**CHAPTER 13 Innovation, Intrapreneurship, and Creativity**

**Learning Objectives**

As [**Chapter 10**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch10) noted, innovation is one of the most important types of organizational change because it results in a continuing stream of new and improved goods and services that create value for customers and profit for a company. Indeed, one important way of assessing organizational effectiveness is the rate or speed at which a company can bring new products to market; a second is the ability to create novel products that become an instant success such as Nintendo’s Wii. Both these types of innovation ensure high performance, but they depend on the level of intrapreneurship and creativity inside an organization.

After studying this chapter you should be able to:

* 1. Describe how innovation and technological change affect each other.
* 2. Discuss the relationship among innovation, intrapreneurship, and creativity.
* 3. Understand the many steps involved in creating an organizational setting that fosters innovation and creativity.
* 4. Identify the ways in which information technology can be used to foster creativity and to speed innovation and new product development.

**Innovation and Technological Change**

[**Innovation**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx2) is the process by which organizations use their resources and competences to develop new and improved products or to find better ways to make these new products and thus increase their effectiveness.[**1**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib1) Innovation can result in spectacular success for an organization. Apple changed the computing industry when it introduced the first PC, Honda transformed the motorcycle market when it introduced its new small 50cc models, Mary Kay changed the way cosmetics are sold when she introduced at-home cosmetics parties and a personalized style of selling, and when Toyota developed lean manufacturing it revolutionized carmaking.

**Innovation**

The process by which organizations use their skills and resources to develop new goods and services or to develop new production and operating systems so that they can better respond to the needs of their customers.

Although innovation brings about change, it is also associated with a high level of risk because the outcome of research and development (R&D) is often uncertain.[**2**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib2) It has been estimated that only 12% to 20% of R&D projects result in products that get to market; the rest are failures.[**3**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib3) Thus although innovation can lead to change of the sort that organizations want—the introduction of profitable new technologies and products—it can also lead to the kind of change they want to avoid: technologies that are inefficient and products that customers don’t want. (The way in which organizations can manage the innovation process to increase the chance of successful learning taking place is discussed in detail later in the chapter.)

**Two Types of Innovation**

In [**Chapter 9**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch09), *technology* is defined as the skills, knowledge, experience, tools, machines, and computers used in the design, production, and distribution of goods and services. Advances in technology are at the heart of the innovation process and today the world is experiencing an unprecedented level of technological change.[**4**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib4) In general, the two principal types of technological change are quantum change and incremental change.

[**Quantum technological change**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx3) refers to a fundamental shift in technology that revolutionizes products or the way in which they are produced. Examples of quantum changes in technology include the development of the first PCs, which revolutionized the computer industry; the development of biotechnology that has revolutionized the treatment of illness by replacing conventional pharmaceutical compounds with genetically engineered medicines; and the emergence of advanced computer software that permits social networking, payments through smartphone, and mobile game playing. New products or operating systems that incorporate a quantum technological improvement are referred to as [**quantum innovations**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx4). The introduction in 1971 of Intel’s 4004 microprocessor, the first “computer on a chip” ever produced, is an example of a quantum product innovation. Quantum innovations are likely to cause major changes in an environment and to increase uncertainty because they force organizations to change the way they operate—as we have discussed in earlier chapters.

**Quantum technological change**

A fundamental shift in technology that revolutionizes products or the way they are produced.

**Quantum innovations**

New products or operating systems that incorporate quantum technological improvements.

[**Incremental technological change**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx5) refers to the improvements that are continuously made to particular technologies over time, and [**incremental innovations**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx6) refer to the superior products or operating systems that incorporate and benefit from those refinements. For example, since 1971, Intel has continuously improved its original 4004 microprocessor, introducing advanced chips such as the Pentium and its Sandy Bridge chips in 2011. Similarly, flexible manufacturing, robots, advanced management software solutions, and TQM are examples of incremental innovations. All these incremental technological changes have dramatically improved the performance, quality, and safety of all kinds of products—and reduced their cost—such as the new mobile computing devices and fuel efficient vehicles currently being introduced.

**Incremental technological change**

Technological change that represents a refinement of some base technology.

**Incremental innovations**

Products or operating systems that incorporate refinements of some base technology.

As one might expect, quantum innovations are relatively uncommon. As Philip Anderson and Michael Tushman note, “At rare and irregular intervals in every industry, innovations appear that command a decisive cost or quality advantage and that strike not at the margins of the profits and the outputs of existing firms, but at their foundations and their very lives.”[**5**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib5) Anderson and Tushman call these kinds of quantum innovations “technological discontinuities,” and in their model of innovation, a technological discontinuity sets off an era of ferment. At the beginning, intense competition between companies in an industry arises to develop the design that will become the dominant model for others to copy—just as Intel’s most advanced chips are the dominant design in the microprocessor industry and Apple’s iPhone and iPad have become the dominant design for a new generation of mobile computing devices.

After the dominant design emerges, the next period of the technology cycle involves an era of incremental change and innovation during which companies work on and improve a specific technology. Competition to improve a technology in order to offer customers a better product, that is, incremental product innovation, is the type of innovation pursued by most organizations. For example, every time a carmaker redesigns and introduces the new version of one of its cars, it is engaged in incremental product innovation, but this is nevertheless a very competitive process. By 2011, for example, global carmakers had all recognized the growing popularity of fuel efficient vehicles and were competing to offer customers new kinds of hybrid or electric vehicles.

The innovations that result from quantum and incremental technological change are all around us. The increasing use of microprocessors used in all kinds of consumer products, cloud computing services that allow users to access their data, music, video remotely through the Internet using new kinds of mobile computing devices, ever-improving flat-screen TVs and gaming consoles, and the genetically engineered medicines produced by biotechnology either did not exist a few decades ago or were considered prohibitively expensive products. Today, these products are taken for granted and are continuously being improved as companies fight for competitive advantage—and indeed to survive. By 2011, for example, leading mobile phone makers like Nokia and Research in Motion found themselves under intense pressure from companies like Apple and Samsung that had forged ahead to develop new smartphone and tablet computer technology that allowed them to leapfrog over their rivals—and their stock price soared as a result.

Technological change is thus both an opportunity and a threat—it is both creative and destructive.[**6**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib6) It helps create new product innovations that pioneering companies can take advantage of, but at the same time, these innovations reduce or eliminate demand for the products made by established but less innovative organizations. For example, the development of the iPod and iPhone by Apple destroyed demand for older products such as the Sony Walkman and Motorola Razr—and the profitability of these companies has plunged as a result.

**Protecting Innovation through Property Rights**

When a company’s managers use its resources in an enterprising way, the result is a stream of innovations that create new and improved products and increase its effectiveness. Companies must invest enormous amounts of money in R&D to develop innovative new products, however. Intel spent over $13 billion on R&D in 2011, for example, and it is also expensive to build new manufacturing facilities to make advanced products—a new chip-making factory costs Intel from $3 to $5 billion to build, for example.

It would hardly be fair or equitable if, after a company spends billions of dollars on these activities, a competitor could just come along, piggyback on the company’s innovations, and start to produce a copycat product. If this were easy to do, few companies would make the investment necessary to develop new products. Technological progress would plunge and a society’s standard of living would advance little over time.

As [**Chapter 6**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch06) discusses, *property rights* give people and organizations the right to own and control productive resources and to profit from them. To motivate entrepreneurs and companies to take risks and invest in new ventures whose payoff is unknown, laws are enacted to protect the profits that result from successful efforts to innovate or create new products. Individual inventors and companies are given the legal property rights to own and protect their creations by the granting of patents, copyrights, and trademarks.

Patents give their owners the property right to use, control, license, and otherwise profit from their creation—a new product such as a door handle, machine, or new drug—for a period of 20 years from the date the patent is issued by the U.S. Patent Office. In other words, patents confer a monopoly right on their owner—the individual inventor or company that has pioneered and paid for the research that led to the new product. One of the most profitable kinds of patents are those obtained by pharmaceutical companies that develop new drugs that better treat some illness or disease. Merck, the company that developed Prozac and Viagra, made hundreds of billions from the sale of these drugs, for example. But once a patent has expired any company can manufacture a copy of the original drug, a generic drug, which is then sold for a fraction of the price of the patented drug, so the huge profits of the company that invented the drug disappear.

Copyrights also confer a monopoly right on their owner. They are typically granted to people who create intellectual property, such as written or visual works—books, videogames, poems, and songs produced by authors, software engineers, poets, and musicians. If they wish, the owners of the copyright can sell it to other people or companies—such as when a movie company buys the rights to turn a new book into a movie from its author. Copyrights last for much longer periods than patents, often the lifetime of the work’s creator and beyond.

Currently, laws governing the length of copyrights are changing. Support is growing for the idea that copyrights to works should be granted for much shorter periods, perhaps for just 20 years or the life of their creator. Once a copyright expires, intellectual property enters the public domain and becomes a public good, meaning that anyone is free to make use of it at no cost. Today, tens of thousands of out-of-copyright books are available on websites such as [**Amazon.com**](http://amazon.com/) and [**www.gutenberg.org**](http://www.gutenberg.org/).

To increase the benefits from their creations, innovators of new products and services are also given the legal right to the trademarks that they use to identify their products to customers. Trademarks are property rights to the name of a product (such as Nescafé or Ivory Soap), any symbols or logos associated with it, and the company that produces it (such as Nestlé or Procter & Gamble). Trademarks give their owner the sole legal right to use these names or symbols and control the use to which they are put—for example—advertising a product, in perpetuity.

Because people and companies have to invest their creativity, time, and money to obtain copyrights and trademarks to develop a brand name, it is only fair to allow them to benefit from the “identity” of their creations. Thus J. K. Rowling, the creator of Harry Potter, holds the copyrights to her books, and she and her publishing company own the trademarks associated with the Harry Potter brand name. Nobody can issue Harry Potter toys or clothing without paying a licensing fee to them because they own the trademark, just as no company has the right to use another company’s patent unless it pays to use it—as long as the patent is in force.

Protecting property and resources of all kinds is one of the principal purposes of the law. The issue of who holds the rights to written resources in the digital age became a hotly debated topic in 2005 when Google announced its intention to scan millions of books in major world libraries and then make them available free over the Web to users throughout the world. Google quickly found itself embroiled in lawsuits with publishing companies that claimed it is violating their copyrights to these works. How long an author, artist, or company should be able to claim copyright over their intellectual property is an issue that the courts have to resolve. [**Organizational Insight 13.1**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13oi1) profiles the way the Rolling Stones developed a set of entrepreneurial skills to take advantage of their brand name and copyrights that has made them the wealthiest rock band in the world.

**Organizational Insight 13.1: The Rolling Stones Are Not Gathering Moss**

The Rolling Stones have been one of the world’s leading rock bands since the early 1960s when they burst into the music scene as the “bad boys” of rock and roll. As with most rock groups in those early days, they were an unproven product with no track record. Desperate to sign recording contracts, the Stones, like most early rock bands, were in a weak bargaining position when dealing with record companies such as Decca, the company they initially signed with. As a result, despite their enormous initial success, they received a relatively small percentage of the profits their best-selling records generated. Later, after these contracts expired and because they were now world famous, the Rolling Stones were able to renegotiate contracts with record companies on their own terms. They also used their fame to find new avenues for entrepreneurship.

Since 1989, the Stones, under the leadership of Mick Jagger, the CEO of Rolling Stones Inc., have based their business model on finding ways to use their product—their unique music and rock persona—to generate profit. Since 1989 the Stones have earned more than $2 billion in revenues; about $700 million has come from royalties earned on the sales of their records and songs. But the incredible success of their world tours generated the remaining $1.3 billion from the ticket sales, merchandising, and company sponsorship money associated with their tours. The way the Stones orchestrate their world tours shows how entrepreneurial they are.

It all began with the Steel Wheels tour in 1989, when for the first time the Stones, working with a Canadian promoter named Michael Cohl, took total control over all aspects of their tour. Before this, the Stones, like most rock bands, put together a schedule of cities to tour. They would then contact well-known promoters in those cities to take responsibility for staging the concert and the sales of tickets; the Stones then received a percentage of total concert revenues. With this business model the promoters were taking away over 60% of total revenues. Cohl proposed a new model in which he would assume responsibility for all 40 concert venues on the Steel Wheels Tour and guarantee to pay the Stones $1 million per concert, a much higher amount than they had ever received before. Cohl felt he could do this because his approach cut out the profits earned by the promoters; he also would be able to negotiate merchandising contracts to promote Stones T-shirts, posters, and so on, and to get corporate sponsorship for the tour.

After they had played the first several venues, it became clear to Cohl that he was losing money on each one. To make the tour a success they would *all* have to find new ways to cut costs and increase revenues. From this point on the Stones became directly involved in every decision concerning staging, music, advertising and promotion, and even the price of concert tickets, which have shot up in every tour since Steel Wheels. The Stones, and particularly Jagger, faced a huge task to learn how to improve the concert tour business model, but they persevered and step by step have continued to refine and develop their approach in every subsequent tour. In the end, the Steel Wheels tour made over $260 million and the Stones made far more than the $40 million they were promised. In later tours, from “Packing Them In” to the “Voodoo Tour” in 1995 and the “Licks” 2003 tour, world revenues from concerts surged, with tickets selling at face price for up to $350.

When Mick Jagger and Keith Richards, who are both now in their late 60s, were asked how long they planned to go on touring, their answer was “until we drop.” The Stones reinvent themselves on every tour as creative artists, and performing at the level expected of them calls for a new burst of enterprise every time they get on the stage and give their billions of loyal fans the show they expect. In 2011, a new Stones 50-year anniversary “farewell’ tour was in the works; whether this tour will go ahead in 2012 is not clear as Richards and Jagger began yet another personal squabble. Clearly, being innovative in the rock music business is never easy—it is very hard work.

**Innovation, Intrapreneurship, and Creativity**

The leaders of innovation and new product development in established organizations are [**intrapreneurs**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx7), employees who notice opportunities for either quantum or incremental product improvements and are responsible for managing the product development process to obtain them. Many managers, scientists, or researchers employed by existing companies engage in intrapreneurial activity. But people like [**Amazon.com**](http://amazon.com/)’s Jeff Bezos or Liz Claiborne who start new business ventures and found organizations are entrepreneurs. They assume the risks and receive many of the returns associated with the new business venture.[**7**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib7)

**Intrapreneurs**

Entrepreneurs inside an organization who are responsible for the success or failure of a project.

There is an interesting relationship between entrepreneurs and intrapreneurs. Many intrapreneurs become dissatisfied when the organization they work for decides neither to support their creative new product ideas nor to fund development efforts that the intrapreneurs think will succeed. What do intrapreneurs do who feel that they are getting nowhere? They often decide to leave the organization and start their own organization to take advantage of their new product ideas. In other words, intrapreneurs become entrepreneurs and found their own organizations that may compete with the organizations they left.

Many of the world’s most successful organizations have been started by frustrated intrapreneurs who became entrepreneurs. William Hewlett and David Packard left Fairchild Semiconductor, an early industry leader, because managers of that company would not support their computing ideas. Their company, now HP, soon outperformed Fairchild. Compaq Computer was founded by Rod Canion, who left Texas Instruments (TI) when managers there would not support his idea that TI should develop its own PC. HP eventually bought Compaq in 2001 to compete with Dell and this merger helped lead to Dell’s current problems, although by 2011 both companies were suffering from competition from Apple, which had hired away many managers from both these companies. To prevent the departure of talented people, organizations need to take steps to promote internal entrepreneurship. (We discuss how to promote successful entrepreneurship in both new and existing organizations later in the chapter.)

All innovation begins with creative ideas. It is important to realize, however, that creative ideas are not just those that lead to major new inventions or achievements: Creative ideas are any that take existing practices a step farther than the norm. [**Creativity**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx8) is nothing more than going beyond the current boundaries, whether those boundaries are technology, knowledge, social norms, or beliefs.[**8**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib8) Deciding that PCs do not have to be beige and can be blue, pink, or even made of clear plastic is a creative idea, just as putting together the first PC was a creative idea. Although the latter may be more memorable, and made Apple founders Steve Jobs and Stephen Wozniak famous, the millions of small creative ideas and actions that have gone into improving PCs since then are nevertheless highly significant and valuable. And Michael Dell’s creative idea of selling PCs over the phone, although not in the same league as making the first PC, nevertheless led to his fame as an innovator.

**Creativity**

Ideas going beyond the current boundaries, whether those boundaries are based on technology, knowledge, social norms, or beliefs.

From this perspective, most people have been and will be creative in their normal endeavors. Thus, employees must grasp the fact that their input, suggestions, and ideas are valuable and organizations should take steps to acknowledge how important these ideas are. Organizations can do this by promoting innovative values and norms in their organizational cultures and reinforce them by providing financial rewards for good ideas—as many organizations do. In 2011, Google’s new CEO Larry Page decided to link employee bonuses and financial rewards to their ability to help the company succeed in its efforts to become a major player in social networking and so compete with Facebook.

Creativity is not just making new things; it is also combining and synthesizing two or more previously unrelated facts or ideas and making something new or different out of them. It is also modifying something to give it a new use or to make it perform better. Synthesis and modification are much more common than creation, and this is why incremental innovation is more common than radical innovation. As Anderson puts it, “We forget that moving a desk so that work flows smoother is also creativity. It’s modification. And creativity also blooms when we redesign a job description so that related tasks are given to the same person. That’s synthesis. It’s even creativity when we cut our losses on a worthless industrial adhesive by slapping it on the back of our secretary’s note pad … that bit of creation is the 3M ‘Post-it’ notes but nothing is going to make your firm creative unless you first help individuals to unlock their willingness to try.”[**9**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib9)

As Nonaka puts it, the process of innovation and creating new knowledge depends on the ability of managers to tap into the tacit, hidden, subjective insights, intuitions, and hunches of people everywhere in an organization.[**10**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib10) The source can be a brilliant researcher’s insight, a middle manager’s intuition about changing market trends, or a shop floor worker’s tacit knowledge built up by intense involvement in the work process over a number of years. The issue is to transform personal knowledge into organizational knowledge that results in new products. This can be complicated because such tacit knowledge is often difficult to verbalize; it is know-how accumulated by experience and tough to articulate in rules, formulas, or principles.

To obtain such tacit knowledge it is necessary to learn through observation, imitation, or modeling. Also, over time, through team interactions, team members learn how to share their knowledge, and team routines and “recipes” develop that are specific to a group and to an organization that lead to innovative kinds of behaviors. Some of these can be written down, though many are present only in the interactions between team members—in their knowledge of each other. Note too that from such interactions additional tacit knowledge may be created so that organizational knowledge builds up, spills over, and increases throughout an organization.[**11**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib11)

A [**knowledge-creating organization**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx9) is one in which such innovation is going on at all hierarchical levels and across all functions and divisions. Different teams meet to share their growing information and insights, so as knowledge is shared throughout the organization, new heights of innovation can be reached. Team leaders, as middle managers, then have to confront the task of translating creative new ideas into the stream of products that customers will buy. It is at this point that the issue of how to create and design an organizational setting to promote creativity and innovation becomes crucial. And designing a setting to encourage creativity is as much a form of innovation as the design of the new products that are created within it.

**Knowledge-creating organization**

An organization where innovation is going on at all levels and in all areas.

**Entrepreneurship as “Creative Destruction”**

The widespread technological changes brought about by increasing global competition that generate new innovations are often referred to as the process of “creative destruction.” This process leads older, less-forward looking companies to become uncompetitive or even driven out of business by new, more innovative ones. No one foresaw how much the rapid advances made by Apple in mobile computing would hurt Nokia and Research in Motion, the leaders for a decade, by 2011. This is “creative” because companies—old ones like Apple or new ones like HTC—can use new global and technological opportunities to make better products or lower the costs of making existing products. Established companies that fail to invest in the “right” new technologies—the ones that provide customers with the most value—can find themselves at such a competitive disadvantage that they are driven out of business unless they can adapt quickly. New startups become the companies that will lead the industries of the future unless “older” competitors can find ways to fight back. Will Microsoft ever be able to meet the challenge from Google because it does not control the online search and advertising business? Will Google find that it will lose its leading position to Facebook because it does not control the social networking market? In the last decades, the emergence of new industries—such as digital communication, biotechnology, robotics, fuel cells, and online retailing and gaming—have created massive disruptions in the business world.

The industrial revolution is another example of how the process of creative destruction works. The old agricultural age, where wealth depended on land and physical labor, gave way to the age of steam-powered machinery and transportation. The new industrialists who used their capital to create new low-cost industries destroyed the old craft guilds. The information technology age represents the latest wave of major technological change in which all kinds of businesses must invest in IT to avoid being left behind by entrepreneurial companies that make such investments first—and then are able to forge ahead.

**Innovation and the Product Life Cycle**

When technology is changing, organizational survival requires that managers quickly adopt new technologies to innovate new products. Managers who do not do so soon find that they have no market for their existing products—and destroy their organization’s future. Sony, for example, long the leader with its Walkman, suddenly lost its leading position in the music player business when Apple came along with its iPod player. But the “ancient” Rolling Stones release new records and tour often to keep their product current and fashionable.

The rate of technological change in an industry—and particularly the length of the product life cycle—determines how important it is for managers to innovate. The [**product life cycle**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx10) reflects the changes in demand for a product that occur over time.[**12**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib12) Demand for the most successful, innovative, new products passes through four stages: the embryonic stage, growth, maturity, and decline. In the *embryonic stage* a product has yet to gain widespread acceptance; customers are unsure what the technology embedded in the product has to offer them, so there is little demand for it. If customers decide the technology is valuable and offers them a “value proposition,” demand for the product takes off, and the product enters its growth stage.

**Product life cycle**

The changes in demand for a product that occur over time.

In the *growth stage* many consumers are entering the market and buying the product for the first time; demand increases rapidly. Mobile computing devices are currently in this stage. Apple’s high-tech mobile devices have spurred most global mobile computing companies to introduce their own products based on similar technologies. The growth stage ends and the *mature stage* begins when market demand peaks because most customers have already bought the product (relatively few first-time buyers are left). At this stage, demand is typically replacement demand because incremental innovation has resulted in a new generation of products that have better features—so customers junk the old ones such as out-of-date cellphones or bulky CRT monitors and TVs and go for high-definition flat-screen LCD TVs. The *decline stage* follows the mature stage if and when demand for a product falls because quantum technological change results in the emergence of a superior alternative product and a product becomes technologically obsolete—the iPod replaced the Walkman, for example.

**rate of technological change**

As this discussion suggests, the most important determinant of the length of a product’s life cycle is the rate of technological change.[**13**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib13) [**Figure 13.1**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13fig1) illustrates the relationship between the rate of technological change and the length of product life cycles. In some industries—such as PCs, semiconductors, and online books and music—technological change is rapid and product life cycles are very short. For example, technological change is so rapid in laptops that a new model becomes outdated only several months after its introduction.

In other industries the product life cycle is somewhat longer. In the car industry, for example, the average product life cycle is three to five years. The life cycle of a car is short because technological change produces a continual stream of incremental innovations in car design, such as the introduction of GPS positioning systems, advanced microcontrollers, plastic body parts, and more energy-efficient engines. In contrast, in industries where the pace of technological change is slower, product life cycles tend to be much longer. In steel or electricity, for example, changes in technology take longer to be introduced, and products such as steel girders and electrical cable can remain in the mature stage indefinitely.

**Figure 13.1 Technological Change and Length of the Product Life Cycle**

**role of fads and fashion**

Fads and fashion are also an important determinant of the length of the product life cycle.[**14**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib14) Today, customers have a major impact on the kinds of technological change that organizations pursue. The WWW and the massive flow of information that takes place quickly through websites such as Facebook and Twitter makes it apparent to customers which kinds of new products are in vogue. So organizations are increasingly watching the changing needs of customers—their fads and fashions—and investing resources to develop new technologies and products that will meet those needs. Few new car buyers today will buy a car introduced even a few years ago that is likely to be technologically outmoded, especially given the new kinds of styles and features the most recent cars possess. Similarly, in the restaurant business, customer demand for certain kinds of food changes rapidly so that the Cajun or Southwest cuisine popular one year may be history the next as Caribbean fare becomes the food of choice. McDonald’s learned this lesson the hard way when tastes changed for fast food, but it has been able to respond successfully by innovating new kinds of fast foods and drinks. Fashion considerations are even more important, where at the upper end of the cosmetics and clothing business the last season’s hit clothing line or perfume is passé by the next season. Thus today product life cycles may last no more than months, and only those companies that have the technological capability to respond fast—by developing new lines of clothing, perfumes, or mobile computing devices—will perform well.

The faster technology changes a product’s life cycle, the more important it is to innovate products quickly and on a continuing basis. In industries where product life cycles are very short, managers must continually develop new or improved technologies or their growth and even their survival is threatened. The PC company that cannot develop new and improved models of ever-thinner, more powerful laptops and tablets within months to compete with those of Apple will soon find itself in trouble—something that has happened to Dell and Sony. The fashion house that fails to develop a new line of clothing for every season cannot succeed, nor can the small restaurant, club, or bar that fails to notice changing fads and fashions. So the problem facing organizations is how best to promote creativity, innovation, and intrapreneurship.

**Managing the Innovation Process**

How should managers control the innovation process in high-tech companies such as [**Amazon.com**](http://amazon.com/) and Google or in mainstream businesses such as supermarkets and restaurants to raise both quantum and incremental innovation? Managers can use several related methods. These same methods also serve to overcome the resistances to change discussed in [**Chapter 10**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch10), which reduce the level of innovation if left unattended. For example, different divisions or functions may be helped or harmed by the kinds of technological change taking place and so resist change. Also, managers may fail to recognize new product opportunities because of the existence of cognitive biases.

**Project Management**

One technique that has proved useful at promoting quantum, but especially incremental, innovation is [**project management**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx11), the process of leading and controlling a specific ongoing work program so it results in the creation of new or improved products. A [**project**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bx12) is a subunit whose goal centers on developing a program of activities that delivers a product or service on time, within budget, and that meets predetermined performance standards. In the race to produce advanced technological products, the issues of managing a project both to reduce the time it takes to bring a new product to market and to reduce the high costs of innovation are becoming increasingly important. So it is useful to examine the role of project managers in effective new product development.

**Project management**

The process of leading and controlling a project so it results in the creation of effective new or improved products.

**Project**

A subunit whose goal centers on developing the products or service on time, within budget, and in conformance with predetermined performance specifications.

Effective project management begins with a clearly articulated plan that takes a product from its concept phase, to its initial test phase, to the modification phase, and to the final manufacturing or—in the case of services—setup phase. The concept phase typically involves the most work and cost of all these phases because the task facing the product development team, led by the project manager, is to use the latest research developments to create new products.

How does a project manager’s job differ from that of a typical manager in an organization? First, a project manager is managing a higher proportion of highly skilled and educated professionals. Typically, many scientists and engineers of all kinds work on a project. A major project design choice involves the decision of how much authority should be decentralized to professional employees to make them responsible for their actions. Each team member’s creative efforts must be harmonized with the needs of the project team as a whole, and with criteria such as a project’s costs and time frame. However, the uncertainty surrounding a project and the fact that unexpected problems, delays, and breakthroughs are typically encountered often makes it difficult to determine when a project will be completed. The process of balancing team members’ creative efforts with cost and time considerations is the most difficult task project managers (PMs) face.

The past experience and intuition of successful PMs allows them to judge how well or poorly progress is being made toward a successful outcome. Balancing the conflicting demands of performance, budget, and time schedule, and resolving the conflicts among them is a difficult process, especially as projects often are ongoing for one to three years or longer. One of the hardest tasks of a PM is to maintain the momentum of the project when team members such as engineers or designers find it difficult to solve specific problems or keep within the budget and a project threatens to flounder. Overcoming inertia, suggesting possible solutions, brainstorming, and providing encouragement and positive feedback are an essential part of the PM’s job. But scientists and engineers can be perfectionists whose only goal is to increase the product’s performance, and the PM must keep the goals of time and cost in mind. Engineers must be convinced that the search for a “perfect” product will turn out to be a disaster if it results in one that is so expensive that customers do not wish to buy it. Sony, for example, engineered laptops as thin as the ones Apple makes today a decade ago but they cost $4000 dollars and customers were not willing to pay such a high price.

It is the ability to think ahead and conduct effective advance planning that is often key to a PM’s success. Based on their past experience, successful PMs know what typical problems arise, and they know how to organize and control employees to solve them. So when a crisis occurs, as it often does, resources can be quickly mobilized to confront and solve it.

Another important aspect of the advanced planning PMs conduct involves deciding how to respond to top managers who are continually evaluating the performance of a project—searching for signs of success or failure, for example. The ability to “sell” and champion their ideas and project is a never-ending task for PMs. Later, we discuss how PMs must be product champions, the people who believe in a project and are committed to its success; if they cannot show their enthusiasm, other managers are unlikely to show support for it. The ability to explain the nature of a new project clearly, and to crystallize its meaning and importance, are major determinants of a PM’s ability to obtain funding for a project, and to gain additional funding for a project behind schedule to help ensure the survival of a project. Many projects are terminated abruptly because top managers lose faith in the PM and the project team.

PMs commonly employ quantitative modeling to conduct effective advanced planning, to uncover potential bottlenecks, and to help speed progress toward successful completion of a project. Such modeling allows PMs to develop “What if?” scenarios and to experiment with finding new and better ways of performing the sequential, and parallel, steps involved in reaching the final product.

One common modeling approach is to develop a *PERT/CAM network* or *GANTT chart*, which are essentially flowcharts of a project that can be built with many proprietary software packages (such as those of Microsoft).[**15**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13bib15) These software packages focus on (1) modeling the sequences of actions necessary to reach a project’s goal, and (2) relating these actions to cost and time criteria, such as the per-week cost of the scientists and engineers employed in the project, to (3) sort out and define the optimal path for reaching the goal. Once the PM has chosen a particular path to follow, these programs provide ongoing feedback on project performance that can be used to assess current project performance.

One of the first, and simplest, of these modeling techniques, the *critical path method* (CPM), captures the essence of what these models try to achieve. The goal of CPM is to determine (1) which particular tasks or activities of the many that have to be performed are critical in their effect on project time and cost and thus (2) to determine how to sequence or schedule critical tasks so a project can meet a target date at a minimum cost. Finding the critical path thus provides an optimal solution to the needs of a particular project. The flowchart in [**Figure 13.2**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch13fig2) illustrates the critical tasks involved in building a house.

The optimal sequencing of tasks that have to be performed to reach the completed product is often worked out by a team, which experiments with different possible sequences. In this simple example of building a house, the most efficient sequencing of steps can be easily discovered. For many more complex projects, however, the analysis of these steps constitutes an important learning tool; many unforeseen interactions between these steps can be uncovered by a careful analysis. Attention is then paid to how to shorten the path—how to reorganize or combine tasks to cut time and cost and improve performance. Frequently, a team experiments by building prototypes of a new facility’s layout or task structure if how to make a product or provide a service is the key issue.

Note the link to reengineering an organization, discussed in [**Chapter 10**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch10), where the move to combine the activities of different specialists or functions and focus on business processes, not activities, is also a way of shortening the critical path. PERT/CRM software packages permit the user to examine and compare many different kinds of configurations to find the best path to job completion. Modern IT systems that use computer-aided design (CAD), discussed in [**Chapter 9**](https://jigsaw.vitalsource.com/books/9781323290941/content/id/ch09), can completely change task sequencing, especially when other types of organizing such as flexible work teams, product teams, and network structures are included in the project management process.

Indeed, such developments have made the job of the project manager increasingly prominent in many organizations. Successful PMs are often those who rise to more general management positions because they have demonstrated their competency in understanding how to design organizational structure and IT systems to facilitate the development of innovative products. Project management is often a prerequisite for promotion to top-management positions today.