the People's Republic of China and has participated in trade negotiations with all of these countries. In addition, he has had assignments at U.S. Embassies in India and Japan.

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THE NEED TO PROTECT INTELLECTUAL PROPERTY AND RIGHTS

REMARKS OF ROGER D. SEVERANCE

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TAIPEI, TAIWAN

DECEMBER 7, 1987

I cannot think of a more appropriate occasion than the first annual Asian Semiconductor and Electronics Technology Industry Conference to discuss intellectual property protection. The electronics industry is one of the industries most affected by intellectual property rights violations.

Why is increased protection for intellectual property important? Existing international conventions have led to the level of intellectual property protection that we have today. But these conventions -- the Berne Convention for the Protection of Literacy and Artistic Works and the Paris Convention for the Protection of Industryal Property -- are not sufficient to stop the worldwide trade losses from counterfeiting and piracy. These conventions were never intended as dispute settlement or enforcement mechanisms. This is why the United States is seeking an intellectual property agreement in the GATT. Such an agreement would also provide internationally agreed standards of intellectual property protection.

The benefits of good protection are substantial.

Importance of Intellectual Property Protection. First, we need to recognize that information based industries are going to dominate world trade in the future. By definition, information industries are those where trade takes place as information flows across borders, rather than product flows. Examples of industries where information flows predominate include pharmaceuticals, telecommunications, services (from banking to fast food), and computer software. These industries export information.

Trade in information industries takes many forms -- manufacturers licensing agreements, royalty arrangements, including franchising, or investment. The key is that production takes place in the country to which the export is made. Payment for the transactions is in the form of fees, royalties, or profits. Unlike trade in products, trade in information does not show up in the trade account. These payments or capital flows are invisibles. Peter F. Drucker, the well-known Professor of Management, estimates that in 20 years income from invisibles trade will exceed income from product trade.

The information flows that take place to create industries in other countries are intellectual property. In improving intellectual property protection, we are creating the environment so information can flow freely. Counterfeiting and piracy are barriers to trade in information. We need to eliminate these barriers as quickly as possible.

While this is the most important reason to protect intellectual property, there are other reasons.

Ownership Rights. The common element of all intellectual property rights is that the inventor, maker, or artist has exclusive rights over the production and sale of the product or creation in question for a designated period of time. This exclusivity enables

the rights holder to obtain monopoly rents for his/her product or creation during the period of protection. It is, of course, this aspect of IPR protection which developing countries find most difficult to accept.

Many in developing countries believe that an innovation, once made known, becomes in a sense a public good and should be freely accessible to all. This assumes that the same number of new inventions and ideas will emerge whether intellectual property is protected or not. This is clearly not the case, for the simple reason that innovation is expensive. The development of a new invention may cost a firm thousands, even millions of dollars. One pharmaceutical company estimated that each commercially viable product cost $80-$100 million over 10 years to develop and bring to market. In order to undertake the research and development in the first place, the firm must have some assurance that it will recoup these expenditures through exclusive rights to the sale of the product over a given time period. Thus a patent gives exclusive rights for an invention the public would not otherwise have. By rewarding inventors, it encourages them to share their inventions with the public.

Similar arguments can be made for copyrights. The possibility of reward encourages creativity in the arts, literature, music, motion pictures, and even in the development of computer software. Without the reward, a society's creative output would be limited.

Trademarks also help a firm recoup product development and marketing expenses. A trademark can serve as a simple shorthand indicating quality to the consumer. Behind this symbol is the goodwill the company may have built up in terms of reputation, service, and value. Misappropriation enables others to benefit from a company's reputation without having incurred the costs.

Foreign Investment. Another reason to protect intellectual property is its role in foreign investment. High technology investment needs adequate protection for intellectual property rights. Such investment often does not flow to countries that do not have adequate protection.

Many, developing countries, especially in Asia, maintain policies of welcoming foreign investment. With the decline in international commodity prices, these countries have sought to increase foreign investment as a means of acquiring more capital for development, creating jobs, and promoting manufactured exports, without raising external debt levels.

Developing countries are competing among themselves for scarce investment dollars. In to meet the competition, countries need to make their investment climates as attractive as possible. Good patent, trademark, and copyright laws, effectively enforced,

contribute to the attractiveness of a country's overall investment climate. In the absence of such laws, or with poor enforcement practices, a potential investor faces a substantial risk of loss which weighs against making the investment or introducing a new product into the host country.

Some examples will help to illustrate this principle:

(1) In 1974, Argentina passed a law requiring uncompensated compulsory licensing of foreign trademarks within five years. In 1977, however, it reportedly repealed the law because of rapid disinvestment by foreign firms during that time.

(2) American publishers have reported that they prefer to print English-language publications for developing countries in Mexico, rather than in Southeast Asia, because Mexico provides good copyright protection.

(3) In the past few years, a number of pharmaceutical companies have withdrawn their research facilities from Canada because of its stringent compulsory licensing requirements.

Technology Transfer. For countries which wish to encourage technology transfer either through direct sale or investment, patent protection is vital. The development of new technology requires

long lead times and high R&D expenditures by a company. In order to make these expenses worthwhile, the company needs to be assured of a steady stream of income from the new technology. A company will not want to sell its most advanced products to a country where it cannot be assured that its research-and-development investment will be protected.

Patent protection, like that of the other intellectual property rights, is not only for foreigners. A country will not be able to encourage technological innovation among its own people without effective patent protection.

There are certain direct benefits to a developing country in having an operative patent system. Such a system could provide for technology transfer through availability of documentation. A patent system encourages early disclosure of information about the invention, which then becomes available to the public. The documents can then be used to learn about an existing invention, so that developing-country inventors need not waste time and resources attempting to duplicate the efforts of others. The documents can also be used to advance the state of technology in a particular industry by serving as the basis for improvements in existing inventions or processes.

Moreover, patents have limits which often are not well understood by policymakers in developing countries. First, they have time limits: in the U.S., 17 years from the date of grant; in Europe, 20 years from the date of application. After that period, others are free to make, use, or sell the patented product. They are also limited to the invention or process as described in the application. Because a patent is only issued for a new invention, it does not deprive the public of existing inventions or processes. A patent gives exclusive rights for an invention the public would not otherwise have.

Most inventions are improvements on existing technology, rather than major breakthroughs in new technological fields. Thus having a functioning patent system would not prevent developing countries from establishing their own automobile, aerospace, or computer industries, as some may fear. Rather, royalties would have to be paid only on those specific components which are currently under patent.

Licensing and Subcontracting. When IPR is protected, licensing agreements can benefit the developing-country licensee as well as the licensor. Such an agreement enables the local entrepreneur to build up sales through a product line that already has an international reputation, while at the same time learning technical know-how and marketing skills from the licensor. Good

intellectual property protection can also promote subcontracting relationships with foreign firms. A foreign patent- or trademark holder who believes his R&D investment will be protected is more likely to seek subcontracting relationships with host country firms than one who faces a climate of inadequate IPR protection.

Export Promotion. Most developing countries are concerned with increasing their exports, especially exports of non-traditional, manufactured items. Such countries need to consider that a good IPR climate would enhance their reputations and visibility as suppliers. While there is certainly an international market for counterfeit goods, they command lower prices than the genuine, licensed articles. A country which is known to protect IPR will be able to "move upmarket" and ultimately increase its foreign exchange earnings.

Consumer Safety. Patents and trademarks also serve to protect the consumer. Unauthorized versions of drugs may be unsafe or ineffective. The same is true said of agricultural chemicals. In 1978, for example, Kenya purchased a counterfeit defoliant, bearing the trademark of a U.S. company, which had been diluted with chalk. As a result, a significant portion of the country's coffee crop yield was reduced 15 percent. Imitation automobile and aircraft parts are frequently cited as potential consumer threats in the United States. Counterfeit products often are substandard -- a cost to the consumer that needs to be taken into account beyond simple considerations of price.

Semi Conductor Chip Protection. You all know I am sure that the designs of semiconductor chips can easily be copied at a small percentage of the initial research and development costs necessary to create an original chip. This counterfeiting shortens the time these research costs can be recovered and discourages investment in this technology.

In response to these concerns, the U.S. Congress enacted the Semiconductor Chip Protection Act of 1984. This act established a new form of intellectual property protection for mask works or semiconductor chips layout design fixed in a semiconductor chip.

The Act provides for a 10-year term of protection for original mask works, measured from the earlier of their date of registration in the U.S. Copyright Office, or their first commercial exploitation anywhere in the world. Mask works must be registered within two years of their first commercial exploitation to maintain this protection. Also, mask works first commercially exploited on or after July 1, 1983, were eligible for protection provided that they were registered in the U.S. Copyright Office before July 1, 1985.

Foreign mask works are eligible for protection under certain criteria. First, the owner of the mask works must be a national, domiciliary, or sovereign authority of a foreign nation that is a party to a treaty, that provides for the protection of a mask work

and to which the United States is also a party, or a stateless person wherever domiciled. Second, the mask work must be first commercially exploited in the United States; or it must come within the scope of a Presidential proclamation.

To encourage development of a new international system for mask work protection, section 914 of the Act permits the Secretary of Commerce to extend the privilege of obtaining interim protection under the Act to nationals, domiciliaries and sovereign authorities of foreign nations if the Secretary finds:

(1) that the foreign nation is making good faith efforts and reasonable progress toward:

(A) entering into a treaty described in section 902 (a)(1)(A), or

(B) enacting legislation that would be in compliance with subparagraph (A) or (B) of section 902 (a)(2); and

(2) that the nationals, domiciliaries, and sovereign authorities of the foreign nation, and persons controlled by them, are not engaged in the misappropriation, or unauthorized distribution or commercial exploitation of mask works; and

(3) that issuing the order would promote the purposes of this chapter and international comity with respect to the protection of mask works.

So far interim orders have been issues for 18 countries; the 12 member states of the European Community, Japan, Sweden, Australia, Canada, Switzerland and Finland. The Secretary's Authority to issue these interim orders has been extended until July 1, 1991.

Protection in Taiwan. Four years ago I led a mission of U.S. consultants and businessmen to Taiwan to talk about better protection for intellectual property. Much has happened since that time.

-- The amended patent law extends protection to chemical and pharmaceutical products, and tightened protection for chemical products produced directly by the use of a patented manufacturing process. New enforcement rules have been issued.

-- Copyrighted works are now protected upon creation even if significantly expanded. Computer software is protected, the copyright is not registered in Taiwan. Also, the duration of copyright has been extended for many of the copyrighted works.

-- Amendments to the Trademark Law increase the amount of damages the legitimate owner may be awarded in a legal action.

-- Civil damages and criminal penalties for patent and copyright infringement also have been increased.

Nevertheless areas remain where further improvements are needed. Copyright protection should be provided for translations of foreign works. Works created before 1975 should also be made eligible for protection under Taiwan's new copyright law. These two issues are being discussed in connection with a proposed bilateral copyright agreement between the United States and Taiwan.

Taiwan should move quickly to adopt an unfair competition law and to conclude Paris Convention-based agreements on trademarks and patents with interested foreign countries.

Patent law implementing regulations need to be promulgated to clarify provisions on compulsory licensing and reversal of the burden of proof so that foreign and domestic process patents are treated in the same manner..

Even with the best intellectual property laws, unless they are vigorously enforced, piracy will not abate. I believe that Taiwan has made a commitment to improve enforcement of its laws. The

number of police raids has been increasing. Last month, Taiwan's National Anti-Counterfeiting Committee and the U.S. Department of Commerce cosponsored an intellectual property enforcement seminar in Taipei to exchange information on enforcement procedures.

Conclusion. Currently, many countries -- including Taiwan, Singapore, Malaysia, Indonesia, and Mexico -- either have already or are now in the process of strengthening laws and enforcement practices. The decisions whether to protect inventions, trademarks, and copyrights and to adhere to international conventions will no doubt be made with an eye to the costs and benefits. It is vital, therefore, that the benefits be properly accounted. Only then will the right choices be made -- not only for the foreign investor, but for developing countries as well.

Thank you.