

THE CORPORATE BOARD

THE LEADING JOURNAL OF CORPORATE GOVERNANCE

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The Board's Fiduciary Responsibility To Market Research

Invest at least one dollar in market research for each dollar invested in engineering.

by Ralph E. Grabowski

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The Board's Fiduciary Responsibility To Market Research

By Ralph E. Grabowski

The evidence is in. Super successful technology-based enterprises average about two dollars in market research for every dollar invested in engineering. Business disasters invest less than a nickel in upstream marketing for each engineering dollar. The implication for the board of directors is that prudent oversight of a company's affairs must include a commitment to invest resources in decisive, up-front marketing.

"Who is going to buy the darn thing?" We ultimately measure a company's success by its ability to design and deliver standard products and services that others will buy, and at a profit.

Why do some new products take off, while others don't sell at all? What makes companies successful? What is the origin of super success or outright failure? Market research is a process of ascertaining needs which customers are willing spend money to satisfy, thus guiding engineering to design the right products. How much shall we invest in market research 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 (market research) from the functions of promotion and selling. Formulating a ratio of marketing to engineering installs market research concurrently with engineering, and sizes the marketing budget with a readily identified number (engineering investment).

Evidence is available to confirm the recommendation that technology-based enterprises invest more in market research than in engineering. To an engineering audience, to the technologists, that might seem outrageous. This author is often asked, "How can you possibly suggest that we devote our precious capital to marketing, much less more to market

research than to engineering, when we have this heavy-duty technology to develop?"

In fact, the evidence shows that commercially successful technology-based enterprises do just that. "Super successes" have an M/E Ratio greater than 1, investing, on average, about two dollars in marketing for every dollar invested in engineering. They invest up-front, before the product is ready. They maintain a higher investment in market research even at the extremes of technology where you might expect more investment in engineering.

Every business basket case, termed a "Flaming Failure," suffers from an M/E Ratio of .1 or lower, averaging less than a nickel invested in marketing for every dollar in engineering.

The data grid at the right demonstrates the relationship of the M/E Ratio to success. The vertical scale is the logarithm of the M/E Ratio. A ratio above 1 indicates more investment in market research than in engineering. "Flaming Failures" are grouped in the left column, and "Super Successes" in the right column. Multiple bullets mean that number of data points at one M/E Ratio.

The implication for the boards of technology-based enterprises is a fundamental shift in oversight and investment commitment to decisive, upstream marketing.

The old product-driven strategies do not work. The old formulas are not helpful.

New products are a classic strategy for growth. However, new products alone do not guarantee

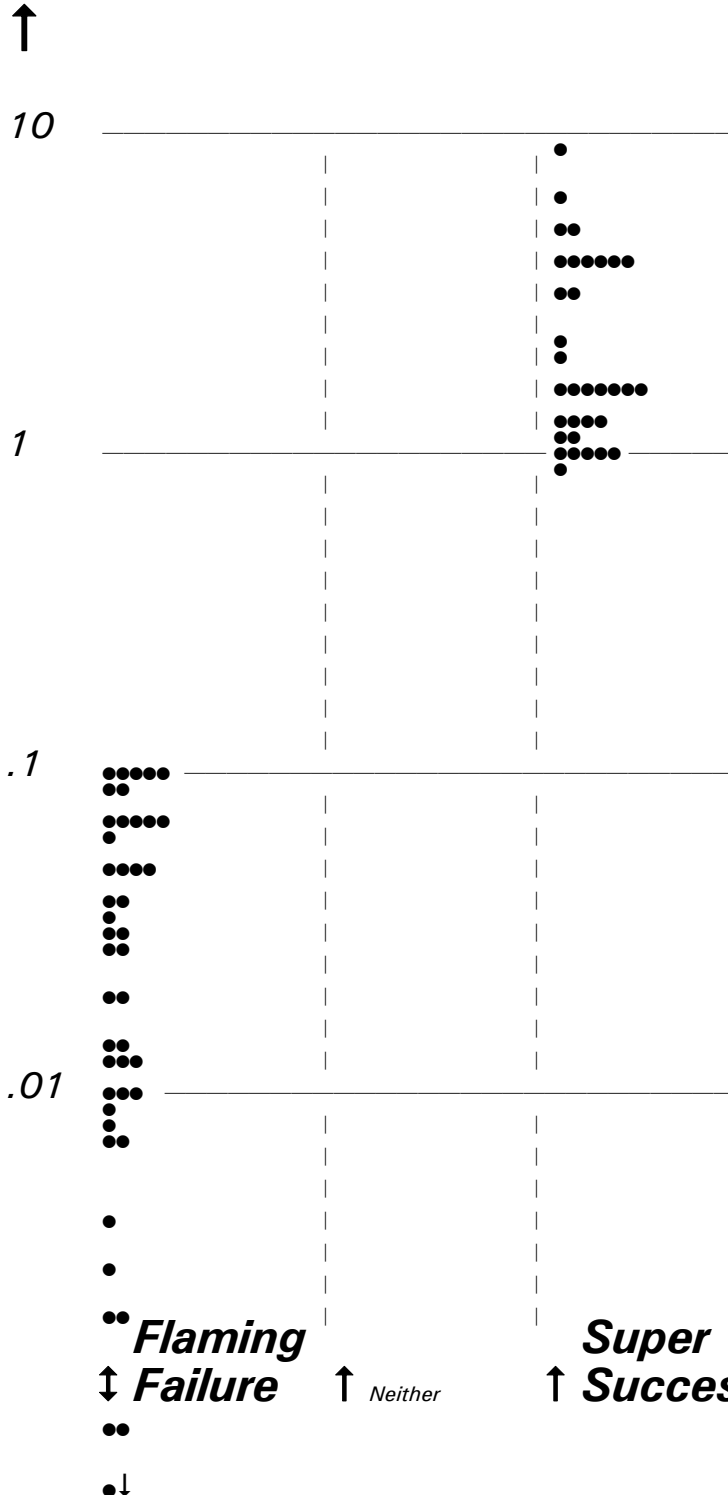
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Marketing*/Engineering Investment Ratio™

(*) excludes promoting and selling



- Infinity Helicos BioSciences, single-molecule DNA sequencing '03
- Infinity Balico, balance aid medical device, Grand Prize Winner '05
- Infinity Angstrom Medica, synthetic bone, Grand Prize Winner '01
- 9 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
- 1.5 thingworld.com, Internet media '98
- 1 - 2 Juno, free e-mail '96
- 1.5 Cytoc, 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 '96
- 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:

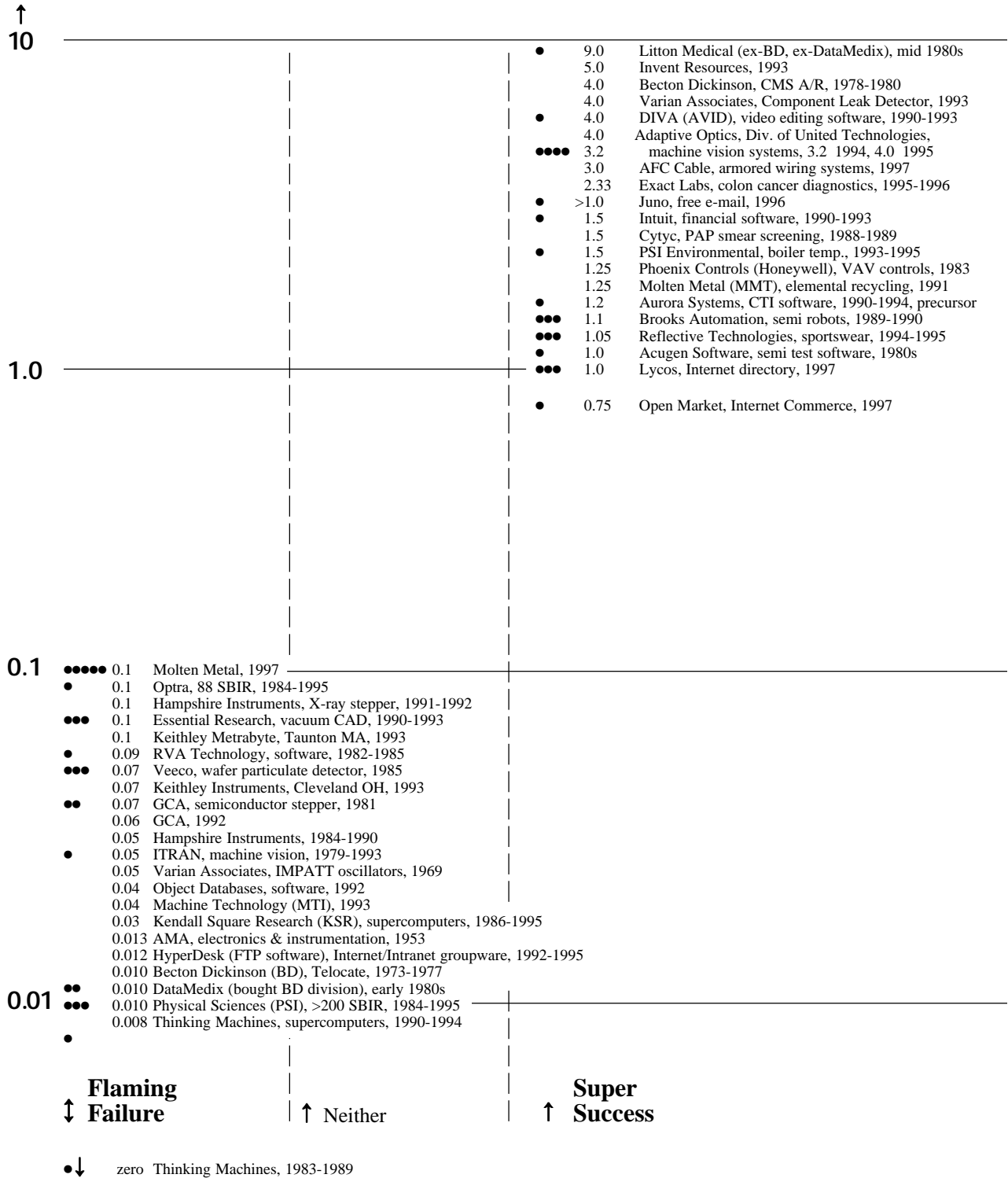
- > 1 Trillion dollars
- > 400,000 jobs created or lost
- > 150,000 engineering slots developed or gone

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 marketingVP.com - results through December 5, 2006
 ●● 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
- .06 GCA '81, semiconductor stepper
- .06 GCA '92, semiconductor stepper
- .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
- .033 Evidian USA, enterprise software (2) '92-'96 & '00-'02
- < .033 KSR, supercomputers '86-'95
- < .03 Cisco, Internet routers '00
- .02 Quarterdeck, operating system (OS) software '90s
- .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 SALL, X-ray stepper '81-'00s
- < .001 WANG Laboratories, PCs & minicomputers '84-'91
- < .001 VNCL, network video '93-'99
- Zero Thinking Machines '83-'89

Marketing*/Engineering Investment Ratio

*Marketing Excludes Promoting And Selling



Source: Ralph E. Grabowski, data through April 6, 1998; <http://marketingvp.com>

•• multiple data at one M/E Ratio

growth. Customers do not buy just any new product. They buy only the new products for which they have a need. For example, Keithley Instruments' Chairman Joe Keithley declared themselves a failure in their 1992 Annual Report, "Our introduction of new products . . . has not produced growth . . . and we are not pleased." Becton Dickinson's Medical Systems division (BDMS) had fifteen major new product initiatives underway in engineering, yet found themselves with losses and declining sales.

Other guidelines express the sum of marketing, promoting, and selling as a percentage of sales. For instance, operating ratio surveys indicate that 15 to 20 percent of sales would be average for a components business, 25 to 30 percent for systems, and 40 to 60 percent for software. 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 board attention and investment commitment away from the marketing portion. That guideline offers no assistance in the timing of the marketing effort. Sales figures are history, while the board needs future-oriented intelligence.

For example, BDMS outspent their main rival, Hewlett-Packard, by 70 percent in total marketing, promoting, and selling—26 percent to 15 percent of sales. Yet Hewlett-Packard was number one in market share and profitable while BDMS was number seven with losses. BDMS could not afford to increase its already large sales-and-marketing budget to "out-market" its rival. BDMS found that the sales percentage formula was not helpful.

This author developed the M/E Ratio to guide technology-based enterprises. The metric was created for the MIT Enterprise Forum, a world-wide non-profit affiliate of MIT which assists these companies.

The M/E Ratio applies to technology-based enterprises investing in the development of standard products. This new 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 market research budget with a readily identified number (engineering investment).

Apportion the marketing investment relative to the engineering investment. Marketing is an investment, just as engineering is an investment. New products and new businesses do not have a sales stream to divide for an estimate of marketing, but they normally have a well-estimated engineering investment.

The M/E Ratio should be a minimum of 1. Invest at least one dollar in marketing for each dollar invested in engineering. The magnitude of the challenge simply requires it. Invest more in market research than in engineering to find out who is going to buy the thing.

Invest those marketing dollars either before, or simultaneously with the engineering dollars. This becomes one definition of marketing, and a means to distinguish marketing from promoting and selling. Marketing occurs at a special time during product development. Marketing is the process that comes before the product is ready.

This model has been tested against real-world results. Data was gathered from the end points, from major successes and serious failures. (The mediocrity in the middle was ignored.) Some labels of success or failures are obvious and acknowledged by the industry, such as Intuit's success, or arrive from this author's business judgement. Other appellations are self-proclaimed, as is Keithley's public declaration of failure. The M/E Ratio is not available from annual reports, and was developed by personal interview. Note that M/E Ratio data was collected narrowly, generally for one 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 1998 is either an overall success or failure. The placement of any company constitutes neither an endorsement nor an indictment by this author.

More than \$8 billion is represented either in value creation by the successes, or in capital squandering

Ralph E. Grabowski

by the 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.

Marketing is different from promoting and selling in both function and in time. Market research is the upstream process before the product is ready, perhaps before committing engineering.

Marketing means designing the product to deliver benefits, and only those benefits, that customers are willing to spend money to receive, thus guiding engineering to design the right products. Marketing is defined as all *pre-production market research* and excludes all promotion and sales expenditures. It includes the primary and secondary market research that supports strategic planning.

Marketing is also the quantification of customer needs, understanding the potential customer, developing business models, customer payback calculations, market segmentation, food-chain analysis, analyzing channels of distribution, and competitive intelligence. Market research not only vectors engineering to design the right products, but guides the promotion motion and the selling motion.

For example, Varian Associates launched their 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 of what engineering should not design. Armed with definitive guidance from marketing, engineering completed the product in nineteen days.

Varian Vacuum Products' Peter Frasso proclaimed, "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."

"If the board is to be ultimately concerned with strategy, and it should be, then the board must be concerned with the amount and relevance of the company's market research activities."

According to Dr. Barry Unger, co-founder of the MIT Enterprise Forum and Lecturer at MIT's Sloan School of Management, "Understanding a company's place in its market is the fundamental intellectual discipline underlying the creation of effective business strategy. If the board is to be ultimately concerned with strategy, and it should be, then the board must be concerned with the amount and relevance of the company's market research activities. Strategy must be based on facts, not on wishes."

The board does not manage the company. Yet the board is responsible for a sound strategy to be in place, for the fundamental direction of the company. It is the market research data that provides the basis for strategy and for strategic decisions. Market research enables direction.

Armed with customer and market data, in six months new BDMS marketing staff abandoned or shelved fourteen out of their fifteen engineering projects as unneeded, ill-conceived, or not decisive. One new product for example, a patient location system called Telocate, had \$.3 million invested in engineering with five U.S. patents granted and fifteen pending. Simple primary market research, performed only after engineering was complete, found that there was *no* need for patient location.

BDMS' marketing then proceeded to identify and plainly specify the one technology (a computer-based patient monitoring system called Arrhythmia Recall or A/R), out of the fifteen, for engineering to focus on for decisive competitive advantage.

Michael Nevins of McKinsey & Co. concludes, "Successful companies think of marketing as the essence of strategy rather than as a sales and advertising function. The shift in spending decisions

[toward up-front market research] and control systems [accounting separately for promoting and selling] is the single most common roadblock to achieving marketing excellence.”

The board might use the M/E Ratio as a tool to provide specific guidance for investment priorities, investment timing, and financial visibility. Market research enables future-oriented intelligence.

Rethink the upstream investment priorities. Effect a fundamental shift to a marketing focus, away from a technology focus. Perform marketing early on, up-front. Assume, for the moment, that the technology will work, and focus on the marketing. The marketing is the big risk. Assume that the technology is not a risk. Having good technology that works is necessary for success. However, having good technology is not sufficient. Every one of the failures in this study had good technology.

Use the M/E Ratio as a test of whether to invest in or approve a new product development. If the business plan demonstrates that the cumulative M/E Ratio is already more than 1, proceed to consider the other issues that you normally would. If the M/E Ratio is less than 1, then put money in earmarked for market research. Encourage hiring or retaining market research people.

When you do decide to invest, incorporate the M/E Ratio into the terms as a financial monitor. Maintain the M/E Ratio above 1. Use the M/E Ratio as a tool to revive the “living dead” organizations. Account for marketing (market research) distinctly from promotion and selling.

Make a major shift in funding to real marketing, to market research. For example, Becton Dickinson’s BDMS made a major shift in funding to market research, raising their M/E Ratio from .01 to 4. With marketing guidance, their sales per salesperson doubled, thus their sales expenses were cut in half. Even though BDMS increased market research by a factor of 400, their overall expenses declined (the sum of marketing, promoting, and selling). In just 24 months,

BDMS tripled market share, returned to profitability, and went from number seven to number two in a mature, flat market.

Restructure and reorganize to be marketing directed, from the top down. Change people. Becton Dickinson brought in a new management team for BDMS. The new division president had a marketing background. They recruited staff who possessed distinct market research skills, tools, and experience, and who proceeded to rigorously apply formal marketing and market research methods.

Trying to return to a growth pattern, Keithley raised their M/E Ratio more than one order of magnitude in 1993, approaching 1 on some new projects. They changed from a product focus to a marketing focus, and reorganized into new business development teams that conducted simultaneous market research and engineering. Sales turned upward in 1995.

Abandon the present “marketing department” cost structure, which often lumps marketing, promoting, and selling together into one department. Each separate function is valuable. However, you cannot tell how much is devoted to each. Selling and promotion are normally large items. As a consequence, marketing can lose visibility. Account separately for each of marketing, promoting, and selling. Include the marketing function done by people without marketing titles, such as company management. Abandon marketing as a cost center. Consider promoting and selling as a cost center for existing products.

Think in terms of dynamics. Imagine your business as a series of entrepreneurial startups, where the new product needs market research, yet there will be no sales until after the product is ready. Abandon the operating ratio philosophy.

Finance the marketing, not just the engineering. Finance the market research at the same level, or higher, than the engineering. Finance the marketing early on in the investment cycle. Insist upon (demand) customer and market data from up-front market research to justify the financing of investments in engineering. Justify market research as an investment in new products, just as engineering is considered an investment in new products.

Well-placed questions can be an effective method for the board to guide the CEO and the corporation.

Well-placed questions can be an effective method for the board to guide the CEO and the corporation. Market research is not a commodity that can be purchased by the ton. Inquire not only about the quantity of marketing, but also about the relevance of the market research, the caliber of the market research staff, and the quality of their activities.

When do you plan on doing market research? (Before, during, or after product development; or never?)

What is the cumulative engineering investment by project? (Engineering + R&D + development)

What is the cumulative *marketing research* investment by project?

If your marketing research investment is less than your engineering investment, what actions will you take to bring the market research budget and investment for each project into parity with engineering investment? Should you change priorities? Will you shift more funds into market research? Can you find money for market research?

Who is going to do the *market research*?

What are that person's skill levels, experience, track record, and training in market research; especially in technology-based enterprises?

Describe the segmentation of the market. Include both those segments that you will serve, and those that you will (by plan) not serve. What, exactly, is your market segment? How will you size the specific opportunity for your company?

What is the "food chain" of your market segment? Include the steps before you as well as after you. Incorporate all the steps from raw material to the ultimate consumer, whether or not you will be involved in all of them. List the major players in each step.

Who is the customer? Hint: "the market" is not your customer. Markets don't buy products; customers do.

How many customers are in the top five? How many are in the top ten?

What are the names, titles, addresses, and phone numbers of those you expect to be your first three customers? When do you expect each of them to enter their first order with you? What do you expect their purchases to be for each of the next few years?

Paint a word picture (plus real pictures and drawings, if you can) of the way your customer does their business now. Model your customer's business.

You are selling aspirin. What is the headache?

What benefits will your product or service deliver?

How will your product affect your customer's business?

What payback will your product or service provide? Be exact: translate every step of how your product or service will affect the way your customer will do their business into a dollar savings/(loss). Sum up the savings/(loss) per year. Calculate payback and ROI.

Paint a word picture (plus diagrams, if you can) of the way your customer justifies and purchases similar products or services, and of the way you expect them to justify and purchase your product. In other words, what is your customer's buying model?

How and when will your market research staff provide guidance to engineering by: growing a relationship with engineering; articulating product concepts; defining important product benefits (specifications) that customers will spend money to receive; identifying features that engineering need not address; developing an unfair, defensible, decisive competitive advantage?

When and what do you plan on discussing with potential customers by personal visit (and phone, E-mail, and FAX) to iteratively validate: the product concept (marketing before engineering); rank and weight of customer needs (benefits that they value); customer willingness to spend money for the benefits that you believe that your product or service will deliver; customer payback; bottoms-up market size; your model of their business; your grasp of their buying model?

Who (or what) is the competition? Hint: You are not allowed to answer, "There is no competition."