A. D. VAN NOSTRAND

FUNDABLE KNOWLEDGE

THE MARKETING OF DEFENSE TECHNOLOGY

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LEA LAWRENCE ERLBAUM ASSOCIATES, PUBLISHERS
1997 Mahwah, New Jersey

Lawrence Erlbaum Associates, Inc., Publishers
10 Industrial Avenue
Mahwah, New Jersey 07430

Cover design by Kathryn Houghtaling

Library of Congress Cataloging-in-Publication Data

Van Nostrand, A. D.
Fundable knowledge : the marketing of defense technology / A.D. Van Nostrand.
p. cm.
Includes bibliographical references and index.
ISBN 0-8058-2122-8 (cloth). — ISBN 0-8058-2123-6 (pbk.)
1. Military research—United States—Finance. 2. Federal aid to research—United States. 3. Research institutes—United States—Finance. I. Title.
U393.5.V26 1997
623.3'068'8—dc20 96-33342
CIP

Books published by Lawrence Erlbaum Associates are printed on acid-free paper, and their bindings are chosen for strength and durability.

Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

For Joan,
whose passion for ideas liberates mine.

Editor's Introduction

Charles Bazerman, Series Editor
University of California, Santa Barbara

In *Fundable Knowledge: The Marketing of Defense Technology*, A. D. Van Nostrand takes us on a remarkable journey into one of the largest knowledge production systems in history, one that has funded much of the academic and industrial research in the United States over the last half-century. Within the closed world of defense research, directed by government mandates for free competitive bidding, an unusual market has developed. Only those closely involved with this often-secret enterprise have had a detailed sense of how this knowledge market worked.

The market sustains itself on paper: legislation, budget resolutions, guidelines and regulations, announcements of initiatives, white papers, requests for proposals, contracts, reports, capability statements. Documents in these well-ordered genres articulate with one another in systematic regularity, carrying out the business of the negotiation, contracting, and production of knowledge within the constraints of law. Yet they also have provided the flexibility to innovate new technologies, as all parties seek after their notions of the possible and the advantageous.

The systematic interaction of these genres defines what knowledge is, what problems get posed, and what kind of knowledge gets produced. The process converts information and potential information into problem-relevant knowledge; moreover, as Van Nostrand points out, the process results in the competance of providers and purchasers to identify and carry out new

knowledge ventures. Increasing competence is as much part of the knowledge produced by the system as are the specific pieces of information contained in final project reports. The capability statement displays most directly the production of competence. Van Nostrand, among his many accomplishments, draws our attention to the ubiquitous but almost invisible genre of capability statement, important in all the professions.

While the defense knowledge market has supported much of the economy by directing defense production and by providing new ideas for the civilian market, it has been kept alive only by the political desire for national security in military terms. In the post-cold-war world, however, national security is being reinterpreted in economic terms. In order to serve the civilian commercial market, this knowledge production system—built on a close communicative relationship between a small number of vendors in symbiotic relation with a single client, articulated through many agencies and subsections—must find a new way of doing business. Its entire system of genres by which knowledge production is conceived, contracted, and completed must be opened up to the needs and dynamics to which it was not originally designed to be responsive. The current stage of defense conversion, making existing defense knowledge available to commercial users, is only the first step in a much larger process of reordering the communicative patterns by which knowledge is produced.

Defense spending (often to our chagrin and embarrassment) has been one of the great machines driving and feeding funds to the development of science and technology, not just in the last half-century, but throughout history. Can we find a peaceful way to maintain serious research on the same scale without a military motive, driven only by social priorities of prosperity, amity, and social well-being, and by environmental health? Will research serve only the most immediate demands of corporations, aimed at products that can turn a profit in a few years, or can we also fund research inspired by possibilities of the future? The answers to these bold questions are to be found, if we are to follow Van Nostrand's lead, not in bold ideological statements, but in the rhetorical details of the systems by which knowledge is produced. The issue then becomes: Can we develop a highly articulated knowledge market that will produce the kind of knowledge we would want to have and that will produce the kinds of competence that will make our world a better place?

Fundable Knowledge: The Marketing of Defense Technology provides powerful tools for thinking about the relationship of the three themes of this series: rhetoric, knowledge, and society.

Preface

The journey on which you are about to embark winds through the domains of a vast knowledge factory. Its route reveals the ways in which these domains of social activity are related. They compound one another with enormous consequence. Successive discoveries along the route disclose a knowledge market that permeates the national economy, a market with both immediate and future implications. Yet with all its disclosures, the itinerary of your journey is more orderly than the one on which I embarked.

The route I traveled was digressive and often circuitous. It began in a course I was teaching at Georgia Tech and reached across campus to a dozen laboratories. It then led to myriad offices at federal agencies in Washington, DC, to meetings of professional societies in disciplines that deal with technology, and to the congressional office buildings. During the first few years of my explorations, new discoveries simply expanded the area of my ignorance. Each new log that I threw on the fire, or that fell into the fire by chance, increased the circle of darkness to be penetrated. By degrees, during the next several years, these discoveries began to reveal the patterns that *Fundable Knowledge* describes.

I could not possibly have arrived at these discoveries without the guidance of many caring persons who taught me along the way. I hope to thank them now by recalling the trail that they helped me blaze. And, with luck, this trail will also introduce you to the scope and sequence of this volume.

The trail began 9 years ago with a course in technical communication at Georgia Tech. A few of us designed the course based on Bruno Latour's proposition that science-in-the-making is a different order of reality from science viewed retrospectively. Intended for undergraduate engineering students, it focused on current research in science and engineering on the Georgia Tech campus; it took advantage of a learning resource distinct from the teaching laboratories. Our resource was the Georgia Tech Research

Institute (GTRI), a congeries of laboratories specializing mostly in related fields of electronics.

What we fashioned was an exercise in cultural anthropology. Welcomed by a group of project directors at GTRI, students in English 3883 became priveleged observers of ongoing laboratory activities. Their responsibilities were to assess what they observed and submit timely reports of their assessments. As their instructor, I had the same responsibilities, but my final report has taken considerably longer to complete. My teachers were my colleagues in this venture at Georgia Tech and at GTRI, notably Ron Bohlander, Devon Crowe, Thomas Gaylord, John Gilmore, Kenneth Knoespel, and Jack Lackey. Their insights into institutional research and development (R&D) and its implications have informed this study. As one of these mentors observed, the students in English 3883 were "spreading out across campus to study the natives."

The natives taught them startling things about the production of knowledge that occurs through the processes of R&D. They taught them first and foremost that R&D is a business, that it is funded and fundable. Without sponsorship, most R&D would not happen. At GTRI about 75% of the R&D is sponsored by federal agencies for the national defense. As customers, the mission agencies in the defense establishment buy their knowledge primarily from R&D vendors. Observing this laboratory environment, the students soon became aware of the distinctive presence of one federal defense agency or another. That presence is as continuous as the dial tone in a telephone. And it is the premise of *Fundable Knowledge*.

In addition to the preeminence of sponsorship, the students discovered another startling fact. They perceived a descrepancy between the announced purpose of an R&D project and what they observed happening in its implementation. They read the proposals to sponsors, written by the project directors, that had led to the contract awards for R&D. But what they saw the researchers pondering were not necessarily the questions that the proposals had addressed and promised to resolve. The researchers were engaged in smaller, unresolved questions occasioned by equipment failure, unexpected test results, or serendipitous discoveries along the way. These questions tended to be instrumental or contingent; they were ways of factoring the larger unresolved conceptual matters. Precisely as Latour has observed, R&D-in-the-making is untidy, not at all like R&D in the textbooks. That sense of process infuses *Fundable Knowledge*.

A third realization that the students reported (with patient help from the project directors) was subtler and probably more profound. It concerned the architecture of these questions. Whether conceptual, instrumental, or

contingent, the questions were typically formulated as *problems*. Values that were unknown but sought-after were consistently being defined in terms of *goals* and *obstacles*, thereby perpetuating a focus on what yet needed to be done. The strategy of such problem formulation was to enable agendas for converting unknowns to a status of being knowable. Once students recognized this mindset, they began to see its evidence in all of the R&D projects they were observing.

This reductive habit of rendering unknown values knowable excited my curiosity. It is what germinated this book about the larger system of knowledge production of which GTRI is a part. It is what set me searching for some conceptual framework for understanding the systemic nature of knowledge production in the whole enterprise of defense technology. Early on, Charles Bazerman helped me wrestle with conceptual frameworks, and James Wiltse helped me comprehend the scope of the enterprise.

Developed in response to the Cold War, the enterprise has vast proportions. During the past 50 years, more than 60% of all U.S. government expenditure for R&D has been invested in defense technologies. The defense R&D community is composed of hundreds of thousands of engineers, scientists, and information specialists. Knowledge is their basic output. The knowledge they produce enables the development of weapon systems, and most of it is available for transfer to civilian applications by state and local governments, educational institutions, and commercial firms. Knowledge is the basic commodity of the defense R&D community, and the knowledge production is systemic.

The market for defense technologies begins with the procurement of R&D projects. As customers, the mission agencies in the Department of Defense (DoD) buy their knowledge primarily from R&D vendors. Together, customer and vendor engage in the collaborative design of R&D projects. Through an elaborate system of iterations, they exchange their interpretations of shared information and thereby produce knowledge. Probably no one person understands all of the systemic complexities of this process. But in my long search for patterns to explain it, I was immeasurably helped by James Bolos, Charles Church, J. W. Dees, Fred Dyer, Michael Kelly, Edward Roberts, Bill Smith, Richard Truly, and Leo Young.

I am also grateful to a cadre of veterans of the defense R&D community; they are several dozen middle managers currently or formerly employed by the Department of Defense or by defense contractors, who have shared their knowledge with me. They have understood that my purpose is to analyze a large social system, not to expose it or denounce it or lobby for it. They have been generously willing to assist in this purpose, to help me "get it right," as

one of them put it. Getting it right meant detailing their own jobs. They were not concerned about the landscape of the larger territory, but their local anecdotes were invaluable. I thank these persons for their help. They are the "old timers" that I refer to in the book.

The iterative process of knowledge production in the defense R&D community occurs within the larger context of political economy. A broad vision of technological capability for defense is spread among many policy makers with differing notions of national security and differing political objectives; it is what I have called a *distributed vision*. Within this context of conflicting special interests, the iterations exchanged by the R&D customers and vendors depend heavily on how the parties position themselves; these iterations reflect intensive marketing and market research. My exploration of special interests soon expanded to the arena of national technology policy and to the corporate cultures of the organizations that collaborate in making it. I needed to understand those organizational relationships, and for their precise observations about them I am indebted to Daryl Chubin, Susan Cozzens, Marcel LaFollette, John O'Brien, Philip Stone, and Arthur Squires. With their help, I was able to see how the various cultures of "official Washington" bear on the defense establishment.

In the production of defense technologies, problems of economics, politics, psychology, and marketing are often mutually contingent. They form a universe of surprising proportions, with insubstantial borders that keep dissolving and opening up new and different disciplinary questions. Exploring this universe was rather like digging a hole in the sand; the deeper one digs, the more the sides cave in, and the wider the excavation. But in the process I had reliable advisors. Richard Barke, Miriam Drake, Geoffrey Eicholz, Melvin Kranzberg, Gary Lehmann, and John Lundberg all gave me valuable insights from the perspectives of their own disciplines, as did Joan Pettigrew, Alan Porter, William Read, David Roessner, Richard Teach, Dean Temkin, and Elizabeth Wadsworth.

The patterns of knowledge production for defense that evolved during the long years of the Cold War are still evident, still operating. But since the end of that confrontation, the institutional resources for such knowledge production have been taxed by the need to make the national economy more competitive. Under the policy of Defense Conversion, this need extends to the federal laboratories engaged in defense R&D. They are now enjoined to engage in the transfer of their vast store of technologies to the civilian sectors of the economy.

Fundable Knowledge addresses the crisis in R&D management that this mandate has caused. The process of technology transfer lays a major burden

on the defense R&D organizations. The new mission of the federal laboratories engaged in defense R&D commits them to two different kinds of goals at the same time. These organizations must now transfer their stored technologies, and they must do so even as they continue to develop new technologies. Moreover, they must sustain both endeavors with limited, or even reduced, funding. Within these organizations the two endeavors are typically seen to be at odds. Deliberately disseminating technologies beyond their military applications contradicts the whole culture of knowledge acquisition that is embedded in the defense establishment.

But even as burdensome as it may seem, the concept of merely disseminating knowledge scarcely explains the delicate and complex operations that technology transfer entails. I am indebted to Clifford Lanham, Kathleen Hayes, and Randy Goldsmith for explaining the intricacies of this process. The commercialization of a technology originally intended for a different application is a transforming process, a process of producing new knowledge.

In this context, many knowledge workers assigned to the transferring of technologies are ill prepared for their new responsibilities. The transfer process entails a marketing mindset, which begins with a perception of the customer's needs. But as customers themselves for the past 50 years, the mission agencies have typically not nurtured this mindset. The resolution of this dilemma is the culminating idea of *Fundable Knowledge*. The marketing of defense technologies has taken a dramatic turn. A new social technology is evolving for the production of knowledge targeted to new uses; a new infrastructure is being grown to support innovation. A solution is inherent in the dilemma.

The strategy of formulating a problem that contains a solution is what set me off on this journey long ago. The strategy is manifest in the public documents of the defense R&D community. They are generic documents. Prepared by R&D customers and vendors for their mutual exchange, these documents record every formal stage in the shaping of defense technologies. They constitute a literature of needs and claims. Rhetorical analysis of their texts reveals how they actually enable the transactions that produce knowledge. I am indebted to Charles Bazerman, Carolyn Miller, Greg Myers, and John Swales for their perceptions of how such analysis can reveal the interplay of text and context. And I have tried to heed the chief canon of discourse analysis, which is to make the analysis transparent so that the discourse can emerge.

The only secret to writing that I know of is rewriting. And the best agent of that process is someone who will read the text and respond to it honestly. After years of engagement, I know what it takes to conduct such formative

reading of a manuscript. The task is to find within it the clues of what it might become and then delineate the chasm between its grasp and is reach. The task is awesome, a supreme act of inference. Therefore, I am deeply grateful to the six readers of the penultimate manuscript of this book. They are Charles Bazerman, Michael Kelly, Marcel LaFollette, Clifford Lanham, Joan Pettigrew, and James Wiltse. From the perspectives of their different disciplines, each of them has committed to this enterprise that supreme act of inference along with a mother's patience. No author could hope for more.

As for the text itself, parts of *Fundable Knowledge* have appeared in other forms. Sections of chapters 6 and 8 derive from my essay, "A Genre Map of R&D Knowledge Production for the U.S. Department of Defense," in Aviva Freedman and Peter Medway (Eds.), *Genre and the New Rhetoric*, Taylor & Francis, 1994; they are reproduced here with the kind permission of Taylor & Francis Ltd. Sections of chapter 11 first appeared as an article entitled "Technology and Communication in Military R&D" in November 1993; they are used here with permission from *Technical Communication*, published by the Society for Technical Communication, Arlington, Virginia.

My text also includes material from other authors. I am indebted to Stephen D. Antolovich, David L. McDowell, A. L. Mullikin, and the Georgia Institute of Technology for permission to summarize selected text material of theirs that appears in chapter 9. I also thank Randy Goldsmith for permission to use his copyrighted matrix, "The Innovation Process: A Model for Commercialization," which appears in chapter 12. The matrix is an evolution of work by Mohawk Research, Inc., with the Department of Energy and the National Society of Professional Engineers' cooperative agreement with the National Institute of Standards and Technology.

Rereading this Preface once more before sending it to press, I am acutely aware of the company I kept during a long journey. And I am struck by how fortunate I have been.

—A. D. Van Nostrand
Georgia Institute of Technology

Glossary of Acronyms

ABM	Anti-ballistic missile
ACTD	Advanced concept technology demonstration
AFOSR	Air Force Office of Scientific Research
AEC	Atomic Energy Commission
AMC	Army Materiel Command
ARO	Army Research Office
ARPA	Advanced Research Projects Agency (see DARPA)
ATBMP	Army Technology Base Master Plan
ATP	Advanced Technology Program
BAA	Broad agency (or broad area) announcement
BMD	Ballistic missile defense
BMDO	Ballistic Missile Defense Organization
CBD	*Commerce Business Daily*
C^3	Command, control, and communications
C^3I	Command, control, communications, and intelligence
CICA	Competition in Contracting Act of 1984
CDI	Center for Defense Information
COTR	Contracting officer's technical representative
CRADA	Cooperative research and development agreement
CRS	Congressional Research Service
DARPA	Defense Advanced Research Projects Agency (see ARPA)
DCAA	Defense Contract Auditing Agency
DCTP	*Department of Defense Critical Technologies Plan*
DDR&E	Director, Defense Research and Engineering
DFARS	Defense Supplement, Federal Acquisition Regulation
DIOR	Directorate for Information Operations and Reports
DOC	Department of Commerce
DoD	Department of Defense
DTIC	Defense Technical Information Center

DOE	Department of Energy
FAR	Federal Acquisition Regulation
FFRDC	Federally Funded Research and Development Center
FLC	Federal Laboratory Consortium
FTTA	Federal Technology Transfer Act of 1986
FY	Fiscal year
GAO	U.S. General Accounting Office
GOCO	Government-owned, contractor-operated
GOGO	Government-owned, government-operated
GTRI	Georgia Tech Research Institute
HSC	Human Systems Center, U.S. Air Force
HDL	Harry Diamond Laboratory, U.S. Army
IAC	Information Analysis Center
ICBM	Intercontinental ballistic missile
IQC	Indefinite quantity contract
IRI	Industrial Research Institute
MAD	Mutual assured destruction
MILSPECS	Military specifications
MIT	Massachusetts Institute of Technology
MOU	Memorandum of understanding
NASA	National Aeronautics and Space Administration
NEL	Naval Electronics Laboratory
NDRC	National Defense Research Committee
NIST	National Institute of Standards and Technology
NSB	National Science Board
NSF	National Science Foundation
NRL	Naval Research Laboratory
NTTC	National Technology Transfer Center
NTIS	National Technology Information Service
NUWC	Naval Undersea Warfare Center
NWC	Naval Weapons Center
OMB	Office of Management and Budget
ONR	Office of Naval Research
ORTA	Office of Research and Technology Application
OSD	Office of the Secretary of Defense
OSRD	Office of Scientific Research and Development
OTA	Office of Technology Assessment
PE	Program element
PM	Program manager
PR	Procurement request

R&D	Research and development
RD&E	Research, development and engineering
RDT&E	Research, Development, Testing, and Evaluation
RFP	Request for proposals
RXD	Research and exploratory-development event
S&T	[Defense] science and technology
SCEL	Signal Corps Engineering Laboratory
SDI	Strategic Defense Initiative
SDIO	Strategic Defense Initiative Organization
SLC	System life cycle
SOW	Statement of work in an RFP
SSA	Sources sought announcement
SSR	Sources sought response
T&E	Testing and evaluation
TRP	Technology Reinvestment Project
URI	University Research Initiative
WRDC	Wright Research and Development Center

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