Student Guide

COURSE 1

MODULE 1

From Concept to Consumer:

Building a Foundation in Problem-Solving

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Ford Motor Company

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COURSE 1:
Building Foundations

How do people dream up new products? How are products made and marketed to customers? How do people communicate their ideas and knowledge in the workplace? How has the workplace changed in the United States over time? What will it be like when you're ready to enter the workforce?

Building Foundations introduces you to the worlds of business, product development, and manufacturing, and helps you develop skills—important for both college and the workplace—that you'll use throughout the rest of the Ford PAS curriculum. In Module 1, you'll work in teams to solve problems related to inventing, developing, and producing products like soft drinks and bicycles. In Module 2, you'll develop important communication skills as you take on the roles of employees of different departments at a fictional fast-food company called Quick 'n Tastee. In Module 3, you'll interview people in the workforce today and use historical documents to understand how and why the workplace has changed over time. You'll develop your research skills in order to create an exhibit for a class Web site that describes the lives of people working in different periods of U.S. history.

Module 1

From Concept to Consumer: Building a Foundation in Problem-Solving

Module 2

Media and Messages: Building a Foundation of Communication Skills

Module 3

People at Work: Building a Foundation of Research Skills

MODULE 1:
From Concept to Consumer
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Module Overview

Have you ever wondered how someone dreams up all of the new products on the shelves at your local department store? How do these products get made? How does someone make sure that your jeans don't fall apart the first time you wash them, or that the brakes on your bicycle work properly?

In Module 1, *From Concept to Consumer: Building a Foundation in Problem-Solving*, you'll find the answers to these questions by taking a look at the manufacturing process, from the invention of new products through their development and production.

In this module, you'll explore the manufacturing process from several different angles. For example, you'll learn how new products are designed, and then work in teams to design a product yourself. You'll take on the role of an employee of a soft drink company and work with a team to come up with plans for launching a new soft drink. In the process, you'll learn about the different departments within a company and how they work together. You'll also learn about the assembly process, and use this information to develop plans for a new bicycle. By the end of the module, you'll know more about the world of manufacturing, and understand what it takes to get a product from a designer's idea to the department store shelf.

ACTIVITY 1:
Inventive Thinking

INTRODUCTION

Have you ever thought to yourself, "Someone should invent a way to . . . ," or " This product would be perfect if they just changed . . ."? This activity is all about the inventive thinking and design process that happen before a product is manufactured. By the end of this activity , you will have a better understanding of why people create new or improved products, and what's involved in the design process.

Learning Goals

- Identify and explain the importance of the steps involved in developing a new product.
- Develop ideas for new products, taking into account the needs of particular consumer groups.
- Describe the consequences to society of the widespread use of new products.

FOR YOUR GLOSSARY

Consumer group
Design specifications
Patent
Prototype

NECESSITY—THE MOTHER OF INVENTION?

Read the following quotations by people who are involved in the design process as writers, inventors, producers, and scientists. As you read the quotations, think about whether any describe your own ideas about invention and design.

1. Necessity is the mother of invention. (Plato, philosopher)
2. I don't think necessity is the mother of invention—invention, in my opinion, arises directly from idleness, possibly also from laziness. To save oneself from trouble. (Agatha Christie, author)
3. An invention does not have to be a huge new machine or something that will change the world. An invention may be an old idea with a new twist of improvement. (Lauren Patricia DeLuca, inventor)
4. It is kind of fun to do the impossible. (Walt Disney, film producer)
5. Invention is 1 percent inspiration and 99 percent perspiration. (Thomas Edison, inventor)
6. Imagination is more important than knowledge. (Albert Einstein, physicist)
7. Mistakes are the portals for discovery. (James Joyce, author)
8. Name the greatest of all inventors: Accident. (Mark Twain, author)
9. When I see something that I don't like, I try to invent a way around it. My job is simply to design gadgets that I like. (Jakob Rabinovich, inventor)
10. I am of those who believe with Nobel that mankind will derive more good than harm from the new discoveries. (Pierre Curie, scientist)

HOMEWORK 1.1

Read **Interesting Inventions**, which describes the work of several inventors, and **What Is Product Design?** Then consider how an invention or an innovation in an everyday product could improve your life. Find out what new inventions or redesigned products your friends and family would like to see developed. Write a two-paragraph description of at least one invention or redesigned product idea.

Interesting Inventions

A Better Umbrella—Karen Schlangen

Have you ever looked critically at your umbrella? You probably take its design for granted, but Karen Schlangen didn't. She noticed many flaws in the current design of the umbrella. For example, you always get wet even with the biggest umbrella, and in gusty winds an umbrella tends to flip inside out. Karen realized that the maximum protection against wind and rain is naturally in the center of the umbrella, but because a central pole is in this space, the user gets wet. Karen redesigned the umbrella—she put the handle off to one side so that the user can be under the center of the dome. She also made the linkages stronger to prevent the umbrella from turning inside out.

A Self-Cleaning House—Frances Gabe

Do you think housecleaning is a big waste of time? We already have many gadgets to make cleaning faster and easier—but Frances Gabe has taken housecleaning one step farther. Instead of inventing another cleaning device, she redesigned her entire house to create a self-cleaning house! Frances modified her own home by attaching a 10-inch square "Cleaning/Drying/Heating/Cooling" unit to the ceiling of each room. With one press of a button, water sprays the room, rinses the entire area, and then blow-dries it. The floors are slanted to allow water to run off into drains, and she keeps valuable or vulnerable items under glass. The furniture is specially coated to be water-resistant. Frances's house also includes more than 68 devices she has patented. For example, there is a kitchen cabinet where the dishes are washed, dried, and stored; a closet in which the clothes are washed and dried where they hang; and bookshelves that dust themselves.

The First Windshield Wiper—Mary Anderson

In 1903, Mary Anderson took a trip to New York City. While touring the city by streetcar, she was captivated by the shivering motormen who continually had to get out to wipe off the snow and ice that collected on the windshields. The motormen had tried a variety of solutions to this problem, but none seemed to help. Mary had an idea, and she made a quick drawing in her sketchbook. Her device would allow the motormen to manipulate a lever from the inside that "activated a swinging arm that mechanically swept off the ice and snow" (National Academy of Engineering, 2001). Her windshield

wipers had rubber blades attached to a spring-loaded arm. When the lever was pulled, the blades swung neatly across the windshield and returned to their original position.

People laughed at Mary's invention. They thought the swooshing back and forth would distract drivers and cause accidents. But Mary Anderson showed them. She received a patent for her windshield wiper a year later. While Mary never sold her invention, it did catch on. By 1913, windshield wipers were standard equipment on American cars, saving lives and making it easier to drive in bad weather .

What Is Product Design?

Product design is an important step in manufacturing. Scientists and engineers, often working in teams, come up with ideas and plans for new products and for the materials and processes that will be used to create them.

Product designers look for new ideas to contribute to their company 's product line. They also look for ways to improve products that already exist. An important first step for product designers is to define the need for a new product, or the need to change one already in production. A new or redesigned product should satisfy a desire or solve a problem that consumers have.

Product designers must think about whether consumers would be interested in buying a new product. They need to learn about the **consumer group** that is likely to buy the product by asking potential customers questions about the product. Designers then modify their product plans based on consumers' responses. They may also research competing products already on the market, and tr y to improve on these products' design, or incorporate design elements that have already proven successful.

In addition to coming up with ideas for new products, it's also the product designer 's job to test these products. Product designers make models of the product, which are called **prototypes**. They use these models to test how well the product works, how long it will last, how safe it is, and if it (or the processes used to make it) will hurt the environment.

Finally, product designers must identify the steps involved in making the product, the types of tools needed, the number of workers required, and how much it will cost. This information is used to determine how much to charge consumers for the product.

The following is a summar y of the initial steps involved in the product design process:

1. Define the need for a product.
2. Invent a new product or improve an existing product to meet this need.
3. Conduct research with the consumers who are likely to buy the product, and then modify the product design as required.
4. Develop and test a model, or prototype, of the product.
5. Estimate how much the product should cost.

After identifying the need for a design and doing research, product designers often develop a set of **design specifications** (the requirements for the product). Sometimes, the design requirements of different people involved in the design process don't match. For example, a product stylist might want to design a product with curved sides, because that's what consumers would prefer, but the production engineer might only be able to make products with straight sides. The final design specifications will be a compromise between the requirements and limitations identified by all the people involved in the design process. Before writing design specifications for a product, it's helpful if these different people meet and develop a list of factors they must consider, such as engineering limitations. Considering these factors in advance helps reduce the need for changes at a later point in the process and is likely to save time and effort.

The following is a list of product requirements that might be part of a product's design specifications:

1. Purpose of the product. Example: "The product will hold musical compact discs."
2. Requirements for materials used in the product. Example: "Materials used must be flame resistant."
3. How consumers will use the product. Example: "The box will have handles that consumers can use to carr y it."
4. Requirements for the product's appearance. Example: "The cell phone should come in several colors to appeal to fashion-conscious consumers."
5. Cost of the product. Example: "The phone will not cost more than $40, which research suggests is the average price for similar products."
6. Safety requirements of the product. Example: "The car should be manufactured in line with federal safety standards."

DISCUSS INVENTION IDEAS

How could an invention or an innovation in an ever yday product improve your life? Work with your team to develop a product proposal that includes the following information:

1. Name of the product
2. Sketch of the product
3. Description of the purpose and function of the product
4. Description of why this product is more useful than anything that already exists
5. List of possible raw materials needed to make this product

DID YOU KNOW?

A **patent** gives a person, organization, or government the exclusive right to make, use, or sell a product or design. Applying for a patent is an important step in protecting the rights an inventor has to an invention or innovation. To get a U.S. patent, an application must be filed in the U.S. P atent and Trademark Office. Any U.S. patents applied for after June 1995 are in force for 20 years from the date of application.

Through 1999, a total of 2,364,878 patents were granted in the United States.

Of these 2,364,878 patents, 1,023,003 are owned by U.S. corporations, 26,760 are owned by the U.S. government, and 340,589 are owned by individual Americans. Of the rest, 847,365 are owned by foreign corporations, 8,174 are owned by foreign governments, and 118,987 are owned by individuals from other countries. Between 1963 and 2000, the number of patent applications filed in the United States was 315,015, but only 175,983 patents were granted.

In the year 2000, the top 10 patenting or ganizations consisted of four U.S. corporations, five Japanese corporations, and one corporation from the Republic of K orea.

For the year 2000, International Business Machines Corporation (IBM) ranked first for receiving patents—with 2,886. This was the eighth consecutive year in which IBM received more patents than any other non-federal patenting organization.

HOMEWORK 1.2

Read the **Did You Know?** and answer the following questions:

1. What group owns the most patents in the United States?
2. Why do you think this is the case?

TO INVENT OR NOT TO INVENT . . .

Watch the second part of *The Wrong Trousers*. As you watch the video, think about the following questions:

1. What do you think of the penguin's new use for the Techno-Trousers?
2. Can you anticipate ways that your team's invention idea could be used for a harmful purpose? If so, is there a way to prevent this?
3. What are some examples of real products that have greatly changed society?
4. What are some disadvantages of the widespread use of these products?

HOMEWORK 1.3

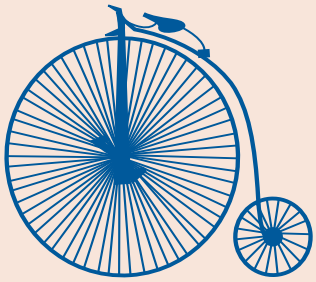
Read **The History of the Bicycle** and review the **Bicycle Timeline: 1810–1980**.

The History of the Bicycle

> Nothing we design or make ever really works . . . Our dinner table ought to be variable in size and height, removable altogether, impervious to scratches, self-cleaning, and having no legs . . . Never do we achieve a satisfactory performance . . . Everything we design and make is an improvisation, a lash-up, something inept and provisional. (Petroski, [quoting David Pye[1]], 1992, p. 47)

The design of the bicycle has had an enormous impact around the world. The bicycle spurred social change by allowing people of all economic levels to travel swiftly and efficiently. Its form led to changes in how women dressed and how people interacted. Technologically, innovations in bicycle design had a wide-ranging impact. Techniques and inventions created for the manufacture of bicycles—including the development of the assembly line and new materials—are now employed in a variety of industries (Oakland Museum of California, 1999).

The first bicycles of the early 1800s were impractical and uncomfortable, and the general public had little use for them. In the 1860s, however, Pierre Lallement, a young French mechanic, developed the velocipede ("fast foot"), made with "two wooden wheels, . . . iron tires, . . . [and a] wooden perch" (Pratt, 1880, pp. 13–14). The first machine to have pedals, the velocipede moved slowly—each rotation of the pedals propelled it forward by just a single revolution of the wheel (Dodge, 1996). In the 1860s, many Europeans and Americans tried riding and racing the velocipede, sometimes in indoor bicycle rinks (Victorian Station, 2001).



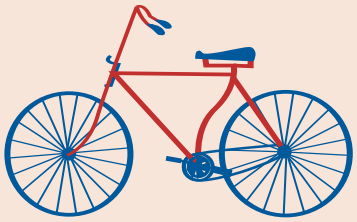
The British never really took to the velocipede, and British mechanics continued to refine bicycle design throughout the 1870s. To address the problem of the velocipede's low speed and uncomfortable ride, the high-wheeler was introduced. A large front wheel (120 to 150 cm in diameter) allowed riders to travel farther with each rotation, and the high-wheeler provided a smoother, more comfortable ride. Advances in metallurgy allowed makers to build the high-wheeler entirely of metal. While expensive (costing six-months' pay for an average worker!), the high-wheeler became a popular fixture in British sporting life. However, its design proved very unstable—the huge front wheel meant that riders were at great risk of "taking a header" (that is, falling on their heads)—and for this reason, few dared ride it (Bike History USA, n.d.).

Nonetheless the success of the high-wheeler did not go unnoticed in the United States. In 1878, Albert Pope, a Boston businessman, imported British high-wheelers and began to manufacture them in the United States

[1] Pye, D. (1988). *The Nature and Aesthetics of Design*. London: Herbert Press, p. 13.

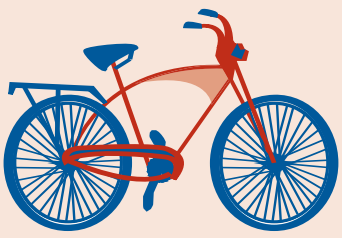
(Smith, 1972). By 1880, cycling had become so popular in this country that a group (including Mr. Pope) formed the League of American Wheelmen (LAW). Fed up with rutted, unpaved roads and run-ins with horses, carriages, and pedestrians, LAW lobbied the government to fund the paving of roads (Sturges, 2003). Improved road conditions may have helped "pave the way" for the automobile to become the preferred means of travel in the 20th century (Nunes, 2002). LAW's work also included rating roads and places to stay; it eventually served as a model for the American Automobile Association (AAA) (Smith, 1972).

Despite its popularity, the high-wheeler remained expensive and awkward to ride. But bicycle technology continued to evolve, and in 1885 a new design emerged—the safety bicycle, chain-driven with two same-sized wheels. The next important innovation was the pneumatic (air-filled) tire, invented around 1888 (Pedaling History, n.d.). The pneumatic-tired safety bicycle was instantly popular and led to a boom in the sale of bicycles.



The safety bicycle also attracted a new group of users to the bicycle—women. Its impact on American women's lives was enormous. "The woman of the 19th century . . . had been given little opportunity to cultivate or express her autonomy" (Willard, 1991)—but now women could travel independently. There was even an impact on fashion, as some women replaced their tight corsets and long skirts with "bloomers" (baggy trousers gathered at the knee or ankle) (Mozer, 1995), making it easier to ride. The famous suffragist Susan B. Anthony said that the bicycle did "more to emancipate women than anything else in the world" (Botkin, 2000).

The manufacturing techniques and inventions generated by the bicycle boom—including the development of ball bearings, lightweight steel tubing, wire spokes, chain and shaft drives, variable gears, single-tube pneumatic tires, reliable brakes, interchangeable parts, and assembly-line techniques for mass production—were also used in other industries. Excited by the possibilities, early bicycle manufacturers and mechanics, including the Wright Brothers and Henry Ford, turned their attention to developing powered machines, such as airplanes and automobiles (About, Inc., n.d.).



Mass-produced bicycles offered an affordable means of transportation. Even so, the bicycle's popularity in the United States began to decrease in the early 20th century, perhaps due to the rise of the automobile and the construction of more highways. By the 1950s and '60s the U.S. bicycle was essentially a children's toy. The balloon-tired Schwinn Phantom bicycle, in particular, was seen as a status symbol for American boys (Dixon & NBHAA, 1999).

The 1970s brought an unexpected event. In 1973, OPEC (Organization of the Petroleum Exporting Countries) declared an oil embargo on the United States as punishment for its support of Israel during the unrest in the

Middle East. Oil prices quintupled, and customers found long lines or empty pumps at gas stations everywhere (Bedard, 1997). With gas so expensive—or unavailable!—the bicycle began to regain its appeal for adults.

Since the 1970s, the bicycle has remained a popular mode of transportation. The 3-speed design was followed by the 10-speed (lightweight, with thin tires) and then the mountain bike (Mozer , 1995)—and new styles continue to appear.

Clearly, the bicycle has had a profound impact on social, technological, and economic histor y. The invention and ongoing development of the bicycle helped to create new industries, fashions, and innovations in manufacturing. With continual improvements in technology, it is exciting to imagine the bicycle of the future and how it will be used.

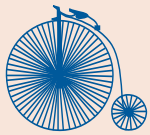
Complete citations are in the References section of this guide.

Bicycle Timeline: 1810–1980

Symbol Key

- Significant Historical Event
- Social Change
- Technological Innovation

1851—Amelia Bloomer and Elizabeth Cady Stanton wear bloomers to the Women's Rights Convention in Seneca Falls, N.Y.



1870s—The high-wheeler is the first all-metal bicycle. It has a large front wheel that allows riders to travel farther than the velocipede with one turn of the pedal.

1890s—Bicyles are very popular! More than 3 million U.S. bicycles are made.

1890s—The pneumatic-tired safety bicycle is introduced.

1810 1820 1830 1840 1850 1860 1870 1880 1890

1817—An early bicycle: Baron von Drais invents the Draisine, which is pro-pelled by pushing.

1863—Pierre Lallement invents the velocipede, with pedals that are applied to the front wheel. The wheel and pedal crank diameters restrict how fast it can go.

1880s—The hard-tired safety bicycle is introduced. It has a smaller front wheel than the high-wheeler.

1880s—The safety bicycle becomes popular among women.

1888—The pneumatic tire is invented.

1902—The American Automobile Association is founded.

1920—Wome n are granted the right to vote with passage of the 19th Amendment to the U.S. Constitution.

1940s—The automobile is the major form of transporation in the United States.

1960s— The bicycle is commonly viewed as a toy for children.

1900 1910 1920 1930 1940 1950 1960 1970 1980

Early 1900s—Bicycle sales fall dramatically.

1903—The Wright Brothers complete the first powered flight carrying a human.

1910—The mass production of automobiles results in more affordable transpor-tation for the public.

1933—Ignaz Schwinn invents a low-pressure balloon tire that makes the bicycle's ride much more comfortable.

1950s— The Schwinn Phantom becomes a status symbol for American boys.

1970—The mountain bike, made for off-road bicycling, is introduced.

1973—OPEC nations embargo oil. The gas crisis causes shortages in gas supplies and high gas costs.

ACTIVITY 2:
The Evolution of Everyday Objects

INTRODUCTION

First we had silk scrolls. Then we had paper . Now we have electronic newspapers, where the information we read changes with the touch of a button. In this activity , you will learn about how products change over time, what makes these changes come about, and what impact these changes have on society.

Learning Goals

- Select and organize information derived from Internet research.
- Develop a timeline showing how a product has evolved over time.
- Explain how social changes influence and are influenced by technological innovations.
- Write a report that explains cause and effect.

FOR YOUR GLOSSARY

Technological innovation

A PRODUCT'S STORY

Having read about the history of the bicycle, you can see that a product may change frequently over time because of advances in technology. A **technological innovation** leads to the creation of new products or allows for the improvement of existing products. But is technological innovation the only factor influencing product change?

At least two other kinds of occurrences influence the evolution of existing products and the development of new products. One is significant historical events. A significant historical event is something important that happened in the past, such as the Arab oil embargo of the 1970s. A second kind of occurrence that can influence product evolution is what is called a social change, or change in society. A social change significantly affects the lives or behavior of a large number of people in a society. For example, the expansion of American women's rights was a significant social change, which was signaled by a number of historical events, including the holding of the Women's Rights Conventions in Seneca Falls, N.Y., and the passage in 1920 of the 19th Amendment to the U.S. Constitution, which granted women the right to vote .

Take another look at the **Bicycle Timeline: 1810-1890** and think about the following questions:

1. Do technological innovations change society or do social changes affect developments in technology?
2. Why do you think historical events, social changes, and technological innovations are all shown on the bicycle timeline?
3. How effective is the timeline at showing the developments in the bicycle over time? How could the timeline be improved?

FORM RESEARCH TEAMS

Your team's job is to research a specific product, write a report about the product, and develop a poster that shows how the product has changed over time. Y our team will then give an oral presentation to explain your research findings.

Before your team begins its research, spend a few minutes brainstorming what you know about your product's development and its relationship to significant historical events. Discuss the following questions and record your answers.

1. How has this product changed over time?
2. How have historical events, social changes, and technological innovations influenced this product's evolution?
3. How has this product's evolution influenced technology and society?

HOMEWORK 2.1

Finish recording the answers to the questions about your product, if you have not already done so.

RESEARCH AND DEVELOP A POSTER AND REPORT

Now you'll begin to research your product. Go to the **Ford PAS Web site** to find information about your product. It is your team's job to sort through your W eb information and develop a poster representing the timeline of your product and a report. Before you begin your research, look over the **Product Timeline and Report Assessment** and plan your work with these standards in mind. Y ou can refer to **The History of the Bicycle** and **Bicycle Timeline: 1810–1980** as examples of a final report and timeline, but you do not need to follow these models exactly.

As you research your product, keep the following questions in mind:

1. How and why has your product changed over time?
2. How have changes in society and technology influenced the design of your product?
3. How has the widespread use of your product influenced society?

Here's what you should include on your poster:

1. A timeline that identifies at least six versions of the product and at least six significant historical events, social changes, and/or technological innovations that are related to these product changes. Dates should be included for the products and other occurrences.
2. Photos or illustrations of at least six versions of the product.

Here's what you should include in your report:

1. A two-page review of how your product has changed over time, including explanations of how the six product versions in your timeline are related to the six significant historical events, social changes, and/or technological innovations in your timeline.
2. A References section that cites all of the sources of your information.

HOMEWORK 2.2

How widely used is your product? Are there any limitations to its use? F or example, can people with disabilities (such as people who have trouble walking, seeing, or hearing) use it? Write a two-paragraph description of a design for your product that would benefit people who have a specific disability.

HOMEWORK 2.3

What are the benefits and drawbacks to society of the technological innovations that have influenced over time the development in the product you are researching? Interview a friend or relative in order to answer the following questions:

1. What are some benefits to society of these technological innovations?
2. What are some drawbacks to society of these technological innovations?
3. What changes would you like to see in this product, and why?

PRESENT POSTERS AND WRAP UP

Now that you've learned about the many developments in the evolution of your product, think about the following questions:

1. Is there such a thing as a perfect product? Read David Pye's quotation from P etroski's book *The Evolution of Useful Things* in **The History of the Bicycle**. What is your reaction to the quotation?
2. How does the latest innovation in your product make the product closer to being perfect?
3. What examples can you think of from your research that show how products are adapted for the specific wants and needs of different consumer groups?
4. If you could improve your product, what would you change? Why would consumers consider your changes to be an improvement?
5. Based on how your product has evolved over time, what do you think it will be like in the future? What social or technological factors might bring about these changes? How do you think these changes might affect society?

HOMEWORK 2.4

Complete the **Teamwork Skills Assessment**.

HOMEWORK 2.5

Read **Sample Interviews 1 and 2**. Then, interview a relative about his or her work and write the answers to the following questions:

1. What kind of company do you work for?
2. What department do you work in?
3. What does your department do for the company?
4. What do you do in your department, and what are you responsible for?
5. What other departments do you most depend on to do your work?
6. What departments depend on you to do their work?
7. What about your work are you most proud of?

Some people, such as small-business owners and independent contractors, don't work for a company or in a specific department. If this is the case for the person you are inter viewing, find out as much as you can about the tasks and responsibilities for which that person is held accountable.

Sample Interviews 1 and 2

Interview 1

Dean McLeod, Cowlitz Project Manager, Tacoma (Washington) Public Utilities

What kind of company do you work for?

I work for a public utility. We provide water, sewer, and power services to our customers. The company has more than 1,000 permanent employees.

What department in the company do you work in?

I work in the power generation section, at a hydroelectric generation facility. Our facility provides bulk power produced from hydroelectric projects at two dams.

What do you do within your department?

I am currently the manager of a hydroelectric project, which includes the following facilities: two dams with generating stations, three parks for recreational vehicles (R.V.s), and two large fish hatcheries. The project has 30 permanent employees and 20 seasonal employees.

Our work team is responsible for the maintenance and operation activities at the dams, parks, and hatcheries. I coordinate the efforts of our team to complete a wide variety of tasks and provide recreational services to the general public.

In my current position, some of my areas of responsibility include budget oversight, employee development, community service, generating unit reliability, park customer satisfaction, hatchery facilities maintenance, public relations for the project, and public safety.

What does your department do for the company?

My group's primary responsibility is to produce low-cost, reliable electrical energy for our public utility customers. To comply with the regulations of our F.E.R.C. [Federal Energy Regulatory Commission] license to operate the dams, we are also responsible for minimizing the impacts of the dams on the natural environment. Within the license, we are required to own and operate R.V. parks to provide recreation opportunities, maintain hatchery facilities to minimize the impacts on natural fish runs, and support the management of 14,000 acres of wildlife habitat.

What other departments do you most depend on to do your work?

Our efforts are supported by the following units: Generation Engineering, Natural Resources, P urchasing, Accounts Payable, Human Resources, Communication, Technical Support, Information Services, Payroll, Transmission and Distribution, Energy Services, and Power Management.

What departments depend on you to do their work?

The overall utility depends on our group to provide low-cost, clean, renewable, and reliable electrical power , while meeting all of our license obligations to operate the hydroelectric project.

What about your work are you most proud of?

Our generating units at the dams—we have two with a 150-megawatt capacity and four with a 40-megawatt capacity—have an availability rating of 99 percent. This means that our generators are up and running, or ready to run, nearly all of the time. Our R.V. parks are among the most popular in the state, with a positive customer service rating of 98 percent. Our fish hatcheries, maintained by project employees and operated by state employees, have consistently released target numbers of juvenile fish. Our project's operating and management costs have come in at or under budget, while we have reduced permanent staff by 12 positions over the past 15 years.

Interview 2

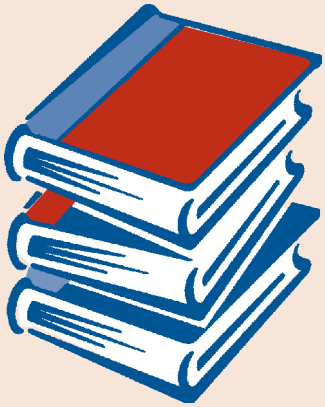
Harriet Dorsen, General Counsel, Random House Publishing Company

What kind of company do you work for?

I work for a book publishing company.

What department in the company do you work in?

I work for the legal department.



What does your department do for the company?

We take care of all of the legal issues that come up in the course of running the business. We make sure that the company stays out of legal trouble, and work to prevent difficulties from arising in the first place. F or example, we work on some of the same issues that most companies have: W e have a lease for our office space, and someone needs to look at the lease from a legal viewpoint. We have contracts with authors, sales agreements with our customers, and contracts with suppliers who provide us printing ser vices or materials. All of

these need to be examined by a lawyer. We also deal with some issues that are unique to book publishing. We review all of our books for libel, so that no one can sue us for statements made in them. We also make sure our books comply with laws regarding copyright, trademark, and invasion of privacy.

What do you do within your department?

I am the chief legal officer for our company. A large part of my work is managing all of the other lawyers in the department. There are lawyers who work with each of the company's divisions, and there are also paralegals who draft contracts and negotiate with authors. I also do legal work in several areas. If we buy or sell a company, I work on the legal issues involved. I also work on government relations, and, since our company is international, I deal with legal issues in other countries.

What other departments do you most depend on to do your work?

The nice thing about working in the legal department is that we interact with all the other divisions in the company. We work with publishing and editing on author contracts to determine how much we will pay for the rights to a book and when the book will be published, as well as on issues of libel. We work with the sales division to determine the terms of sale to our customers. We work with production on contracts with our suppliers. All departments have legal issues that we work on.

What departments depend on you to do their work?

All of the departments depend on us to provide guidance on legal matters.

What are you most proud of in your work?

We have been successful in decreasing the number of legal problems that the company has had, and in minimizing problems before they turn into larger issues. This is the most important thing that our department can do for the company.

ACTIVITY 3:
Making Product Decisions

INTRODUCTION

Aluminum or plastic? Caffeine or no caffeine? Television ads or radio spots? These are some of the questions that are involved in manufacturing a new soft drink. In this activity , you will learn about different departments within a company by taking on the role of an employee at an imaginary company. You have thought about product design and development. Now you will investigate production planning and manufacturing processes as you plan the launching of a new soft drink. By the end of this activity , you'll see that manufacturing is not just what happens on the assembly line—it is a complex set of tasks and decisions that involve ever yone in a company.

Learning Goals

- Describe the functions of four departments within a manufacturing company .
- Make decisions that take into account conflicting concerns and points of view within an organization.
- Communicate designs and production decisions through written reports and oral presentations.

FOR YOUR GLOSSARY

Contingency plan
Demographics
Downcycled
Market research
Net profit
Product launch

DISCUSS JOBS AND DEPARTMENTS IN COMPANIES

Share with the class what you learned during your inter view. Your class will make a list of company departments and jobs. Think about what each of those departments might be responsible for doing within the company, using the following questions:

1. Are any departments missing from your class's list?
2. Are there some departments that might not belong in ever y company?
3. What is each department responsible for?
4. How do you think these departments interact with one another? Do they ever have conflicting goals or agendas?

HOMEWORK 3.1

Read the **Department Packet** for your department and be prepared for a discussion based on the information contained in it.

COMPANY INFORMATION:

Acme Soft Drink Company

About the Company: Acme Soft Drink Company is a medium-sized soft-drink maker with a strong presence in both the United States and several other countries. Acme is unusual among soft-drink manufacturers in that it makes both soft drinks and their containers (aluminum cans). The company sells three soft drinks, of which its cola is the most popular , but it is thinking of expanding its product line.

Product Distribution: Acme Soft Drinks are available in the United States, Europe, Japan, and China

Current Products: Retro Root Beer, Super Orange Fizz, Extreme Cola

Number of Employees: 1,000 worldwide

Manufacturing Plants: One in Iowa, one in Georgia, and several other plants around the world

Consumer Base: Young adults between the ages of 14 and 26

The Problem

Acme wants to expand its line by developing a new brand of soft drink for the U.S. market. The company is thinking about a lemon-lime-flavored soft drink. Competition with other brands will be stiff , so its product will have to meet customer needs and be favorably priced. This new soft drink will also need an aggressive marketing campaign. Many different departments at Acme will be involved in the development, production, and marketing of this new product, and they all have different concerns. How can Acme develop a new soft drink that will satisfy everyone and make a profit for the company?

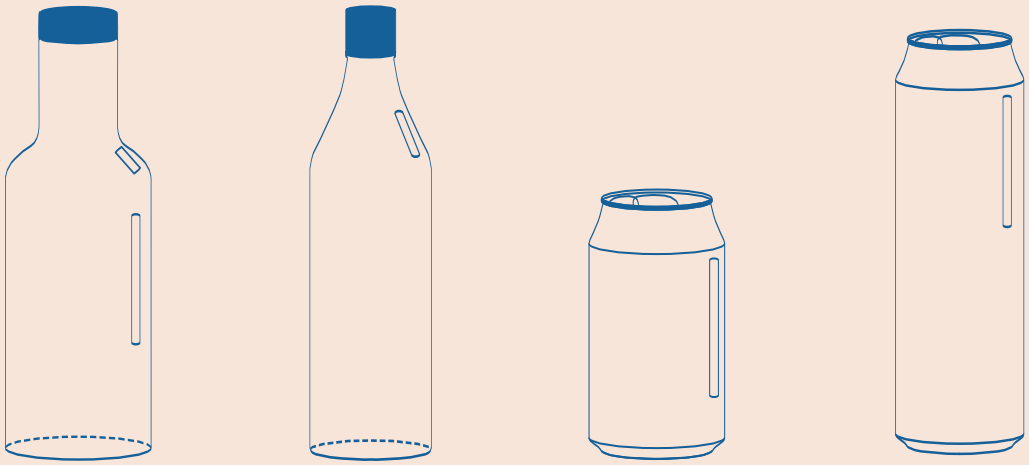
Your Job

Acme is planning to hold a company-wide meeting to decide on a strategy for producing the new soft drink. Before this meeting, Acme has asked individual teams, each consisting of one member of the Corporate Citizenship, Finance, Marketing and Sales, and Production Departments, to come up with a Soft Drink Production Plan to share with the company.

Meet with other representatives from your department to discuss the new soft drink and make some preliminar y decisions. Then attend a team meeting with one representative from each department, where you'll share your department's information and concerns. Keep in mind, however, that other representatives will have their own information and concerns, which you may not be aware of . Since everyone's concerns and expertise will be different, you and your team members will have to make some compromises as you work to design and produce a profitable product that consumers will buy.

Finally, your team will present its Soft Drink P roduction Plan during the company meeting, and you and your co-workers will decide on a final plan. Y our team's challenge will be to persuade members of the other teams that your plan is the best one for Acme Soft Drink.

Container Choices for Acme's New Soft Drink



20-oz. "wide mouth" bottle **16-oz. plastic bottle** **12-oz. aluminum can** **20-oz. aluminum can**

DEPARTMENT PACKET:

Corporate Citizenship

As a member of Corporate Citizenship, you play a unique role in the or ganization. You are responsible for the following:

1. Ensuring that the company acts responsibly in regard to the environment and social issues
2. Interpreting government regulations and implementing practices in the company that comply with these regulations
3. Responding to consumers' concerns about products and manufacturing practices

Your department wants to make sure that the new product is environmentally sound and socially responsible. Corporate Citizenship has three primary concerns:

1. What materials will the packaging be made of , and are the production processes for the container environmentally sound?
2. Will the product contain recycled content?
3. Will the product contain caffeine?

You recently received an e-mail from a consumer group that is concerned about the caffeine levels in your soft drinks, which are heavily marketed to young people. Y ou also received a report on the environmental issues related to packaging materials and an informational Caffeine Brief from Acme's Research and Development Department. Using these documents as a guide, meet with other members of your department to come up with answers to the above questions and to gather any other relevant information specific to your department. Since other departments may want to take different approaches, based on their own concerns, you may want to come up with some **contingency plans** (alternative strategies) for each issue. For example, another department may have a reason to disagree with your choice of packaging materials; together , you will need to come up with a compromise solution. If you have a contingency plan that includes other materials options you might find acceptable under certain conditions, it will be easier to come to an agreement.

3/01 9:15 a.m

From: "Concerned Mothers and Others" **<concernedmoms@cmando.org>**

To: "Acme Corporate Citzenship Dept." **<corporate_citizenship@acmesoda.com>**

Subject: Caffeine Levels in Acme Soft Drinks

To Whom It May Concern:

We at Concerned Mothers and Others (CMANDO) are very troubled by the use of caffeine in Acme's soft drinks and the company's continued marketing to middle and high school students. As you know, Acme's Extreme Cola contains 65 mg of caffeine, one of the highest levels in the industry! Scientific studies have shown that excessive caffeine consumption can be bad for children's health. Although you claim that this product is not marketed to children, it is one of the most popular drinks on high school campuses around the country. CMANDO has heard that Acme is in the process of developing a new beverage that may include levels of caffeine equal to those in Extreme Cola. We want you to know that we are very disturbed by this trend toward higher caffeine levels in soft drinks. If you develop this new product with excessive caffeine levels, we will not stand idly by: We will organize a consumer boycott, not only of your new product, but of all of Acme's soft drinks.

Please consider the welfare of our children, and act responsibly!

Sincerely,

Lisa Smith
President
Concerned Mothers and Others

CAFFEINE BRIEF

Acme is considering using caffeine as an ingredient in its new soft drink. These are Acme's three caffeine choices:

Caffeine Level	Milligrams per 12 oz.
None	0
Typical soft drink	40
"Supercharged" soft drink	65

Facts About Caffeine

1. Caffeine is a drug that stimulates the central ner vous system. It is found naturally in coffee beans, tea, chocolate, and some other foods. Pure caffeine can be extracted from plants or produced synthetically. It has no odor or taste.

2. The effects of caffeine can include:

   increased alertness
   feelings of greater energy
   reduction in muscle fatigue
   increased heart rate
   irritability
   insomnia

3. Caffeine is an addictive substance. Studies have shown that children and young adults can become just as addicted to caffeine as adults, and manifest similar withdrawal symptoms if they are deprived of it.

4. Withdrawal symptoms include:

   headaches
   irritability
   tiredness
   inability to think clearly

5. Although there have been many studies conducted on caffeine's effect on the body, results are still inconclusive. Some groups maintain that it can be harmful, while others say that it is safe for ever yday use.

6. Very small children are less able to process caffeine; the drug stays in their bodies for a longer period of time and has a greater effect.

7. Some experts say that 50–100 mg of caffeine a day is fine for adolescents and young adults.

8. Large doses of caffeine can cause excessive excretion of calcium and magnesium, both of which are needed to build strong bones. Some experts worr y that children who consume too much caffeine may not be building strong bones during a critical development period.

9. Caffeine can also act as an appetite suppressant, and some worr y that young people who drink too many caffeinated beverages are not eating enough healthy foods to get the nutrients that are essential for proper growth.

Caffeine Levels in Soft Drinks and Other Beverages

The following chart illustrates typical caffeine levels in some brand-name soft drinks and other caffeinated beverages:

Beverage	Caffeine Level (mg)
Drip Coffee, 7 oz.	115–175
Espresso, 2 oz.	100
Acme Extreme Cola, 12 oz.	65
Mountain Dew, 12 oz.	55
Pepsi, 12 oz.	38
Coca-Cola, 12 oz.	34
7-Up, 12 oz.	0

REPORT ON PACKAGING MATERIALS AND ENVIRONMENTAL IMPACT

Overview

Acme is considering four different packaging options for the new soft drink: a 12- oz. aluminum can, a 20-oz. aluminum can, a 16-oz. plastic bottle, and a new 20- oz. "wide mouth" plastic bottle that the Engineering Department has developed. Acme will use only one of these four containers for its new soft drink for the foreseeable future.

Aluminum Cans

Raw Materials

Aluminum is made from a naturally occurring mineral, bauxite, which is a non-renewable resource. Bauxite is refined, mixed with small amounts of other metals, cast into ingots, rolled into long sheets, and sent to Acme and other can-manufacturing plants.

The aluminum-making process produces air emissions, such as hydrogen fluoride, carbon monoxide, sulfur dioxide, and volatile organic compounds, all of which can be harmful to the environment if the process is not controlled properly.

The aluminum-making process is very energy-intensive.

Manufacturing Process

Cans are stamped out of aluminum sheets, shaped, cleaned, printed, baked, coated with a protective spray , baked again, and tested for leaks. After filling, they are fitted with a lid.

One process of concern in can manufacturing is the use of thermal curing (i.e., baking cans at a high heat to dry the protective coating). The thermal curing process releases volatile or ganic compounds and carbon dioxide into the environment.

An alternate curing process uses ultraviolet light, which significantly reduces emissions and, in the long run, is cheaper. Acme currently uses thermal curing but could move to ultraviolet light, though the change could be costly.

Recycling

Currently, more than 60 percent of aluminum cans in the United States are recycled. However , virtually all cans could be recycled.

Recycled aluminum from cans can be used to make new cans. In some cases, recycled cans can be back on supermarket shelves as new containers in two months.

Using recycled aluminum reduces the energy costs associated with producing an aluminum can by 95 percent.

Acme will be able to use approximately 50–55 percent recycled aluminum in its new cans.

Plastic Bottles

Raw Materials

Plastic is made of oil, natural gas, or coal, all of which are non-renewable resources. The raw material is heated, and, in the presence of a catalyst, its large molecules are broken down into smaller ones. These molecules are then chemically bonded into chains, called polymers. This process creates plastic resins that can be used in a variety of products, including soft-drink bottles.

Manufacturing PET resin, the plastic resin used to make soft-drink bottles, generates toxic emissions, such as nickel, ethylbenzene, ethylene oxide, and benzene.

The plastic-making process is also energy-intensive.

Manufacturing Process

Heated PET resin is injected into bottle-shaped molds. The resin is forced against the sides of the molds, using compressed air, and then cooled. This process is called blow-molding. Lids are attached after the bottles are filled.

Acme does not currently manufacture plastic bottles, but, if it did, it would now be possible to eliminate most waste and pollution in the plastic-bottle-making process. However, one of the solvents commonly used to clean bottle molds has been implicated in ozone depletion and global warming. This solvent could be replaced by a biodegradable solvent, but the cost would be considerable.

Recycling

The percentage of PET bottles that are recycled has been steadily declining since 1995, while the number of pounds recycled per year remains steady. The current rate of recycling is slightly more than 20 percent. This is in part due to the lar ge increase in soft drinks available in plastic containers, and per haps also to consumer difficulty in accessing plastic recycling bins.

Plastic bottles are generally **downcycled**, that is, they are not reused to make the same product but are used in a product of lesser value. Recycled PET is generally used in carpets and as clothing material, such as polyester fleece.

It is possible to use recycled PET in soft-drink bottles, but it costs more than using new PET resin. Corporate Citizenship would like Acme to use 25 percent recycled PET if the new soft drink comes in plastic bottles.

The energy used to recycle plastic bottles is eight times less than the ener gy required to make the same amount of new resin. Extracting and refining the raw materials for plastic resin is ener gy-intensive. Plants that manufacture new PET resin use fossil fuels (oil or coal) for power , and release carbon dioxide into the atmosphere.

Using recycled plastic also decreases the emission of carbon dioxide and nitrogen oxide.

DEPARTMENT PACKET:

Finance

As a member of the Finance Department, you have four primary responsibilities:

1. Working with other departments to plan, build, and market products that are profitable
2. Developing corporate budgets and monitoring company performance
3. Processing invoices and payments
4. Preparing annual financial statements for stockholders, governmental agencies, and managers

Your department's primary concern for this new product is that it be profitable for the company. The soft drink should be purchased by as many customers as possible at the maximum price they're willing to pay. It should also cost the company as little as possible to produce, so that the **net profit** per unit (the amount earned per unit after all expenses associated with producing and selling the product are deducted) is high. The Finance Department also has some other concerns:

1. What material should the packaging be made of?
2. What size bottles should be used?
3. What should the marketing strategy be?
4. At what price should the soft drink be sold?

You have just received a report containing financial information affecting the development of this new product. Using this report as a guide, meet with other members of your department to come up with answers to the previous questions and to gather any other relevant information specific to your department. Since other departments may want to take different approaches, based on their own concerns, you may want to come up with some **contingency plans** (alternative strategies) for each issue. For example, another department may have a reason to disagree with your choice of marketing strategies; together, you will need to come up with a compromise solution. If you have a contingency plan that includes other marketing strategies you might find acceptable under certain conditions, it will be easier to come to an agreement.

NEW SOFT DRINK DEVELOPMENT REPORT

Finance Department Profit and Marketing Guidelines

Acme's profit guidelines are included here as a reminder of Finance's primary considerations regarding this new product.

All products must meet Acme's minimum profit standard. This means that the materials, production, and distribution costs cannot exceed 45 percent of the consumer price per unit. For example, if the consumer price of a soft drink is $1, then the production cost per unit cannot exceed $.45.

It is desirable to maximize the profit per soft drink; however, the profit must eventually be balanced against consumer needs. If the product has a high profit but consumers don't purchase it, Acme will still lose money. Marketing costs should be minimized while still reaching the largest audience.

Materials, Production, and Distribution Costs

The Finance Department has researched the price of four different packaging options for the new soft drink:

- Option 1: Traditional 12-oz. aluminum can
- Option 2: "Super-size" 20-oz. aluminum can
- Option 3: 16-oz. plastic bottle
- Option 4: 20-oz. wide-mouth plastic bottle—a new design the product design team has been exploring

Packaging	Material Cost per Unit	Soft-Drink Cost per Unit*	Production and Overhead Cost per Unit	Distribution Cost per Unit
12-oz. aluminum can	$00.15	$00.015	$00.10	$00.01
20-oz. aluminum can	$00.19	$00.025	$00.12	$00.02
16-oz. plastic bottle	$00.11	$00.020	$00.20**	$00.02
20-oz. plastic bottle	$00.14	$00.025	$00.25**	$00.03

* Although Acme has not yet decided whether to include caffeine in this soft drink, its inclusion will not have an effect on the soft-drink cost per unit.

** Currently, no Acme products are packaged in plastic bottles. If Acme puts its new soft drink in bottles, it will need to build a new production line, which will increase the cost of production.

Another materials consideration is recycled content. Representatives from Corporate Citizenship have indicated an interest in including post-consumer recycled materials in the new soft-drink containers. While recycled aluminum ore costs approximately the same as vir gin (newly produced) ore, recycled plastic resin costs twice as much as vir gin resin. It is not currently known what percentage of recycled resin is being considered for the new design. Finance should calculate the costs of plastic bottles with 5-, 10-, and 25-percent recycled content.

Retail Price

Research indicates that consumers have a different "price threshold" for each packaging option. If the price per unit exceeds this threshold, sales will drop off , making the product unprofitable. Interestingly, the price threshold is not strictly related to the amount of soft drink per unit. Competitor pricing of similar products is also included in the Packaging Prices table. (No competitor pricing was available for the 20- oz. bottle, since it is a new design.)

Packaging Prices

Packaging	Consumer Price Threshold	Competitors' Retail Pricing
12-oz. aluminum can	$00.65	$00.65
20-oz. aluminum can	$00.85	$00.80
16-oz. plastic bottle	$00.85	$00.85
20-oz. plastic bottle	$01.10	N/A

Marketing Costs

Acme has four different marketing options for the new soft drink: TV , radio, newspapers, and billboards. The company is likely to use a combination of two or three of these to reach the lar gest audience possible. The initial marketing campaign will run for eight weeks. The Marketing Costs table indicates the cost for each marketing strategy if it is used nationwide for eight weeks, as well as the number of people in the tar get audience who will be exposed to each marketing campaign. The cost includes both the production costs and the costs of purchasing airtime, newspaper space, or billboard space. The marketing budget for this project is $23 million.

Marketing Costs

Marketing Strategy	Cost	Total Target Audience Reached
Prime-time television, 30-second ads	$16.5 million	760 million
Non-prime-time television, 30-second ads	$7.5 million	300 million
Radio, 30-second ads during "drive time"	$4 million	350 million
Newspapers, half-page ad in all major papers	$2.5 million	300 million
Billboards, 10 in all major cities	$2 million	400 million

DEPARTMENT PACKET:

Marketing and Sales

As a member of the Marketing and Sales Department, you have four primary responsibilities:

1. Conducting market research to determine customers' demands
2. Developing advertising strategies that attract customers
3. Selling the product to wholesale and/or retail customers
4. Maintaining customer relationships

First and foremost, it is your department's job to make sure that this new soft drink appeals to customers. While the Marketing and Sales Department agrees that the lemon-lime flavor could be popular, it has some other concerns:

1. What will the packaging look like? What is most likely to attract customers?
2. Should this soft drink contain caffeine?
3. It is now mid-March; when should the soft drink be introduced to the market?
4. Which marketing strategy should the company focus on: television, radio, print, or billboards?

Your department has been conducting some **market research** by collecting and evaluating information about how consumers behave and what they want from products. You need to determine what consumers are looking for in a new soft drink. You have just received a memo containing the results of the research, as well as a brief on marketing strategy. Using these documents as a guide, meet with other members of your department to come up with answers to your questions and to gather any other relevant information specific to your department. Since other departments may want to take different approaches, based on their own concerns, you may want to come up with some **contingency plans** (alternative strategies) for each issue. For example, another department may have a reason to disagree with your choice of marketing strategies; together, you will need to come up with a compromise solution. If you have a contingency plan that includes other marketing strategies you might find acceptable under certain conditions, it will be easier to come to an agreement.

Soft Drink Company

Memo

To: All Marketing and Sales Staff

From: Market Research

Date: March 16th

Re: New Soft Drink Research Results

As you know, Acme is in the process of developing a new lemon-lime-flavored soft drink. We have recently compiled the results of some relevant market research, which focused on the behavior patterns of the new soft drink's target audience of 14 to 26 year olds, especially in regard to beverage purchase and consumption. The results are as follows.

Flavor and Caffeine Content
Senior management at Acme wanted Marketing to confirm that the lemon-lime flavor would be popular with consumers and to research consumer preference as to caffeine levels in soft drinks. Acme is considering making a soft drink with either no caffeine, 40 mg of caffeine per 12 oz., or 65 mg of caffeine per 12 oz.

The lemon-lime flavor appeals to a wide audience, and there is room in the market for a new competing brand. In a survey given to a random sampling of 10,000 people in the target audience, 55 percent said that they purchased lemon-lime soft drinks once every week or more often. Of this 55 percent, 90 percent would be willing to try a new brand. This survey confirms that Acme's decision to focus on the lemon-lime flavor is economically sound.

In a taste test, consumers preferred Acme's new soft drink 2 to 1 over the current leading brand. Caffeine preferences varied by age group. Eighty percent of 17 to 26 year olds surveyed preferred caffeinated soft drinks. Fifty percent of 17 to 26 year olds said that whether a soft drink was caffeinated influenced their purchasing decision "somewhat," although taste was more important. Acme's largest audience,17 to 22 year olds, preferred higher levels of caffeine, while 22 to 26 year olds preferred more moderate levels. Finally, 14 to 16 year olds did not care whether a soft drink contained caffeine. Each of these groups drank an average of two 12-oz. soft drinks a day.

Extreme Cola, which contains almost 20 mg more caffeine than the leading competitor's brand, is Acme's most popular product.

Packaging
Acme is considering four different packaging options for the new soft drink: a 12-oz. aluminum can, a 20-oz. aluminum can, a 16-oz. plastic bottle, and a new 20-oz. "wide mouth" plastic bottle that the Engineering team has developed. Acme will use only one of these four containers for its new soft drink for the foreseeable future.

Page 1 of 2

Soft Drink Company

When given a choice between aluminum cans and plastic bottles, 55 percent of consumers preferred plastic bottles. Reasons for choosing plastic bottles varied but included “drew my attention,” “more comfortable to hold,” and “contained more soft drink.” Reasons for choosing aluminum cans included “cheaper,” “colder,” “easier to stack in the fridge,” and “easier to recycle.”

Supermarkets are more likely to place plastic bottles in chilled “impulse purchase” displays located near checkout lines. However, cans are still the most common choice available in vending machines, which represent approximately 7 percent of Acme’s sales. No data are available on the percentage of sales resulting from “impulse purchase” displays.

In several tests performed in supermarkets around the country, consumers were given the choice of purchasing Acme’s Extreme Cola in each of the four containers listed above, with the following results:

- Thirty percent of consumers purchased prototypes of the new 20-oz. plastic bottle. When asked why they chose this container, responses included “looked cool,” “had more soft drink in it,” and “is easier to drink because of the bigger opening at the top.”
- Twenty-five percent of consumers purchased 12-oz. aluminum cans.
- Twenty-five percent of consumers purchased 16-oz. plastic bottles.
- Twenty percent of consumers purchased 20-oz. aluminum cans. Consumers who chose other containers were asked why they did not choose this can. Responses included “awkward size,” “wouldn’t fit in my car’s cupholder,” and “looked funny.”

Product Launch Date

It is now the middle of March. Acme needs to decide when to launch the new soft drink and begin a high-profile marketing campaign. Acme will only be able to sustain the marketing campaign for two months, so timing is critical.

Soft drink sales are at their highest during the summer and early fall. August, September, July, and June, in that order, are the peak months for soft-drink purchases.

There is an increase in soft-drink purchases during late August, when students go back to school, and another in late June, when summer vacation begins. A marketing campaign could be developed around either of these themes (“Back to school” or “School’s out!”).

Studies have shown that it takes approximately three to four weeks for product recognition and strong sales to develop.

MARKETING BRIEF

Acme is planning the **product launch** of its new soft drink with an eight-week marketing campaign. To introduce, or launch, the new product, Acme will advertise in two to three different formats, with a maximum budget of $23 million. The following chart, received from the Finance Department, outlines the current prices for an eight-week campaign for each advertising medium (including repeat viewings), and the target audience reached through each format:

Eight-Week Marketing Campaign Options

Marketing Strategy	Cost	Total Target Audience Reached
Prime-time television, 30-second ads	$16.5 million	760 million
Non-prime-time television, 30-second ads	$7.5 million	300 million
Radio, 30-second ads during "drive time"	$4 million	350 million
Newspapers, half-page ad in all major papers	$2.5 million	300 million
Billboards, 10 in all major cities	$2 million	400 million

Television Advertising

Advantages of Television Advertising

- Television reaches a large and diverse audience.
- Television's audience increases during fall and winter.
- Ratings **demographics** ensure that you can target your ad to the most appropriate audience.
- Consumers are left with strong impressions that stay with them when they make purchasing decisions.

Disadvantages of Television Advertising

- Television's audience decreases during spring and summer.
- Prime-time television ads are extremely expensive.
- Ads that run in times other than prime time are cheaper but less effective.
- Television audiences can change channels or leave the room during commercials.
- Viewers may ignore ads when viewing pre-recorded or taped programs.

Radio Advertising

Advantages of Radio Advertising

- Radio's listening audience increases during spring and summer.
- Radio is personal; if a DJ reads an ad on the air, it's an implied endorsement of the product.
- Since radio ads are inexpensive enough to place on several stations, listeners may hear the ad even if they turn the dial.
- If the right ad is used, radio is an effective way to sell an "image."

Disadvantages of Radio Advertising

- Radio's listening audience decreases during fall and winter.
- Listeners need to hear an ad four to six times before a message sinks in.
- People listen to the radio only during certain times of day, and they may not remember the ad when they go to the supermarket.
- Consumers can't see the product.

Newspaper Advertising

Advantages of Newspaper Advertising

- Ads can be targeted within the paper to reach the appropriate audience.
- Newspapers are portable, so consumers are more likely to be near supermarkets or vending machines when they read the ad.
- New ads can be run on short notice.

Disadvantages of Newspaper Advertising

- Newspapers are typically read once and then discarded.
- Other ads on the same page may compete for the reader's attention.
- Consumers may not read the ad.
- Newspapers are not read regularly by the target audience.

Billboard Advertising

Advantages of Billboard Advertising

- Ads have a captive audience; people can't "turn off" billboards.
- Billboards are seen by both people in cars and buses and people walking by (pedestrians).
- Billboards are an inexpensive way to create big, "splashy" advertising.

Disadvantages of Billboard Advertising

- If cars are moving quickly, the ad may not be seen.
- Some consumers consider billboards to be eyesores and may associate their negative reactions with the product.
- Targeting the ad's audience and measuring the ad's effectiveness is difficult.

DEPARTMENT PACKET:

Production

As a member of the Production Department, you have three primary responsibilities:

1. Making the required quantities of the product to the required specifications at the required time
2. Overseeing the quality of the product
3. Developing schedules for the production process

Your department is concerned about whether the new product can be efficiently produced, makes good use of Production's equipment and space, and can easily fit into production schedules. You want to have a say in the following decisions:

1. It is now mid-March; when should the company begin production of this new product?
2. What materials will the new packaging be made of, and what will the design look like?
3. In which plant will the new soft drink be manufactured?
4. Will the packaging materials contain recycled content?

You have just received a report with information about Acme's two production facilities, as well as an internal memo about the use of recycled content in packaging materials and a new coating method for aluminum cans. Using these materials as a guide, meet with other members of your department to come up with answers to the above questions and to gather any other relevant information specific to your department. Since other departments may want to take different approaches based on their own concerns, you may want to come up with some **contingency plans** (alternative strategies) for each issue. For example, another department may have a reason to disagree with your choice of packaging materials; together, you will need to come up with a compromise solution. If you have a contingency plan that includes other materials options you might find acceptable under certain conditions, it will be easier to come to an agreement.

FACILITIES REPORT

Overview

Currently, Acme has two large facilities in the United States: one in Iowa and one in Georgia. The Iowa plant manufactures Extreme Cola, and the Georgia plant manufactures Retro Root Beer and Super Orange Fizz. All of Acme's soft drinks are currently packaged in aluminum cans that are also made in the plants.

Acme is considering four different packaging options for the new soft drink: a 12- oz. aluminum can, a 20-oz. aluminum can, a 16-oz. plastic bottle, and a new 20- oz. "wide mouth" plastic bottle that the engineering team has developed. Acme will use only one of these four containers for its new soft drink for the foreseeable future. Acme is planning to begin production of its new line at the rate of 2 million cans or bottles per month, but anticipates that that number might double by the following spring.

Acme's Iowa Plant

Plant Information

The plant has three separate buildings, each dedicated to different aspects of the soft-drink-making process.

In Building A, the aluminum cans are manufactured. Cans are stamped out of aluminum sheets, shaped, cleaned, printed, baked, coated with a protective spray, baked again, and tested for leaks.

In Building B, the soft-drink ingredients are combined, put into cans, and carbonated, and the cans are fitted with lids.

Building C is currently used as a storage facility for soft-drink ingredients, coils of aluminum, and spare factory parts.

Current Production and Schedule

The Acme Iowa plant produces Extreme Cola exclusively. It manufactures an average of 6 million cans of cola each month.

The aluminum can-making facility currently runs at capacity about 80 percent of the time. The factory produces fewer cans during the winter months.

Building B has recently been outfitted with a state- of-the-art two-line filling machine. This machine currently works at only about 55 percent of capacity during peak production.

Workforce

The Acme Iowa plant currently employs 200 full-time workers who are directly involved in the soft-drink-manufacturing process. It also employs about 20 part-time workers who can work full time if production demands are high.

The unemployment rate in Iowa is relatively high, so it would be fairly easy to fill any new positions that resulted from additional production demands at the plant.

New Production Considerations

In Iowa, the Acme managers are considering moving to a new "just in time" inventor y system, which is already in use at the Geor gia plant. In this system, soft-drink ingredients and coils of aluminum sheeting are not delivered to the factor y until they are needed to make new cans of soft drink. Using this system would free up most of the space in Building C for a new production line, which, whether it made bottles or cans, would have a maximum capacity of about 6 million units per month.

Production of a new line could begin as early as July , depending on what the soft-drink container is made of .

Standard 16-oz. plastic bottle equipment is readily available and easy to install and maintain. This equipment could be ready for production by July 1st, and the filling equipment could be adjusted to hold plastic bottles by July 15th. The first bottles of soft drink could be shipped no later than July 20th.

The new "wide mouth" plastic bottle is a custom design. The plastic bottle equipment supplier will need to modify its equipment to meet Acme's needs, and this will take some time. The earliest the equipment could be up and running is September 1st, and shipping of the new soft drink could begin by September 7th.

Because the can-making facility in Building A is already working close to capacity , a new can-making line would need to be installed in Building C. Aluminum can-manufacturing equipment is lar ge and difficult to install, and Building C would need to under go some renovations before the new equipment could be put into place. The earliest that aluminum cans of the new product, whether 12 oz. or 20 oz., could be shipped is October 20th.

Acme's Georgia Plant

Plant Information

The Georgia plant is a more unified facility than the Iowa plant. Cans are produced at one end of a very large shop floor and moved directly to the filling line at the other end of the floor.

Current Production and Schedule

The Georgia plant produces both Super Orange Fizz and Retro Root Beer. These products are less in demand than Extreme Cola, so total production at the facility is about 4 million cans per month.

The can-making and can-filling lines are both running at about 65 percent of capacity. The current maximum production capacity is 6 million cans of soft drink per month. However, with some substantial modifications to the lines, production could be increased to 9 million cans per month.

The Georgia plant uses a multi-filling machine that can simultaneously fill 12- oz. cans with three different flavors of soft drink.

Workforce

Acme's Georgia plant currently employs about 130 full-time workers on the plant floor.

The community and the surrounding areas in Georgia are currently experiencing very low unemployment rates. It would take a couple of months to find enough employees to support increased production at the plant, and they would need to be paid more than their counterparts in Iowa.

New Production Considerations

There is not enough space at the Georgia plant to install an entirely new production line, so the Georgia plant cannot manufacture either of the new plastic bottles that Acme is considering.

Renovations to Acme's current production line would take about three and a half months to complete, since the facility could not be shut down while they were taking place. The new soft drink could be shipped by August 15th.

If Acme decides on a 20- oz. aluminum can, the current can-making equipment can be modified, but a new filling line will need to be installed next to the current one. This will add a month to the production schedule and means that the current filling line will still not be working to capacity.

2/28 11:49 a.m

Soft Drink Company

From: "Douglas Tran" **<dtran@acmesoda.com>**

To: "Acme Production Dept." **<production@acmesoda.com>**

Subject: Recycled PET resin and UV can coating

Dear Production Team,

As we move forward with production plans for Acme's new soft drink, the folks at Corporate Citizenship have asked us to look into two new production possibilities that they say would be more environmentally responsible. First, they want us to look into using recycled PET resin if we go with plastic bottles. I've had Sarah from the Engineering Department look into this, and it turns out that there are some problems with plastic resin.

As you all know, soft-drink bottles need to be strong enough to withstand the pressure from the carbon dioxide that makes the drink fizz. Recycled resin has to be reprocessed (which is very expensive, by the way–recycled costs twice as much as new resin) to increase the strength of the product. Even then, there are still issues with quality control and strength. We can't use any more than 10 percent recycled, or we'll have some quality control problems on the shop floor. In my opinion, we shouldn't use more than 5 percent, just to be on the safe side. (As you know, we already use about 55 percent recycled aluminum in the can-making process.)

On the other hand, if we go with aluminum, Corporate Citizenship wants us to change the way that we coat the cans. Right now, after we spray on the protective coating that prevents erosion, the cans are baked at extremely high temperatures in order to dry. It turns out that this process releases solvents into the air, which is not good for the environment. However, there's a new kind of coating available that can be dried by using ultraviolet light. Because the cans aren't heated, they release fewer solvents into the atmosphere. This process also uses less energy, which, in the long run, will save a little money for the plants. That is all well and good, but I'm concerned about installing the new system. If we put it in the Georgia plant, we'll have to stop can production for a few days, and the cost will come out of the plant's operating budget. However, if we install it in Iowa, it will go in with the rest of the new equipment, and it won't cost much more than the regular heat-based equipment. I'm relying on you to decide what would be best for both Production and the whole company.

Douglas Tran
Vice President and Manager
Production Department
Acme Soft Drink Company

HOLD A DEPARTMENT MEETING

Meet with other members of your department at Acme to come up with answers to the questions your department is concerned about. Although there is no written assignment to turn in right now, be sure to take good notes; you will need them when you meet with your Company team to develop a final production plan.

HOMEWORK 3.2

Read **Department Descriptions** and write your answers to the following questions:

1. Which of these departments would you most like to work for? Why?
2. What two tasks might you be responsible for if you worked in this department?
3. Would you like to work for any of the other departments you learned about during the class discussion? Why?

Department Descriptions

Corporate Citizenship

The Corporate Citizenship Department plays a unique role in the or ganization. It has three key responsibilities:

1. Ensuring that the company acts responsibly in regard to the environment and social issues
2. Interpreting government regulations and implementing practices in the company that comply with those regulations
3. Responding to consumers' concerns about products and manufacturing practices

Corporate Citizenship wants to make sure that this new product is environmentally sound and socially responsible.

Finance Department

The Finance Department has four primary responsibilities:

1. Working with other departments to plan, build, and market profitable products
2. Developing corporate budgets and monitoring company performance
3. Processing invoices and payments
4. Preparing annual financial statements for stockholders, governmental agencies, and managers

Finance's primary concern for this new product is that it be profitable for the company . The soft drink should be purchased by as many customers as possible at the maximum price they 're willing to pay, while costing the company as little as possible to produce, so that the net profit is high.

Marketing and Sales Department

The Marketing and Sales Department is responsible for the following:

1. Conducting **market research** (surveying potential customers) to determine customers' demands
2. Developing advertising strategies that attract consumers
3. Selling the product to wholesale and/or retail customers
4. Maintaining customer relationships
5. First and foremost, it is Marketing's job to make sure that this new soft drink appeals to customers.

Production Department

The Production Department has three key responsibilities:

1. Making the required quantities of the product to the required specifications at the required time
2. Overseeing the quality of the product
3. Developing schedules for the production process
4. Production wants to ensure that the new product is designed to be efficiently produced, makes good use of Production's equipment and space, and can easily fit into production schedules.

HOLD A COMPANY TEAM MEETING

Meet with representatives from the other departments to complete the Soft Drink P roduction Plan. Look at the **Soft Drink Production Plan and Company Presentation Assessment** to see how your work will be evaluated.

As you complete the **Soft Drink Production Plan**, you'll need to work together as part of a team to come up with solutions that benefit ever yone. Your team will present your plan to the company and try to convince them that your approach is best.

PRESENT PRODUCTION PLANS AND WRAP UP

Present your final production plan to the other company teams during the company -wide meeting. Remember, you are trying to persuade them that your plan is the best, so be clear about why your team believes that its decisions are the right ones.

When each team has presented and the class has decided on a final production plan, consider the following:

1. Were there disagreements between the different departments over any of your decisions? If so, why did the departments disagree?
2. Did one department have more influence over the decision-making process than the others? Were there some goals that took precedence over others? If so, why?
3. Were there departments not present at the company meeting that contributed to the product design? If so, what role did those departments play in the process?
4. You were asked to make decisions about a new product in two days. How long do you think this process might take in a real company?

HOMEWORK 3.3

Read **Processes and Flowcharts**.

EXTENSION

3.1

Create a name, logo, and advertising slogan for your soft drink.

Processes and Flowcharts

A process is a series of actions or operations by which **inputs** (such as raw materials) are transformed into **outputs** (products or services). An everyday example of a process is cooking. Through a series of actions, you take ingredients and transform them into a meal. In a manufacturing plant, a process may be a series of assembling operations that result in a product, such as an automobile, a microchip, or an envelope. A process might also be referred to as a procedure or a plan. It can be a simple series of actions or a complex series of actions. When designing a process, it's important to consider factors that might limit the process. For example, what if you couldn't get the tools you need for the process? Availability of tools is one factor that might limit a process. All processes also have customers or people who have a stake in the quality of the product or service that results from the process. When designing a process, it's important to consider the customer (which may just be you).

Communicating a Process

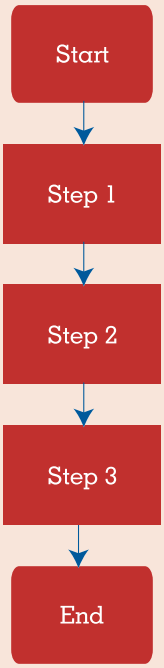
Once you have designed a process the next step is to clearly communicate that process to the people who need to make it happen. Have you ever tried to put something together using an unclear set of instructions? What was the result? What could have made the instructions clearer? Think about what information needs to be included in the instructions about a process to make them effective. Consider the following instructions for making a peanut butter and jelly sandwich:

1. Put peanut butter on bread.
2. Put jam on bread.
3. Put the slices of bread together.

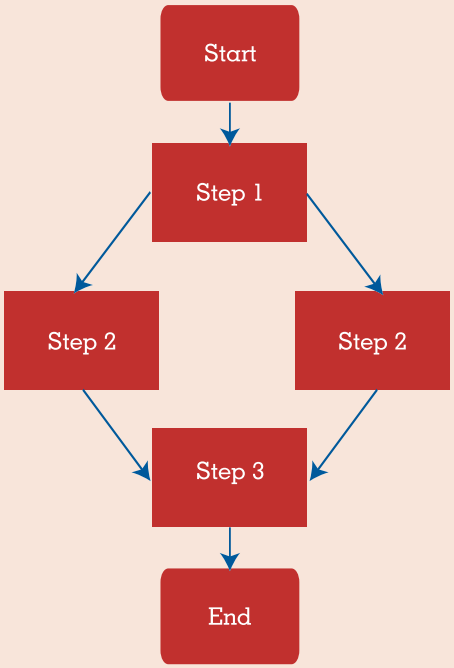
What about these instructions is clear? What would make them clearer?

Flowcharts

One way to convey information about a step-by-step process is to create a **flowchart**—a diagram that shows the starting and ending points in a process and the sequence of actions at each step (or workstation) within the process. For example:

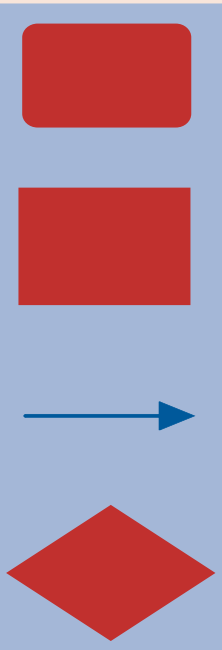


A flowchart can also show that more than one workstation is needed to carry out an action. For example:



The following table shows four basic symbols used to make a simple flowchart.

Flowchart Symbols



A rounded rectangle marks the start or end of a process. Usually this symbol is labeled with the words "Start" or "End."

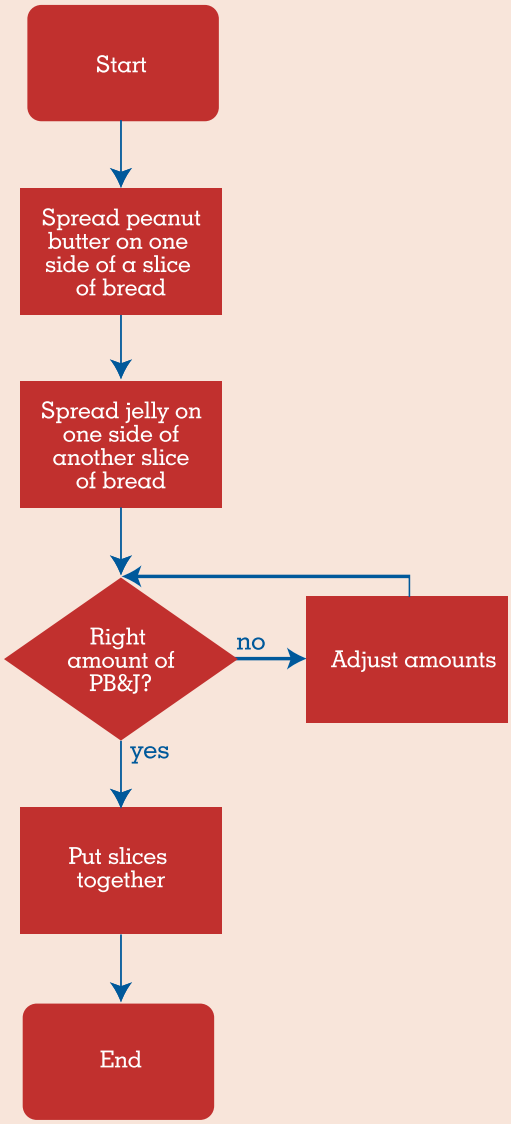
A rectangle indicates a single step in a process, such as "Measure one cup of flour." A rectangle can also indicate an entire subprocess within a lar ger process, such as "Make cake." In most flowcharts, the rectangle symbol is used most frequently.

A line with an arrow indicates the sequence of steps and the direction of the flow of work.

A diamond indicates a decision step. Usually, the question in the symbol will require a "yes" or "no" answer, and then lines will branch off from this symbol to different parts of the flowchart according to the answer .

In the following flowchart, describing how to make a peanut butter and jelly sandwich, the diamond shows where a decision about sandwich quality needs to be made. Notice that the next step to take differs depending on your answer to the question posed in the diamond.

Questions for Reflection



1. Could you follow these written directions and make a peanut butter and jelly sandwich?
    - Put peanut butter on bread.
    - Put jam on bread.
    - Put the slices of bread together.
2. What steps would you need to add to the directions if someone had never seen a sandwich before?
3. Could you follow the directions in the flowchart to make the sandwich?
4. What steps would you need to add to the flowchart?
5. Where could decision steps be added to the flowchart to ensure the quality of the final sandwich?
6. What pictures could you add to make the flowchart more effective?

ACTIVITY 4:
Putting a Product Together

INTRODUCTION

Did you know that the first envelopes were made by the Babylonians in 2000 B.C.? They enclosed tablets in clay wrappers, which they crimped together and baked. For this activity, you'll be making envelopes of a more modern variety. The purpose of this activity, however, is not to learn how to make envelopes but to learn what is involved in designing a production process. It is important to use clear instructions and communication in the production process. You will also be introduced to some different approaches to the assembly of products.

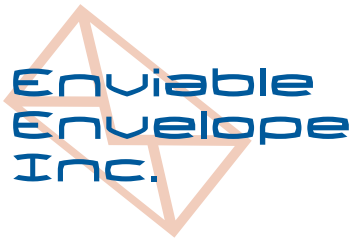
Learning Goals

- Describe the advantages and disadvantages of division of labor as compared with other production systems.
- Develop, evaluate, and revise a step-by-step procedure for making a product.
- Construct and interpret flowcharts and process tables representing multi-step processes.
- Collaborate with team members to complete a project.

FOR YOUR GLOSSARY

Blueprint	**Flowchart**	**Outputs**
Division of labor	**Inputs**	**Template**

PLAN A PROCESS



The Enviable Envelope Company has found so many problems with quality on its production lines that it is seeking proposals for the design of new assembly lines. Your team's job is to create a production process for producing one type of envelope and to evaluate other design proposals.

Your Production team needs to develop a production kit that includes ever ything the assembly-line workers at Enviable Envelopes need to make lar ge quantities of high-quality envelopes. The first part of your production kit will be a **blueprint** for making an envelope. A blueprint is a detailed plan or set of instructions. Your blueprint will include a list of materials and a **template**, a pattern or diagram that is used to guide someone in tracing, cutting, or otherwise manufacturing something. The production kit will also include a flowchart and process table to provide more information about the production process.

DID YOU KNOW?

Why is it called a blueprint?

Since the 1800s, great strides have been made in people's ability to copy documents. Before 1840, making a copy of a drawing, map, or architectural plan meant tracing it by hand. The first major technological change in copying documents involved the use of sunlight!

> In 1840, Sir John Herschel, an English mathematician . . . and chemist, was working with light-sensitive emulsions. . . . He discovered that paper coated with potassium citrate and then exposed to light produced a blue color . By . . . drawing on thin, translucent paper and laying it on top of the coated paper and exposing these layers to sunlight, he . . . produced a print of white images on a blue field (Smithsonian, 1997).

Herschel's invention was modified and refined over the next one hundred years. The original blueprints, blue paper with white lines, were common prior to the invention of the copy machine. Today, digital technology continues to change the way graphics are reproduced. Now the term "blueprint" has taken on a broader meaning and includes any detailed plan or set of instructions.

Before you begin working on your production kit, look over the **Production Kit Assessment** to see the criteria that will be used to evaluate your work. The blueprint, flowchart, and process table that your team develops for your production kit must be clear enough for a team of workers to follow without asking additional questions.

Figure out how your envelope is made, and then put together a blueprint to describe that process.

CHECKING FOR QUALITY: SOONER THAN LATER?

During production, mistakes can be made anywhere in the process. When a defective product continues through the production process, time and materials are wasted at ever y step. Today many manufacturers build in quality checks at each step in the process to save time and money .

GO WITH THE FLOW

You now have a blueprint that describes how to make your envelopes, but Enviable Envelopes also wants you to provide some information that helps the company think about how the production process will flow and what workers will be doing. Consider what additional information a flowchart and process table can add to help the production workers. Use **Processes and Flowcharts** and the following sample process table to help you think about these questions:

1. How is information in a flowchart and a process table similar?
2. How is it different?
3. For what is a blueprint most useful? How about a flowchart? A process table?

DIVISION OF LABOR

Breaking down a production process into clear steps and assigning people and machines to accomplish each step is called **division of labor**. Henry Ford is famous for using this principle for his assembly lines. In 1908, when he began selling the Model T for $850 each, the car quickly became very popular, and Ford soon couldn't meet the demand for it. His solution was to install a moving belt in his factory so employees could build cars one piece at a time, rather than one car at a time. Each employee focused on doing one thing very well, rather than being responsible for a number of tasks. Ford's new system produced cars so quickly and efficiently that the cost of assembling the cars decreased significantly. Ford decided to pass these savings to his customers, and in 1915 he dropped the price of the Model T to $290.

Sample Layout of a Process Table

Step #	Job Title	Job Description	# of Workstations	# of Workers at Each Workstation	Tools and Materials	Output

Create a flowchart and a process table for your envelope production process.

HOMEWORK 4.1

Make a process table to represent an ever yday process, such as making a meal or washing your hair . Create a flowchart that shows the steps involved in the process, including checks for quality.

TEST AND REFINE A PROCESS

Once you've developed a production kit, try out the process. Make at least 10 envelopes following the process you have developed. Pay attention to any problems, and revise your kit to correct those problems. Consider the following questions as you test your process:

1. Are the instructions clear?
2. Do the instructions describe everything you need to know to make a quality envelope?
3. Do you have adequate quality checks during the process?
4. How will you check the quality of your completed envelopes?
5. Is the process efficient? How long does it take?
6. A bottleneck is an area where the work is backing up. Will any steps turn into bottlenecks?

EVALUATE A PROCESS

Your team is going to take on the role of production testers at Enviable Envelopes. Exchange production kits with another team that developed a kit for a different kind of envelope. Your job is to try to make 20 envelopes following the process outlined in the other team's kit. As you do this, the other team will test your kit. Afterward, you will exchange feedback about the quality of each kit.

To prepare your feedback, write your answers to the following questions:

1. Can you easily follow the instructions provided? If not, what instructions are unclear? What information is missing?
2. What is helpful about the instructions? What characteristics of the instructions make them effective?
3. Do you know if you are following the instructions correctly? If so, how? If not, how would you change the instructions so that it's clear you are following them correctly?

WRAP UP

Consider the following questions about the envelope-making process you have just completed:

1. When you developed the envelope-making process, did you tr y different arrangements of workers?
    - What worked best? Why?
    - What are some benefits of division of labor?
    - What are some disadvantages of division of labor?
2. Was one person responsible for quality control, or were quality checks done by each person at each stage of the process? Which technique produced higher -quality envelopes?
3. What parts of the envelope-making process do you think machines could do rather than people?
4. What were the characteristics of effective instructions in this activity?
5. Did you work well as a team?
    - Why or why not?
    - How did you decide who was going to do what?
    - What makes a good team member? What do you expect from other team members?

HOMEWORK 4.2

Complete the **Teamwork Skills Assessment**.

EXTENSION

4.1

The development of the envelope has a long history. In 1997, Maynard Benjamin, president of the Envelope Manufacturers Association, shared his knowledge with *Smithsonian Magazine*. Benjamin explained that because paper was so expensive, for many centuries letters were simply folded and sealed to make sure that unintended people didn't read them. By the 17th century, separate envelopes appeared in Spain and France. King Louis XIV of France (1638–1715) made it popular to use a cover to keep letters private. He had his secretary cut out forms with a template, and fold and paste them to make envelopes for his letters to his court.

Find out more about the history of the envelope. Use your research to propose ideas for future products for the envelope-manufacturing industry.

ACTIVITY 5:
Seeing Companies in Action

INTRODUCTION

How is sugar made? How is the body of a guitar formed? This activity takes you on a scavenger hunt for answers to these and other mysterious manufacturing questions! Y ou have thought about the decisions involved in planning how to manufacture a product, and you have designed your own manufacturing process for envelopes. Now you have the chance to explore how raw materials are turned into some other common products.

Learning Goals

- Describe at least five manufacturing processes, including quality control procedures, used in the production of ever yday objects.
- Conduct Internet research and summarize findings, incorporating appropriate citations.
- Develop and present a Microsoft® PowerPoint® presentation that incorporates text and graphics.

FOR YOUR GLOSSARY

Manufacturing process

GO ON A SCAVENGER HUNT

You and your team are going on a scavenger hunt—for information about how some common products are manufactured. A **manufacturing process** is a series of operations that transform raw or unfinished materials into finished products. These operations can be done by hand, by machine, or by a combination of both.

Read the **Scavenger Hunt** to find out what information to search for. Go to your assigned Web site—all the information you need to answer the questions about your product can be found there. As you answer each question, make sure that you cite the source of your information. You need to cite the name of the Web site and the Web site's URL (uniform resource locater), or address. You will use the information you gather to create a PowerPoint presentation to share with your classmates.

Before you begin your hunt, look over the **Scavenger Hunt and PowerPoint Presentation Assessment**.

CREATE A POWERPOINT PRESENTATION

Work with your teammates to create a PowerPoint presentation using the scavenger hunt questions and answers. Incorporate pictures or diagrams into your presentation, and cite your sources for information and pictures.

HOMEWORK 5.1

Identify the inputs and outputs involved in the manufacturing process for your scavenger hunt product.

GIVE PRESENTATIONS AND WRAP UP

Give your PowerPoint presentation and answer any questions. After teams have all completed their presentations, think about the following questions:

1. Which of the manufacturing processes were done by machine and which were done by people? Were there some that used both?
2. What are the advantages and disadvantages of each of these methods?
3. What kinds of checks for quality did you find in the manufacturing process?
4. What role do raw materials play in the quality of the final product, and what role does the manufacturing process play? Are there products for which one or the other of these might be more important?

HOMEWORK 5.2

Think about a bicycle. Which parts of a bicycle are you most familiar with? Note what you already know about the construction of bicycles and what you would like to learn about bicycles. Which features of a bicycle are most important to you?

EXTENSION

5.1

Go to the **Ford PAS Web site**, and choose another product. Research how this product is manufactured. Create a PowerPoint presentation describing the steps in the process of manufacturing that product. Include at least one diagram that shows the steps involved in the manufacturing process.

ACTIVITY 6:
Designing for the Future

INTRODUCTION

You have learned about inventions, how products change over time, what it takes to launch a new product, and the processes involved in putting a product together . Now you are ready to research and redesign a product—a bicycle. In this activity , you'll learn about the materials and designs of today's bicycles, and you'll use this knowledge to design a "bicycle for the future" for a particular consumer group. By the end of this experience, you'll be a bit of a bicy - cle expert (if you aren't already), and you'll have glimpsed the possible future of the bicycle.

Learning Goals

- Synthesize information in order to describe a complex process.
- Apply methods of production planning to an existing product.
- Develop a creative product design proposal that takes into account customers' wants and needs.

FOR YOUR GLOSSARY

Subassembly

RESEARCH BICYCLE SUBASSEMBLIES

Have you ever thought about how a bicycle is put together? Your Research team's job is to find information about one major bicycle subassembly and then prepare a chart displaying your research. A **subassembly** is a collection of related parts assembled into a unit that is one component of a final product. Later, you will work with your team to design a subassembly production process.

To begin your research, go to the **Ford PAS Web site** to look for the following information:

1. How does your subassembly work? What role does it play in the bicycle itself?
2. What are the individual parts of your subassembly? (Try to find at least six parts.) What is the function of each part of your subassembly?
3. How were the materials processed to make them suitable for each part?
4. How are the parts assembled into the subassembly?
5. How much do some materials cost compared to other materials? (For example, does aluminum cost more than titanium?)

Place the information about your bicycle subassembly on chart paper.

HOMEWORK 6.1

Interview two friends or family members about their bicycle-riding habits. Find out what they like about the design of bicycles they have ridden, and also what bothers them when they ride a bicycle.

DESIGN A BICYCLE SUBASSEMBLY PRODUCTION PLAN

The Swiftline Bicycle Company has just learned that your Research team is made up of experts on one of the subassemblies of a bicycle. The company wants to hire a team to design a subassembly production plan, and your team is an excellent candidate for the job. Your task is to design and present a production plan for putting your bicycle subassembly together. You need to figure out how a group of workers can efficiently make large quantities of the subassembly. Your goal is to do such a good job designing and presenting your plan that the Swiftline Bicycle Company selects it.

Look at the **Subassembly Production Plan Assessment** to see the criteria your teacher will use to evaluate your work. Plan your work with these criteria in mind.

Here's what you should include in your subassembly production plan:

1. A blueprint that describes the steps involved in making the subassembly .
2. A flowchart that shows the location of each workstation, with labels for the individual steps involved in making the subassembly, including checks for quality. Use **Processes and Flowcharts** on pages 54–57 as a guide.
3. A process table that identifies and clearly describes each job, the number of workers and workstations needed for each job, the tools and materials needed for each job, and a description of the output for each job. The Sample Layout of a P rocess Table shows how you might organize your information.

Sample Layout of a Process Table

Step #	Job Title	Job Description	# of Workstations	# of Workers at Each Workstation	Tools and Materials	Output

After you develop your blueprint, flowchart, and process table, review your plans to make sure that your production line is set up well and that the process results in high-quality bicycle subassemblies. Try to anticipate and correct any problems that might arise during production.

DISPLAY SUBASSEMBLY PRODUCTION PLANS

When the Research teams' charts and subassembly production plans are displayed, take a look at each one and record two pieces of information about each subassembly . The information you record should be facts that you think could help you think about how to design a new and improved bicycle.

DESIGN A BICYCLE FOR THE FUTURE

Engineering can be a combination of art, creativity, and imagination. You now have an opportunity to put your creativity and imagination to work as bicycle design engineers—but don't forget to think about the customer! You'll want to strike a balance between designing what you think would be a cool innovation and designing what customers are willing and able to buy.

Working in teams, develop a proposal for a bicycle for the future. Share the inter view data you gathered for homework with your Design team. As a team, specify a consumer group for whom you would like to design a bicycle. What are the preferences of this consumer group? Refer to the interview data you gathered.

Work together to come up with a bicycle design that addresses the features you think would be most important for your consumer group. Look at the **Bicycle Design Proposal Assessment** to see the criteria your teacher will use to evaluate your work, and plan your work with these criteria in mind.

DID YOU KNOW?

Did you know that riding your bicycle after dark is about four times more dangerous than daytime riding? Gregory Yoder and Matthew Young, two mechanical engineering students at the University of Florida, were concerned about how often their friends rode their bicycles at night, so they came up with an idea for a bicycle that glows.

University of Florida engineering students demonstrate a prototype of their glow-in-the-dark bicycle.

Yoder and Young thought that the technology used in a night light might be useful in making their friends' bicycle rides less dangerous. The glowing bicycle they designed is covered with battery-powered electro-luminescent panels that make the bicycle visible up to 600 feet away. The panels are better than reflectors, because the light will not dim when blocked from a light source. Night-time riders now have a safer way to get from place to place, thanks to these bicycle designers!

PRESENT AND EVALUATE BICYCLE DESIGNS

As each Design team presents its Bicycle Design P roposal, think about the following questions:

1. How practical is the design?
2. Which group of consumers would the design be most likely to appeal to?
3. Are there any problems that might arise in a bicycle with this new design?

EXTENSION

6.1

Research how the different subassemblies of a bicycle are put together to make a completed bicycle. Create a production plan for putting the subassemblies together , including a blueprint, flowchart, and process table.

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