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PART 1

Venture Opportunity, Concept, and Strategy

Entrepreneurs have important roles in creating new businesses that fuel progress in societies worldwide. The entrepreneur uses a combination of innovation and technology to foster new, effective means of activity in all facets of life. The capable entrepreneur learns to identify, select, describe, and communicate the essence of an opportunity that has attractive potential to become a successful venture. The entrepreneur is able to describe the valuable contributions of a venture and create the design of a business model that can be sustained by a competitive advantage. 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. Finally, the venture team builds an innovation strategy that fosters the sustainable advantage of the technology venture. ■

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CHAPTER 1

Capitalism and the Technology Entrepreneur

The empires of the future are the empires of the mind.
Winston Churchill

CHAPTER OUTLINE

1.1 The Entrepreneur and the Challenge
1.2 Entrepreneurial Activity Based on Innovation and Technology
1.3 Entrepreneurial Capital and the Value of a Venture
1.4 Building an Enterprise
1.5 Economics, the Entrepreneur, and Productivity
1.6 The Knowledge Economy
1.7 The Firm
1.8 Dynamic Capitalism and Creative Destruction
1.9 The Sequential Case: AgraQuest
1.10 Summary

What enables global capitalism?

Entrepreneurs provide the creative force capitalism needs to work. Entrepreneurs strive to make a difference in our world and contribute to its betterment. They are also motivated by achievement, independence, and the accumulation of wealth. In this chapter, we describe the characteristics of the people called entrepreneurs and the process they use to create new enterprises. We describe the four types of entrepreneurship used to respond to opportunity: incremental, innovative, imitative, and rent-seeking. Engineers and scientists often respond to the challenge to build important new enterprises by combining their knowledge of new technologies with sound business practices. The technology entrepreneur's role in the improvement of an economy and the role of knowledge in the creation and growth of new enterprises are described. Finally, the firm or organization as the key structure for a new enterprise and the system of innovation used by new ventures are depicted. ■

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1.1 The Entrepreneur and the Challenge

Wealth and social change are created by people who strike out on their own and are devoted to worthy tasks and enterprises that make a difference in the world. An **entrepreneur** is a person who undertakes the creation of an enterprise or business that has the chance of profit (or success). Entrepreneurs distinguish themselves through their ability to accumulate and manage knowledge, as well as their ability to mobilize resources to achieve a specified business or social goal [Kuemmerle, 2002a].

The entrepreneur is a bold, imaginative deviator from established business methods and practices who constantly seeks the opportunity to commercialize new products, technologies, processes, and arrangements (Baumol, 2002). Entrepreneurs are skilled in applied creativity, thrive in response to challenge, and look for unconventional solutions. They experience challenges, create visions for solutions, build stories that explain their visions, and then act to be part of the solution. They forge new paths and risk failure, but persistently seek success.

The Horatio Alger myth describes the rise of a young man from rags to riches through entrepreneurism. In this myth, the entrepreneurial hero personifies freedom and creativity. A century ago, this was a common possibility, although actually limited to a few success stories such as those of John D. Rockefeller and Andrew Carnegie. The key virtue was self-reliance and diligence. While this possibility remains for a few today, almost all entrepreneurs are educated, experienced, and skilled. Furthermore, entrepreneurship is an attitude and capability that diffuses beyond the founding team to all members of its organization. For most, collective entrepreneurship represents the path toward a promising economic future. Most growing firms strive to infuse the culture of the entire company with the entrepreneurial spirit. Thomas Edison created an enterprise that became General Electric. Steve Jobs and Steve Wozniak founded Apple Computer, one of the first personal computer companies. These entrepreneurs combined their knowledge of valuable new technologies with sound business practices to build important new enterprises that continued to maintain their entrepreneurial spirit for years after founding.

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 firms that exhibit performance, leadership, reputation, and longevity. Examples of new enterprises that have made a significant contribution to life in our day are provided in Table 1.1. What organization would you add to the list?

Entrepreneurs seek to achieve a certain goal by starting an organization that will address the needs of society and the marketplace. Entrepreneurs are prepared to respond to a challenge to overcome obstacles and build a business. When faced with difficult situations, they are prepared to make the extra effort to overcome these obstacles and succeed. 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."

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TABLE 1.1 Important new enterprises that started or emerged from 1973 to 2005.

- Amazon.com
- Amgen
- Apple Computer
- Cisco
- Conservation International
- Dell Computer
- Doctors Without Borders / Medecins Sans Frontières
- eBay
- Federal Express (FedEx)
- Genentech
- Google
- Intel
- Microsoft
- Nature Conservancy
- Nokia Corporation
- Qualcomm
- Southwest Airlines
- Starbucks
- Virgin Group
- Wal-Mart

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."

Entrepreneurs are resilient people who pounce on problems, determined to find a solution. The elements of the ability to overcome a challenge are summarized in Table 1.2. Most entrepreneurs create a compelling story that brings in more partners on a journey into unmapped challenges. They concentrate on husbanding resources, open-mindedness about the future, and learning as they go in order to create something of value [Sarasvathy, 2004].

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 onto their destinations overnight. He turned in his paper describing this plan to his Yale University professor,

TABLE 1.2 Elements of the ability to overcome a challenge.

- Able to deal with a series of tough issues
- Able to create solutions and work to perfect them
- Able to handle many tasks simultaneously
- Resilient in the face of setbacks
- Willing to work hard and not expect easy solutions
- Well-developed problem-solving skills
- Able to learn and acquire the skills needed for the tasks at hand

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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, entrepreneurs create a novel response to an opportunity 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.

When does a person know that he or she is ready to assume the mantle of entrepreneur? When people are ready to assume the risk and effort and are truly motivated to organize an enterprise to meet the entrepreneurial challenge, they will most likely know it since they will be unable to think of anything but the challenge. A straightforward test of a potential entrepreneur is provided in Table 1.3. Take the test and see if you are ready. Perhaps the right opportunity has not yet emerged, but when it does, you can prepare now to seize it.

An **opportunity** is a favorable juncture of circumstances with a good chance for success or progress. It is the job of the entrepreneur to locate new ideas and put them into action. Entrepreneurs respond to opportunities by exploiting changes, needs, or new skills or knowledge within the context of their industry. Thus, **entrepreneurship** may be described as the identification and exploitation of previously unexploited opportunities [Hitt, 2001]. Fortunately for the reader, it is a systematic, repeatable discipline that can be learned.

Entrepreneurship can consist of innovation or the introduction of creative change. Change is generally considered as part of the entrepreneurial expectation. In that sense, the entrepreneur is a change agent. Change agents thrive in a land of opportunity in which people can rise from nothing to greatness, depending on their talents and their hard work. Entrepreneurs act as change agents for progress when, as Abraham Lincoln said in 1864, they are offered "an open field and a fair chance for industry, enterprise and intelligence."

Since only about one-third or fewer new ventures survive their first three years, entrepreneurial ventures can be viewed as experiments or probes into a market. This approach is consistent with the goals of change agents who are willing to accept failure as a potential outcome of their venture.

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. The would-be entrepreneur should, if possible, engage in this sequence: do it, then

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TABLE 1.3 Entrepreneur test.

Are you an entrepreneur? Answer each question by checking yes or no.

	Yes	No
1. When I am faced with a challenge, I am confident that I can work through it.	___	___
2. I want to be financially independent and be rewarded for my accomplishments.	___	___
3. Trying something new is attractive, even if I know the risk of failure is significant.	___	___
4. I would prefer to gain independence and control my destiny.	___	___
5. Building a new enterprise is important to me.	___	___
6. My experiences during my youth and early career have shown me the benefits of starting a new enterprise.	___	___
7. Starting a new business some day soon is always in my thoughts.	___	___
8. I like working with others and can provide leadership when called upon.	___	___
9. Our society and my family provide a strong, supportive base for my initiatives.	___	___
10. I possess strong technical and relationship skills in the industry I wish to enter.	___	___
Add your total score for yes and no:	___	___

Seven or more yes answers mean that you may be ready to act as an entrepreneur in the near future.

reflect on it. 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 first step is to craft small experiments in new activities with entrepreneurial teams or small ventures. Through these small experiments, the entrepreneur develops new contacts and mentors. He or she may also find a challenge that serves as a catalyst for a new venture.

1.2 Entrepreneurial Activity Based on Innovation and Technology

Capitalism and enterprise are about having a dynamic economy and innovation, but ultimately, they rest on the actions of businesspeople who assume and accept the benefits and risks of an initiative. It is people acting as leaders, organizers, and motivators who are the central figures of modern economic activity. Most entrepreneurs strive to make a productive, useful contribution to their society while creating wealth for shareholders and themselves. Profit maximization, however, is not the only goal of these creative businesspeople, who also value independence and leadership challenges.

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TABLE 1.4 Four types of entrepreneurship.

1.	**Incremental venture:** The founding and management of a routine business exhibiting modest novelty
2.	**Innovative venture:** The initiation and operation of a business based on an innovation
3.	**Imitative venture:** The identification and imitation of a novel business or venture
4.	**Rent-seeking venture:** The founding of a business that utilizes standards, regulations, and laws to share in some of the value of an existing enterprise

Three factors make up entrepreneurial action: (1) a person or group who is responsible for the enterprise, (2) the purposeful enterprise, and (3) initiation and growth of the enterprise. The individuals responsible for the organization were described in section 1.1. The purposeful enterprise may be a new firm organized for a suitable and attractive purpose or a new unit within or separated from an existing business corporation. Furthermore, the organization may be based on incremental changes, innovation, imitation, or rent-seeking behavior.

The first type of enterprise emphasizes the founding and management of a business that entails moderate novelty, such as a new restaurant in town. The founder may still be thought of as an entrepreneur. In the second form, the entrepreneur engages in an innovative activity that results in novel methods, processes, and products. The third, imitative venture, is founded by an entrepreneur who is involved in the rapid dissemination of an innovative idea or process. This person or group finds a novel innovation and transfers it to another region or country. The final means of entrepreneurship is called rent-seeking or profit-seeking and focuses on the use of regulation, standards, or laws to appropriate some of the value of a monopoly that is generated somewhere in the economy. These four types of entrepreneurship are summarized in Table 1.4.

In this book, we emphasize the creation of the innovative venture that will have a significant impact on a region, a nation, or the world. A minor or significant incremental innovation may afford the entrepreneur a new opportunity. Alternatively, a radical or transforming innovation may provide an entrepreneur an important and very significant opportunity to make a productive contribution.

The third factor of entrepreneurial action is the initiation and growth of the enterprise. To start an innovative venture, the entrepreneurial team identifies an attractive opportunity that also matches the team's skills. The opportunity offers the entrepreneurial team a favorable chance to solve a problem or meet a need by creating or applying a technology.

Technology includes devices, artifacts, processes, tools, methods, and materials that can be applied to industrial and commercial purposes. Intel was formed to apply semiconductor technology to the design and manufacture of semiconductor circuits. Microsoft was formed to create and distribute computer software products for applications in industry and the home. The four steps that an entrepreneur typically follows to start a business appear in Table 1.5.

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TABLE 1.5 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.

Perhaps the most critical aspect of enterprise formation is narrowing in on the best opportunity. Most people see many opportunities but find it difficult to know when to select a specific one and act on it. One useful method of selecting an opportunity is to look for the sweet spot that matches opportunity with interests and capabilities, as shown in Figure 1.1. Most entrepreneurs-to-be will experience a set of good opportunities that flow by over time. They

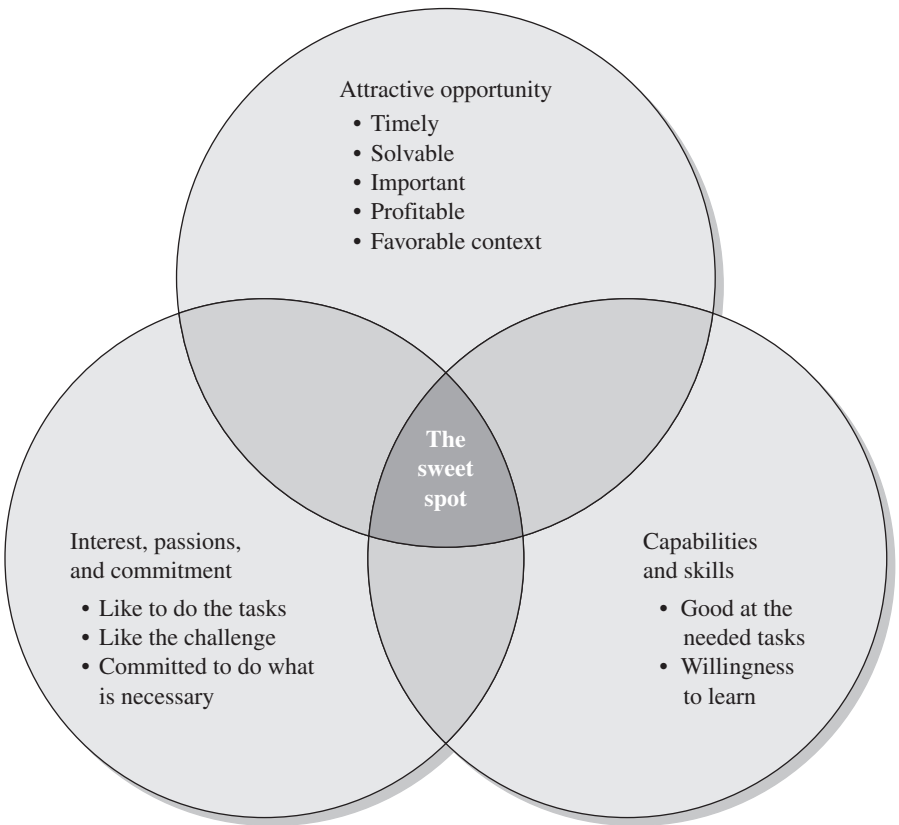

FIGURE 1.1 Selecting the right opportunity by finding the sweet spot.

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TABLE 1.6 Five characteristics of an attractive opportunity.

- Timely—a current need or problem
- Solvable—a problem that can be solved in the near future with accessible resources
- Important—the customer deems the problem or need important.
- Profitable—the customer will pay for the solution and allow the enterprise to profit.
- Context—a favorable regulatory and industry situation

also will have interests, activities, and tasks they like to do. Furthermore, they have capabilities or skills and knowledge that qualify them for certain tasks.

Good opportunities display the characteristics of a potential to solve important problems within economic constraints. Usually, they will look attractive because they can be profitable to the new venture as well as valuable to the customers. An attractive opportunity displays the five characteristics listed in Table 1.6. The entrepreneur seeks a timely, solvable, important problem with a favorable context that can lead to profitability.

It is the entrepreneur who adds value to the opportunity by creating a response to a good opportunity. The opportunity, and a general response to it, is not unique—many recognize but few possess the relevant passion to solve the problem as well as the capability to do so. It is really the passion and capabilities that distinguish the entrepreneurial team. The selection process consists of looking for the best match of opportunity, capabilities, and interest (passion).

Jeremy Jaech attended the University of Washington, receiving a BA in mathematics in 1977. He joined the computer science graduate program after graduation, completing his master's degree in 1980, while working at Boeing on computer graphics. In 1983, he joined Atex, a maker of computer systems for newspapers. After nine months, Atex closed the facility where he worked, and Jaech needed to find an opportunity for himself. His capabilities were computer programming for graphics, and his interest was to achieve independence and success. His passion was for developing software for desktop computer graphics. His former boss at Atex suggested they form their own company that would create software for desktop computer graphics. Jaech was a good technical leader, and his boss was a good manager; together, they made a solid team. In 1984, the two men founded Seattle-based Aldus Corporation, which created the software called PageMaker that launched desktop publishing on personal computers.

By 1989, although Aldus had grown, Jaech was faced with a new challenge. He wanted to broaden the product line, but his partner/CEO wanted to remain focused on desktop publishing. Jaech saw an opportunity to create a Windows-based software product for general-purpose drawing. He matched his capabilities with his interests and in 1990 started a new firm that was later called Visio Corporation. When the company's first product was shipped in 1992, it had 14 employees. It went public as a 200-person

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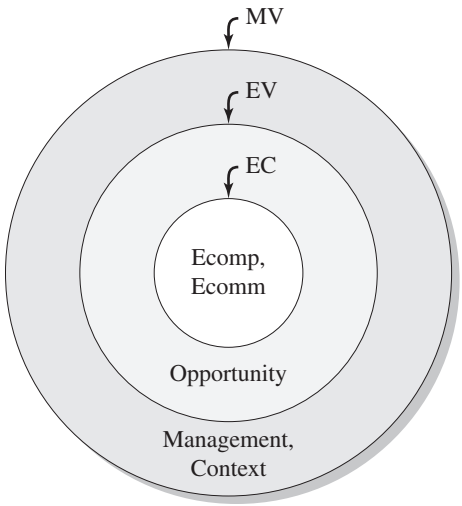

FIGURE 1.2 Expected market value.

activities can be summarized as a result of effective and efficient management, (M). In addition, we will represent changes in the contextual situation, such as a recession or new government regulations, by context (C). Then, an approximate qualitative model for market value is

$$MV = M \times C \times EV$$

Substituting EV from equation (1.2), we have

$$MV = M \times C \times Opp \times Ecomp \times Ecomm \tag{1.3}$$

As depicted in equation (1.3) and Figure 1.2, the expected market value of an enterprise after a period of time will be the result of the cumulative value of management, context, opportunity, competence, and commitment. All of these factors must be strongly present to achieve success. The enterprises that promise the greatest returns lead to entrepreneurs being attracted to opportunities that seem to be brighter. They evaluate their management skills, the context, the opportunity, their team competencies, and their commitment leading to a choice of a new venture.

The firm Google was founded in 1999 by two 26-year-olds who developed a search engine. As a search gateway to the Internet and over 8 billion Web pages, Google is an attractive and useful website. A daily tool for millions of users, it can be queried in 105 languages. It is an excellent example of a powerful combination of entrepreneurial capital, competence, and commitment. The management and leadership of Google are excellent and continue to grow Google's business and value [Hardy, 2003]. As a result, the market value of Google is significant.

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1.4 Building an Enterprise

"The Genesis of Palm Computing" —Jeff Hawkins (Palm)

Sun Microsystems was founded in 1982 by a team of four young men. The concept of a workstation—a high-performance desktop computer—linked to a network was developed at Xerox Palo Alto Research Center (PARC) in 1980. By 1982, Xerox PARC had a network of workstations running sophisticated applications. Workstations were leading-edge devices for computer-aided design.

From the age of 15, Vinod Khosla had wanted to start a company. After receiving his bachelor's degree in electrical engineering at the Indian Institute of Technology, he went to Carnegie-Mellon University to study for his master's in biomedical engineering. Khosla then entered the Stanford University MBA program. At graduation, he joined a small start-up called Daisy Systems, a firm in the computer-aided engineering (CAE) industry.

At Daisy, he saw the need for a workstation to support CAE software. After a year at Daisy, Khosla decided to start his own firm to build workstations. Khosla's skills were in the design of computers and knowledge of the CAE industry. In 1981, he drew up a specification for a workstation that was influenced by Xerox PARC knowledge. At that point, Khosla looked for a partner. There was a project at Stanford called the Stanford University Network (SUN), and there he found a talented graduate student, Andy Bechtolsheim, who agreed to join Khosla in January 1982 to form a company. They wrote a business plan and within a month attracted several million dollars of venture capital. With the funds in hand, they got Scott McNealy, an MBA classmate, to join the team. By May 1982, they had a prototype computer and had made their first sale.

To create the software for their computer, they recruited Bill Joy in June 1982 from the University of California, Berkeley. Joy had led the project to create Berkeley UNIX. By June 1982, the company was led by four engineers and MBAs in their twenties who then built it into the world-renowned Sun Microsystems. Khosla had marketing, design, and leadership skills; Joy was a leading software designer of UNIX; McNealy possessed manufacturing and management skills; and Bechtolsheim had strong skills for designing the hardware workstation. This powerful team created a company that revolutionized the computer industry.

Khosla and his team possessed a great measure of commitment and competency. The opportunity was very attractive, and the industrial context of the new firm was very supportive of their venture. The team's management skills were good given their few years of experience. When Khosla and his team examined the opportunity and their new venture, they saw that the potential market value of their enterprise could be very significant, if they executed their plan effectively. Equation 1.3 expresses the potential market value as

$$MV = M \times C \times Opp \times Ecomp \times Ecomm$$

Any entrepreneurial team can estimate the qualitative market value of its enterprise by reviewing five factors of the qualitative equation: management, context, opportunity, competences, and commitment.

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1.5 Economics, the Entrepreneur, and Productivity

All entrepreneurs are workers in the world of economics and business. **Economics** is the study of humans in the ordinary business of life [Mankiw, 2000]. Economics can also be defined as the study of how society manages its scarce resources. 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.

Entrepreneurs flourish in nations that provide legal and social incentives for their activities. A business environment with sound infrastructive and legal protections will encourage entrepreneurs. A culture that supports and protects intellectual capital such as patents will provide the necessary context for risk-taking ventures. The ranking of 10 selected nations by measures of economic activity is provided in Table 1.8. Nations large and small can provide the context for entrepreneurial activity. In the United States, 10.5 percent of the working population was engaged in entrepreneurial activity in 2003. The figure for 2000 was 16.6 percent [Breeden, 2002]. New ventures and start-ups have been the source of an estimated one-half to two-thirds of the new jobs created in the United States over the past decade. The entrepreneur turns a social problem into an opportunity, a productive organization, and new, well-paid jobs.

TABLE 1.8 Ranking of 10 selected nations by measures of economic activity.

Country	Business environment[1]	Start-up index[2]	Patents[3]	Nobel Prize winners[4]
United States	1	1	2	1
United Kingdom	3	3	5	2
Netherlands	2	4	6	7
Germany	8	8	3	3
Switzerland	4	7	8	5
Finland	5	2	9	9
Sweden	7	5	7	6
France	9	9	4	4
Japan	10	10	1	8
Ireland	6	6	10	10

[1]Ease of doing business, infrastructure, and policies.
[2]Ease of starting new enterprises.
[3]Number of patents granted to residents, 1998.
[4]Nobel Prize winners in physics and chemistry, 1901–2000.

Source: Pocket World in Figures, The Economist Books, London, 2002.

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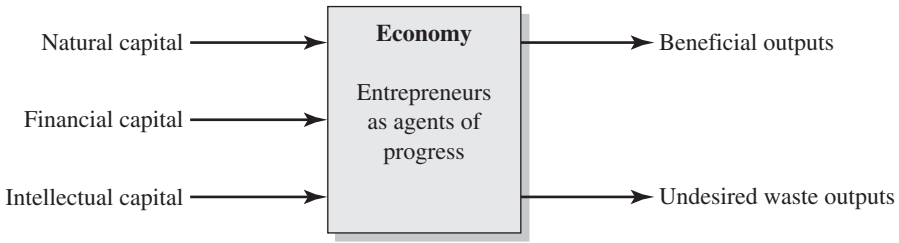

FIGURE 1.3 A model of the economy.

An economic system is a system for the production and distribution of 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 1.3. The inputs to the economy are the natural capital, intellectual capital, and financial 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 irreversible change at certain thresholds of use or impact.

Financial capital refers to financial assets, such as money, bonds, securities, land, patents, and trademarks. The **intellectual capital** of an organization is the talents of its people, the efficacy of its management systems, the effectiveness of its customer and supplier relations, and the technological knowledge employed and shared among its people and processes. Intellectual capital is knowledge that has been formalized, captured, and used to produce a process that provides a significant value-added product or service. Intellectual capital is useful knowledge that has been recorded, explained, and disseminated, and is accessible within the firm [T. Sewart, 2001]. The sources of intellectual capital are threefold: human capital, organizational capital, and relationship 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

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support the human capital. Relationship capital (RC) is the quality of relationships with a firm's suppliers, allies, partners, and customers. Relationship capital is often called social capital.

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.

Productivity growth is important since it provides all the increases in people's standard of living. Over the past half-century, the U.S. workforce (including immigration) has grown at about 1.7 percent annually, and productivity per worker has risen at 2.2 percent, generating real economic growth (excluding inflation) averaging 3.9 percent. This is an excellent record, due in great part to the impact of technology entrepreneurship.

Rising output per worker comes from two sources: (1) new technology and (2) smarter ways of doing work. Both paths have been followed throughout human history, and they became faster tracks with the coming of the Industrial Revolution. The twentieth century started with new techniques of management and many new inventions. The century ended with smarter management techniques and dramatic advances in electronic technology, which helped revive productivity growth after limited gains through much of the 1970s and 1980s.

The business system works to drive out inefficiency and forces business process renewal. During the past 25 years, the forces of entrepreneurship, competition, and deregulation have encouraged new technologies and business methods that raise efficiency and efficacy. In recent years, due to competition, much of the benefits of strong productivity has flowed to consumers in the form of lower prices. Innovation, entrepreneurship, and competition are important sources of productivity growth.

1.6 The Knowledge Economy

Ideas are many, but knowledge is rare. Ideas are filtered and transformed into knowledge, which can be used to guide the actions of entrepreneurs. Ideas are the raw material from which knowledge is produced. We start with an idea and pass it through an authentication process in which it may be verified, refuted, or transformed using additional information. Business ideas are filtered through an authentication process, and if commercialized, they will be validated or invalidated by the market.

The flow of knowledge from science and technology leads to the application of this knowledge in products, processes, and services—the essence of business. The complexity of science and technology, appropriately applied, can lead to simple and easily understood products. In many ways, we may think of products as embedded knowledge. Knowledge involves transformed expertise and information. **Knowledge** can be defined as the awareness and possession

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TABLE 1.9 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

of information, facts, ideas, truths, and principles in an area of expertise. Thus, a person may be said to be knowledgeable of finance but less knowledgeable of product design or manufacturing methods.

Knowledge can be used for wise actions by entrepreneurs. Intellectual capital is the sum of knowledge assets of an organization. This knowledge is embodied in the talent, know-how, and skills of the members of an organization. The intellectual capital of a firm is used to transform raw material into something more valuable. Mondavi Winery succeeds because of the human capital of its grape growers and wine makers. McDonald's relies on the organizational capital of its recipes and processes. A local coffee shop where the waiter recognizes you and knows your favorite latté relies on its social capital. Social capital is based on strong, positive relationships. The elements of intellectual capital are summarized in Table 1.9. We state that intellectual capital (IC) is a summation:

$$IC = HC + OC + SC \tag{1.4}$$

where OC = organizational capital, HC = human capital, and SC = social capital.

For many, if not most, firms, intellectual capital is the organization's most important asset. It is more valuable than its other physical and financial assets. Many firms depend on their patents, copyrights, software, and the capabilities and relationships of their people. This intellectual capital, appropriately applied, will determine success or failure. Knowledge has become the most important factor of production.

The role of a firm* is to transform inputs into desirable outputs that serve the needs of customers. A firm exists as a group of people because it can operate more effectively and efficiently than a set of individuals acting separately. Furthermore, a firm creates conditions under which people can work more effectively than they could on their own. Thus, firms exist to coordinate and motivate people's economic activity [Roberts, 2004]. A firm is more effective because (1) it has lower transaction costs and (2) the necessary skills and talent are gathered together in effective, collaborative work. A model of the firm

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

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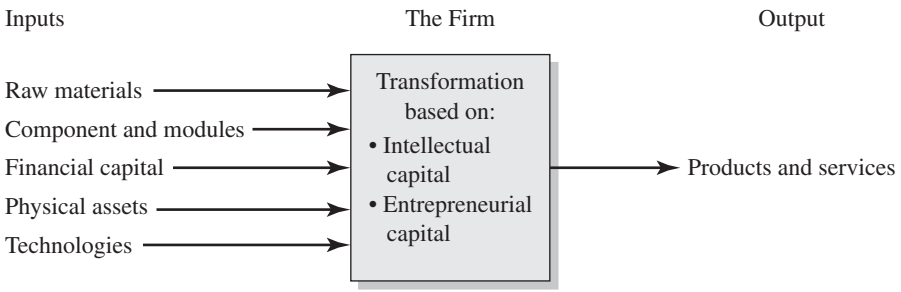

FIGURE 1.4 The firm as transforming available inputs into desired outputs.

as a transformation entity is shown in Figure 1.4. The transformation of inputs into desired outputs is based on the intellectual capital and the entrepreneurial capital of the firm. As an example, consider Microsoft, a powerful software firm. It creates and purchases technologies, develops new software, and builds a client base. The transformation of its inputs into outputs is based on its formidable stock of intellectual capital and entrepreneurial capital.

One hundred years ago, successful companies such as U.S. Steel were primarily managing physical assets. Today's successful firms such as Microsoft manage knowledge and intellectual capital. Intellectual capital, along with physical assets, transforms raw material to valuable products. The growth of knowledge-based innovation enables economic progress to continue to spur social progress. Acting through an organization, the entrepreneur works for new ideas and change in the face of go-slow opponents [Mokyr, 2003].

Human capital, embodied in people, has mobility—it goes where it is well treated. 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. Many talented people leave their jobs to join start-up firms because they seek achievement, independence, and opportunity.

Two characteristics of intellectual capital give it power to add value [T. Stewart, 2001]. Firms can use intellectual capital to reduce the expense of physical assets or maximize the return on those assets. Financial companies, for example, can expand their reach to more customers using software and websites to enable online banking as an alternative to building more branches. Another way to expand their reach efficiently through organizational capital is to establish mini-branches in grocery stores. No longer do a firm's physical assets limit its reach.

Modern entrepreneurial firms breed a constant flow of high-impact products that create value and stimulate economic growth by bringing new methods, technologies, and ideas to the global marketplace [Schramm, 2004]. Often they work in partnership with mature firms, government, and universities.

The intellectual capital of a new firm encompasses its people's cognitive knowledge, skills, system understanding, creativity, synthesis, and trained intuition [Quinn, 1997]. Fortunately, knowledge is one of the few assets that

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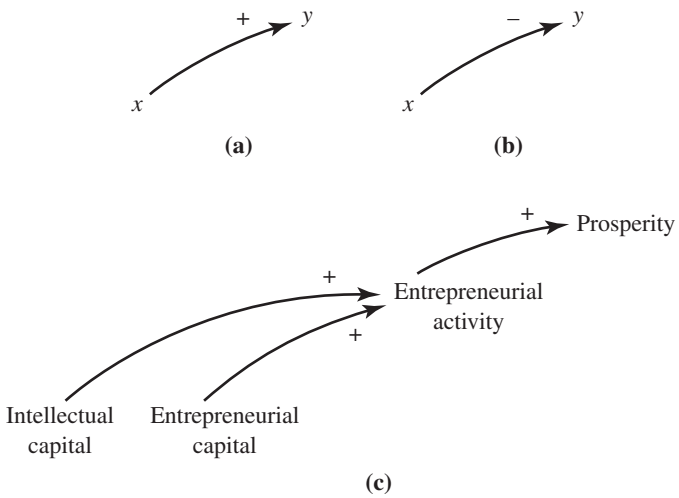

FIGURE 1.5 Causal diagram: **(a)** ***y*** increases as ***x*** increases, **(b)** ***y*** decreases as ***x*** increases, **(c)** entrepreneurial activity leads to increasing prosperity.

grows when shared. By organizing around intellectual capital, a new firm strives to leverage it, usually through collaboration, development, and sharing.

A causal diagram can help to portray causal links in a system. Variables are related by causal links, shown by arrows. The link of Figure 1.5a implies that if x increases, then y increases. The link shown in Figure 1.5b implies that if x increases, then y decreases. For example, Figure 1.5c implies that as a firm's intellectual capital and its entrepreneurial capital increase, it will increase its entrepreneurial activity and prosperity [Sterman, 2000].

1.7 The Firm

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 do so, a firm acts to develop, attract, and retain intellectual capital. The firm develops and uses intellectual capital to build the strengths of the firm and to provide the desired products.* The firm provides a place where people can collaborate, learn, and grow.

The firm's actions are based on its knowledge of its customer, its product, and its markets. The firm must identify and understand its customers, its competitors, and their values and behavior. Knowledge of organizations, design,

* Henceforth, we use *products* to refer to products and services.

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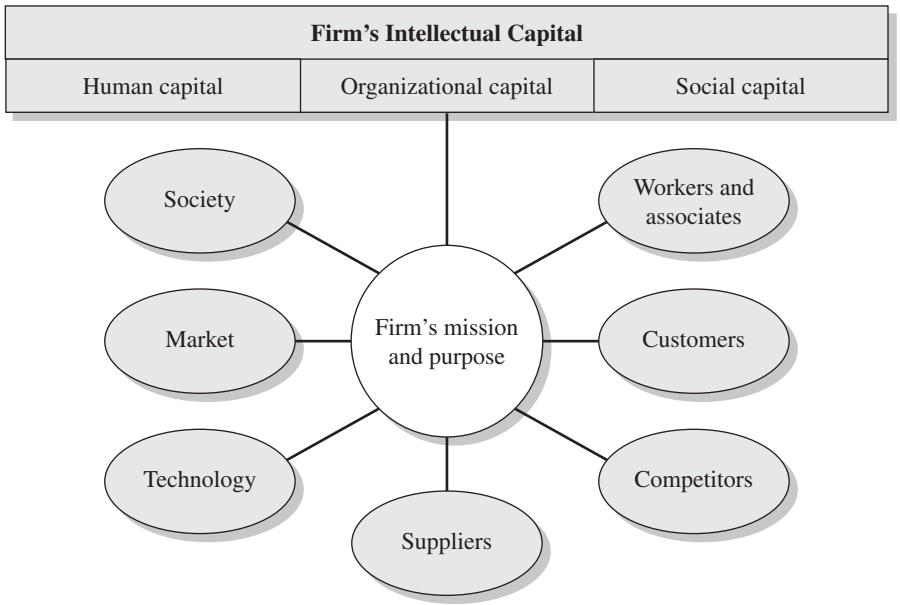

FIGURE 1.6 A firm's theory of business depicts how it understands its total resources, activities, and relationships.

and technologies is filtered through a firm's strengths and weaknesses. The firm acts on all this knowledge.

First, a firm is clear about its mission and purpose. Second, the firm must know and understand its customers, suppliers, and competitors. Third, a firm's intellectual capital is understood, renewed, and enhanced as feasible. Finally, the firm must understand its environment or context, which is set by society, the market, and the technology available to it. We can call this the **theory of a firm's business,** or how it understands its total activities, resources, and relationships. Figure 1.6 depicts the business theory of a firm. One hundred years ago, firms were hierarchical and bureaucratic with a theory of business that emphasized making long runs of standardized products. They regularly introduced "new and improved" varieties and provided lifetime employment. Today, firms compete globally with high-value, customized products. They use flattened organizations and base their future on intellectual capital. Firms look to brands and images to cut through the clutter of messages. In the future, a firm's human capital—talent—will become more important.

One way to look at the future of a firm is as a competition among its stakeholders. Flexibility and leanness mostly benefit the firm's shareowners. Placing a high valuation on talent gives more power to the workers. A good reputation means the firm needs to look after its community and society. Customers stand to gain power as competitors vie for their attention. The

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entrepreneur in the new firm strives to build a firm that serves all its stakeholders well.

1.8 Dynamic Capitalism and Creative Destruction

One view of economic activity describes a world of routine in which little changes. In this static model, all decisions have been made, and all alternatives are known and explored. Clearly, no economy is static, and change appears to be certain. In a world of change, entrepreneurs seek to embrace it. Entrepreneurs match ideas for change with opportunity. These changes include the adoption of new and better (or cheaper) sources of input supplies, the opening of new markets, and the introduction of more profitable forms of business organization.

Economic progress can be described as the generation of new types of goods and services that can be produced efficiently. Progress occurs because individuals engage in creating insights that change the nature of both economic inputs and outputs. Entrepreneurial insight is the recognition of a profit opportunity that was previously unnoticed [Holcombe, 2001].

The profit of the new firm is the key to economic growth and progress. By introducing a new and valuable product, the innovator obtains temporary monopoly power. Lower costs may give the innovative firm profits higher than those of its rivals, which must continue to sell at higher prices to cover their higher expenses. Alternatively, a superior product may permit a price above that charged by other firms. The same concept clearly fits all forms of successful change. The free spirit of entrepreneurs provides the vital energy that propels the capitalist system.

Dynamic capitalism is the process of wealth creation characterized by the dynamics of new, creative firms forming and growing and old, large firms declining and failing. In this model, it is disequilibrium—the disruption of existing markets by new entries—that makes capitalism lead to wealth creation [Kirchhoff, 1994]. New firms are formed by entrepreneurs to exploit and commercialize new products or services, thus creating new demand and wealth. This renewal and revitalization of industry leads to a life cycle of formation, growth, and decline of firms.

Joseph Schumpeter (1883–1950) described this process of new entrepreneurial firms and waves of change as **creative destruction.** Born and educated in Austria, Schumpeter taught at Harvard University from 1932 until his death in 1950. His most famous book, *Capitalism, Socialism and Democracy,* which appeared in 1942 [Schumpeter, 1984], argued that the economy is in a perpetual state of **dynamic disequilibrium.** Entrepreneurs upend the established order, unleashing a gale of creative destruction that forces incumbents to adapt or die. Schumpeter argued that the concept of perfect competition is irrelevant because it focused entirely on market (price) competition, when the focus should be on technological competition. Creative destruction incessantly revolutionizes the economic structure from within, destroying the

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old structure and creating a new one. The average life span of a company in the Standard and Poors 500 declined from 35 years in 1975 to less than 20 years today. Less than four of the top 25 technology companies 30 years ago are leaders today—perhaps only IBM and Hewlett-Packard. Companies are collections of assets and expertise in the short term and pure opportunity in the long term.

Schumpeter's theory was based on disruptive (radical) innovations. He depicted the innovator as creative and nonhedonistic with a goal of major change and improvement. He described firms that faced uncertainty, change, and competition and were unable to rationally develop profit-maximizing strategies. Little doubt now exists that the economy is driven by firms that capitalize on change, technology, and challenge. This book is focused on helping the reader to purposefully become an agent for creative destruction by creating his or her own firm. An example of an agent for creative disruption is Bill Gates, who established Microsoft and introduced DOS, Windows, and Office. Gates saw a discontinuity from mainframe computers to personal computers. The digital video disk (DVD) created a new wave of creative destruction in the movie rental business as DVDs replaced videotapes in the 1990s.

With his partners, Jeremy Jaech (see Section 1.2) founded Aldus Corporation when he saw a disequilibrium or **discontinuity** in the newspaper graphics industry. The old system was based on larger workstation computers, and he saw a transition to desktop personal computers using Microsoft Windows. Jaech saw the opportunity and matched it with his interests and capabilities in a new firm.

Most entrepreneurs should look for opportunities based on discontinuities since they can lead to important results, creative destruction, and significant wealth creation. Discontinuities can occur through a new technology, a big cultural change, or a new threat to society such as pandemic disease, global warming, and terrorism.

A recent large discontinuity in the modern global world is mobile communication and recreational activities. Many people want access to information, music, videos, and other media while away from home or the office. This has led to cell phones and new handheld devices such as the Apple iPod that can receive video and audio files.

The entrepreneur of the creative destruction receives a temporary monopoly until rivals figure out how to mimic the innovation. The high profits of the original new product will attract imitators quickly. They imitate the original monopoly and help to disseminate the new product or service.

1.9 The Sequential Case: AgraQuest

The AgraQuest case illustrates and illuminates the issues raised in each chapter. It focuses on a real-life emerging firm in the life science industry that illustrates each factor described in a chapter. AgraQuest

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(www.agraquest.com) is an entrepreneurial firm that may significantly contribute to improved environmental and social conditions and agricultural industries around the world. Read the segment on the case at the end of each chapter and learn of a real-life effort that could make a big difference to the world.

Every seven years in the woodsy town of Killingworth, Connecticut, where she grew up, Pamela Marrone would feel the droppings of gypsy moth caterpillars raining down on her head as the cyclical pests gorged on maples and oaks. Desperate to save a heavily infested dogwood, her father once ignored his own organic gardening tenets and blasted the tree with a chemical called a carbamate.

By the next morning, every bee, every ladybird beetle, every lacewing—all the "good" bugs that fed on plant pests—lay dead on the ground. In her youth, Marrone knew that she wanted to keep the good bugs while deterring bad pests. She recognized a great opportunity that, if solved, could help farmers prosper while using natural pest control agents (not chemicals). Furthermore, as a youth, Marrone had tried, with her parents' encouragement, several modest entrepreneurial ventures at craft fairs and state fairs.

Marrone studied entomology (the study of the forms and behavior of insects) at Cornell University, going on to North Carolina State University, from which she received her doctorate in 1983. She then spent seven years as the leader of the new pest control unit at Monsanto in St. Louis, where she acted on her dedication to the natural control of pests. At Monsanto, Marrone built her technical and entrepreneurial skills. As a result, in 1990 she was recruited by Novo Nordisk, a Danish company, to create a biopesticide subsidiary called Entotech Inc. in Davis, California.

Entotech's goal was to hunt for natural products that can defeat plant scourges without wreaking havoc on human beings, animals, helpful insects, or soil. But in 1995, Entotech was sold to Abbott Laboratories, prompting Marrone to start her own firm to meet the challenge of building a successful company that would use a new search process for identifying natural products for pest control. Thus was born AgraQuest. Marrone possessed the interest and passion, the capabilities and skills, and saw an attractive opportunity in the sweet spot of Figure 1.1.

1.10 Summary

The entrepreneur is the creative force that allows free enterprise to flourish. Entrepreneurship is the process through which individuals and teams bring together the necessary resources to exploit opportunities and in doing so create wealth, social benefits, and prosperity.

The critical ideas of this chapter are:

- The entrepreneur as creator of a great enterprise.
- The entrepreneur responds to an attractive opportunity.