

F405
S528.

8860676

Marketing High Technology

William L. Shanklin
Kent State University

John K. Ryans, Jr.
Kent State University

LexingtonBooks
D.C. Heath and Company
Lexington, Massachusetts
Toronto

Library of Congress Cataloging in Publication Data

Shanklin, William L.
Marketing high technology.

Includes index.

1. High technology—Marketing. 2. High technology industries.
I. Ryans, John K. II. Title.

HC79.T4S49 1984 621.381'7'0688 83-48064
ISBN 0-669-06914-0

Copyright © 1984 by D.C. Heath and Company

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage or retrieval system, without permission in writing from the publisher.

Third printing, June 1985

Published simultaneously in Canada

Printed in the United States of America on acid-free paper

International Standard Book Number: 0-669-06914-0

Library of Congress Catalog Card Number: 83-48064

Introduction

Our ancestors were undoubtedly amazed by the revolutionary scientific devices and discoveries of their times that we take for granted today. Who marvels now over the electric light bulb, the automobile, or the Salk vaccine? Likewise, our children's children will hardly be impressed with present-day technological breakthroughs. The space capsule that first took astronauts to the moon will be but one of the many "Model Ts" of tomorrow.

Consequently, the *high* in high technology depends on the times. To early humans, the discovery of the wheel and its possibilities was advanced applied science. And such incremental gains in applied science, meager though they may later seem to be, are enormously important to us: Technology brings freedom to our lives from laborious tasks, facilitates our education through improved worldwide communications, and mitigates our worries over disease. Inarguably, technological progress also carries with it great responsibility, especially with regard to controlling technology's potential for destructive use. Advances in weaponry systems, exporting computer capabilities to totalitarian regimes for possible use in surveillance of dissident citizens, and genetic engineering have all raised moral and ethical issues in our day. There are essential economic ramifications from high technology as well. These are the focal point of this book.

The nation that thrives in high technology is going to have a superior material standard of living vis-à-vis its sister nations and a larger say in the conduct of world affairs. Power and influence inevitably flow to the countries most adept at fostering the discovery and advancement of technology. (The same can be said for the individual states within the United States.) And adeptness depends not only on the collective ability of a nation's scientists to make headway in the laboratory, but also on the prowess of its business people in developing and marketing incipient technologies in a commercially successful way. Indeed, the development of high technology that fulfills a significant human need or desire, present or future, is the critical marketing task. Keen and perceptive need discernment and fulfillment do not make the actual selling job superfluous, but they certainly make it easier.

Technological innovation in the United States and elsewhere in the free world has often been the product of individual free-lance inventors who saw their ideas through to ultimate success, frequently in the face of many trials and tribulations and with great odds against the inventor. Thomas Edison's advocacy and use of the industrial research laboratory in the nineteenth cen-

ture began to change this pattern and to shift technological innovation to corporate sponsorship—although one-person entrepreneurs did and still do occasionally succeed.

With increased corporate sponsorship of technological innovation came an important dichotomy between those people who conceptualized and invented technology and those individuals who developed, financed, and marketed it. Risk of failure was also spread over more individuals, primarily the corporate shareholders or oftentimes the venture capitalists. We feel that this distinctive and critical division of labor between the technological and business sides of innovation has been largely glossed over in the ongoing debate in the United States about the causes of and remedies for the nation's eroding technological leadership.

As the United States has watched its technological edge erode in various fields, we have heard it said repeatedly that what the United States needs is more scientists, mathematicians, and engineers, as well as improved schooling in the sciences at all educational levels. We could not agree more with these recommendations, as long as they are presented as only one part of the solution and not a panacea. We believe that even if the United States somehow could miraculously produce enough capable scientists, mathematicians, and engineers overnight, our technological concerns as a nation still would not be resolved. The most brilliant scientist or engineer might be a poor discerner of market needs—the place where every technological breakthrough must ultimately prove its worth. Scientists and engineers are just as susceptible as the rest of us to becoming enamored with their own work and consequently to making errors of judgment about how others will perceive and accept it. Technologically oriented corporate employees need solid direction from the marketplace of today or tomorrow if their efforts in the laboratory are to coincide with corporate goals and strategies. The role of marketing is to provide this direction. As Dr. Edward W. Ungar of Battelle Memorial Institute told us, "In corporate R&D, most ideas for new products need to be evaluated against the test of whether or not the product will be accepted in the competitive marketplace."

We began the project which resulted in this book by first testing our intuition that the same marketing concepts and techniques that are so largely responsible for the high standard of living enjoyed by mass distribution societies need adaptation and sometimes refinement to fit the specialized and often singular needs of companies engaged in high technology. Our belief was based on our discussions with a number of executives in high-tech companies. We also asked ourselves two questions: "Even if this is true—that traditional marketing concepts and practices need adaptation and refinement—is this topic worth researching and writing a book about? Would we really make a contribution?"

After further discussions with management in a diversity of high-tech companies and with government officials concerned about U.S. technological leadership and the U.S. export position, our answers to these questions were resoundingly affirmative. To say that many of the people we asked were excited and encouraging about a research-supported practical book on marketing high technology would not be an overstatement. In our opinion, the demand for a book on marketing high technology only rarely resulted from a situation where engineers and scientists were running a company without the counsel of personnel with first-rate marketing knowledge and savvy. Something far more fundamental was at work. We concluded that conventional marketing concepts and methods work best once a technology has matured and established itself in the marketplace. But in the initial stages of market acceptance—what we term the supply-side stages—the same marketing concepts and techniques are sometimes not applicable. In this book, we look at both supply-side and demand-side marketing and suggest how each can be employed effectively. In particular, the volatility of high-tech industries calls for creative approaches to product management and to human resource staffing requirements (entrepreneurial managers versus maintenance managers) over the product and technology life cycles. Similarly, the intrinsic complexity of high technology has interesting and *meaningful implications for the communications functions—advertising and personal selling.*

Since we started the project which led to this book, our judgment about the need for practical research-based guidance on the marketing and management of high technology (supply-side marketing, we call it) has been reaffirmed by the people we have come across in our research and by the number of leading universities that have established programs within their business schools on entrepreneurship and the management of innovation. Most of these programs are partially funded by high-technology companies of note, and at least one major university has begun to offer a joint graduate degree between its schools of business and engineering.

After we satisfied ourselves that there was a real need for a book on marketing high technology, we turned to collecting data. Initially, we searched for existing marketing literature that pertained precisely to marketing high technology. But we were not content merely to rely on an individual author's claim for the usefulness of a concept or technique; we wanted to see for ourselves what the experience had been, if any, with a given concept or technique under actual high-tech marketplace conditions. To do so, we solicited the opinions of knowledgeable executives within successful high-tech firms. We wanted to know, "What has been the track record for . . . ?" In those instances where the marketing literature appeared to be silent on the usefulness to high technology, of a marketing

concept, method, or activity, we proceeded in a like manner. Further, we sought new ideas and explored possibilities we had developed. Our efforts were comprehensive—we covered virtually every fundamental area of marketing management and research.

Our data came from executives in a wide and representative cross-section of high-tech industries, from ventures as diverse as robotics and biotechnology. The data were collected over several years by means of in-person and telephone sessions, written questionnaires, and a number of in-depth studies on specific marketing areas, such as personal selling and advertising in high-technology markets. Our data sources have one thing in common beyond being in high technology: They are all proven winners in the high-tech sweepstakes. While much can be learned from the mistakes of companies that have failed (and we cite and consider such mistakes from time to time), we hardly want to offer advice and counsel on marketing high technology that is founded on the experiences of losers in the marketplace. Consequently, when we refer to what high-tech firms do in the way of marketing, we mean successful companies that have proven themselves in marketplace competition over enough years to demonstrate that their success is not a fluke.

Let us say at the outset that this is not a book on how to market high technology. Rather, it is a book on what to do to market high technology in order to increase the chances of success—what marketing concepts, techniques, and activities to use (or not to use). The details and intricacies of how to are left to other sources.

Acknowledgments

The development of any book requires the advice and assistance of many individuals. Writing a book in an area that has not been previously explored makes such help even more essential. While we totally accept the responsibility for the material presented here, we wish to express our gratitude to the many persons who have provided us with valuable perspectives.

Our particular thanks go to Michael R. McGinley of Corning Medical and Scientific, Corning Glass Works; Ronald Evenson of Mill-Rose Laboratories, Inc.; Timothy J. Bublick and Nancy Lieber of The DeVilbiss Company; Robert Donath (*Business Marketing*); William Kolarik (U.S. Department of Commerce); Richard Reiser of Reiser Williams DeYong; Erik Borre of Novo Industri S/A; Robert Pacenta of Hewlett-Packard; Dean Peebles of Goodyear International; Dr. Alan Steggles of the N.E. Ohio College of Medicine; Stephen N. Bowen of NCR; Dr. Richard T. Hise of Texas A&M; Dr. Raj Aggarwal of the University of Toledo; and Mark G. Frantz of Frantz Medical Development Ltd. for their contribution at one or more critical points in the process. Further, we wish to acknowledge those many high-tech company executives who took the time and made the effort to respond to our detailed surveys and follow-up inquiries; without their assistance this book would not have the type of strong factual base that we desired.

At the operational level, we wish to gratefully acknowledge the efforts of Janet Currey, our typist; Janet Parkinson, our editor; Lori Mitchell, research assistance, of the University of Toledo; Susan DeSai, research assistant, of Kent State University; Kem Mraovich of Kent State University; and our secretaries, Susan Andrews of the University of Toledo; Mary Bruce of Kent State University; and Bernedette Messina of Kent State University.

Contents

	Vignettes	ix
	Figures and Tables	xi
	Introduction	xv
	Acknowledgments	xix
Chapter 1	Technological Innovation and Marketing	1
	A Place for Supply-Side Marketing	4
	High-Tech— <i>The Agenda for America?</i>	12
	What Is High Technology?	18
	Why a Book on High-Tech Marketing?	19
	What to Expect	23
Chapter 2	Marketing Organization and Sales Management	29
	Types of High-Tech Firms	29
	Marketing Organization	34
	Personal Selling and Sales Management	46
Chapter 3	Positioning and the Selection of Target Markets	57
	The Art of Market Segmentation	58
	Positioning: The Selection of a High-Technology Target Market	60
	What Are the Special Targeting Problems of the High-Technology Firm?	61
	What Do We Mean by Positioning?	63
	Stages in Positioning for the High-Technology Marketer	64
	Market Segmentation and Target Market Refinement	69
Chapter 4	Searching for Market Opportunities and Insight	75
	Marketing Research: The Make or Buy Decision	77
	Diffusion of Technological Innovation: Basis of Insight into Marketing High Technology	80
	Creating and Considering New Product Ideas	85

	Estimating Market Demand	93
	Irony of Ironies	98
Chapter 5	Managing High-Tech Products	101
	Technological Innovator or Imitator?	108
	Beware of Using the Product Life Cycle for Strategy Formulation	110
	The New Product Process	113
Chapter 6	Directing the Presentation	121
	Marketing-Advertising Confusion	122
	Planning	128
	Setting Objectives	129
	Creative Strategy	131
	Presentation Tactics	134
	Besides Planning	137
Chapter 7	Processing and Pricing	151
	Basic Distribution Channels	152
	Pricing	165
Chapter 8	Strategic Market Planning	179
	Change Is the Only Constant	179
	Composing and Using Alternative Scenarios	183
	Bureaucracy and Formal Planning Systems	193
	Linking Market Strategies to Technical Strategies	196
	Strategic Thinking at the Societal Level	199
	Appendix	201
	Index	203
	About the Authors	217

Vignettes

Chapter

1	High-Tech Movers and Shakers: Yesterday and Today	3
	How Top Executives in High-Technology Companies See Themselves—Their Behavioral Characteristics and Motivations	9
2	Organizing for an R&D-Marketing Interface: The Micom Systems, Inc., Case	42
	Corning Medical Sales Organization	50
	High Tech Can't Forget Sales	53
4	Marketing Research Manager for High-Technology Company	79
5	Genetic Systems Corporation: Product Strategy in a Leading Biotechnology Company	114
6	Managing an Imaginative Worldwide Corporate Campaign	143
	The Quintessence of a High-Tech Advertising Agency	146
7	Corning Medical's Distribution Channels	157
	Robotics Industry Channels	161
	Are Reps Right for You?	164
8	Medi-Redi Labs: Struggling to Predict the Future	187

Figures and Tables

Figures

1-1	The R&D Effort Portfolio	22
2-1	Marketing-Directed Approach	47
2-2	Marketing-Sales Equality	47
2-3	Corning Medical Sales Organization	49
3-1	Stages in Positioning for Targeting High-Tech Markets	65
4-1	The Diffusion Process	82
4-2	A More Behavioral Look at the Diffusion Process	82
5-1	S-Shaped Sales Curve	102
5-2	Technology Life Cycles	107
5-3	The Product Life Cycle	110
5-4	The Typical New Product Process in the Successful High-Tech Firm	117
6-1	Target Market Communications	126
6-2	Ten Fastest Growing Business-to-Business Publications	139
6-3	DeVilbiss Company Advertisement	140
6-4	Novo Laboratories Advertisement	144
6-5	CXC Corporation Advertisement	147
7-1	Traditional Consumer and Industrial Goods Channels	155
7-2	Corning Glass Works Advertisement	158
7-3	The Porter Curve	170
7-4	When to Use a Penetration or Skimming Strategy for Pricing New Products	174

Tables

2-1	Frequency in Which Various Organizational Functions Report Direct to Chief Operating Officer	37
2-2	High-Tech Marketing Executives' Views on Key R&D/Marketing Issues	40
2-3	Sources to Find Names of Prospects	54
2-4	Methods of Initially Contacting Potential Prospects	55
5-1	Where Successful High-Tech Firms Get New Product Ideas	115

1

Technological Innovation and Marketing

Certain imperatives define our mission: creating a technological advantage—that is, research; and creating a commercial advantage—or marketing.

Technological progress in any society is fostered and facilitated by the presence of three key ingredients—innovative and creative people, an economic climate conducive to entrepreneurship, and the managerial know-how both for stimulating new concepts and taking the promising ideas through to successful initial commercialization and beyond. These three elements complement one another and produce synergies. Innovation works best when all three ingredients are present. To see that this is so, one needs only to compare the technological track records of the capitalist-oriented, open-society nations of the world to those of the closed, socialist countries. Historically, in the technological-leader nations, there has been an exalted role for the uncommon person (in this case, the entrepreneur), whereas in the technological-follower countries of the world, it tends to be the common person who is idealized.

For innovation to thrive, technological pioneers, first and foremost, are needed to dream their dreams and follow them through to a glorious or an inglorious end. Success often comes to individuals who seem to possess the knack for snatching victory from the jaws of defeat—driven persons who won't take no for an answer. This description aptly fits the vast majority of the founding fathers of great modern-day fortunes and companies.

During some of the darkest days in U.S. economic history, Chester Carlson, a patent attorney, doggedly pursued the idea that culminated in the Xerox Corporation. He was forced to set up shop in his kitchen because the leading mimeograph firms spurned Carlson's efforts to sell his then-unwanted idea of an electrostatic printing process.¹ Even in the Great Depression of the 1930s, there was a place for an incurable optimist with the temerity to challenge the conventional wisdom, the perseverance to keep

The epigraph is a remark by Robert P. Luciano, President and Chief Executive Officer, Shering-Plough Corporation, in his presentation before the New York Society of Security Analysts, June 17, 1983.

going in the face of adversity and rejection, and the tolerance to cope with the considerable risk of failure. With initial help from the Battelle Memorial Institute in Columbus, Ohio, now the world's foremost contract research and development organization, and later through participation by the Haloid Corporation, then a small Rochester-based manufacturer of photographic and photocopy papers, the entrepreneurial Xerox story took shape over two-and-one-half decades. In 1961, the Haloid Xerox Company changed its name to the Xerox Corporation, and the rest of the story is well known.

Carlson's story is an old one that is being relived today by others like him. In extolling various contemporary entrepreneurs, a popular advertisement reads, "Here's to gut feelings and those who still follow them." A motivational book on the market describes famous rejections that ultimately became rousing successes because the dreamers behind them would not quit. The underlying theme in all these rejection-turned-success stories is that the people involved had the strength and conviction to keep trying against great odds. Maybe it is the "animal spirit" that economist John Maynard Keynes thought was the root of all entrepreneurship. Theodore Roosevelt might well have been paying high tribute to the past, present, and future pioneers of technological advancement—and failure—when he said, "It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly, who errs and comes short time again and again . . . and who at worst, if he fails, at least fails while daring greatly . . ."

Chester Carlson's stick-to-itiveness and drive and the related traits described by Theodore Roosevelt are unusual, but far from unique, even in today's more sophisticated and complex times. And these traits are just as essential as always to productive innovation.

A second ingredient in the innovation mix is an environment that permits and encourages creativity. What about the U.S. environment, now and in the recent past? First, the results: The number of U.S. patents issued to Americans has fallen 25 percent since 1971, while the number issued to foreigners has increased 14 percent. Approximately 40 percent of the patents now issued by the United States government go to individuals from other countries. America's most notable foreign competitors, Japan and West Germany, outperform it in both capital investment and research and development as a percentage of total national output. The antidote to the problem has been described by the successful and innovative corporation, United Technologies: an economic atmosphere more encouraging to innovation. The company suggests the need for policies and programs to expand savings and investment, to enhance the climate for risk-taking and innovation, to encourage adequate corporate profits, and to ease the tax and

High-Tech Movers and Shakers: Yesterday and Today

A Legend in His Time

Thomas Alva Edison deserves the accolade "greatest inventor." The "Wizard of Menlo Park" (after the New Jersey location of his first laboratory) patented 1,093 inventions in the United States and 2,000 to 3,000 more in foreign countries. Prominent among these were the electric light bulb, the motion-picture projector, and the phonograph. Edison also improved both the telephone and typewriter. A personal guideline that served him well was "First, be sure a thing is wanted or needed, then go ahead."

Edison's many works were the legacies of a man who had but three months of formal schooling. Remarkably, early in his life he was thought to be intellectually slow, an experience later to be shared by a young Albert Einstein.

True to his beliefs that "genius is two percent inspiration and ninety-eight percent perspiration," Edison had great perseverance and patience. When working on a project, he would toil 18-19 hours a day for stretches of 5 and 6 days at a time. Before achieving a breakthrough on his storage battery, he conducted 8,000 tests without success. Edison's acute hearing problem no doubt aided him in giving his work undivided attention.

Thomas Edison was interested in financial rewards only because they made possible further innovation. He set up the first equipped industrial research laboratory (West Orange, New Jersey, 1887), thus establishing the all-important precedent for organized research.

An Entrepreneur's Entrepreneur

William R. Hambrecht can appropriately be described as an entrepreneur behind entrepreneurs. His venture capital firm, Hambrecht and Quist, finances mostly high-tech business endeavors in their start-up and formative stages. Hambrecht, a Princeton University graduate who says his worst subject was science, is known in high-tech circles as the "banker to the future." He has "incubated the future" by financing over 150 ventures, including, for example: ARGO Systems (innovator of advanced radar and signal reconnaissance military systems); Avantek (microwave components); Collagen Corporation (their product takes the plastic out of plastic surgery); DiaSonics (pioneers of diagnostic imaging alternatives to x-rays); and SofTech (programming applications for ultrasophisticated computer languages). Hambrecht and Quist has brought some sixty high-tech firms public, including the initial offering of Apple Computer stock.

Whenever William Hambrecht evaluates potential venture capital commitments, what he looks for initially is evidence of the entrepreneur. He says, "We back people, not products." As a rule of thumb for the venture capital business (the risky business of financing innovation), one out of ten investments is expected to have a very large return on investment within five years.^a

^aBiography of William R. Hambrecht adapted from "The Low-Profile Impresario of High Technology," *United—The Magazine of the Friendly Skies*, April 1983, pp. 118-117.

regulatory burdens that undercut firms' ability to create, compete, and produce.

The third component of technological innovation is managerial know-how to develop and market high-tech products. This book concentrates largely on this aspect of innovation. Innovation can and does occur through happenstance. History is replete with mostly fortuitous beginnings for technological innovations. However, the structure of U.S. industry is far different now from the way it was in the days of Edison and Ford. There is a real need now for much more planned technological innovation within the corporate structure, rather than having society rely on the single-person venture that has historically characterized technological breakthroughs. If the United States is to maintain technological leadership, it must be achieved primarily within the corporate framework. Technological research, development, and marketing simply require too much capital and expertise for the single-venture entrepreneur.

Fortunately, marketing thought and practice has advanced and been refined to the point where a great deal is known about enhancing the success of high-tech product endeavors. Marketing technology has kept pace with engineering technology. Yet, in high-tech firms, there is too frequently an absence of adequate marketing knowledge and skills; consequently, the product failure rate is higher than it should be or would be with the application of appropriate marketing concepts and methods. Marketing knowledge and expertise is vital to the success of high-tech firms. It is often easier to find and hire people capable of researching and engineering high-tech products than it is to find and employ people knowledgeable about how to mitigate the consumer nonacceptance risks inherent in high-tech product conceptualization, development, and commercialization. The difficulty lies not so much in inventing and engineering new products, but in the application of the technology in a way that will result in market acceptance and its all-important by-products, profitability and return on investment.

A Place for Supply-Side Marketing?

Marketing books have traditionally been demand-side oriented and have devoted most of their attention to consumer products. High-technology marketing, however, involves demand-side *and* supply-side marketing expertise and pertains to consumer and industrial products/processes.

Why is the supply-side so essential? We are concerned with unleashing and managing Yankee ingenuity, the integrating theme of which is supply-side marketing: the marketing of products that are on the cutting edge of technology; those that create or revolutionize markets and demand; the kinds of products which make possible significant advances in standards of

living or new ways of doing things. In short, the types of products that earned for the United States the reputation for technological innovativeness in the first place.

The supply-side concept has its origins in classical, pre-Keynesian economic theory. The idea that supply can create its own demand is known as Say's Law, after the nineteenth century French economist Jean Baptiste Say. Until recently, this assertion had lost much of its intellectual currency, as most modern-day economists were educated on the familiar demand-side precepts of John Maynard Keynes.

Just as most Keynesians are in varying degrees uncomfortable with supply-side economics, individuals educated and reared on demand-side marketing (i.e., market demand *should* precede and trigger product development and the formulation and funding of marketing strategies) look skeptically at supply-side marketing thinking. To many of the demand-siders, supply-side thinking is dangerous, product-centered, and myopic—antithetical to the demand-side focus on consumers and their needs and wants. This point represents far more than mental fencing: the economic penalties of corporate top management not coming to grips with supply-side concepts can be very real and can result in missed opportunities.

Supply-side marketing, then, refers to any instance where a product can create a market—in other words, a demand for itself—instead of the conventional other-way-around. Or, put differently, the product is responsible for the demand, rather than the demand being responsible for the product. Supply-side marketing pervades many of the Chester Carlson-Xerox and kindred high-tech Horatio Alger success stories.

The essence of supply-side marketing has been delineated by Akio Morita, who is chairman and chief executive officer of Sony Corporation. In his view, the more innovative a product is, in terms of being a radical departure from the past, the more likely it is that potential purchasers might not initially see its usefulness or benefits. For instance, in 1950 Sony marketed a tape recorder. Even though it was a real technological breakthrough, the general public thought of it as a toy. The tape recorder was not seen as a device for learning languages or storing speeches. Experiences like this have led Morita to believe that, for technological innovations, markets must be created, not surveyed.³ This philosophy is reflected in the slogan printed on Sony helicopters: "Sony: Research Makes the Difference." The prominence given to this theme emphasizes the degree of importance that Sony attaches to its chairman's philosophy.

Of course, what Morita is referring to are high-technology products, especially those that potential customers (industrial or ultimate consumers) cannot readily relate to present products and current life styles, such as automobiles in their early days, radios in the 1920s, television in the 1940s, and hand-held calculators in the 1960s. Biotechnics or gene-splicing is a