

Book Reviews

Robert A. Burgelman and Modesto A. Maidique, *Strategic Management of Technology and Innovation*. Homewood, Illinois: Irwin, 1988. ISBN 0-256-03481-8.

The ultimate goal of strategic management of technology and innovation is the development of new products which, in turn, are the main engines of business growth. Consequently, this important book addresses a subject of vital concern to all businesses, small and large, the successful management of innovation. It can be read with profit by anyone involved in management of high technology, and this includes managers whose job it is to develop successful new products. It is also of significance to anyone interested in the international competitiveness of business enterprise. I shall review it from the standpoint of a teacher of strategic marketing in a business school environment.

In the strategic management of technology, a business seeks to direct technical resources toward the most valuable technical progress achievable with current resources. Progress is measured by the ability to generate innovative new products based on new technology. The strategic management of innovation, on the other hand, is the process of converting technical inventions into successful new products. It is the process by which products that best fit market needs are delivered within the functional capabilities of the firm. It can readily be seen that uncertainties and unknowns abound in this process, making the operational implementation of these ideas a highly challenging prospect.

In 1982, the consulting firm of Booz, Allen & Hamilton (BAH) conducted a study of the new product development process. It found that the "the success rate of commercialized new products has not improved, on average, over the last two decades."¹ In addition, they compared companies achieving greater than 90 percent success with

companies achieving less than 50 percent success in new productions by surveying 700 companies that had introduced 13,000 new products between 1976 and 1981. They found that both groups introduced about the same mix of new products, spent about the same proportion of sales on R&D and promotion, used a formal, new product process and spent about the same proportion of time and expense on the various steps in the new product process.²

What, then, separated the successful from the unsuccessful? According to BAH, the two most important factors in successful new product introductions are: (1) how well the product fits market needs and (2) the functional strengths of the company. Since the publication of the BAH, a number of articles have been published on the subject of the determinants of success in new innovating products. These studies have enriched the basic concept with detail and evidence, but none has stated the challenge of strategic management of technology and innovation more clearly or succinctly. This means that any book proposing to teach the management of technology and innovation must be evaluated in the light of the BAH study and its progeny as I do here.

The authors are offering a course manual for teaching the management of technological change. Accordingly, there is relatively little original research included in this book. Rather, it is best characterized as a combined case book and a book of readings. Students at Babson College frequently complain that the case materials on this subject are more complex and difficult to master than is typical of case materials in general. It is, therefore, necessary to include a number of readings to fill in some of the gaps and suggest outlines for future analysis where they exist. Michael Porter's work on technological strategy is ideal for this purpose.³ The authors in the book under review have done a skillful job of blending cases with a number of landmark readings to make the subject at once

more digestible and more approachable for students.

The book is divided into three main parts. The first part focuses on the problem of designing and implementing a technology strategy. The second part examines the new product development process, and the last part addresses the problems of managing innovative systems within large corporations.

While this is a worthwhile book, it does not get off to a good start. The introduction is centered around a rather simplistic case intended to outline a major issue in the strategic management of technology and innovation. As the brief introduction to the book makes clear, the authors want to direct attention to the issue of whether you need to know just what a technology does or know how that technology works in order to make effective decisions about technology strategy and new product development. In other words, is it enough to know what a telephone does, or do you also have to know how it works? This issue has engendered a rather sterile debate and, in light of the powerful issues raised in the BAH study, the answer to this problem is relatively unimportant.

The real meat of the book begins with the first major part on technology strategy. The eight cases and nine readings address the major issues and highlight product situations. The cases include both consumer goods and industrial goods and are a bit heavily weighted toward computer technology with only one case about a biotechnology company. This is, perhaps, a matter of educational preference. I like biotechnology cases because the dividing lines among alternative technologies are more sharply defined, and the need for a clear technology strategy stands out starkly. On the other hand, my students report that they have the most difficulty with the biotechnology cases because of their technical complexity. Nonetheless, the case materials included here allow ample opportunity to emphasize any of a wide variety of issues and will, no doubt, be useful to a wide variety of instructors.

The readings in the first section are especially well-chosen, including a classic chapter from Porter and a very creative piece on an audit of innovative capabilities, that draws together several important ideas from the literature. On the other

hand, the important topic of technological forecasting is covered by a long, rambling and dated article that is more likely to convince students that this approach cannot be used effectively rather than that it can be. Overall, this section does a solid job of presenting the case for making technology one of the key dimensions of business strategy.

The next major part is devoted to the new product development process and begins on a high note with a case designed to highlight the importance of the marketing-engineering-manufacturing triad, followed by a case on the subject of the new product learning cycle. This is one of the most vital issues in new product success and should be a major topic in any course on this subject. The case material is bolstered by an extensive article on the new product learning process which includes some interesting survey results on the determinants of new product success that support and extend the original BAH study cited above. Unfortunately, the issue is dropped after only two cases and a few readings.

From here, the focus shifts to the internal corporate venturing process which addresses the issues raised when new technology leads a company into entirely new businesses. The case material is bolstered by an article by Robert Burgelman, "Managing the Internal Corporate Venturing Process: Some Recommendations for Practice," which carefully surveys the problems and issues that arise when a new venture must be established within an existing corporate structure. This section concludes with an interesting case and article, focusing on the effect of what the authors call "prefunding" factors on the success of new high technology start-ups. In one of the most innovative pieces of research yet, this section clearly establishes the concept that start-ups are so short of people, funding and time that they can ill afford even a single mistake. Further, successful start-ups are characterized by careful product planning at every stage combined with concentration on a clearly defined, limited and embryonic customer set as a target market.

The final part of the book addresses the operational and organizational issues involved in attempting to link R&D efforts to product development. The section opens with a description of

the classic situation of the Xerox Palo Alto Research Center (PARC). PARC has sometimes been characterized as a national resource. Xerox, itself, began as a start-up, bucking the odds when market research said that the total market for copiers in the United States would not be more than 5,000! Surely this company had enough entrepreneurial culture to learn how to develop new ventures to capitalize on the incredible number of path-breaking innovations developed at PARC. But as we know, PARC innovations and researchers have fueled the personal computer business companies, none of them Xerox. This situation may also be used as a paradigm for the apparently increasing incidence of innovations developed in the United States' research labs but exploited commercially by companies from other countries. The public policy implications of these findings are not discussed at all.

The remainder of this section of the book consists primarily of case materials which allow students and instructors to explore the issues raised by the PARC experience: (1) how to insure that the output of R&D is transferred to other parts of the firm, (2) under what conditions should new ventures be established, (3) how to manage internal entrepreneurs as strategists, (4) under what conditions can innovative activities be adequately institutionalized and (5) the need for new types of organizational arrangements between highly talented individuals and corporate entities.

The section concludes with an article by M. Maidique and R. H. Hayes, "The Art of High Technology Management," which attempts to define management styles of successful high technology entrepreneurs. The article arrives at the paradoxical conclusion that successful organizations are characterized by "business focus, organizational cohesion and integrity" on the one hand, and by "adaptability, entrepreneurial culture and hands-on top management" on the other hand. In short, a combination of order and disorder which mirrors the relatively unstructured creative process and the relatively focused product development process. This truly captures the dilemma as well as the excitement of high technology business.

The authors readily acknowledge their intellectual debt to a number of researchers in the field. Paradoxically, however, they omit the central

contribution of Eric von Hippel, while including him in their list of intellectual debts. It was von Hippel⁴ who has led the way in showing us why, in industries marked by fast-moving technology, traditional market research typically yielded sterile results. His work also provided a much needed framework describing what has become a common practice in successful high technology firms, that of identifying lead users and utilizing their experiences as development partners in the new product process.

This omission highlights a serious flaw in an otherwise well-constructed course concept. Despite paying obeisance to the importance of the market-R&D-engineering interface, the book focuses on integrating strategy (presented as a top management issue) with R&D, while marketing is left in the background, as the off-stage player who mysteriously supplies the product concept or the target market definition. Unfortunately, you will search in vain for material on product line management and the use of product innovation to extend the life cycle of existing products or possible cannibalization of revenue from new products. Nowhere are pricing, promotion or distribution channels addressed. In addition, several topics in the usual treatment of the new product development process are omitted entirely. These include design for ease of manufacture, design for serviceability and developing the service organization along with the product to reflect customer needs with respect to quality and service. By these omissions, the book seems to fall prey to the "better mousetrap" fallacy of new product development.

Let us now evaluate the course concept proposed by Burgelman and Maidique, using the two criteria from the BAH study; that is (1) how well the product fits market needs, and (2) the functional strengths of the company. I find their course concept satisfies the second criteria exceptionally well in that it addresses head-on the issues of formulation of technology strategy and integrating R&D into the corporation. On the other hand, this book and the course concept fall well short of teaching students how to insure that the product will fit market needs by failing to integrate marketing into both the strategy and R&D processes. The same shortcomings characterize a disturb-

ingly large number of high technology failures in American industry.

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Notes

¹ "New Products Management for the 1980's, Booz, Allen & Hamilton, Inc., reprinted in Philip Kotler and Keith Cox, *Marketing Management and Strategy*, Englewood Cliffs, NJ: Prentice-Hall, 1984, pp. 244–56.

² Ibid.

³ Michael Porter, *Competitive Advantage*, New York, Free Press, 1985.

⁴ Eric von Hippel, "Lead Users: A Source of Novel Product Concepts," *Management Science*, 32 (July, 1986), reprinted in Michael L. Tushman and William L. Moore, eds., *Readings in the Management of Innovation*, Harper & Row, 1988, pp. 352–66. See also Eric von Hippel, "Learning from Lead Users," in Robert D. Buzzell, ed., *Marketing in an Electronic Age*, Boston, Massachusetts: Harvard Business School Press, 1985, pp. 308–17.

P. Milgrom and J. Roberts, *Economics, Organization and Management*. New Jersey: Prentice Hall, 1992. ISBN 0-13-224650-3.

This major new text does not quite cover everything suggested by the title, but its broad scope does cut across traditional divisions to include some of the most interesting facets of industrial and labour economics. The main focus is on the internal organization of the firm from a systematic point of view based on modern economic theory, though carefully kept at a level accessible to undergraduates. On the way, the authors deal with a wide variety of topics such as allocation by price and allocation by other mechanisms, bounded rationality, adverse selection, moral hazard and incentive pay, risk sharing and insurance, property rights, executive compensation, corporate finance and governance, and the boundaries of the firm.

This book represents a considerable achievement. It is the first systematic textbook treatment of the economics of organization. Clear, rigorous but informal discussion of the main topics is enlivened by illustrative case studies and buttressed

by simple, formal models. End-of-chapter exercises at various levels are also included. Few other texts provide such accessible introductions to so many related topics at the frontiers of current research.

The efficient functioning of the organizations in which most people spend most of their working lives is arguably of considerably greater importance for economic performance than the fine details of (external) market structure that still preoccupy industrial economists. The limited role of the external labour market and the corresponding importance of human resource development inside the firm in Japan is emphasized, as is the dominance of non-owner stakeholders — primarily employees — in the goals of the J-firm.

I was disappointed that the book lacks references to countries other than the US and Japan. The importance of works councils and board-level codetermination in protecting employee-stakeholders in European countries such as Germany and Sweden is scarcely mentioned at all. The explicit priority accorded to residual ownership claimants in both economic theory and business schools in the US and UK has not been accompanied by the superior economic performance and competitiveness claimed by theorists and official policy. Nor is it clear why Anglo-American managers can generally raise their salaries in spite of lagging performance while more modestly paid Japanese or German managers and even Japanese transplants in the West can attain superior performance and more cooperative labour relations with lower salaries.

Another omission is any account of the growth of small-firm employment and the "flexible-networking" or cooperative agreements between small firms with family or regional ties that represent an alternative to both hierarchy and market control. The prevalence of such relationships in parts of Italy, or with small subcontractors in Japan, is not easily explained by the neoclassical theory upon which Milgrom and Roberts rely almost exclusively.

The importance of fairness and equity in economic interactions has been developed recently by Frank (1988), Solow (1990) and others, drawing on extensive research by psychologists. Such considerations are likely to prove even more crucial for the understanding of internal organiza-

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