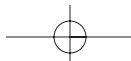
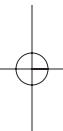


# **Technology Ventures From Idea to Enterprise**



# Technology Ventures

## From Idea to Enterprise

**Richard C. Dorf**

*University of California, Davis*

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## Higher Education

### TECHNOLOGY VENTURES: FROM IDEA TO ENTERPRISE, SECOND EDITION

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This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 0 DOC/DOC 0 9 8 7 6

ISBN 978-0-07-352922-6

MHID 0-07-352922-2

Senior Sponsoring Editor: *Michael S. Hackett*

Developmental Editor: *Kathleen L. White*

Executive Marketing Manager: *Michael Weitz*

Project Coordinator: *Tracy L. Konrardy*

Senior Production Supervisor: *Sherry L. Kane*

Associate Media Producer: *Christina Nelson*

Designer: *John Joran*

Compositor: *Techbooks*

Typeface: *10.5/12 Times Roman*

Printer: *R. R. Donnelley Crawfordsville, IN*

#### Library of Congress Cataloging-in-Publication Data

Dorf, Richard C.

Technology ventures : from idea to enterprise / Richard C. Dorf, Thomas H. Byers. — 2nd ed.

p. cm.

Includes index.

ISBN 978-0-07-352922-6 — ISBN 0-07-352922-2 (hard copy : alk. paper)

1. Information technology. 2. Entrepreneurship. 3. New business enterprises. I. Byers, Thomas (Thomas H.).

II. Title.

HC79.I55D674 2008

658.1'1—dc22

2006023211

CIP

www.mhhe.com

## DEDICATION

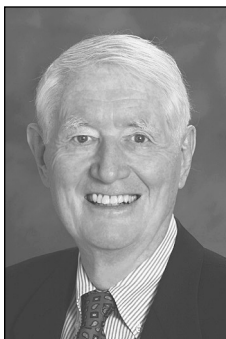
**For our spouses: Joy M. Dorf and Michele L. Mandell.  
We recognize their love and commitment to this  
publication that will help others create important  
technology ventures for the benefit of all.**

---

RICHARD C. DORF, THOMAS H. BYERS

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**Richard C. Dorf** is professor of electrical and computer engineering and professor of management at the University of California, Davis. He is a Fellow of the American Society for Engineering Education (ASEE) in recognition of his outstanding contributions to the society, as well as a Fellow of the Institute of Electrical and Electronic Engineering (IEEE). The best-selling author of *Introduction to Electric Circuits* (7th Ed.), *Modern Control Systems* (10th Ed.), *Handbook of Electrical Engineering* (3rd Ed.), *Handbook of Engineering* (2nd Ed.), and *Handbook of Technology Management*, Dr. Dorf is cofounder of six technology firms.



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## FOREWORD

by **John L. Hennessy, President of Stanford University**

I am delighted to see this book on technology entrepreneurship by Dorf and Byers. High-technology companies are both an important part of our world's economic growth story as well as the place where many young entrepreneurs realize their dreams.

Unfortunately, there have been relatively few complete and analytical books on high-technology entrepreneurship. Dorf and Byers bring their years of experience in teaching to this book, and it shows. Their personal experiences as entrepreneurs are also clear throughout the book. Their connections and involvement with start-ups—ranging from now established companies like Sun Microsystems and Yahoo to new ventures just delivering their first products—add a tremendous amount of real-world insight and relevance.

One of the most impressive aspects of this book is its broad coverage of the challenges involved in high-technology entrepreneurship. Part I talks about the core issues involved in deciding to pursue an entrepreneurial vision and what characteristics are vital to success from the very beginning. I am pleased to see that building and maintaining a competitive advantage and the critical issue of market timing are key topics. During the Internet boom, while several great new companies were built, too many entrepreneurs and investors forgot several key principles: have a sustainable advantage, create a significant barrier to entry, and be a leader when the market and the technology are both ready. Hopefully, the material in these chapters will help prevent future irrational behavior by both entrepreneurs and investors.

Part II examines the major strategic decisions that any group of entrepreneurs must grapple with: how to balance risk and return, what entrepreneurial structure to pursue, how to find and cultivate the best employees and help make them productive, and the critical issues of intellectual property. Indeed, these are problems that every company faces, and ones that must be continuously examined by the leadership in any organization.

Part III discusses the operational and organizational challenges that all entrepreneurs must tackle. Virtually every start-up led by a technologist that I have been close to inevitably wonders whether it needs sales and marketing. Sometimes in such companies, you hear a remark like: "We have great technology and that will bring us customers; nothing else matters!" I remind them that without sales, there is no revenue, and without marketing, sales will be diminished. Understanding how to approach these vital aspects of any successful business is crucial. The related topics of building the organization, thinking about acquisitions, and managing operations are also important. If you fail to address these aspects of your company, it will not matter how good your technology is.

Finally, Part IV talks about putting together a solid financial plan for the company, including exit and funding strategies. Of course, such topics are crucial, and they are often the sole or dominant topics of “how-to” books on entrepreneurship. Certainly, the financing and the choice of investors are key, but unless the challenges discussed in the preceding sections are overcome, it is unlikely that a new venture, even if well financed, will be successful.

In looking through this sage and comprehensive treatment, my overwhelming reaction was, “I wish I had read a book like this, before I started my first company (MIPS Technologies in 1984).” Unfortunately, I had to learn many of the topics covered here in real-time and often by making a mistake on the first attempt. In my experience, it is the challenges discussed in the earlier sections that really proved to be the minefields. Yes, it is helpful to know how to negotiate a good deal and to structure the right mix of financing sources, especially so that as much equity as possible can be retained by employees. If, however, you fail to create a sustainable advantage or have a sales or marketing plan that is solid, the employee’s equity will not be worth much.

Those of us who work at Stanford and live near Silicon Valley are in the heart of the land of high-technology entrepreneurship. With this book, many others will get to share the extensive and deep insights of Dorf and Byers on this wonderful process that builds tomorrow’s companies and business leaders.

---

## PREFACE

Entrepreneurship is a vital source of change in all facets of society, empowering individuals to seek opportunity where others see insurmountable problems. For the past century, entrepreneurs have created many great enterprises that subsequently led to job creation, improved productivity, increased prosperity, and a higher quality of life. With one-third of the world's population lacking access to basic energy needs and two-thirds with annual incomes of less than \$2,000, entrepreneurship can play an important role in finding solutions to these challenges facing civilization.

Many books have been written to help educate others about entrepreneurship. Our textbook is the first to thoroughly examine a global phenomenon known as "technology entrepreneurship." Technology entrepreneurship is a style of business leadership that involves identifying high-potential, technology-intensive commercial opportunities, gathering resources such as talent and capital, and managing rapid growth and significant risks using principled decision-making skills. Technology ventures exploit breakthrough advancements in science and engineering to develop better products and services for customers. The leaders of technology ventures demonstrate focus, passion, and an unrelenting will to succeed.

Why is technology so important? The technology sector represents a significant portion of the economy of every industrialized nation. In the United States, more than one-third of the gross national product and about half of private-sector spending on capital goods are related to technology. Although making up only 15 percent of the S&P 500, the technology sector generates 45 percent of the daily trading volume on the New York stock markets. It is clear that national and global economic growth depends on the health and contributions of technology businesses.

Technology has also become ubiquitous in modern society. Note the proliferation of cell phones, personal computers, and the Internet in the past decade and their subsequent integration into everyday commerce and our personal lives. When we refer to "high technology," we include information technology and electronics companies, life science and biotechnology businesses, and those service firms where technology is critical to their missions. At the beginning of the 21st century, many technologies show tremendous promise, including photonics and Internet advancements, medical devices and drug discovery, nanotechnology, and materials technologies related to energy and the environment. The intersection of these technologies may indeed enable the most promising opportunities.

The drive to understand technology venturing has frequently been associated with boom times. Certainly, the often-dramatic fluctuations of economic cycles can foster periods of extreme optimism as well as fear with respect to entrepreneurship. However, some of the most important technology companies

have been founded during recessions (e.g., Intel, Cisco, and Amgen). This book's principles endure regardless of the current state of the economy.

## APPROACH

Just as entrepreneurs combine things to create innovations, we integrate the most valuable entrepreneurship and technology management theories from some of the world's leading scholars, educators, and authors. We also provide an action-oriented approach to the subject through the use of examples, exercises, and lists. By striking a balance between theory and practice, we hope our readers will benefit from both perspectives.

Our comprehensive collection of concepts and applications provides the tools necessary for success in starting and growing a technology enterprise. We show the critical differences between scientific ideas and true business opportunities. Readers will benefit from the book's integrated set of cases, examples, business plans, and recommended sources for more information.

We illustrate the book's concepts with examples from the early stages of both traditional high-technology firms (e.g., Microsoft, Google, and Genentech) and those that use technology strategically (e.g., Starbucks and Wal-Mart). How did they develop enterprises that have had such positive impact, sustainable performance, and longevity? In fact, the book's major principles are applicable to any high-growth, high-potential venture. This includes nonprofit enterprises such as Conservation International and the Kauffman Foundation.

## AUDIENCE

This book is designed for students in colleges and universities, as well as others in industry and public service, who seek to learn the essentials of technology entrepreneurship. No prerequisite knowledge is necessary, although an understanding of basic accounting principles will prove useful.

Entrepreneurship was traditionally taught only to business majors. Because entrepreneurship education opportunities now span the entire campus, we wrote this book to be approachable for students of all majors and levels including undergraduate, graduate, and executive education. Our primary focus is on science and engineering majors enrolled in entrepreneurship and innovation courses, but the book is also valuable to business and other students with a particular interest in technology ventures.

For example, the courses at Stanford University and the University of California, Davis, based on this textbook regularly attract students from majors as diverse as computer science, product design, political science, economics, pre-med, electrical engineering, history, biology, and business. Although the focus is on technology entrepreneurship, these students find this material applicable to the pursuit of a wide variety of endeavors. Entrepreneurship education is a wonderful way to teach universal leadership skills, which include being comfortable with constant change, contributing to an innovative team, and



demonstrating passion in any effort. Anyone can learn entrepreneurial thinking and leadership. We particularly encourage instructors to design courses where the students form study teams early in the term and learn to work together effectively on group assignments.

## WHAT'S NEW

Based upon feedback from readers and new developments in the field of high-technology entrepreneurship, numerous enhancements appear in this second edition. Recent compelling academic theories and practitioner insights in entrepreneurship are included in the text. Upgraded examples and exercises place even more emphasis on technology ventures worldwide. A special exercise called the “venture challenge” at the end of each chapter steps the reader through the formation of a venture.

Business plan development materials and tools are expanded and summarized in a single chapter. This includes an annotated table showing how to best organize the contents of a professional business plan. A bundled DVD has numerous video clips that highlight specific sections and cases in the book with inspirational comments by entrepreneurs, investors, and teachers. Two new full-length cases are included in the appendix. Some minor reordering of chapters streamlines the remaining content.

## FEATURES

The book is organized in a modular format to allow for both systematic learning and random access of the material to suit the needs of any reader seeking to learn how to grow successful technology ventures. Readers focused on business plan development should consider placing a higher priority on chapters 7, 10, 12, 17, and 18. Regardless of the immediate learning goals, the book is a handy reference and companion tool for future use. We deploy the following wide variety of methods and features to achieve this goal, and we welcome feedback and comments.

*Principles and Chapter Previews*—A set of 20 fundamental principles are developed and defined throughout the book. They are listed in the inside front cover as well. Each chapter opens with a key question and outlines its content and objectives.

*Examples and Exercises*—Examples of cutting-edge technologies illustrate concepts in a shaded-box format. Information technology is chosen for many examples because students are familiar with its products and services. Exercises are offered at the end of each chapter to test comprehension of the concepts.

*Sequential Exercise and Case*—A special exercise called the “venture challenge” guides readers through a chapter-by-chapter formation of a new enterprise. In addition, a case study about an actual biotechnology firm, AgraQuest, runs from one chapter to the next.

**TABLE P1 Mapping of cases.**

Cases in appendix B	Reference chapters	Issues
World Indigo	3 to 7, 12, 15, 20	Business model and strategy, team, global business, execution
Biodiesel	2, 3, 11, 17	Opportunity, finance, marketing
Yahoo! 1995	3, 4, 7, 17, 18	Business concept, finance, business plans
Barbara Arneson	12, 17	Stock options, finance
Jon Hirschtick	4, 12, 17, 18, 19	Strategy, team, finance, negotiations
Artemis Images	2, 3, 12	Opportunity, value proposition, team
Radco	3, 12, 20	Business model, team, ethics

*Business Plans*—Methods and tools for the development of a business plan are gathered into one special chapter, which includes a thoroughly annotated table of contents. Two complete business plans are also provided as samples in appendix A.

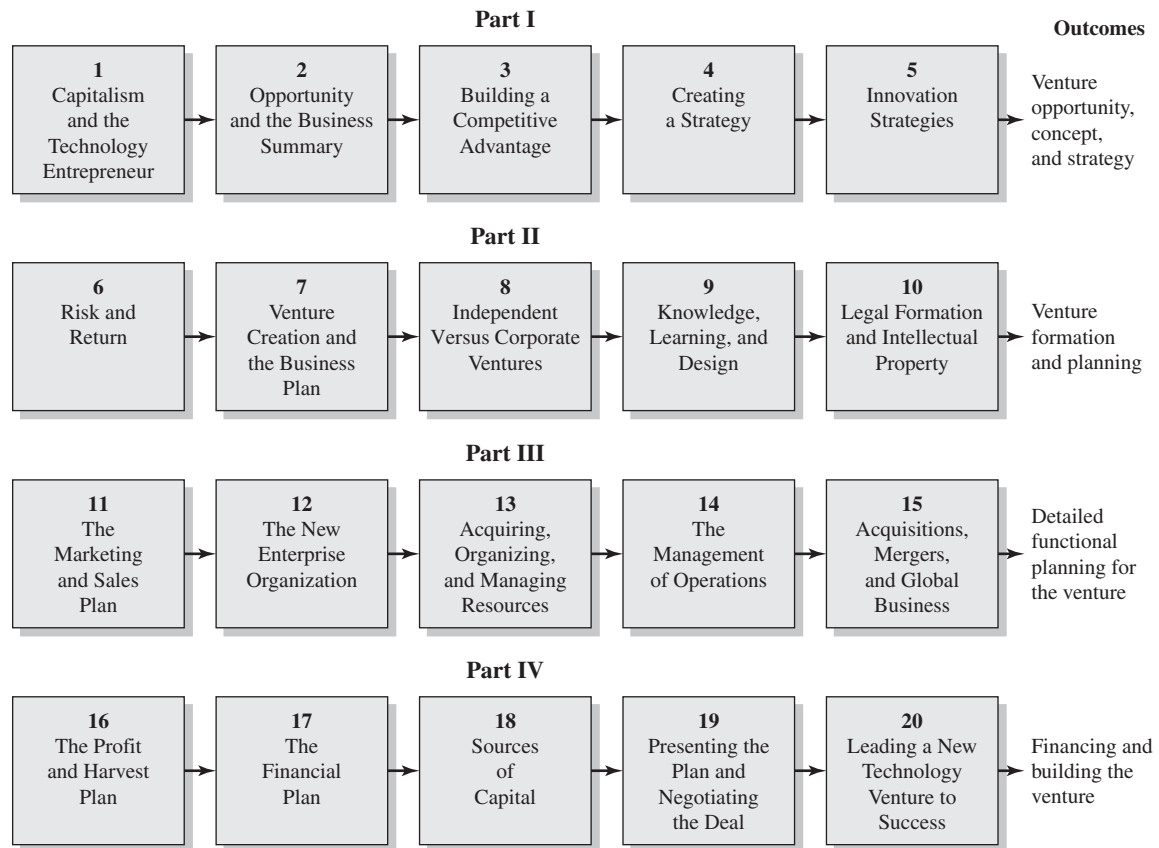
*Cases*—Seven comprehensive cases are included in appendix B. A mapping of how these cases relate to specific chapters in the book is provided in Table P1. Additional cases from Harvard and ECCH are recommended on the textbook's websites.

*References*—References are indicated in brackets [Smith, 2001] and are listed as a complete set in the back of the book. This is followed by a list of entrepreneurship-related websites in appendix C and a comprehensive glossary.

*Chapter Sequence*—The chapter sequence represents our best effort to organize the material in a format that can be used in various types of entrepreneurship courses. The chapters follow the four-part layout shown in figure P1. Courses focused on creating business plans can reorder the chapters with emphasis on chapter 7 among others.

*DVD Media Package*—A DVD of video segments is bundled with the book. Special icons throughout the book denote when to view these comments from world-class entrepreneurs, investors, and teachers. More free videos clips and podcasts are available at Stanford's Educators Corner website (see <http://edcorner.stanford.edu>).

*Websites and Blog*—Please visit websites for this book at both McGraw-Hill Higher Education (<http://www.mhhe.com/dorfbyers2e>) and Stanford University (<http://edcorner.stanford.edu/techventures>) for supplemental information applicable to educators, students, and professionals. For



**FIGURE P1** Chapter sequence.

example, a complete syllabus for an introductory course on technology entrepreneurship and a PowerPoint presentation for each chapter are provided for instructors. Visitors to either website can link to the author's blog to interact with the authors and other readers.

## ACKNOWLEDGEMENTS

Many people have made this book possible. Our editors at McGraw-Hill were Suzanne Jeans, Michael Hackett, and Katie White. We thank all of them for their insights and dedication. We also thank Tracy Konrardy and the McGraw-Hill production team for their diligent efforts.

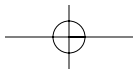
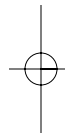
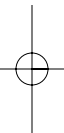
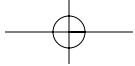
Our colleagues at Stanford University and the University of California, Davis, were helpful in numerous ways. We are indebted to them for all of their

great ideas and support. At Stanford, they include Scott Cannon, Eric Carr, Emily Cox, Kathleen Eisenhardt, Forrest Glick, Kailash Gopalakrishnan, Yvonne Hankins, John Hennessy, Randy Komisar, Thomas Kosnik, Kelley Porter, James Plummer, Elisabeth Pate-Cornell, Emily Ma, Rajit Marwah, Asha Nayak, Ted Sacerdoti, Tina Seelig, Robert Sutton, and Adam Wegel. At UC Davis, they include Robert Smiley, Andrew Hargadon, Nicole Biggart, Jerome Suran, Ben Finkelor, Kurt Heisinger, and Marc Lowe.

Practitioners and industry leaders who provided key input included Brook Byers, Ken Byers, Gordon Eubanks, Bob Fung, Jeremy Jaech, Pamela Marrone, and John Walter. We also express sincere appreciation to all of the reviewers of the first and second edition manuscripts and media packages: George Abe, University of California, Los Angeles; Ronald Baecker, University of Toronto; David Barbe, University of Maryland; Edgar Blevins, Southern University and A&M College; John Callister, Cornell University; David Charron, University of California, Berkeley; W. Andrew Clark, East Tennessee State University; Robert Crocket, California Polytechnic and State University, San Luis Obispo; Maryann Feldman, University of Toronto; Alan Flury, Georgia Institute of Technology; Buck Goldstein, University of North Carolina, Chapel Hill; Susannah Howe, Smith College; Andrew Isaacs, University of California, Berkeley; Jim Jindrick, University of Arizona; Liz Kisenwether, Pennsylvania State University; Clifton Kussmaul, Muhlenberg College; Salvador Landeros, National University of Mexico; Anthony J. Marchese, Rowan University; Thomas Mason, Rose-Hulman Institute of Technology; Mel I. Mendelson, Loyola Marymount University; Arlen Meyers, University of Colorado; Tom Miller, North Carolina State University; Steve Nichols, University of Texas, Austin; John Ochs, Lehigh University; David Pistrui, Illinois Institute of Technology; Robert Podlasek, Bradley University; Jon D. Pratt, Louisiana Tech University; Edward Rubesch, Mahidol University; Erik Sander, University of Florida; Tammy Schakett, Columbus State Community College; Jerry Schaufeld, Worcester Polytechnic Institute; Gerry Scheffelmaier, Middle Tennessee State University; Michael Song, University of Missouri, Kansas City; James L. Stevenson, Massachusetts Institute of Technology; Brent Strong, Brigham Young University; Joseph Toth, Duquesne University; Rodrigo Varela Villegas, Universidad ICESI; Ken Vickers, University of Arkansas; Stephen Walsh, North Carolina State University; William J. White, Northwestern University; Charles Wright, Florida A&M University; Wei Zhang, Tsinghua University; Ed Zschau, Princeton University.

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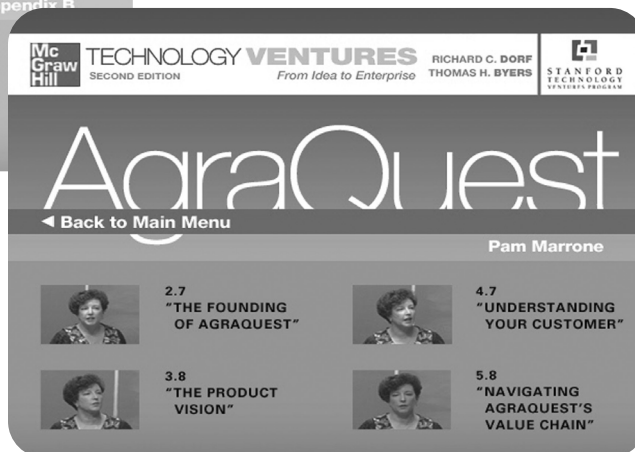
# GUIDED TOUR

## Student DVD

A DVD packaged with the book provides over 25 short video clips of world-class entrepreneurs, investors, and teachers sharing their insights on key topics in the book.



Featured videos include a series of clips Pam Marrone, founder of AgraQuest, the company highlighted in the running case throughout the text, as well as a video on the “Early Choices for the Founders, Investors, and Advisors” of Yahoo!.



## MEDIA SUPPLEMENTS FOR STUDENTS AND INSTRUCTORS



See the DVD...

Videos are organized by chapter section and are identified in the book with a “See the DVD” icon.



Other video clips featured on the DVD include:

- “Changing the Business Plan in Response to a Changing Environment”—Gordon Ringold (Surromed)
- “Measuring Success: You Measure What Matters”—John Thompson (Symantec)
- “Global Outsourcing”—Jeff Hawkins (Palm)
- “Small Innovations for Reducing Company Costs: PayPal and SpaceX”—Elon Musk (SpaceX)

More free video clips and podcasts are available at Stanford’s Educators Corner website <http://edcorner.stanford.edu>.



# MEDIA SUPPLEMENTS FOR STUDENTS AND INSTRUCTORS

The 2nd edition is supplemented by two websites, collectively bringing students and instructors the most extensive resources available for technology entrepreneurship courses. Visitors to either website can link to the author's blog in order to interact with the authors and other readers.

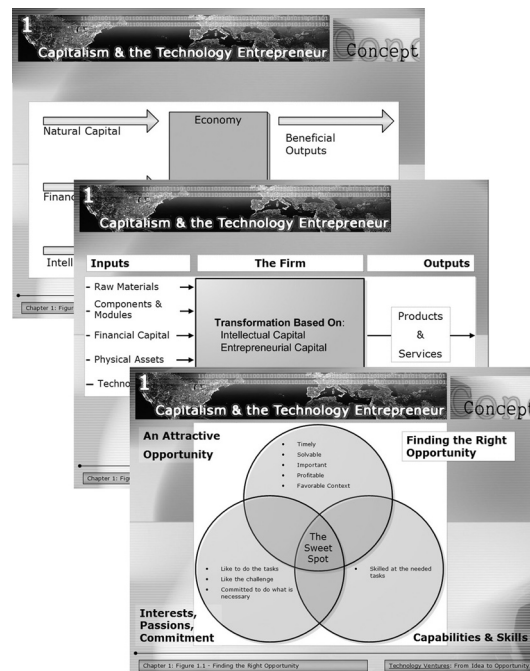
## McGraw-Hill Website [www.mhhe.com/dorfbyers2e](http://www.mhhe.com/dorfbyers2e)

Accessed with a password, the McGraw-Hill website for instructors features:

- Answers to end-of-chapter exercises
- Teaching notes in Word and PDF format for the cases in Appendix B
- Extensive lecture PowerPoint presentations based on the text

**Lecture PowerPoints** provide instructors with a framework for organizing their lectures, and reference topic-related videos on the corresponding DVD.

The screenshot shows the McGraw-Hill website for the textbook 'Technology Ventures: From Idea to Enterprise, 2/e' by Richard C. Dorf and Thomas H. Byers. The page includes a navigation bar with links for 'Student Edition', 'Instructor Center', 'Information Center', and 'Home'. A 'Feedback Help Center' link is also present. The main content area lists the authors and provides a detailed table of contents for both the Student Edition and the Instructor Center. The Student Edition includes sample business plans, chapter exercises, answer keys, case teaching notes, additional web links, and chapter slide decks. The Instructor Center includes a table of contents, feature summary, book preface, book forward, about the authors, glossary, Stanford website, entrepreneur magazine offer, and courses using the textbook. A small image of the book cover is shown on the right. Below the table of contents, there is a paragraph of text describing the book's focus on technology entrepreneurship and its approach to teaching the subject. At the bottom, there is a copyright notice for 2006 McGraw-Hill Higher Education and a link to the Terms of Use and Privacy Policy.





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## Stanford University Website http://edcorner.stanford.edu/techventures

Rich with content, the author-created Stanford website provides relevant media for each chapter in *Technology Ventures*, including:

- Videos and case studies from Harvard Business School and Stanford University
- Resources on how to best integrate the book's business plans and case studies into entrepreneurship courses

Dorf and Byers, 2nd Edition

## TECHNOLOGY VENTURES

Supporting Resources and Teaching Materials

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About The Textbook  
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## Welcome

**About This Website**

This website provides instructors and students of high-technology entrepreneurship with learning resources complementing *Technology Ventures: From Ideas to Enterprise* with Student DVD, a McGraw-Hill Higher Education textbook written by Richard C. Dorf and Thomas H. Byers (ISBN #007329442X for hardcover edition and ISBN #0071246223 for international student edition). Containing a wide variety of recommended media, the website includes case studies, short video clips, articles, and PowerPoint slides all focused on the creation and management of technology ventures. This site will continue to evolve with new media and features.

**Start Here to View Media By:**

Book Contents provides relevant media for each chapter in *Technology Ventures*, including videos and case studies from Harvard Business School and Stanford University. Additional resources are provided regarding how best to integrate the book's business plans and case studies into entrepreneurship courses.

Sample Course Syllabus is derived from an actual Stanford University class including 24 sessions with all related content.

This website is free and open to students and instructors alike. It is a part of the Stanford Technology Ventures Program's Educators Corner, which is a digital archive of entrepreneurship education materials. Instructors seeking detailed teaching notes and answer keys related to the textbook should visit the "Instructor Only" section of the course website hosted at McGraw-Hill Higher Education.

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Also provided on the Stanford site, a **sample syllabus** derived from an actual Stanford University class includes 24 sessions with all related content.

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## CHAPTER ONE

Capitalism and the Technology Entrepreneur

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