TECHNOLOGY VENTURES

From Idea to Enterprise

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Technology Ventures
From Idea to Enterprise

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Mc Graw Hill Education

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DEDICATION

For our wonderful families.
We warmly recognize their love and commitment to this publication that will help others create important enterprises for the benefit of all.

THOMAS H. BYERS, RICHARD C. DORF, ANDREW J. NELSON

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FOREWORD

by John L. Hennessy, President of Stanford University

I am delighted to introduce this book on technology entrepreneurship by Professors Byers, Dorf, and Nelson. Technology and similar high-growth enterprises play a key role in the development of the global economy and offer many young entrepreneurs a chance to realize their dreams.

Unfortunately, there have been few complete and analytical books on technology entrepreneurship. Professors Byers, Dorf, and Nelson bring years of experience in teaching and direct background as entrepreneurs to this book, and it shows. Their connections and involvement with start-ups—ranging from established companies like Facebook and Genentech to new ventures delivering their first products—add real-world insights and relevance.

One of the most impressive aspects of this book is its broad coverage of the challenges involved in technology entrepreneurship. Part I talks about the core issues around deciding to pursue an entrepreneurial vision and the characteristics vital to success. Key topics include building and maintaining a competitive advantage and market timing. As recent history has shown, it is easy to lose sight of these principles. Although market trends in technology are ever shifting, entrepreneurs are rewarded when they maintain a consistent focus on having a sustainable advantage, creating a significant barrier to entry, and leading when both the market and the technology are ready. The material in these chapters will help entrepreneurs and investors respond in an informed and thoughtful manner.

Part II examines the major strategic decisions with which every entrepreneur grapples: how to balance risk and return, what entrepreneurial structure to pursue, and how to develop innovative products and services for the right users and customers. It is not uncommon for start-ups led by a technologist to question the role of sales and marketing. Sometimes, you hear a remark like: "We have great technology and that will bring us customers; nothing else matters!" But without sales, there is no revenue, and without marketing, sales will be diminished. It is important to understand these vital aspects of any successful business. These are challenges faced by every company, and the leadership in any organization must regularly examine them.

Part III discusses operational and organizational issues as well as the vital topic in technology-intensive enterprises of intellectual property. Similar matters of building the organization, thinking about acquisitions, and managing operations are also critical. If you fail to address them, it will not matter how good your technology is.

Finally, Part IV talks about putting together a solid financial plan for the enterprise including exit and funding strategies. Such topics are crucial, and they are often the dominant topics of "how-to" books on entrepreneurship. While the

financing and the choice of investors are key, 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 book, my 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 much of this in real-time, often making mistakes on the first attempt. In my experience, the challenges discussed in the earlier sections are the real minefields. Yes, it is helpful to know how to negotiate a good deal and to structure the right mix of financing sources, especially so employees can retain as much equity as possible. However, if you fail to create a sustainable advantage or lack a solid sales and marketing plan, the employees' equity will not be worth much.

Those of us who work at Stanford and live near Silicon Valley are in the heartland of technology entrepreneurship. We see firsthand the tenacity and intelligence of some of the world's most innovative entrepreneurs. With this book, many others will have the opportunity to tap into this experience. Exposure to the extensive and deep insights of Professors Byers, Dorf, and Nelson will help build tomorrow's enterprises and business leaders.

PREFACE

Entrepreneurship is a vital source of change in all facets of society, empowering individuals to seek opportunities 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. Entrepreneurship is now playing a vital role in finding solutions to the huge challenges facing civilization, including health, communications, security, infrastructure, education, energy, and the environment.

Many books have been written to help educate others about entrepreneurship. Our textbook was 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. 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 smartphones, personal computers, tablets, and the Internet in the past two decades and their subsequent integration into everyday commerce and our personal lives. When we refer to "high-technology" ventures, we include information technology enterprises, biotechnology and medical businesses, energy and sustainability companies, and those service firms where technology is critical to their missions. At the beginning of the twenty first century, many technologies show tremendous promise, including computational systems, Internet advancements, mobile communications platforms, networks and sensors, medical devices and biotechnology, artificial intelligence, robotics, 3D manufacturing, nanotechnology, and clean energy. 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 state of the economy.

APPROACH

Just as entrepreneurs innovate by recombining existing ideas and concepts, we integrate the most valuable entrepreneurship and technology management theories from the world's leading scholars to create a fresh look at entrepreneurship. 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, our readers gain 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 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 high-technology firms (e.g., Apple, Google, and Genentech) and traditional firms that use technology strategically (e.g., FedEx 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 growth-oriented, high-potential venture, including high-impact nonprofit enterprises such as Conservation International and the Gates 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 and high-growth 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 by 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 students and others with a particular interest in high-growth ventures.

For example, our courses at Stanford University, the University of Oregon, 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 in which 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 technology entrepreneurship, numerous enhancements appear in this fourth edition. Recent compelling academic theories and practitioner insights in entrepreneurship from leading scholarly journals, trade books, and popular blogs and press are included in the text. Special attention is given to business model development and measurement, lean start-ups, design thinking, intellectual property, and marketing and sales. All examples and exercises were reviewed to place even more emphasis on exciting technology ventures around the globe.

Chapters 1 and 2 have been extensively revised to better introduce the art and science of venturing. Chapter 3 now contains the latest techniques on business model development and lean start-up methodologies. The concept story and business plan development materials and tools are consolidated and improved in a new Chapter 6 to start Part II. Similarly, a new Chapter 8 consolidates and expands content regarding creativity and product development. Chapter 11 is solely focused on the vital topic of intellectual property. Chapter 12 now has all key material on teams and organizational learning in one place. Two new full-length cases regarding clean technology and sustainability are included in the appendix. The AgraQuest sequential case in each chapter has been replaced with an examination of an exemplary enterprise relevant to that material. Cases no longer in use from previous versions are available on our websites. Some reordering of sections within 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 and model development should consider placing a higher priority on Chapters 3, 6, 9, 11, 12, 17, 18, and 19. 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 is 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 Spotlights—A special exercise called the "venture challenge" guides readers through a chapter-by-chapter formation of a new

TABLE P1 Overview of cases.

Cases in appendix B	Synopsis	Issues
Method	A start-up contemplates a new product line	Opportunities, vision and the business model, marketing and sales
Method products	A product development effort runs into problems	Innovation strategies, creativity, and product development
Biodiesel	Three founders consider an opportunity in the energy industry	Opportunity identification and evaluation, business model
Yahoo!	Two founders face a decision on financing that forces them to confront their vision	Vision and business model, sources of capital, business plan
Barbara's Options	A soon-to-be graduate weighs two job offers	Stock options, finance
Artemis Images	A promising image management company runs into trouble	Competitive strategy, business model, team, finance
Sirtris Pharmaceuticals	A life sciences firm faces major decisions about its future	Alliances, licensing, market strategy
Cooliris	A young entrepreneur struggles to hire a team	Hiring process, scaling issues

enterprise. At the end of each chapter's narrative, a successful enterprise is profiled in a special "spotlight" section.

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. A sample business plan is provided in appendix A.

Cases—Eight comprehensive cases are included in appendix B. A short description of each case is provided in Table P1. Additional cases from Harvard and ECCH are recommended on this textbook's websites.

References and Glossary—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 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 and models can reorder the chapters with emphasis on Chapters 3, 6, 9, 11, 12, 17, 18, and 19.

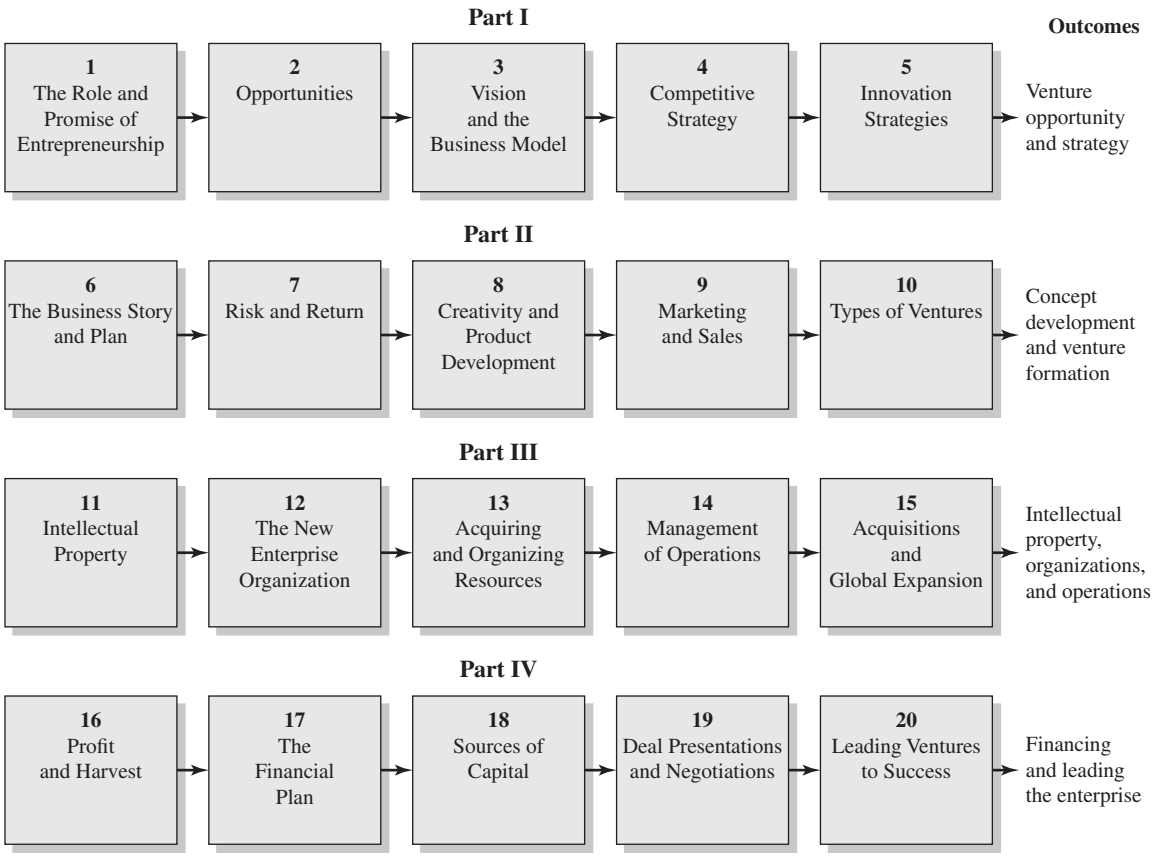

FIGURE P1 Chapter sequence.

Video Clips—A collection of suggested videos from world-class entrepreneurs, investors, and teachers is listed at the end of each chapter and provided on this textbook's websites. More free videos clips and podcasts are available at Stanford's Entrepreurship Corner website (see http://ecorner.stanford.edu).

Websites and Social Networking—Please visit websites for this book at both McGraw-Hill Higher Education (http://www.mhhe.com/byersdorf) and Stanford University (http://techventures.stanford.edu) for supplemental information applicable to educators, students, and professionals. For example, a complete syllabus for an introductory course on technology entrepreneurship and additional learning resources for each chapter are provided for instructors.

ELECTRONIC TEXTBOOK OPTIONS

E-books are an innovative way for students to save money and create a greener environment at the same time. An e-book can save students about half the cost of a traditional textbook and offers unique features like a powerful search engine, highlighting, and the ability to share notes with classmates using e-books.

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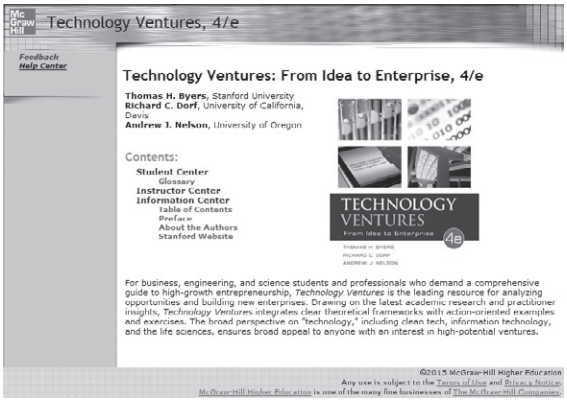
Media Supplements for Students and Instructors

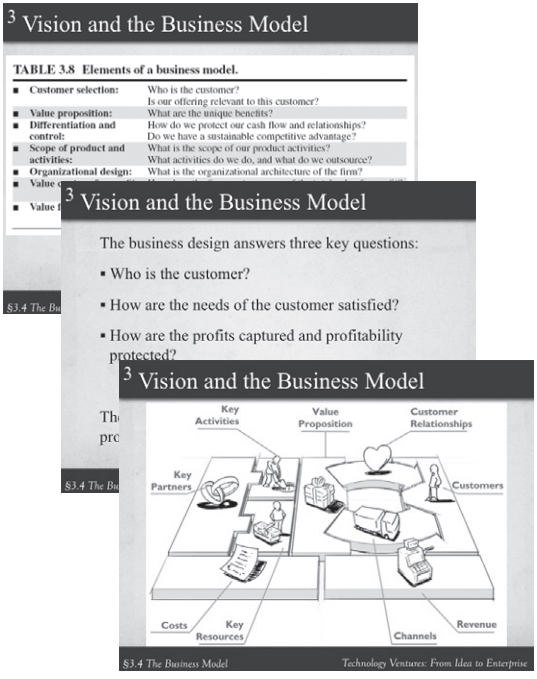
The 4th edition is supplemented by two websites, collectively bringing students and instructors the most extensive resources available for technology and high-growth entrepreneurship courses. Visitors to either website can link to the authors' social networking sites in order to interact with the authors and other readers.



McGraw-Hill Website www.mhhe.com/byersdorf

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 sample presentations based on the text



Sample presentations provide instructors with a framework for organizing their lectures, and reference topic-related videos on the textbook's websites.

Media Supplements for Students and Instructors

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

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

- Video clips and podcasts of entrepreneurial leaders including founders, CEOs, venture capitalists, authors, educators, and policy makers.
- Suggested case studies from Harvard Business School and other universities around the globe.
- Resources on how to best integrate the book's business plans and case studies into entrepreneurship courses.
- Links to compelling resources on entrepreneurship.
- Additional sample business plans to augment the executive summary in appendix A.
- Sample syllabi including one from an actual Stanford University course for students of all majors.
- A collection of the videos listed in the "Video Resources" section at the end of each chapter in this textbook.

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PART I

Venture Opportunity and Strategy

Entrepreneurs create new businesses that fuel progress in societies worldwide. They use innovation and technology to foster positive impact and activity in all facets of life. Entrepreneurs identify, develop, and communicate the essence of an opportunity that has attractive potential to become a successful venture. They describe the valuable contributions of the venture, and they design a business model that can adapt to changing circumstances. The venture team creates a road map (strategy) that can, with good chance, effectively lead to the commercialization of the new product or service in the marketplace with a sustainable competitive advantage. ■

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CHAPTER 1

The Role and Promise of Entrepreneurship

There are risks and costs to a program of action. But they are far less than the long-range risks and costs of comfortable inaction.
John F. Kennedy

CHAPTER OUTLINE

What drives global entrepreneurship?

Entrepreneurs strive to make a difference in our world and to contribute to its betterment. They identify opportunities, mobilize resources, and relentlessly execute on their visions. In this chapter, we describe how entrepreneurs act to create new enterprises. We identify firms as key structures in the economy and the role of entrepreneurship as the engine of economic growth. New technologies form the basis of many important ventures where scientists and engineers combine their technical knowledge with sound business practices to foster innovation. Entrepreneurs are the critical people at the center of all of these activities. ■

1.1 Entrepreneurship in Context

From environmental sustainability to security, from information management to health care, from transportation to communication, the opportunities for people to create a significant positive impact in today's world are enormous. **Entrepreneurs** are people who identify and pursue solutions among problems, possibilities among needs, and opportunities among challenges.

Entrepreneurship is more than the creation of a business and the wealth associated with it. It is focused on the creation of a new enterprise that serves society and makes a positive change. Entrepreneurs can create great and reputable firms that exhibit performance, leadership, and longevity. In Table 1.1, look at the examples of successful entrepreneurs and the enterprises they created. What contributions have these people and organizations made? What organization would you add to the list? What organization do you wish you had created or been a part of during its formative years? What organization might you create in the future?

TABLE 1.1 Selected entrepreneurs and the enterprises they started.

Entrepreneur	Enterprise started	Age of entrepreneur at time of start	Year of start
Benioff, Mark	Salesforce.com (USA)	35	1999
Bezos, Jeff	Amazon.com (USA)	31	1995
Brin, Sergey	Google (USA)	27	1998
Dell, Michael	Dell Computer (USA)	19	1984
Dorsey, Jack	Twitter, Square (USA)	30	2006
Goyanechea, Rosalia	Zara (Spain)	31	1975
Greene, Diane	VMWare (USA)	42	1998
Huateng, Ma	Tencent Inc. (China)	27	1998
Ibrahim, Mo	Celtel (Africa)	42	1998
Lerner, Sandra	Cisco (USA)	29	1984
Li, Robin	Baidu (China)	32	2000
Ma, Jack	Alibaba.com (China)	35	1999
Plattner, Hasso	SAP (Germany)	28	1972
Rottenberg, Linda	Endeavor (Chile, Argentina)	28	1997
Shwed, Gil	Check Point (Israel)	25	1993
Tanti, Tulsi	Suzlon Energy (India)	37	1995
Yunus, Muhammed	Grameen Bank (India)	36	1976
Zennstrom, Nikalas	Skype, Kazaa (Sweden)	37	2003
Zuckerberg, Mark	Facebook (USA)	20	2004

Entrepreneurs seek to achieve a certain goal by starting an organization that will address the needs of society and the marketplace. They are prepared to respond to a challenge to overcome obstacles and build a business. As Martin Luther King, Jr. (1963), said, "The ultimate measure of a man is not where he stands in moments of comfort and convenience, but where he stands at times of challenge and controversy."

For an entrepreneur, a **challenge** is a call to respond to a difficult task and the commitment to undertake the required enterprise. Richard Branson, the creator of Virgin Group, reported [Garrett, 1992]: "Ever since I was a teenager, if something was a challenge, I did it and learned it. That's what interests me about life—setting myself tests and trying to prove that I can do it."

Thus, entrepreneurs are resilient people who pounce on challenging problems, determined to find a solution. They combine important capabilities and skills with interests, passions, and commitment. Over nearly a decade, Fred Smith worked on perfecting a solution to what he viewed as a growing problem of organizations to find ways to rapidly ship products to customers. To address this challenge, Smith saw an opportunity to build a freight-only airline that would fly packages to a huge airport and then sort, transfer, and fly them to their destinations overnight. He turned in his paper describing this plan to his Yale University professor, who gave it an average grade, said to be a C. After he graduated, Smith served four years as a U.S. Marine Corps officer and pilot. Following his military service, he spent a few years in the aviation industry building up his experience and knowledge of the industry. Then, he prepared a fully developed business plan for an overnight freight service. By 1972, he had secured financial backing, and Federal Express took to the air in 1973. Federal Express became a new way of shipping goods that revolutionized the cargo shipping business worldwide.

Smith and other entrepreneurs recognize a change in society and its needs, and then, based on their knowledge and skill, they respond with a new way of doing things, typically by recombining people, concepts, and technologies into an original solution. Smith saw that the combination of dedicated cargo airplanes, computer-assisted tracking systems, and overnight delivery would serve a new market that required just-in-time delivery of critically important parts, documents, and other valuable items. Smith adapted computer technology to manage the complex task of tracking and moving packages. More fundamentally, Smith matched his passions and skills as a person with a good opportunity.

An **opportunity** is a favorable juncture of circumstances with a good chance for success or progress. Attractive opportunities combine good timing with realistic solutions that address important problems in favorable contexts. It is the job of the entrepreneur to locate new ideas, to determine whether they are actual opportunities, and, if so, to put them into action. Thus, **entrepreneurship** may be described as the nexus of enterprising individuals and promising opportunities [Shane and Venkataraman, 2000]. As illustrated in Figure 1.1, the "sweet spot" exists where an individual's or team's passions and capabilities intersect with an attractive opportunity.

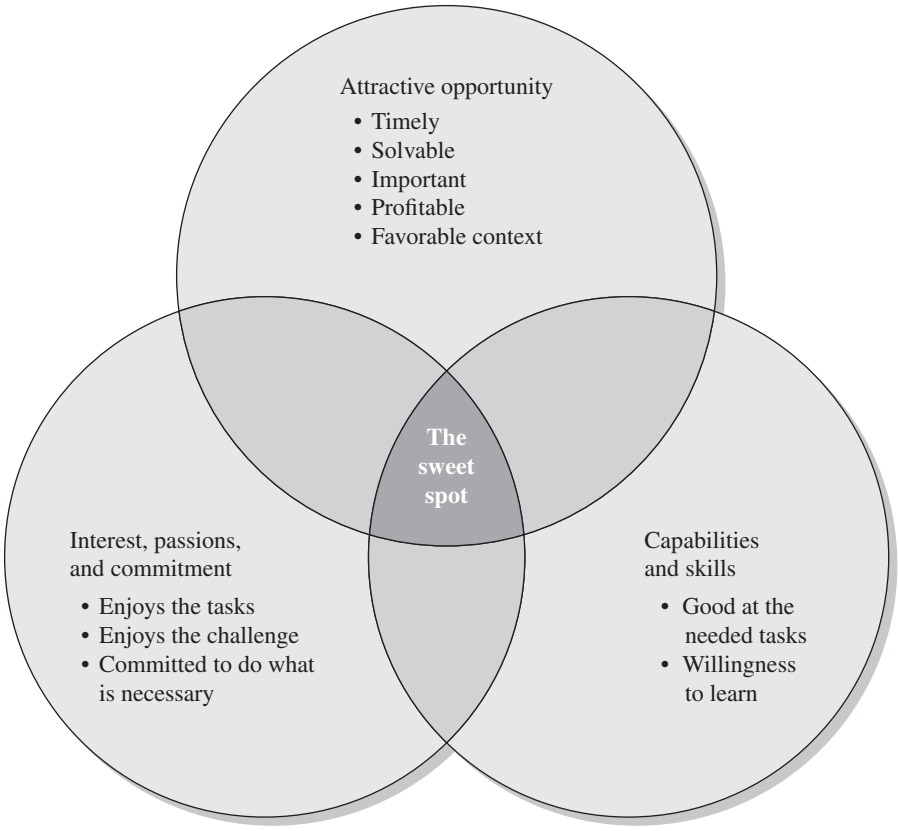

FIGURE 1.1 Selecting the right opportunity by finding the sweet spot.

Entrepreneurship is not easy. Only about one-third of new ventures survive their first three years. As change agents, entrepreneurs must be willing to accept failure as a potential outcome of their venture. But, regardless of whether the right opportunity has emerged, a person can learn to act as an entrepreneur by trying the activity in a low-cost manner. To avoid the realm of daydreams and fantasy, a person needs to start the practice of experimenting, testing, and learning about his or her entrepreneurial self [Ibarra, 2002]. The would-be entrepreneur should, therefore, engage in this sequence: do it, then reflect on it.

The first step is to identify the hypotheses associated with an idea: what assumptions is the entrepreneur making when concluding that an identified problem is really a problem and that a proposed solution is a good and realistic solution? Then, the entrepreneur can test these hypotheses by engaging with knowledgeable individuals, such as potential customers, employees, and partners. Through these small experiments, the entrepreneur not only develops contacts and mentors

TABLE 1.2 Four steps to starting a business.

1. The founding team or individual has the necessary skills or acquires them.
2. The team members identify the opportunity that attracts them and matches their skills. They create a solution to match the opportunity.
3. They acquire (or possess) the financial and physical resources necessary to launch the business by locating investors and partners.
4. They complete an arrangement or contract with their partners, with investors, and within the founder team to launch the business and share the ownership and wealth created.

critical for executing upon an idea [Baer, 2012], but also learns more about the opportunity, and what changes may be necessary to make it viable. In this way, entrepreneurship is akin to the scientific method, in that entrepreneurs seek to gather data in connection with hypotheses, and they refine their ideas based upon their findings [Sarasvathy and Venkataraman, 2011]. Put simply, as Y Combinator founder Paul Graham advises, there are three key things necessary to creating a successful startup: start with good people, make something that people actually want and are willing to pay for, and spend as little money as possible while you validate the market and your product acceptance by buyers [Graham, 2005].

If team members identify an opportunity that attracts them and matches their skills, they next obtain the resources necessary to implement their solution. Finally, they launch and grow an organization, which can grow to have a massive impact, like those enterprises listed in Table 1.1. The four steps to starting a business appear in Table 1.2. Most entrepreneurs repeat these steps multiple times as they work to validate an opportunity, making continual adjustments as they learn more.

Ultimately, entrepreneurship is centrally focused on the identification and exploitation of previously unexploited opportunities. Fortunately for the reader, successful entrepreneurs do not possess a rare entrepreneurial gene. Entrepreneurship is a systematic, organized, rigorous discipline that can be learned and mastered [Drucker, 2002]. This textbook will show you how to identify true business opportunities and how to start and grow a high-impact enterprise.

1.2 Economics and the Firm

All entrepreneurs are workers in the world of economics and business. **Economics** is the study of the production, distribution, and consumption of goods and services. Society, operating at its best, works through entrepreneurs to effectively manage its material, environmental, and human resources to achieve widespread prosperity. An abundance of material and social goods equitably distributed is the goal of most social systems. Entrepreneurs are the people who arrange novel organizations or solutions to social and economic problems. They are the people who make our economic system thrive [Baumol et al., 2007].

According to Global Entrepreneurship Monitor (GEM) researchers, the United States maintained about a 12 percent entrepreneurial activity rate between 1999 and 2011. Thus, one in ten U.S. adults was engaged in setting up or managing a new enterprise during that period [Phinisee et al., 2008].

These entrepreneurs have had a tremendous impact on U.S. economic growth. For example, venture capital funds, which invest in companies led by entrepreneurs, accounted for just two-tenths of one percent of U.S. Gross Domestic Product in 2012. VC-backed companies, however, accounted for 11 percent of private sector jobs and 21 percent of U.S. GDP [National Venture Capital Association, 2013]. Another 2010 study found that for all but seven years between 1977 and 2005, existing firms were net job destroyers, losing a combined average of 1 million jobs per year [Kauffman Foundation, 2010]. By contrast, new firms in their first year added a combined average of 3 million jobs. Venture-backed companies such as Amazon, Netflix, Apple, Google, Intuitive Surgical, and Salesforce have accounted for tremendous new employment over the past two decades.

An economic system is a system that produces and distributes goods and services. Given the limitations of nature and the unlimited desires of humans, economic systems are schemes for (1) administering scarcities and (2) improving the system to increase the abundance of goods and services. For a nation as a whole, its wealth is its food, housing, transportation, health care, and other goods and services. A nation is wealthier when it has more of these goods and services. Nations strive to secure more prosperity by organizing to achieve a more effective and efficient economic system. It is entrepreneurs who organize and initiate that change.

Almost all variation in living standards among countries is explained by **productivity,** which is the quantity of goods and services produced from the sum of all inputs, such as hours worked and fuels used. A model of the economy is shown in Figure 1.2. The inputs to the economy are natural capital, financial capital, and intellectual capital. The outputs are the desired benefits or outcomes and the undesired waste. An appropriate goal is to maximize the beneficial outputs and minimize the undesired waste [Dorf, 2001].

Natural capital refers to those features of nature, such as minerals, fuels, energy, biological yield, or pollution absorption capacity, that are directly or indirectly utilized or are potentially utilizable in human social and economic systems. Because of the nature of ecologies, natural capital may be subject to

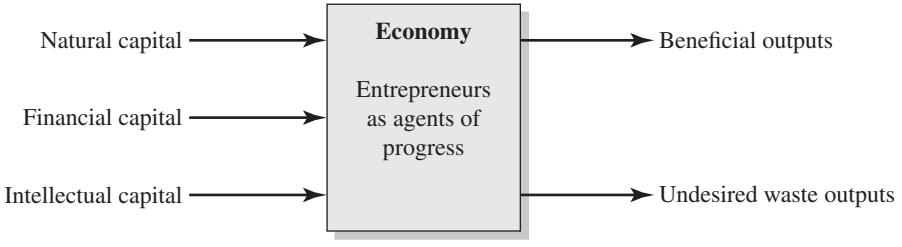

FIGURE 1.2 A model of the economy.

TABLE 1.3 Three elements of the intellectual capital (IC) of an organization.

Human capital (HC): The skills, capabilities, and knowledge of the firm's people
Organizational capital (OC): The patents, technologies, processes, databases, and networks
Social capital (SC): The quality of the relationships with customers, suppliers, and partners
$IC = HC + OC + SC$

irreversible change at certain thresholds of use or impact. For example, global climate change poses a serious threat to sources of natural capital.

Financial capital refers to financial assets, such as money, bonds, securities, and land, which allow entrepreneurs to purchase what they need to produce goods and services. The **intellectual capital** of an organization includes the talents, knowledge and creativity of its people, the efficacy of its management systems, and the effectiveness of its customer and supplier relations. The sources of intellectual capital are threefold: human capital, organizational capital, and social capital. **Human capital** (HC) is the combined knowledge, skill, and ability of the company's employees. **Organizational capital** (OC) is the hardware, software, databases, methods, patents, and management methods of the organization that support the human capital. **Social capital** (SC) is the quality of relationships with a firm's suppliers, allies, partners, and customers. These elements of intellectual capital appear in Table 1.3.

Intellectual capital can be thought of as the sum of the knowledge assets of an organization. This knowledge is embodied in the talent, know-how, and skills of the members of an organization. Thus, a firm needs to attract and retain the best people for its requirements in the same way that it seeks the best technologies or physical assets. Knowledge is one of the few assets that grows when shared. By organizing itself around its intellectual capital, a new firm can leverage its benefits through collaboration, development, and sharing.

The economy as portrayed in Figure 1.2 consists of the summation of all organizations, for-profit as well as nonprofit and governmental, that provide the beneficial outputs for society. These are the organizations that we study and will label as enterprises or firms*. Entrepreneurs constantly form new organizations or enterprises to meet social and economic needs.

The purpose of a firm is to establish an objective and mission and carry it out for the benefit of the customer. Thus, the purpose of Merck Corporation is to create pharmaceuticals that protect and enhance its customers' health. To carry out its purpose, each individual firm transforms inputs into desirable outputs that serve the needs of customers.

* Henceforth, we use firm to represent organizations, enterprises, and corporations.