Channel

BUSINESS & MARKETING NEWS FOR THE SEMICONDUCTOR EQUIPMENT & MATERIALS INDUSTRY

SEPTEMBER 1997, VOLUME 10, NUMBER 7

Managing In the '90s

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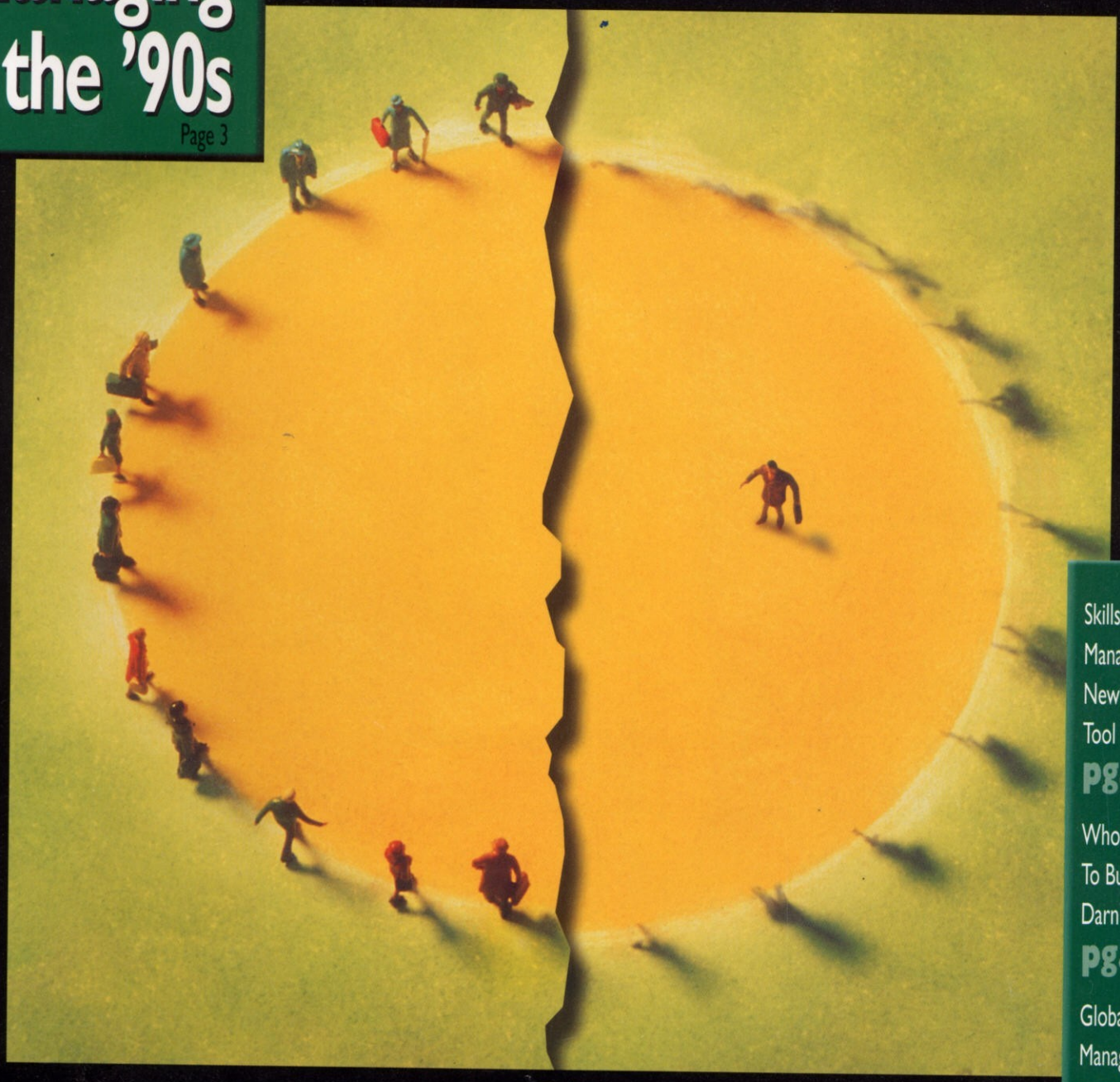

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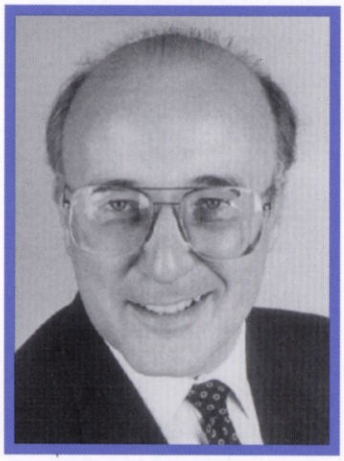
Who Is Going To Buy The Darn Thing?

An Approach for Semiconductor Equipment Firms



by Ralph Grabowski

Brooks Automation rose from stagnation to dynamic growth. GCA shut its doors. Highly visible successes and failures are all around us. What is the process that leads to successful new products and enterprises, and what process leads to failure?

Pierre Lamond, a veteran of National Semiconductor, proclaimed in 1986, "In the 1970s, it was technological innovation. Now it's marketing. What's important is which features you choose to put in your chips, not which ones you're capable of putting there."

Marketing is the up-front process of ascertaining needs that customers are willing to spend money to satisfy, thus guiding engineering to design the right products. How much shall we invest in marketing to enable success, and when?

A new metric has been developed to answer these questions, the Marketing/Engineering Investment Ratio (M/E Ratio). This model separates marketing from the functions of promotion and selling. Formulating a ratio of marketing to engineering installs marketing concurrently with engineering, and sizes the marketing budget with a readily identified number (engineering investment).

Data from diverse technologies, including semiconductor equipment, reveals that super successes invest more in marketing (exclusive of promoting and selling) than in engineering. Flaming failures suffer from an M/E Ratio of .1 or lower.

The implication for technology-based enterprises is a fundamental shift in management attention and investment commitment toward decisive, up-front marketing.

Exactly how much is "more" marketing? Classical guidelines express the sum of marketing, promoting and selling as a percentage of sales. For instance, operating ratio surveys indicate that 25-30 percent of sales would be average for a systems business such as semiconductor equipment.

However, formulas expressed as a percentage of sales are of no use for new products (or new markets, or new fields), since new products have no sales until the product is ready. Lumping the functions together diverts management attention and investment commitment away from the marketing portion. Time is not in the guideline.

	Investment ratio	Developing the product	Ramping up orders
Marketing	1	$	
Engineering	1	$	
Promoting + selling	3		$ $ $
	5	time →	

Figure 1: The Marketing/Engineering Investment Ratio

When should we invest in marketing? This author developed a new metric to solve these issues, the Marketing/Engineering Investment Ratio, for the MIT Enterprise Forum in 1992 (see Figure 1). It includes:

- Apportion the marketing investment relative to the engineering investment with a minimum Marketing/Engineering Investment Ratio of 1.
- Invest those marketing dollars either before, or simultaneously, with the engineering dollars. Marketing is defined as the up-front process that comes before the product is ready (along with engineering). Promoting and selling come after the product is ready.

The evidence is in. Figure 2 demonstrates the relationship of the Marketing/Engineering Investment Ratio with success. The vertical scale is the log of the Marketing/Engineering Investment Ratio. A ratio above 1 indicates more investment in marketing than in engineering. Data points are in three columns: "Failure" on the left, "Success" on the right, and "Neither" in the middle. Multiple bullets indicate that number of data points at one M/E Ratio.

Data was gathered from the extremes, from super successes and flaming failures. Some are obvious, such as Brooks Automation's success, or arrive from this author's business judgment. Others are self-proclaimed, such as Keithley's public declaration of failure. Note that the M/E Ratio data was gathered narrowly, generally from one

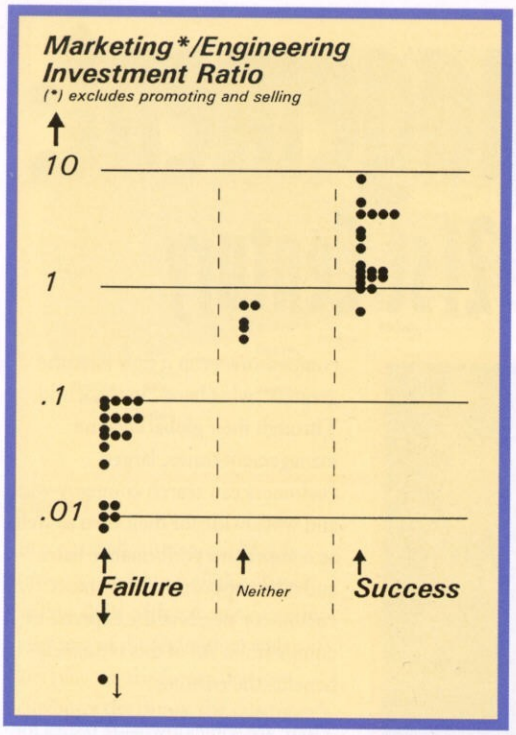


Figure 2: Relationship of the Marketing/Engineering Investment Ratio with success

product at one time. For example, Varian Associates supplied data from a 1969 failure from one division and a 1993 success from another. That does not mean that Varian in 1997 is either an overall success or failure. The placement of any company constitutes neither an endorsement nor an indictment by this writer.

More than $5 billion is represented either in value creation by super successes or in capital squandering by flaming failures. The data is consistent from the 1950s through the 1990s, from startups to Fortune 500 firms, and across a broad range of technology-based enterprises.

Super successes invest more in marketing (exclusive of promoting and selling) than in engineering. They invest up-front, before the product is ready.

For example, Varian Associates launched its 990-CLD Component Leak Detector in 1993 with an M/E Ratio of 4, investing in nine months of marketing before committing engineering. Although the helium leak detector is a half-century-old instrument, Varian's marketing effort surfaced the "voice of the customer" to define and create an entirely new market segment, the component leak detector. Marketing developed explicit lists of what engineering should design, and what engineering should not design. Armed with definitive guidance from marketing, engineering completed the product in 19 days.

Varian Vacuum Products' manager Peter Frasso proclaimed in an interview for this article, "This is a super success! We created a whole new product category, and dominate that market to this day. The component leak detector business never existed before 1993, but now represents a significant and growing fraction of all our leak detector revenue. Marketing is very cost-effective."

Although Brooks Automation pioneered robot wafer handlers and cluster tooling, by 1989 the order rate was stagnant, below $4 million. The company was performing essentially no marketing. The management team purchased Brooks for $2.1 million and brought in a new president, Bob Therrien, who began investing heavily in marketing, raising the M/E Ratio to 1.1.

"Dynamite!" said Bob Therrien of the results. Sales climbed 25-fold to $90.4 million in 1996. Shortly after its 1995 IPO, Brooks achieved a market capitalization of $182.4 million. Brooks' 50 percent CAGR (1991-95) was double that of wafer fab equipment. Brooks' 77.5 percent growth in 1996 out-performed the industry's 11.8 percent rate.

Acugen Software captured a semiconductor test software segment dominated by an entrenched competitor, Data-I/O. Acugen's president Peter de Bruyn Kops invested in marketing at an M/E Ratio of 1 and developed "superior technology in ways that mattered to the customer." Acugen was propelled from a one-person startup to world market dominance in 18 months. With no capital and no sales force, Acugen overwhelmed the competitor's 50-person field sales group.

Avoid the pitfalls of the flaming failures, suffering from a Marketing/Engineering Investment Ratio of .1 or lower. GCA created steppers in the 1970s, grew to more than $400 million in sales in 1984 with over 3,000 employees, and became the world leader in semiconductor fab equipment. GCA's 1981 M/E Ratio was .07. Consequently, it did not have enough marketing horsepower to understand the customer dynamics or the competitive situation, nor the marketing strength to guide the corporation. Just before closing its doors, GCA had a 1992 M/E Ratio of .06. Former GCA executive Bill Tobey observed, "We just blew it!"

Although Hampshire Instruments consumed $75 million developing X-ray steppers, nobody would buy the darn thing. Former CFO Robert Kern recounts, "Hampshire's M/E Ratio was .05 from 1984-1990. In 1991 and 1992, president Moshe Lubin tried desperately to find out what customers really wanted, doubling the M/E Ratio to .1. It wasn't enough! They closed the doors in 1993."

In 1969, Varian Associates abandoned IMPATT oscillators, the solid-state replacement for the microwave klystron tube. Its M/E Ratio was, at best, .05. Despite enjoying a four-year technological lead on the competition, GUNN diode oscillators, Varian could not find enough customers to buy the darn things.

Keithley Instruments' chairman Joe Keithley declared his company a failure in its 1992 annual report, "Our introduction of new products . . . has not produced growth . . . and we are not pleased." Keithley's M/E Ratio was .07. Sales peaked at $100 million per year in 1990, then declined to $90 million in 1994.

Trying to return to a growth pattern, Keithley raised its M/E Ratio one order of magnitude to .7 in 1993. It changed from a product focus to a marketing focus and re-organized into new business development teams that conducted simultaneous marketing and engineering. Sales turned upward in 1995.

Optra developed a laser semiconductor metrology system with a portion of $14 million from 88 SBIR awards. Optra's M/E Ratio was .1 in areas where it considers itself a commercial failure, and .4 to .7 in areas where it had limited commercial success.

President Jim Engel explains, "Optra is a failure. We got what we deserved. We should have spent more money on marketing!"

Ask yourself, "Who is going to buy the darn thing?" Evidence is now available. Invest more in marketing than in engineering to find out. Assume that your technology will work. Make a major shift in funding to up-front marketing with this management tool for the 1990s, the Marketing/Engineering Investment Ratio.

About the Author . . .

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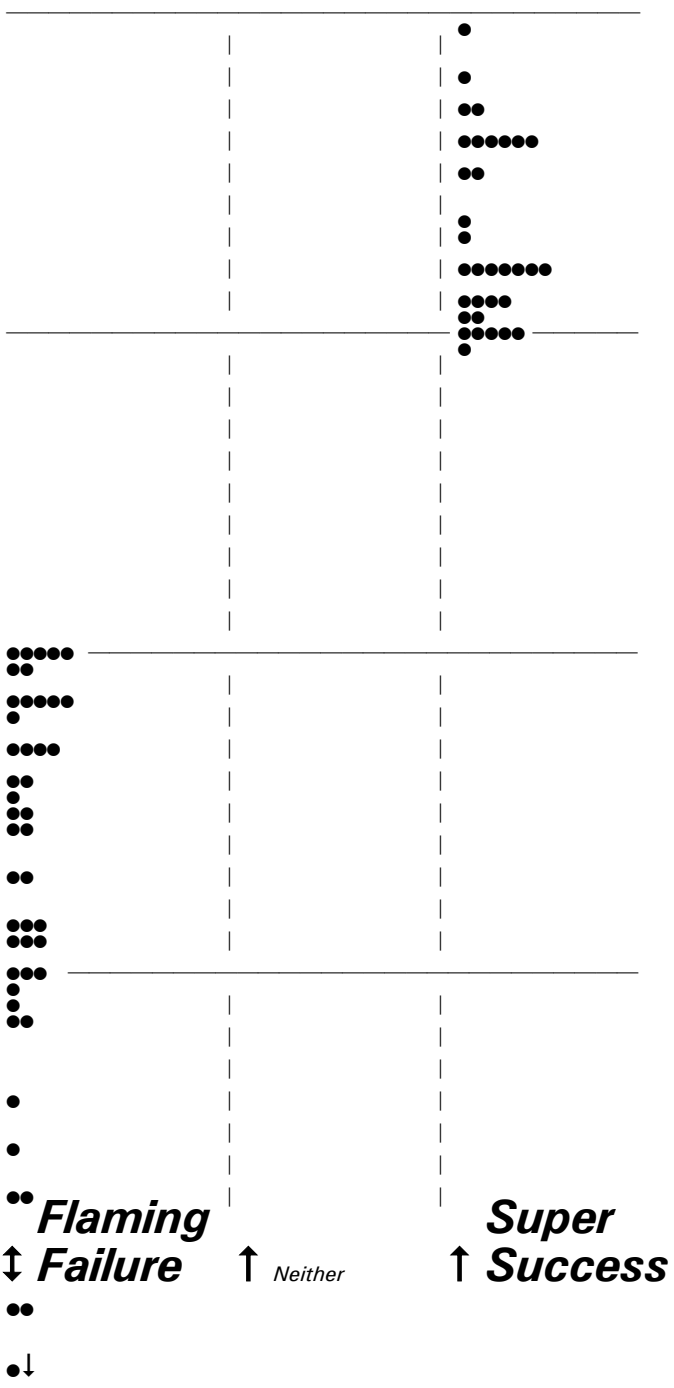
Marketing/Engineering Investment Ratio*™

(*) excludes promoting and selling



Infinity	Balico, balance aid medical device, Grand Prize Winner '05
Infinity	Helicos BioSciences, single-molecule DNA sequencing '03
Infinity	Angstrom Medica, synthetic bone, Grand Prize Winner '01
	MIT $50K Entrepreneurship Competition
9	Litton Medical (ex-BD, ex-DataMedix), mid '80s
6.25	MolecularWare, bioinformatics MIT $50K Grand Prize '99
5	ZippyCool, beverage cooler MIT $50K Semi-finalist '99
5	Invent Resources, product development '93
4	Becton Dickinson, medical - arrhythmia recall '78-'80
4	Varian Associates, Component Leak Detector '93
4	DIVA (AVID), video editing software '90-'93
4	LiquidPiston, combustion engine MIT $50K Runner-Up '04
4	ZippyCool, beverage cooler MIT $50K Semi-finalist '99
4	Adaptive Optics, Div of United Technologies
3.2	two machine vision systems, 3.2 '94, 4 '95
3	AFC Cable, armored wiring systems '97
2.33	Exact Labs, colon cancer diagnostics '95-'96
> 2	MarketSoft, enterprise software '98-'02
> 1.5	Dell Computer, PCs '90s
1.53	thingworld.com, Internet media '98
1 - 2	Juno, free e-mail '96
1.5	Cytyc, PAP smear preparation '88-'89
1.5	Intuit, financial software '90-'93
1.5	Z2, injection molding flow device MIT $50K Finalist '99
1.5	PSI Environmental, boiler temperature gauge '93-'95
1.25	Phoenix Controls (Honeywell), VAV controls '83
1.25	Molten Metal (MMT), elemental recycling '91
1.2	Monster, employment via the Internet '98
1.2	Aurora Systems, CTI software '90-'94 and precursor
1.1	Brooks Automation, semi robots & cluster tools '89-'90
1.1	Evidian USA, enterprise software '97-'99
1.05	Reflective Technologies, reflective sportswear '94-'95
1	Amana (Raytheon), RadaRange microwave oven '66-'75
1	Acugen Software, semi test software '86-'00s
1	Lycos, global Internet hub and media '97
1	EMC, enterprise storage '90s
.9	Open Market, Internet commerce software '98

Financial and human impact:

> 1 Trillion dollars
> 400,000 jobs created or lost
> 150,000 engineering slots developed or gone

marketingVP.com – results through June 17, 2010
●● multiple data at one M/E Ratio™

.1	Molten Metal '97
.1	Optra, electro-optic sensors - 88 SBIR '84-'95
.1	Keithley Metrabyte, data acquisition Taunton MA '93
.1	MRS Technology, FPD lithography '86-'97
.1	Hampshire Instruments, X-ray stepper '91-'92
< .1	Essential Research, vacuum system CAD '90-'93
.09	RVA Technology, software '82-'85
.07	StarGen, fabless semiconductors '99-'06
.07	Orchid BioSciences, genotyping '98
.07	Veeco, wafer particulate detector '85
.07	Keithley Instruments, Cleveland OH '93
.07	GCA '81, semiconductor stepper
.06	GCA '92
.05	Brooks Automation, semi robots '77-'85
.05	Hampshire Instruments, '84-'90
.05	ITRAN, machine vision '79-'93
< .05	Varian Associates, IMPATT microwave oscillators '69
.04	Object Databases, software '92
< .04	Polaroid, instant photography '90s
.037	Machine Technology (MTI), semi track '93
.033	Raytheon, RadaRange microwave oven '44-'65
.033	Micronix, X-ray stepper '81-'87
.03	Evidian USA, enterprise software (2) '92-'96 & '00-'02
< .03	KSR, supercomputers '86-'95
.02	Cisco, Internet routers '00
.02	Quarterdeck, operating system (OS) software '90s
< .02	Luminus Devices, LED lighting '10
.015	Cetacean Networks, real-time Internet & VoIP '00-'04
.014	Fusion Lighting, lighting '91-'02
.013	Genuity, Internet '98-'00
.013	electronics & instrumentation, AMA, '53
.012	HyperDesk (FTP), Internet groupware '92-'95
.01	Becton Dickinson (BD), Telocate patient location '73-'77
.01	DataMedix (bought BD division), early '80s
.01	Physical Sciences (PSI), > 200 SBIR '84-'95
< .01	Xerox, copiers '94-'02
.008	Thinking Machines, supercomputers '90-'94
.007	Lotus, office software '90s
.007	Nortel, telecom '84-'02
.004	Digital Equipment (DEC), PCs & minicomputers '90s
.003	Applicon, Computer-Aided-Design (CAD) '72-'82
.002	Lucent, telecom '67-'03
.002	SAL, X-ray stepper '81-'00s
< .001	WANG Laboratories, PCs & minicomputers '84-'91
< .001	VNCI, network video '93-'99
Zero	Thinking Machines '83-'89