

Humans have the ability to think and reason. How can we use our abilities to protect endangered species?

Preparing for Your Career

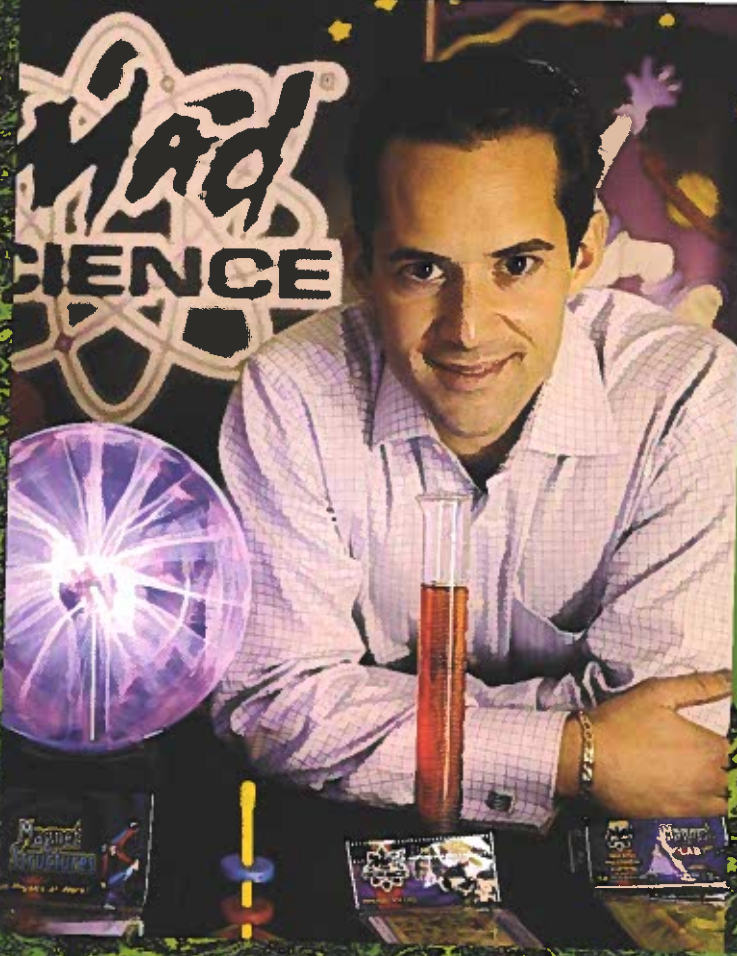
Better by
Design

Ariel Shlien created The Mad Science Group

Ariel Shlien is an entrepreneur who, together with his brother Ron, cofounded Mad Science. Their passion for science led them to develop activities that they performed at parties, as well as workshops at local schools and community centers. They provide a unique assortment of hands-on programs, live presentations, theatrical productions, and innovative products. The company is now franchised globally, in all major cities in North America and in 29 countries worldwide. They deliver over 200,000 presentations a year to 4.8 million children and their families.

The Mad Science Group makes learning science fun.

"Being an entrepreneur is all about having a vision, making it happen, and believing in yourself."



Reading Target

Connecting to Prior Knowledge

One good way to prepare yourself to read new material is to think about what you already know about the subject. What do you know about careers in technology? Use the Reading Target at the end of this chapter to record your ideas, even if you are not sure of some of the facts.

Key Terms

aptitude
break-even point
budget
business plan
career
career plan

corporation
customer service
debt
discrimination
distribution system
entrepreneur
entrepreneurship
equity
ethics
free enterprise system
goal
harassment
leadership
liabilities

long-term goals
marketing plan
mentor
overhead expenses
partnership
personal skills
short-term goals
soft skills
sole proprietorship
stock
stockholders
teamwork
work ethics
workplace skills

Objectives

After reading this chapter, you will be able to:

- Identify various career opportunities in technology.
- Develop a career plan.
- List skills needed to be successful in the workplace.
- Identify career opportunities that are available for students.
- Participate in a school-based company.

Useful Web sites:
madscience.org

A *career* is an occupation, a way of making a living. Farmers plant, fertilize, cultivate, and harvest crops. Ranchers breed, feed, and care for animals. Horticulturalists grow and maintain plants, shrubs, and trees. Forestry workers cut, transport, and process trees for papermaking, construction, and furniture manufacturing. Geologists locate minerals and fossil fuels. Miners operate the machinery to extract raw materials. Oceanographers study the plant and animal life of the oceans. Environmentalists try to find solutions to problems relating to land use, pollution, conservation of natural resources, and the preservation of wildlife.

Careers in Technology

The variety of careers available in the field of technology is almost endless. As our world becomes more closely tied to technology, even more new careers become available. In this chapter, you will learn about different types of companies. You will learn what is necessary to prepare yourself for a career of your choice. Even if you have not made up your mind about what career you want to pursue, you can take steps now that will help you prepare for any career in the future.

Types of Companies

There are three basic types of business ownership: sole proprietorship, partnership, and corporation. Each type has both advantages and disadvantages.

In a *sole proprietorship*, one person owns the company. See **Figure 17-1**. This person is responsible for all of the company's debts. Sole proprietorships are the easiest type of business to start because one person makes all the decisions.

A *partnership* is a business that consists of two or more people. These people draw up a contract that specifies each person's responsibilities. The contract also specifies how profits will be shared, how disputes will be settled, and how much money each person will contribute to the company. It may also specify how they will close the company and divide the assets, should the need arise.

A *corporation* is a legal entity that is not tied to a specific owner or handful of owners. Instead, it is owned by *stockholders* (people who buy *stock*, or shares, in the company). Large corporations may have thousands of stockholders. The stockholders elect a board of directors to make decisions and manage policies. See **Figure 17-2**. Corporations are different from sole proprietorships and partnerships in that the shareholders are not personally liable for the corporation's debt. If the company fails, their personal assets cannot be used to pay any debt the company has.



Figure 17-1. A sole proprietorship is owned by a single person. In some cases, a small sole proprietorship may require nothing more than a telephone and a computer.

Traditional Career Opportunities

Many technology-related careers are related to manufacturing or construction. The people who work in manufacturing have jobs in factories. Many work on the production lines, but other opportunities are available as well. For example, engineers carry out research to find new technologies. Market research analysts determine the need for new and existing products. Management personnel oversee the production or construction process. They also help ensure that the workplace is safe for workers.



Figure 17-2. A corporation's board of directors is responsible for making major decisions about product lines, investments, and other company matters.

People who work in the construction industry are responsible for planning and building structures. They may work on homes, bridges, dams, hospitals, highways, and shopping centers, among other things. See **Figure 17-3**. Skilled workers specialize in a trade. Examples include carpenters, plumbers, and roofing specialists. Civil engineers and surveyors perform many different tasks. They design and lay out structures, estimate costs, and prepare material specifications. They survey building sites and organize work schedules. Construction managers supervise the building process to ensure that the structure follows approved plans.

A growing number of technology-related careers are service-oriented. People in these careers may work for companies such as computer repair shops, information technology companies. See **Figure 17-4**. They may also work for nontechnical companies such as dry cleaners or a public library. These businesses, too, depend on technology.

Some service-related jobs are offered through the federal, state, or local government. These include public health services and public works facilities. Public works departments take care of many things we take for granted. For example, they keep the streets clean, clear snow from the streets in winter. They also maintain vehicles such as police cars, street sweepers, garbage trucks, and ambulances if these services are offered by the local government.

Entrepreneurship

An alternative to traditional careers in which you work for an established company is to become an entrepreneur. An *entrepreneur* is a person who owns his or her own company. *Entrepreneurship*, or becoming an entrepreneur, takes a lot of planning, determination, and skill. To be successful, an entrepreneur must be willing to work long hours. Success also depends on the person's knowledge of every aspect of the business.



Figure 17-3. Traditional construction workers work for companies that build structures of all kinds. These concrete specialists are pouring the concrete for a new bridge.

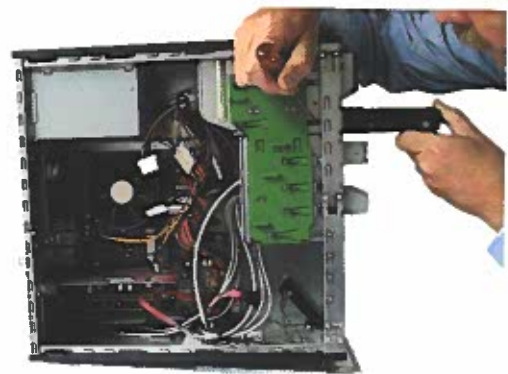


Figure 17-4. Computer repair is a technology-based business opportunity that has become necessary only in the last 30 years.

For example, suppose you started a business to sell mugs printed with the mascots of local high schools. You would have to know where to buy the mugs and how to have the mascots or logos printed on them. You would also have to know how many mugs to purchase, how many to print with each mascot or logo, and how much to charge for them to make a profit. You would have to know something about marketing and advertising. You would also have to be able to work with money so you could keep your accounting straight.

Entrepreneurship has many advantages over working for someone else. For example, you can set your own hours. You can choose your own equipment and make your own policies. You do not have to answer to a supervisor.

On the other hand, entrepreneurship also has disadvantages. Even though you can set your own hours, you will find that you need to work many hours a week. In addition, only a percentage of those hours will be spent actually doing the work. The remaining hours will be spent planning, purchasing, paying bills, and doing other accounting tasks. Also, even though you do not have to answer to a supervisor, you *do* have to be responsive to your customers. "People skills," such as getting along with others, are very important. You will be responsible for your own customer service. What if someone buys your product but then does not like it? What if the product breaks? You will need to develop customer service policies to cover these things.

Most entrepreneurs are sole proprietors because sole proprietorships are the easiest type of business to form. This adds an additional level of risk, however. If the business is not successful, the entrepreneur is personally responsible for any debt the business acquires.

Nevertheless, many entrepreneurs are both successful and happy with their career choice. By planning carefully and investing wisely in their company, they overcome any disadvantages and enjoy their independence. See **Figure 17-5**.



Figure 17-5. Even though this entrepreneur spends extra hours each evening working on accounts, he enjoys his work and is glad to be working for himself.

Developing a Career Plan

Whichever type of career you are considering, you can achieve it more easily if you have a plan. A *career plan* is a blueprint that will help you make the right choices to be successful in the career of your choice.

Identifying Interests and Aptitudes

When you were a child, you may have told people, “I want to be a movie star!” or “I want to be a police officer!” These ideas were based on your interests. Interest is an excellent starting point for choosing a career. Most careers, however, require much more than just interest. You must have an *aptitude*, or natural talent or ability, for the work.

Before you can create a career plan, you need to take a good look at your interests and aptitudes. Are you interested in mechanical objects and how they work? Do you like to build things? Do you enjoy solving puzzles? To begin work on your career plan, make lists of the things that interest you and the things you do well.

Identifying Strengths and Weaknesses

In addition to interests and aptitudes, everyone has specific strengths and weaknesses. For example, some people have a knack for working with other people. Someone with this strength might be good at customer service jobs that require calming angry customers. Other people seem to be able to fix just about anything. Someone with this strength would be good at service or repair jobs.

It is important to know your weaknesses as well as your strengths. If you lose your temper easily, for example, customer service is not the career for you. Understanding your strengths and weaknesses can help you choose a career that you enjoy and can do well.

Creating Your Career Plan

You may think it is too soon to begin working on your career plan. What if you change your mind about the career you want? You do not have to choose a specific career now. Keep in mind, though, that many exciting careers require advance preparation. You can do certain things now to make these careers possible later.

A career plan is not a static document. It can grow and change with you. By identifying a general *type* of career that interests you, you can help ensure that when the time comes to choose, you will have everything you need. You will be prepared to pursue any career that interests you.

Your career plan should be suited to your individual needs. It may not look at all like your best friend's career plan. However, all career plans begin with career goals. A **goal** is a statement of what you want to accomplish. Some goals are **short-term goals**—goals you can achieve in a year or two. Others are **long-term goals**. These goals may take many years to accomplish.

An example of a long-term goal is: "Work in the health care industry." This is a very broad goal that includes many different types of careers. Your long-term goal can be flexible. It will change along the way as you develop new interests and skills. You can make it more specific, or even change your mind completely and decide to pursue another goal instead.

After you specify your long-term career goal, think about steps you can take to accomplish it. One of the very first steps is usually to find out more about the career or type of career. What education will you need to work in this area? What classes can you take now or in high school that will make it easier to follow this career? List the steps you will take to begin preparing yourself for this career. **Figure 17-6** is an example of a career plan created by a student who is interested in agricultural technology.

If you do not have any idea of what career you might want, consider making not one, but several career plans. Create one career plan for each type of career you think you might be interested in. Find out more information about all of them. Then you can compare them to see which ones you want to pursue.

Career Plan	
Goal:	Career in agricultural technology.
Short-Term Goal:	Find out everything I can about agriculture and the people who work in agricultural technology.
Long-Term Goal:	Obtain a fun, satisfying job in agricultural technology that pays well.
Step 1:	Research to find all the different types of jobs available in agricultural technology.
Step 2:	Find out more about each type of job identified in Step 1, including education and experience needed.
Step 3:	Talk to people who currently work in agricultural technology to get first-hand information about their jobs.
Step 4:	Identify and take courses that will help me reach my goals.
Step 5:	Review my goals to see how much progress I have made.
Step 6:	Determine whether my goals are still valid, and revise them if necessary.

Figure 17-6. An example of a career plan for a student who is interested in agricultural technology. Notice that the student has not identified any specific career. She is still exploring options, and her career plan reflects that.

Workplace Skills

To be successful at any job, you will need more than just job-related skills. You will need *workplace skills*, which are sometimes called *soft skills*. These include communication skills and the ability to get along with other people. They also include work ethics, dependability, and punctuality (being on time for work).

Teamwork and Leadership

Teamwork, or working well with others, is one of the most important soft skills. See **Figure 17-7**. Most jobs require you to cooperate with other people on a daily basis. All team members are responsible for the final output or results of the project. However, each member in the team has individual responsibilities. Each member must fulfill these responsibilities if the project is to succeed. Therefore, part of being a good team member is to do the part assigned to you. Taking your share of the responsibility and doing your part will make you a respected member of any team.

All teams need a good leader. *Leadership* is the ability to guide team members and keep the team on track. It involves problem solving, creative thinking, and excellent communication skills. A good team leader respects each team member and inspires team members to contribute. To be a good leader, however, you must first learn to be a good team member.

Work Ethics and Legal Aspects

When you accept a job, you take on certain responsibilities. You are responsible for arriving on time and for doing your work properly. These and similar responsibilities are known as *work ethics*. Your employer relies on you to be dependable and to work within the company rules. In many cases, other people depend on you to do your job so that they can do theirs.

Figure 17-7. Teamwork helps any type of project run smoothly, whether it is related to school, work, or just having fun. These students are working together to finish a school project.



Your employer also expects you to work within the law and to treat everyone equally. **Discrimination** is the unfair treatment of someone based on a personal characteristic such as age or gender. Discrimination is against the law. Employers are not allowed to discriminate when they hire, and employees cannot discriminate on the job.

Harassment is another job-related issue. **Harassment** means tormenting someone by your words or acts. It includes making rude comments about someone or making fun of someone. It can even include teasing if you keep teasing someone even after that person has asked you to stop. In most companies, you can be fired for harassing coworkers.

Personal Skills

Your **personal skills** include communication skills and how well you get along with other people. They also include dressing appropriately for the job and behaving in a businesslike manner. See **Figure 17-8**. Your attitude toward your job, your employer, and your coworkers is another personal characteristic that is often grouped with personal skills. Employers look for workers who have a good attitude. Keeping a good attitude even when things go wrong is a good way to advance in your career.



Figure 17-8. Dressing appropriately for your job and maintaining a neat, clean appearance are important personal skills.

Student Career Opportunities

As a student, you have opportunities to explore many different kinds of careers. Various student organizations help students investigate career opportunities. Joining one or more of these organizations can help you find out more about careers you find interesting.

Technology Student Association

If you have thought of a future as an engineer, scientist, or technologist, you should consider joining the Technology Student Association (TSA). Over two million students have already participated in its activities. TSA provides projects and competitions suited to everyone, including activities related to every area of technology. Examples include agriculture and biotechnology, construction, digital photography, vehicle design, electronic gaming, video production, Web site design, and many others.

The TSA Web site (www.tsaweb.org) provides information about many topics of interest to technology students. State and local chapters allow you to become more fully involved with the organization. You can meet with other technology students, exchange ideas, and work on the TSA's current National Service Project.

Other Student Associations

Depending on your interests, you might want to check other resources. For example, Junior Achievement is a worldwide organization for elementary, middle, and high school students. This organization concentrates on helping students manage the financial aspects of a career, including entrepreneurship. You can go to the organization's Web site (www.ja.org) to find more information about how this organization can help you.

Your school or community might also offer associations that you can join to help you get started in a technology career. Check with your teacher to find out more about these and other opportunities.

School-Based Company

Are you curious about how it might feel to be a part of a company? This chapter provides guidelines for participating in a school-based company. See **Figure 17-9**. You can experience starting and running a company in a risk-free setting. The business you will develop will be one that the entire class can work on under the guidance of your teacher. Your class will select a business that you can set up and run within the school year.



Figure 17-9. Working with your classmates in a school-based business helps you learn about working in a company. It also builds important teamwork and communication skills.

Although the size of your business will not match that of the typical corporation, you will operate in a similar manner. You will become part of our free enterprise system. In a *free enterprise system*, people make most of the decisions about how to use the country's economic resources. The government does not specify who can do what job and for what amount of money. People are free to start a business or work for someone else. Their business can produce anything from athletic shoes to construction cranes. The four parts of the free enterprise system are:

- People who decide how to use resources and purchase goods
- Companies that produce goods and provide services to make a profit
- Markets that buy and sell goods, services, and finances
- Governments that make and enforce rules to protect rights and property

Deciding on a Product

The first place to look for ideas for a school-based business is the school itself. What are the needs in the school? What complaints do students or teachers have? What could be improved? **Figure 17-10** contains a few ideas. Use these as a starting point for a class brainstorming session.

Remember that you will not have a lot of time to form your company and make a product. The product you decide to make should be something simple. The equipment to make it should be readily available and easy to use. For example, suppose you decided to recycle paper. You could collect paper that has only been used on one side and then cut it into various sizes. You could then glue or bind the paper together to make notebooks and notepads. The equipment needed for this business would be a mechanical paper cutter, glue, cardboard, and a binding machine.

Product Theme	Possible Products
Sports	Banners, flags, or a large hand that could be carried and displayed by fans
Special Events	Posters, mugs, silk-screened T-shirts
Repairs	School desks, outside benches, tables
Recycling	Wastepaper, leftover food

Figure 17-10. Examples of ideas for products for a school-based business.



Think Green

Green Product Analysis

Many opportunities exist for providing environmentally friendly products and services. If you select such a product for your class company, you can help your school and community at the same time you practice running a business. After you brainstorm product ideas, test each idea for its “green quotient” by asking the following questions:

- Can the product be made from renewable resources?
- Can the product be made without the use of chemicals or processes that will harm the environment?
- Will the finished product be biodegradable? If not, what plans could be made for reuse or recycling?

Creating Your Business Plan

To start your business, you need a plan. Writing your ideas on paper is the first step in a plan to make your company come alive. A *business plan* serves several purposes. First, it serves as a road map that points the way to success. You may have to change your route if you encounter a roadblock, but the business plan always points to your destination.

A business plan also becomes a standard against which you can compare your success. It provides targets to aim for and completion dates. It lists important details and realistic ways to achieve your business goals.

Initial Plan and Feedback

After you have decided on the product your company will make, create a short version of a business plan. The purpose of this version is to explain your idea to a mentor. A *mentor* is someone who has knowledge about the product the class is proposing and agrees to provide advice. See **Figure 17-11**. This person can be your teacher or someone else in the community. The class should make a short presentation to the mentor using the short business plan. Include the following points:

- State the name of the proposed company and give a brief description of the product to be made

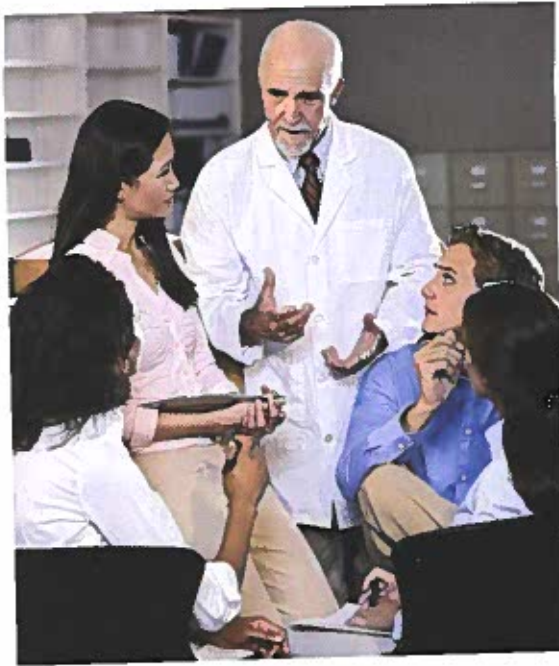


Figure 17-11. Mentors are professionals who have experience with the product or business you want to start. A mentor can help you start out right and stay on the right track as you develop your business.

- Explain why this type of business interests the class
- Explain the type of product and how it will be made
- Describe the advantages of the product over the competition
- Describe the qualifications class members have to operate the business
- State the proposed selling price of the item and the expenses to make it

Schedule 30 minutes after your presentation to listen to the mentor's suggestions. Later, discuss the mentor's ideas and modify the proposal before you begin work on the full business plan.

Avoiding Pitfalls

A detailed, well-thought-out business plan is vital to avoid some of the common reasons businesses fail. In fact, the process of creating a detailed business plan forces you to pay attention to all aspects of the company, including possible pitfalls.

One primary reason businesses fail is lack of research. It is important to learn all about the proposed product or service. Now is the time to think about selling points. What will set your product apart from the competition?

Financial problems are a second reason for failure. They can arise if you do not have enough capital to start. They can also be caused by not having enough cash flow to carry the company until the product begins to make a profit for the company. Poor management, failure to control costs, and failure to collect amounts due are other reasons for financial problems.

If the product does not meet customer needs, it will not sell well. Research into customer wants and needs is essential to avoid this pitfall. Finally, not having enough staff or having staff without the necessary skills can result in business failure.

Detailed Business Plan

Your detailed business plan can help you prevent all of the pitfalls mentioned in the previous section. **Figure 17-12** shows a recipe for a detailed business plan. Use this as a template to create a business plan that is specific to the product your company will make. Many sample business plans are also available on the Internet. You may want to look at some of them for further ideas.

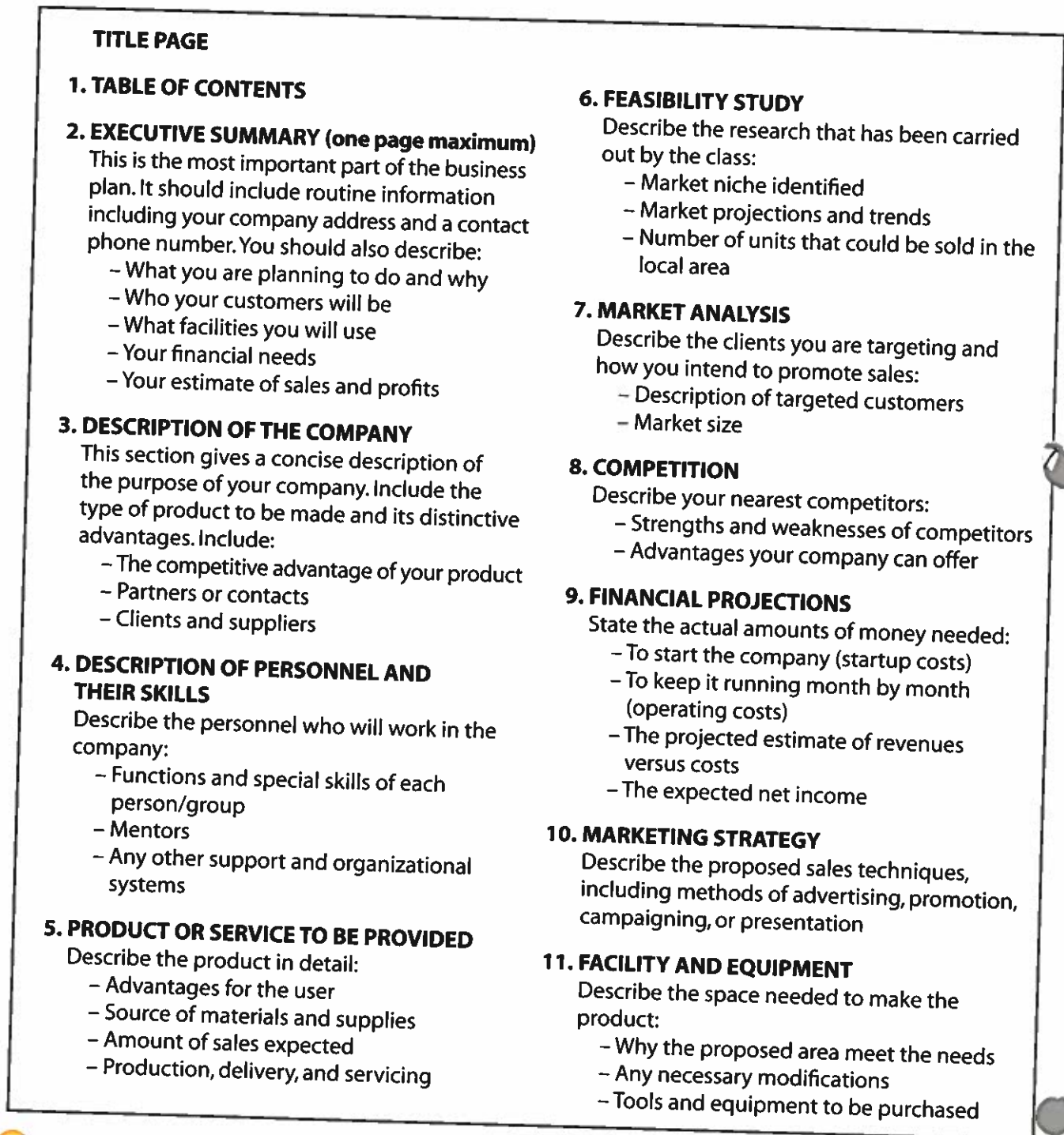


Figure 17-12. A template for a detailed business plan.

Obtaining Capital

The amount of startup money your business will need depends on the type of business. Plan for enough operating funds to keep the company going for the school year. You may need to borrow at least a small amount of money. If so, how much is required? When will the money be needed? What is the best source for financing your business?

From a corporate point of view, there are only two ways to raise money. **Debt** occurs when you take a loan from a bank or other financial institution. These institutions do not usually invest directly in a business. They make money from the interest they charge on the money they lend. Your business must repay the money, plus interest, regardless of how well the business is doing. You may hear people refer to debts as **liabilities**.

Equity, on the other hand, does not have to be repaid. Instead, the person who provides the equity invests in the company. He or she owns a part of the business. If the business fails, the investors lose their money. If the business is successful, investors share in the profit. The disadvantage of using equity is that the investors own part of the company and have control in the business. See Figure 17-13.

Entrepreneurs often finance their startup costs using personal credit cards or savings. Other alternatives include negotiating supplier credit, obtaining personal loans from banks, or getting loans from family members.

Specifying a Budget

A **budget** is an estimate of costs and expenses that a company does not want to exceed. Planning a budget is an important tool for making a company successful. To create the budget for your company, first determine all of the things you will need. Include the cost of equipment or tools needed, as well as supplies and any **overhead expenses** (utilities, rent, and salaries). The cost of equipment and tools is generally a startup cost. It only happens once. Overhead expenses are ongoing expenses that the company will need to pay on a regular basis.

Accounts Payable	15,000	0
Notes Payable	0	0
Line of Credit Payable	0	0
Taxes Payable	0	0
Other Current Liabilities	0	0
TOTAL CURRENT LIABILITIES	15,000	0
Long Term Debt	20,000	19,000
Other Long Term Liabilities	0	0
TOTAL LONG TERM LIABILITIES	20,000	19,000
Owner's Capital Contribution	50,000	50,000
Owner's Draw	2,000	2,500
Earnings	10,000	12,550
OWNER'S EQUITY	58,000	60,050
LIABILITIES & EQUITY	93,000	93,300

Figure 17-13. Business owners keep careful track of liabilities and equity to help make sure the debts can be repaid and the investors will make a profit.

Next, list your startup money and expected profits. Compare the expenses and money on hand. Plan to spend only the money that is available at a specific time. The purpose of budgeting is to ensure that you do not spend more money than you make, causing your business to fail. See **Figure 17-14**.

Financial Factors

For a class-based business, you may be able to use school facilities. This will significantly lower your costs. The school may even allow you to use the space and any necessary equipment free of charge. In your business, as in any business, low overhead costs and low spending are better than running up large debts.

To create a realistic budget, you will need to determine the price for which your company will sell your product. Factors that help determine the price include:

- A projection of the number of items that will be sold
- The cost of making the product
- The cost of servicing the product (if you decide to provide service)
- Overhead expenses
- The expected break-even point

The **break-even point** is the point at which the income from items sold equals total expenses. After your company reaches the break-even point the company begins to make a profit.

Strategies to Minimize Costs

To stay within budget, most companies plan strategies to minimize their costs. For your school business, an example of minimizing costs is to get permission to use school facilities instead of renting space. You can also minimize costs by buying supplies in bulk. However, be careful not to buy more than you need. Plan your manufacturing methods to reduce waste as much as possible. Waste is expensive!

Figure 17-14. Budgeting and then keeping track of your company's expenses helps keep the company profitable.



Math Application

Cost Estimation

Accurate estimation of costs is essential to creating a realistic budget. If your actual costs are greater than you estimated, your company will go over budget.

The list of building materials shown below includes costs for raw materials, labor, and overhead. An example of a cost estimate is shown below.



Estimated Costs

Raw Materials		
Glass blocks (24 blocks @ \$13.43)	\$322.32	
Tile glue	17.67	
Grout	12.96	
Framing lumber	56.11	
Caulk	5.79	
Total materials		\$414.85
Labor		
12 hours @ \$32/hour		384.00
Overhead		
Utilities	211.00	
Equipment rental	160.45	
Total overhead		371.45
Total Cost		\$1170.30

Math Activity

Estimate the costs for your class business. First, copy the chart below to a separate sheet of paper. Then fill in the chart with your estimates. Be sure to itemize the costs in each category.

Item	Cost
Raw Materials (Itemize)	
Labor (Estimate the number of hours and multiply by the hourly rate you will pay)	
Overhead Costs (Itemize)	

Hiring and Training

The next task is to hire and train the staff. In your school-based company, the staff will consist of members of your class. First, identify the specific tasks that need to be done to run the company and make and sell the product. For each task your class identifies, you will need a task group, or department. The function of each department will vary depending on the product. **Figure 17-15** explains the tasks performed by various departments in a typical company.

Team Member Roles

To decide who will play which role in your school-based company, have each class member complete a form. Class members should state which group they would like to work in and why. They should also list their skills and qualifications for the position. As a class, and based on these forms, decide who will belong to each group.

Department	Typical Roles
Purchasing	Determining what needs to be purchased Completing paperwork Ordering items Receiving orders from vendors
Inventory	Maintaining a current count of supplies and products Notifying Purchasing when more supplies are needed
Management	Setting targets and specific goals with deadlines Motivating employees to do their jobs well Solving problems Keeping the business on target and within budget
Financial	Completing daily and monthly cash records Keeping a log of all sales and expenses
Personnel	Ensuring that each member of the team fulfills their work requirements Evaluating work schedules
Information Technology	Maintaining computers and computerized equipment in good working order Installing and maintaining any software used by the business Maintaining the company Web site
Customer Service	Work with customers before, during, and after sales to ensure customer satisfaction

Figure 17-15. Typical roles of departments within a company.

Mentors

One of the first steps in building a successful team is realizing that there are a lot of things you and your classmates do not know. You will probably need the help of experts. You have already identified a mentor to help you with your business plan. As you identify other information you need, you can search for mentors who can supply it. These people may be students, teachers, or other people in the community.

Mentors play a role in many different companies, not just those run by students. See **Figure 17-16**. For school-based businesses, however, experienced business and social leaders often volunteer their help. Smart business owners listen to the advice offered by mentors and other interested people. These people can give you the benefit of long years of experience for free. They can help your team avoid some of the pitfalls of starting a new business.

Mentors are particularly useful for suggesting ways to deal with financial and business management. They can also help you establish public relations. In some cases, they can help you extend product sales beyond the local area. Mentors provide business information, help your team focus, make recommendations, and act as a sounding board for your ideas.

Production and Quality Control

In Chapters 1 through 14, you learned how to design and make products. In Chapter 15, you learned about how products are manufactured and the difference between traditional and lean manufacturing techniques. For best results, you may want to use lean manufacturing methods in your business.

The inspection of products, or quality control, occurs in both types of manufacturing. In traditional manufacturing, products are inspected both during and at the end of the manufacturing process. This system is costly. When defective parts are found, they are usually thrown out.



Figure 17-16. Mentors can help all kinds of companies, especially small businesses, by giving financial advice and business tips.

With lean manufacturing, workers have a responsibility for the quality of the product throughout the manufacturing process. See **Figure 17-17**. When they find a mistake, the assembly is stopped and the situation that led to the problem is fixed. As a result, no products have to be thrown away, which reduces costs. This is why lean manufacturing is the preferred method for most businesses.

Preparing a Marketing Plan

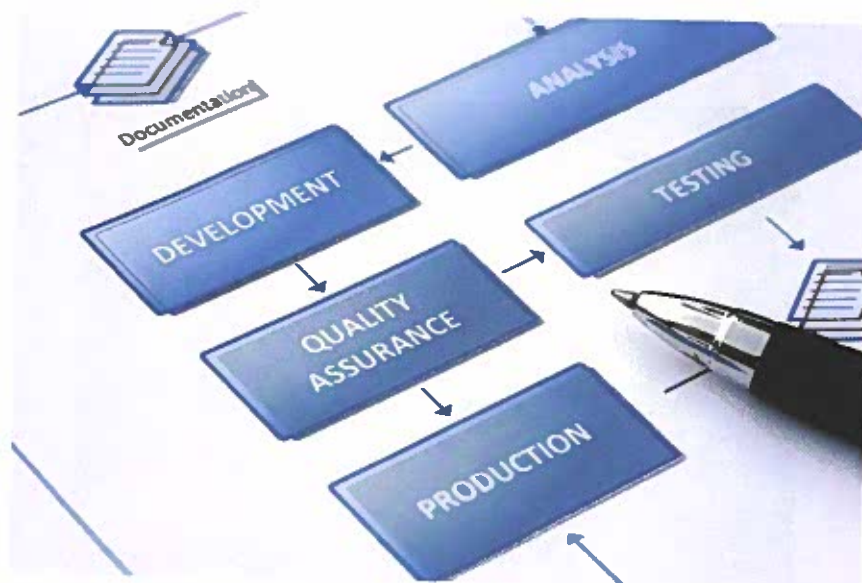
An effective *marketing plan* sets your product apart from your competitors' products. It describes how and to what kind of customers you will market your product. It describes the target market.

You can develop a good marketing plan only after you know the facts about potential customers. A marketing plan identifies the customers, attracts them to see the product, and persuades them to buy it. Who will buy your product? What are the characteristics of people who will buy your product? How can you best appeal to this market?

To start your marketing plan, first describe how your product is different from competing products. Next, think about your customers. You want to know as much about them as possible: their age group, income, education, and many other factors. These factors determine how you will present, or market, your product to the customers.

It is important to know your competition. Your market is influenced by your competitors and the strengths of their products. For example, if one of your competitors is offering a very low price, you may have trouble competing on price. It may be better to focus on their weaknesses and make sure your product excels in those areas. In this example, the competitor may be able to offer low prices because of a high output. If this is so, your company may be able to offer better product customization, with lower output. Customization would become part of your marketing plan.

Figure 17-17. Building quality control and quality assurance into the overall development and production of a product results in less waste. This helps control costs and makes the company more profitable.



Looking for a specific selling point or product need is called *targeting*. If you know your target market, you will know exactly where to focus your attention and resources. You can even design features especially for your target market. Targeting can reduce the competition because it allows you to meet specific needs more effectively than your competitors.

Advertising Your Product

Your advertising campaign is closely tied to your marketing plan. You will want to create advertisements that appeal to people in the target market. See **Figure 17-18**. What type of advertisements or promotions do they use? Do they use flyers, ads in local papers, or discount coupons? Do they buy only from local stores, or do they order from catalogs or the Internet?

To avoid misreading, keep your advertisements simple. Place the key message you want to convey in the headline. Emphasize unique benefits of your product, but do not make false promises. Use color for a greater visual effect and to increase the readability of the text.

Many different advertising opportunities are available to your business. You can use social media to let friends know about your product. You can distribute brochures at school or post a large ad in a strategic place. Contact a local paper and get a reporter interested in your product. You can even find a prominent person in the community who likes and uses your product and ask that person to promote it.



Figure 17-18. You can find many templates for advertising brochures, flyers, and business cards on the Internet. The template shown here might be appropriate if you are targeting customers who care about the environment.

Selling and Distributing Your Product

How and where will you sell your products? Will you need to rent retail (store) space, or will you set up a booth at school? Will your class receive requests by mail and ship directly from your classroom? Will your class sell from a Web site? These decisions depend partly on your methods of advertising and the customers you are targeting.

After you decide on your sales methods, you can determine how to distribute your products. If you rent retail space or set up a booth, you need only consider how to get the products to the store or booth. However, if you set up a Web site to sell your product, or if you accept orders by mail, you will need to set up a distribution system.

A *distribution system* is the method you use to get the product to the customers. For example, you could use the U.S. Postal Service to mail the product to your customers. See **Figure 17-19**. You could make arrangements with another delivery service, such as UPS or Federal Express. Whichever method you use, consider the charges involved. How much are your customers willing to pay for delivery?

Providing Customer Service

Customer service is the process of dealing with customers at all stages of customer contact. It includes helping customers choose the right product for their needs. It also includes making the actual transaction, of sale, easy for customers by being pleasant and helpful. Finally, customer service includes handling any questions or complaints customers have after they have purchased the product. This is also known as *customer support*.

Figure 17-19. Your method of distribution affects the packaging for your product. If you use a delivery service, the packaging must protect the product in transit.



The extent of customer service you provide after the sale depends on the type of product you are providing. At a minimum, your company should provide a way for customers to contact you. Supplying an e-mail address or phone number in your advertising material is one good way to do this.

Customer Service Representatives

Customer comments will vary greatly. Some customers may be delighted with the product. Others may believe it does not perform as advertised. The students who respond to the comments are your company's customer service representatives. They must have good communication skills and good people skills. They must also be familiar with all aspects of the product so they can explain it to people who may be having trouble using it. See Figure 17-20.

When a customer contacts your company, listen to the customer's point of view. Reply directly to the points that are mentioned. Pleasing customers is critical to good service. Your customer service representative's response can make the difference between an unhappy customer and a happy customer. Unhappy customers may talk to friends about their bad experience. Happy customers often bring in new clients.

Ethics and Legal Responsibilities

Businesses can be held accountable if they make decisions that are harmful to customers or the general public. In its simplest form, *ethics* is a matter of knowing right from wrong. Creating a reputation for being ethical can help your business become successful and stay successful. A company that makes a reputation for being unethical loses customers quickly.



Figure 17-20. Customers who cannot get a product to work frequently become annoyed well before they call customer service. Your company's representatives need the skills and patience to deal calmly with frustrated customers.

Ethical businesses avoid shipping faulty products. For example, if a product is discovered to be dangerous in some way, the company immediately stops selling it and offers refunds to people who have already purchased it. Although these practices may cost the business money, they can also help keep the company from being sued. They also help your company maintain the confidence of current customers. These customers are then more likely to return to your company and buy future products.

Closing and Evaluating Your Company

Most school-based companies are meant to last only through the school year. Near the end of the year, your class will close the company and liquidate its assets. Liquidation involves selling the company's assets, including leftover supplies, finished products, and any tools and equipment the company has purchased. It also includes paying all outstanding debts.

If money remains after all the debts have been paid, you will need to decide what to do with it. In a real corporation, the money would be divided among the stockholders. In your school-based company, your class may want to consider donating the profits to benefit people in your community. You may choose to donate to an established charity or to address immediate local needs, such as personal hardship caused by a plant shutdown or by a natural disaster. Helping out financially not only benefits the recipients, but also provides publicity for your school, your mentors, and any future school-based companies your school may form.

After liquidating the company, your class can review and discuss the experience of forming a company. What skills have you learned that may help you in later life? If you were to start over now, would you do anything differently? If so, what would you do differently, and why?

End
Note

As new technologies are developed, we tend to incorporate them into our daily lives. We depend on them. Can you imagine life without a telephone? Prior to Alexander Graham Bell's invention in 1876, people did not have telephones. The same is true of many other technologies we take for granted today. Think about all of the new career opportunities that were created just by the invention of this one device.

New technology almost always results in new career opportunities. In the future, you may have a chance to work in a field that is entirely unknown today. As you consider all of the possibilities now and in the future, do not forget entrepreneurial business opportunities. These can be especially exciting when new technologies are introduced. If a related career does not exist, you can create one!

Summary

Reading Target

- Many different types of career opportunities are available in technology, and new opportunities are constantly developing.
- A career plan is a tool that can help keep you focused on your career goals.
- To be successful in a career, you need soft skills as well as job-related skills.
- Students can participate in school-based companies or even form their own entrepreneurships.
- A school-based company provides an opportunity for students to gain experience in a risk-free environment.

Connecting to Prior Knowledge

Copy the following graphic organizer onto a separate sheet of paper. Allow space in each row for one or more sentences. Before you read the chapter, write sentences in the first column to record your current knowledge about careers in general and technology careers in particular. As you read through the chapter, record new concepts you learned by reading the chapter. When you are finished, review the chart to see how much you have learned. If you have questions about topics in the chapter, record your questions at the bottom of the chart. Ask your questions in class or do research on your own to find the answers.

What I Know (Or Think I Know) about Careers	What I Learned in This Chapter
Careers in Technology	
Developing a Career Plan	
Workplace Skills	
Student Career Opportunities	
School-Based Company	
Further Questions:	

Test Your Knowledge

Write your answers to these review questions on a separate sheet of paper.

1. What is the major difference between a corporation and a partnership or sole proprietorship?
2. What is an entrepreneur?
3. What personal traits should you assess before you develop a career plan?
4. Name at least six workplace skills you may need in a typical career.
5. Name at least two student organizations that can help technology students prepare for a career.
6. What is the purpose of a business plan?
7. Why do most school-based companies rely on mentors?
8. What is the difference between debt and equity?
9. What is a break-even point, and why is it important?
10. What skills do successful customer service representatives have?

Critical Thinking

1. Suppose a company has three partners who share equally in the company's debts and profits. After several years, profits are declining, and two of the partners want to dissolve the company. The third partner is convinced the company can be profitable again and does not want to dissolve the company. How could the partners resolve this disagreement fairly?
2. Suppose you own a company that makes toys for small children. Before selling each type of toy, you have it tested professionally to be sure it is safe and that it will not break under normal usage. A customer contacts your customer service department claiming that the toy she bought broke the first time her toddler used it. What should you do in this situation?

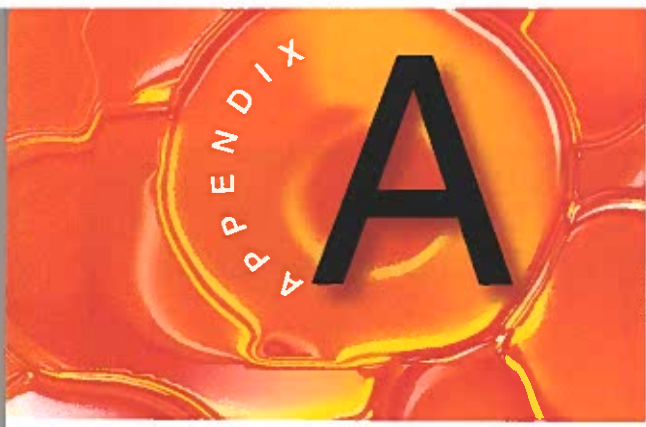
Apply Your Knowledge

1. Go to the TSA Web site (tsaweb.org) and find out what is involved in competing in a TSA event. As a class or in small groups, choose a competition in which you are interested. Read the detailed specifications and rules for your chosen event. As a class, hold a similar competition. How might this help prepare you for national competition?
2. Investigate other national competitive opportunities for technology students. Examples include First Vex Challenge, First Lego League, and BEST Robotics.
3. You know that more and more technologies are being developed. Many of these are the result of refining existing products to address special or related needs. Write an essay explaining why it can be said that “specialization of function is at the heart of many technological improvements.”
4. Technological activities and advances can be divided into four categories: applying technology, designing technology, producing technology, and assessing technology. Create a chart that shows technological advances in the last 50 years and the category to which each advance belongs.
5. Quality control is a very important part of any technological process. Prepare a multimedia presentation that shows how quality control can be accomplished in each of the major areas of technology.
6. Think about a business you would like to start. Prepare a short business plan that you could present to a mentor to gain more knowledge about how to start and run the business.

STEM Applications



1. **MATH** Suppose you are operating a store to sell widgets. Your total overhead costs are \$10,000 per month. You sell an average of 1,000 widgets every month. Each widget costs \$50 to make. If you marked up the price by 20% and sold 1,000 widgets, you would make \$10,000, because $20\% \times \$50,000 = \$10,000$. Since your operating costs are also \$10,000, you would not make any profit. Calculate how much you would have to charge to pay yourself a salary of \$20,000 per year.
2. **TECHNOLOGY** Throughout this chapter, the point has been made that new technologies provide new career opportunities. However, technology plays a larger role. Investigate how technology has affected the process of searching for, obtaining, and keeping a job. How is job-hunting today different from job-hunting 50 years ago?



History of Technology

Period	Food	Shelter	Clothing	Defense	Transportation	Communication	Health
500,000–10,001 BC	-hoe -harpoon -nets for fishing	-cave -painting -hides over frame -oil lamp	-animal skins -needle	-fire -spear -bow and arrow	-dugout	-hieroglyphics	
10,000–1 BC	-Archimedes' water screw -waterwheel -quern to grind corn -trained animals to pull plows -pottery -spoon -fishhook -sickle	-sun-dried mud hut -lock and key -rope and pulley -gear -brick -arch -nail -glass -bath	-vertical loom -cosmetics	-monumental stone buildings -bronze and iron weapons -knives -swords -sling	-sled -wheel -sail -boat -skis -harness (oxen)	-ink and paper -cuneiform writing -Phoenician alphabet -astrolabe -Etruscan alphabet -first coinage -papyrus -maps	-false teeth
AD 1 – 1399	-aqueduct -windmill -horse collar -horseshoe -porcelain drinking vessels	-stained glass -Roman central heating -clock -dome -chimney	-spinning wheel -trousers -felt hat -button -lace	-crossbow -bronze-cast cannon -gunpowder -gun	-magnetic compass -Roman roads -Viking longboat -horse stirrup and saddle -rudder -skates	-movable type -paper from bamboo (Chinese) -stencil -pen -printing	-hospital -spectacles
AD 1400 – 1699	-ice cream -pressure cooker -bottle cork	-wallpaper -watch -fneodolite -water closet (toilet) -thermostat -barometer -surveying instrument	-knitting machine -umbrella	-artillery shell -naval mine -hand grenade -rifle -submarine	-diving bell -dredger -telescope -wheelchair	-Gutenberg's press -arithmetical signs (+ – = X ÷) -news paper -envelope -calculating machine	-toothbrush -artificial limbs -microscope -thermometer -inoculation
AD 1700 – 1849	-canned food -threshing machine -carbonated water -steam tractor -reaper -seed drill -sandwich -fertilizer	-electricity -street lighting (gas) -iron frame building -fire extinguishers -cement -matches -central heating	-spinning jenny -power loom -colton gin -sewing machine -waterproof coat -dry cleaning	-Winchester rifle -standard parts for guns -machine gun -shrapnel	-pneumatic tire -bicycle -lifeboat -locomotive -hot-air balloon -sextant -roller skates	-metric system -photography -lithography -typewriter -Morse's telegraph -Braille -steel pen -eraser -postage stamp	-bifocals -anesthetics -sedatives -porcelain false teeth -ambulance -vaccination -plastic surgery -stethoscope -blood transfusion

The six simple machines were developed during this period